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FEUP FACULDADE DE ENGENHARIA UNIVERSIDADE DO PORTO

The morphological sense of commerce

Symbioses between commercial activity and the form and structure of Portuguese medium-sized cities

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To Sílvia

"But here the omnibus stopped; people got in and out; the omnibus went on again — but it's better to give the work to a small man, she thought, looking at the huge plate-glass windows of one of the large shops, instead of going to one of those big firms. There were always small shops side by side with big shops. It puzzled her. How did the small shops manage to make a living? she wondered"

Virginia Wolf, 'The Years' (1937)

ACKNOWLEDGMENTS

Hello.

First of all, so that his name can appear in the first paragraph (not because it is customary, but because he truly deserves), I would like to thank Professor Paulo Pinho. It was he who first invited me to do this thing called a PhD when I was working in the private sector, and then gave me the honor of becoming my supervisor. Apparently, once wasn't enough, for he had been my supervisor when I took my Master's Degree. I must have done a good turn somewhere. Few people have the ability to say a lot in just a few words. Professor Pinho is one of those persons.

This being said, bear with me while I talk a little nonsense. If you don't want to bear with me, fell free to skip to Chapter 1 – Introduction.

The one thing that my grandfather always taught me was that 'cities are conquered on foot'. I have always deeply appreciated the wonderful pieces of wisdom my grandfather shared with me, but he forgot to tell me that when working on a PhD thesis about commercial activity, 'foot' is not enough. You need 'feet'. Both of them. The right one and the left one. Gladly, unlike Garfield, I was not born with two left feet, so I have to thank many generations of Marinhos and Saraivas for what I can only refer to as 'some sturdy genes'.

Probably because they do not wish to be conquered, cities are not very pedestrian-friendly. After strenuously trotting along every single street, every single sidewalk (when they did exist!) and every single footpath, in order to get to every building and discover every single shop, in each of the four cities studied, I can only express my deepest gratitude towards my shoe manufacturer of choice: Nike. My pair of white Court Tradition's has been my most faithful companion in my journeys, and has (mostly) allowed me to avoid many painful blisters. To this day uneven sidewalks, unpaved roads, uncertain terrains, overzealous car drivers, and very odd constructions in very odd sites still haunt me in my dreams.

Having spent many hours, days, weeks, months even (no, not years), roaming the streets, I have come across very interestingly peculiar characters. To them all, my thanks. There were those which peered at me with curious eyes, dying to ask me questions, but never did. There were those who side-glanced me as they walked by. There were those who stared, and stared and stared. There was that man in Aveiro who became very much interested on how I had gotten a bird's eye view map of the city (which I had printed from google.maps!). There were those who whispered as I went along (no doubt commenting on my good looks), and those who leered. There were those who audible debated my presence, as if I was not there. There were those who feared for their lives when they saw me cataloguing their store. Some hid in the shop. Some stood at the door facing me menacingly. There were those who approached me abruptly. Countless asked me disrespectfully what the **** I wanted. In four cities and over 8.000 shops, only one shopkeeper (of those who approached me) treated me with decency and respect. It was in Leiria.

I want especially to thank that lady in Vila Real, who took time from her undoubtedly busy schedule to exit her shop, spy on me for 2 or 3 minutes, then proceed to insult me, harass me, demand that I should explain my procedures, comings and goings and photo-taking, (which I did), all in a, shall we say, yelling tone of voice, then demand my credentials only to, upon seeing them, stipulate that they

could be a forgery, and then continue to yell and insult me as I turned around to leave, not stopping until I was way down the road. I still think of her this day.

It was more than adding a local color to my work. They truly helped me to further develop my character. For the sake of all the shops, regardless of color, creed, education or basic decorum, I carry on.

None of these journeys, nor indeed the investigation as a whole, would have been possible without the silent, yet sound, financial help of the Foundation for Science and Technology (FCT). They were kind enough to grant me a 4 year scholarship without ever setting eyes upon my person, and, albeit having a few difficulties in answering phones and handling bureaucratic procedures, are a prove that this country still believes in investigation, in gaining knowledge, and that it is willing to finance young sound minds (modesty forbids me to think myself as one of those) in the pursuit of that knowledge.

Nor could I have gone to the four cities in question, had I not some very fine people in each municipality who have answered my e-mails, received me in meetings and sent me the information and material I needed to proceed. My thanks to António Soares and Paulo Mesquita of Aveiro's City Hall, to Olga Cravo and Adriana Jacob of CIRA, to Carlos Borralho of Évora's City Hall and to José Carlos Fernandes and João Gonçalves of Vila Real's City Hall. It was João Gonçalves who once told me he could not send some material by e-mail because it was too heavy, and then forced me to travel 200 km with a 500 GB disk so that I could retrieve, in the end, a 516 kB file. It was a nice day. I wish I could thank someone in Leiria, but I never heard from anyone there. After countless e-mails and phone calls with secretaries with no avail, I received, a couple of months later, like an apparition, a letter containing (some of) the information I required. Although I tried, I never heard from them again.

I also wish I could thank someone in each city's Commercial Association. My phone calls and e-mails have never been answered, except once. Évora's commercial association told me, in a marvelous piece of writing, that they did not have any information concerning commercial spaces, and dutifully supplied me with the phone number and e-mail of the city hall. Needless to say that my faith in Commercial Associations has never been the same since. On the other hand, the very fine people of INE were very quick in answering my e-mails and supplying me with the information I required, although, apparently, they seem to have lost the databases from 1981 and 1991.

When not travelling I found a home in SPTA, in FEUP, and became a member of CITTA. They even gave me an office, can you imagine that! These acronyms mean something more than just institutions and departments. They mean people, all with whom I have connected in different ways and became, yes let's say it, more than colleages, friends. Thank you, all you lovely people at SPTA, who, notwithstanding your own problems, your own research, had the misfortune to put up with little old me, my peculiar views and unbashful ways. Many a torment I gave their ears, many a lunch we shared under a cloud of rapturous monologues (or so I thought). Poor kind souls. Poor AJ and Lopes and Zé Pedro and Aninhas and Cecília and Diana, and so many others who right now are mad at me for not being mentioned by name. I am sorry if I ever bored you to death, or gave you an indigestion. Luckily (for them) I spent the last 6 months writing the thesis at home. They only had to put up with me for 3 and a half years.

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you always had patience for my problems. Thank you Prof. Fernanda Sousa and thank you Miguel Torres for long answers to quick questions. It was also Torres who challenged me to write an usual set of acknowledgments. If you are bored, dear reader, please take it up with him. He is now at Cambridge. Like Rick, he went there for the waters. He was misinformed.

And then there are all my friends, from football, from the cinema sessions, from the theater (which I could perform in the first, second and third year of PhD, but not on the fourth – too much work, confound it!). I don't think I ever mentioned my PhD to them in the first three years, and I don't think I ever mentioned anything else in the fourth. But as the Bard says, 'all's well that end's well'.

I would also like to thank all the doctors that have attended my illness for the last 15 years, without avail. Thank you for discarding my problem, just because the illness is little known, there is no national day or collection, there has never been a TV special about it, and to this day there is no text-book cure for it. Thank you for the days I was so full of pains I could not work. Thank you for all the others in which I did work, but just through sheer will power.

An ethereal thanks to William, who many years ago taught me how to write. I mean really write. Writing is an art, whether it is on a novel, a sonnet or a doctoral thesis. If words don't flow, regardless of the subject matter, then readers will drop like flies. There is nothing more sad than unread words, words on a shelf that no-one looks at. Hopefully, this thesis will present more than words, and will not lose itself on a shelf, sandwiched between two more, half-forgotten, documents. To spend 4 years on a single research one has to believe it is, first, any good, and second, important. Well, it is good to be important, yet it is more important to be good. One may not succeed, but at least it is one's duty to try. Here is my humble attempt.

So to you, dear reader, my very special thanks. If you are reading this, you have made it to the third page. Just a few hundred more to go. It is for you, and for the sake of knowledge sharing, that this has been written. Let it not rust on a shelf.

Further righting skills came from Agatha, Charles, Leslie, Herbert George, Ian, Jane, John Ronald Reuel, Virginia. If only my words filled the page as yours, this would have been a synch. And of course I would like to thank Thomas, who more than often, every time I needed to be focused and 'in the zone', took me to 'That Next Place'.

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But lo, this is a contradiction, for my heart belongs entirely and alone, selfishly, to Sílvia. A cliché would be to say that 'If nothing good comes of this PhD, at least it led me to you'. But something good did come of this PhD, even before it is published or defended. It led me to you. You are my love, my light and my life. I will not write here how much you mean to me, to my life, to who I am, and how important you were to this PhD. That is for your eyes only.

Final words? As Scarlet O'Hara would say (if she ever was granted a PhD scholarship and if Rhett ever allowed her to work at an University): 'As God as my witness, I shall never write another PhD

again’. A post-graduation? Maybe. But never a PhD. Hurray for me. After all, tomorrow is (indeed) another day.

Much obliged. Enjoy.

ABSTRACT

The act of buying and selling has evolved from being considered a simple need to being regarded as one of the principal wealth generators of post-modern societies. Commercial activity has therefore not only been the cause of much (most of the times unsubstantiated) debate by a large array of actors but also, increasingly, been the object of detailed (and substantiated) research. If at first glance it appears that everything has already been said regarding this activity's role in modern cities, there are nonetheless two crucial elements that seem to elude current theories and practices. First commerce is more than often considered as a dependent variable, that is, its location, characterization and performance is taken to be a mere consequence of the city's market conditions and consumer behavior patterns. Few have assumed that commerce can actually have an active, rather than a reactive, role in the structuring of the urban realm. Second, due to the first reason, most commercial studies have focused on the geographical, economic and social fields of research, more than often merely concerned with maximizing market shares. The *morphological sense* seems to be generally absent in commercial research. Only in the last 10 years have authors addressed this issue, but it has mostly been through the form of sporadic contributions, presenting focused views (considering one single variable in one single city) that nonetheless do not zoom on the micro-scale, and lacking interdisciplinary approaches. This lack of integration, paradoxically, results in a lack of data available, which also contributes to a general lack of knowledge, that can justify the inadequacy, even if well intended, of many commerce-related decisions and the inexistence of proper public policies.

This research, therefore, acknowledges two facts: that commerce may not (always) be a dependent variable and that the 'morphological' component can contribute, more than it is supposed, to the understanding of commercial patterns in cities. With this in mind the literature review is devised in order to show that a theoretical link between the form and structure of cities and the commercial landscapes they possess can be established, through the contribution of various fields of research. Once this is achieved, and focusing particularly on the Portuguese medium-sized city scenario, concrete evidences on the existence of this link are obtained through a case-study analysis that contemplates more than one city, compiles data and research techniques from more than one field, and introduces new methodologies. Consequently, four original GIS city-models/databases, one for each city, containing commercial, morphological, structural and temporal variables were produced, explored and compared. If these models can contribute to overcome the lack of data on commercial research, their interpretation can unveil which micro-scale morphological variables inherent to city spaces can affect (and be affected by) commercial behaviors. In this regard this research can offer the justification for known, but seldom proved, phenomena, contradict popular 'myths', and provide new findings and hypothesis. These include (i) a series of indicators concerning commercial/morphological behaviors and needs, that can constitute values of reference or comparison for other studies or commercial policies; (ii) the evidence that cities with more morphological (rather than statistical) similarities will have, on the micro-scale, more commercial similarities; and (iii) at least six overall aspects that constitute the bridge between commercial activity, and the form and structure of cities, of which all other variables seem mostly to depend on. This contribution can assist planning practitioners to make informed decisions when designing regulations and implementing projects, as well as offering the theoretical basis that can, in the future, improve Retail Location Theory decision-making at various levels, increase the capacity and probability of success of planning policies concerning commercial spaces and ultimately, contribute to the optimization of the benefits these can offer to cities.

Keywords: commerce, medium-sized cities, urban morphology, Space Syntax, urban planning

RESUMO

O acto de 'comprar e vender' deixou há muito de ser considerado uma mera necessidade para ser visto como um dos principais geradores de riqueza das sociedades pós-modernas. Deste modo, a actividade comercial não só tem sido a causa de um acérrimo debate (muitas vezes pouco substanciado) por parte de uma grande panóplia de actores, como também tem sido, cada vez mais, objecto de uma detalhada (e substanciada) investigação. Se à primeira vista poderá parecer que já tudo foi dito no que respeita ao papel desta actividade na cidade moderna, existem contudo dois elementos cruciais que aparentam não fazer parte do pensamento teórico e das execuções práticas desta vertente de investigação. Primeiro, o comércio é considerado, a maior parte das vezes, como uma variável dependente, isto é, a sua localização, caracterização e *performance* é tida como uma mera consequência das condições de mercado e dos padrões de consumo. Poucos são aqueles que assumem que o comércio poderá ter um papel activo, em vez de reactivo, na estruturação do espaço urbano. Segundo, em consequência da primeira razão, a maior parte dos estudos sobre o comércio têm-se focado nas vertentes geográficas, económicas e sociais, muitas vezes apenas com o intuito de maximizar a rentabilidade dos estabelecimentos. A vertente morfológica aparenta estar, geralmente, ausente da investigação sobre comércio. Apenas nos últimos dez anos um conjunto de autores tem tentado abordar esta problemática, mas mesmo assim esta contribuição tem aparecido de uma forma esporádica, através de visões muito focadas (análise de uma só variável numa só cidade) mas que contudo não abordam a micro-escala, e com uma clara falta de integração inter-disciplinar. Paradoxalmente, esta falta de integração tem como consequência a falta de informação disponível sobre comércio, o que contribui para a falta de um conhecimento geral sobre as dinâmicas da actividade, o que bem poderá justificar a falta de adequação de muitas decisões tomadas, mesmo que bem-intencionadas, e a inexistência de políticas públicas convenientemente ajustadas.

Consequentemente esta investigação considera como basilares dois factos: que o comércio poderá não ser (sempre) uma variável dependente e que a componente 'morfológica' poderá contribuir, mais do que normalmente é considerado, para a compreensão dos padrões comerciais nas cidades. Com isto em mente a revisão da literatura tem como objectivo mostrar que um elo teórico pode ser estabelecido entre a forma e a estrutura das cidades, e a paisagem comercial que elas possuem, através da contribuição integrada das várias disciplinas que abordam este tema. Uma vez isto estabelecido, e focando particularmente nas cidades Portuguesas de média dimensão, provas concretas da existência deste elo são obtidas através de uma análise de casos de estudo que contempla mais do que uma cidade, compila informação e usa técnicas de investigação provenientes de mais do que uma disciplina, e introduz novas metodologias. Consequentemente, quatro bases de dados/modelos virtuais, um para cada cidade, completamente originais, contendo informação comercial, morfológica, estrutural e temporal, foram construídos, explorados e comparados numa base SIG. Se estes modelos permitem contribuir para eliminar a falta de dados existentes sobre a actividade comercial, a sua interpretação, à micro-escala, pode revelar quais as variáveis morfológicas dos espaços urbanos que podem afectar (e ser afectadas por) o comportamento dos espaços comerciais. Neste sentido, esta investigação pode oferecer a justificação para fenómenos conhecidos, mas raramente provados, contradizer 'mitos' populares, e apresentar novas descobertas e hipóteses. Estas incluem: (i) uma série de indicadores de comportamento e necessidade comercial/morfológica das cidades, que podem constituir valores de referência ou de comparação úteis para outros estudos ou políticas comerciais; (ii) a prova de que cidades com maiores semelhanças morfológicas (ao invés de estatísticas) vão ter, à micro-escala, comportamentos comerciais mais semelhantes e (iii) pelo menos seis elementos gerais que caracterizam a ponte entre a actividade comercial e a forma e a estrutura das cidades, dos quais

todas as outras variáveis aparentam depender. Esta contribuição poderá auxiliar profissionais da área do planeamento a fazer decisões informadas ao nível da criação de regulamentações e da execução de projectos, bem como oferecer as bases teóricas que poderão, no futuro, melhorar a vários níveis a tomada de decisão em processos envolvendo a Teoria da Localização Comercial, aumentar a capacidade e a probabilidade de sucesso de políticas de planeamento no que respeita os espaços comerciais e finalmente, contribuir para a optimização dos benefícios que estes podem oferecer às cidades.

Palavras-chave: comércio, cidades médias, morfologia urbana, Análise Sintática, planeamento urbano

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ACRONYMS

B2C – Business to Consumer

CBD – Central Business District

CPT – Central Place Theory

DGAE – Direcção Geral das Actividades Económicas (General Board of Economic Activities)

GIS – Geographic Information Systems

ICT – Information and Communications Technology

INE – Instituto Nacional de Estatística (National Statistics Institute)

PDM – Plano Director Municipal (Municipal MasterPlan)

QCA – Quadro Comunitário de Apoio (Community Support Framework)

RLT – Retail Location Theory

SIT – Spatial Interaction Theory

UCDR – Unidades Comerciais de Dimensão Relevante (Commercial Units of Relevant Dimension)

ULM – Urban Landscape Model

M1 – Multipurpose 1

M2 – Multipurpose 2

MC – Multipurpose Comparison

C – Comparison

S – Single Isolated Purchase

"The social activity named commerce, as bad as it is seen nowadays by theorists of impossible societies, is still one of the two distinctive characteristics of the so called civilized societies. The other distinctive characteristic is the one named culture. (…) It is, indeed, noticeable that the societies which most prominently have stood out in the creation of cultural values are the ones which have prominently stood out in the assiduous exercise of commerce. Commercial, eminently commercial, was Athens. Commercial, eminently commercial, was Florence. (…) As commerce is, by nature, an economic interpenetration of societies, it is in commerce that the material relations between societies reach their full height[1]."

(Fernando Pessoa, 1926)

1
INTRODUCTION

1.1. BACKGROUND

1.1.1. STATE OF THE ART

To live is to shop. In Stanley Kubrick's film '2001: A Space Odyssey' (1968) the dawn of man occurred when he discovered how to turn a bone into a working tool. The dawn of society might as well have happened when the first commercial transaction took place. Since the Industrial Revolution, when the 'shop' gained a permanent physical location within the city and became 'aware of itself' (Pessoa, 1926), the act of 'shopping' has become an integral part of city-living.

Cities are more than people, and more than space. They are people in a space. And commerce may be the link between the inhabitants and the spaces they use. First, people shop for necessity. Then, they shop for pleasure. If cities have evolved from 'artifacts' (Karaman, 2001) to 'organisms' (Moudon, 1997), commerce has evolved from being considered just an 'economic activity' to an 'experience' (Pine, Gilmore, 1999), as the paradigms of both commerce and consumption change (Cachinho, 1994). And because it is so, there is a growing interest in the proven capacity commerce has of driving urbanization processes (Evers, 2001) and of promoting and developing successful urban spaces (OdC, 2000a), boosting their economic and social value. A clever succession of shopping windows can give color to a street. Street cafés fill the sidewalks and allow for resting places. On the other hand, big box developments in peripheral areas (although much debated) have been crucial to land development, and in-city shopping centers have been the key to many successful downtown revitalization projects (Whysall, 1995; Lowe, 2004, 2005; Emery, 2006).

[1] Translation by author.

Inspired by documents such as the 'Manifest of Barcelona' and the 'Memorandum of Oporto'[2], European planners have been trying to understand how retail-led regeneration can be beneficial to city centers (Fernandes, 1994; Balsas, 2000, 2001; Moreira *et al*, 2006) and what policies they should adopt (Balsas, 2001; Musso, 2010; Grant, Perrott, 2011). In whatever form, commerce will always be where people are, or else (given enough momentum) it will make people be where it is. And this is translated into changes in the economic and morphological composition of cities.

Although this is, in theory, consensual, the truth is that the understanding of commerce as a structuring element of the 'organic' city has never been given enough importance in the literature. Until recently, commerce's geographical dispersion was considered as an after-the-fact consequence of the city's economic market conditions, consumer behavior patterns and demographic conditions (Borchert, 1998). The relationship between the two entities – commerce and city – was considered as a one way flux; from city to commerce. Fluctuations in the market justified alterations in the commercial landscape, which inevitably sought the best conditions, and no-one assumed that commerce itself could be the cause of such shifts in the value of locations.

The literature has treated commerce as a dependent variable, a consequence, not a cause. According to this point of view, historians and geographers have weaved the evolution of commercial hierarchies in the city (Kwan-Yiu, Kong-Sut, 1971; Axenov *et al*, 1997; Borchert, 1998; Wang, Jones; 2002; Fernandes, 2003; Shan, 2004), sociologists have tried to understand the behavior of the shopper (Gregson *et al*, 2002; Sinha, 2003; Sinha, Unyal, 2005; Sarma, 2007) and of those who sell (Varanda, 2004); and economists have dwelt on the values of location, in terms of market-shares (retail location theory - RLT), using various mathematical models (Yrigoyen, Otero, 1998; Mendes, Themido, 2004, Reynolds, 2005). In Portugal and in other European countries, the consensus among the authors was that commercial planning was mostly inexistent (Guy, 1994) or was left to the private sector, and urban planners had a little understanding of commerce (Nuno Portas *in* CCRC, 1995) or treated it as a second rate activity (Fernandes *et al*, 2000). There was not a planning for commerce, but just a global planning that mentioned commerce occasionally (Borchert, 1998). Even retail-led regeneration projects were many times evaluated solely through their economic spill-over capacity, and their ability to keep the market share of their hinterland (Lowe, 2005).

The motto of RLT is '*location, location, location*' (Taneja, 1999, *cit in* Porta *et al*, 2007) and that the '*site makes the shop*' (Alexander *et al*, 1999). According to this theory, the success of a commercial establishment depends on the favorable market conditions of a given site. But location is much more than a mere physical place on a map. Location is much more than the economic capacity of the customers in the catchment area, and the market competition. Location is accessibility. Location is built landscape. Location is layout and design. That is, location is also *morphology*.

Recently, authors have been calling attention to the lack of urban morphology elements in commercial literature (Van Nes, 2005; Sarma, 2006) and to the lack of knowledge on how urban form affects the spatial distribution of retail activities (Villain, 2011). Urban environment conditions have, according to Axenov *et al* (1997), significantly increased their impact and turned into the major group of factors that shape the commercial spaces' market.

Yet the understanding of this impact is still limited. Most morphological studies present a narrow view, and lack an interdisciplinary approach. If geographical studies of store pattern spatial analysis were limited because shops were considered as having the same weight (just dots on a map) and existed in a space without (morphological) characterization, the first studies introducing elements

[2] Outcomes of the 4th and 6th 'Congress of Urban Commerce' held in 2004 and 2006, respectively.

intrinsic to 'the city' were direct geographical pattern comparisons. RLT compares store location with estimated business volumes, while other studies simply overlap commercial distribution maps with those of socio-economic densities (Kompil, Çelik, 2006; Smith, 2006; Barke, 1997) or land-use and transport networks (Jingman, 2009; Villain, 2011) at city level, or even at regional or national level (Marques, 2003). Joosten and van Nes (2005) note that the literature focuses on the macro-scale and has not yet zoomed into the micro-scale (street, building).

When it does, there is also a distinction (seldom overcome) between the study of the store itself and the study of the urban environment in which the store is. The *interior* environment of the store has been characterized in economic/geographical literature through non-morphological characteristics (type of activity, sales data, employee information). Studies on intrinsic morphological characteristics of the store are rarer, focusing on building type, window display, and spatial layout (Barke, 1998; Allegri, 2010). Crime researchers have also analyzed store layout design (Saraiva, 2008, 2011) and technics to increase the safety of products through design (Lester, 2001), but their concern, to reduce shop burglary, is unrelated to the role of commercial activity in the city.

On the other hand, the *external* environment of the store has also received attention. The historical/geographical literature has developed time-lines of context, unrelated to the intrinsic characteristics of space, or to that matter, of commerce. For example, the works of Fernandes (1993), in Portugal, or Tokatli, Boyaci (1999), in Turkey, present demographic, urbanistic and political changes on one side, and commercial dispersion changes on the other, not linking them. The relationship of the store with the accessibility of the network has been clearly defined in the Space Syntax (or analogue models) literature (Van Nes, 2001, 2005; Joosten, van Nes, 2005; Sarma, 2006; Porta *el al*, 2007; Jingman, 2009, Villain, 2011), whilst shop dispersal has also been compared with the properties of city blocks and buildings (Tokatli, Boyaci, 1999; Yoshida, Omae, 2003; Joosten, van Nes 2005). While the latter approach focuses on the network, neglecting morphological characteristics apart from location in the grid[3], the former does exactly the opposite. Both however do not consider the types of articles sold and other intrinsic characteristics of *each* store. Lastly, many commercial urbanism projects also consist in physical improvements to exterior elements (street, parking spaces, shop windows, lighting fixtures, urban furniture) with the aim of creating attractive environments able to induce shopping. Studies on marketing and place-attraction have also been developed (Teller *et al*, 2010).

1.1.2. CHASING MYTHS

The facets of commerce, and the fields of research, seem endless. '*The emphasis of society is specialization, not integration, but both are needed*' says Whitehand (2007). It is true that commercial literature has specialized, and has tackled the economic, historical, geographical, social, physical and (to some extent) morphological facets of retail, but it has not yet achieved a level of integration. Furthermore, commerce is also important to other areas, such as leisure and tourism, whilst having a social and political importance. Not only it employs a vast number of people (voters), but also many stores, especially 'traditional' ones, are self-owned, therefore crucial to the small economy, whilst large-multinationals are important for each country's national and international economic growth.

But because of this vast amount of research, because everybody shops at a daily basis, because there are a great number of people working directly in the sector, and because its social importance makes it a constant theme in the *media* and in political agendas, the ideas about commerce (and particularly

[3] For example Topçu and Kubat (2007) morphologically compare 2 cities, solely through Space Syntax analysis.

about commerce and city) circulate more than they ought. Regardless of the literature, 'popular' knowledge on commerce has created many unsubstantiated myths. Commercial trends are often told as a worn-out tale, in broad strokes, and many alleged 'patterns' in shopping behavior have seldom been explored or debated in the literature, because they are taken for granted.

Traditional retailers still point their fingers to large shopping centers as the cause of their demise, but Thomas and Bromley (2002) argue that it is still being disputed whether edge of center superstores enhance the attraction of the center, compete with existing facilities or are completely neutral. In their English case study concerning an anchor superstore in a city center, they showed that the pedestrian flow occurred from the center shops to the superstore, and not the other way around as it would be expected (that the center stores would benefit from spin-off superstore shopping). At the same time traditional retailers are accused of lack of action and vitality (OdC, 2001a), and surveys show that people still shop at traditional stores[4]. Commercial urbanism policies and retail-led regeneration schemes are generally regarded as beneficial to city centers, but Guy (2004) urges planners to be careful with the maxim '*town center first, come what may*' and Instone and Roberts (2005) show how these schemes can be prejudicial to surrounding traditional local centers. Also Robertson (1999) shows that in American small-city downtowns commercial strategies are poorly rated in terms of revitalization projects. Other physical strategies, such as historic preservation, main street approaches and pedestrian improvements are much more popular. In Space Syntax there is a common notion that shops always locate in the most spatially integrated streets, and in those with a high degree of connectivity to its vicinity (Hillier *et al*, 1993; Hillier, 1999; Porta *et al*, 2007) but Teklenburg *et al* (1994) have already proven that, in the suburban case, this may not be so. Most literature views commerce as an after-the-fact consequence of the city. But the creation of new city areas and road networks around large-scale commercial facilities and the regeneration of derelict downtown spaces through shopping-led strategies are proofs that commercial planning may lead urban processes. And if this is true for larger commercial facilities, which have attraction enough, and power enough, and generate enough wealth for these changes to happen in the livability of spaces, it can be safe at least to propose that at a local scale this influence has happened all the time, to a lesser degree. Transport planners, for example, have analyzed the impact of retail in logistics models. If commerce can influence transport networks, then the flux of impact can go, as well, from commerce to city.

1.1.3. PORTUGAL AND MEDIUM-SIZED CITIES

The Portuguese context is a particular one. As most European countries with a medieval background, the traditional commercial heritage is still very much imprinted in city centers, but at the same time, Portugal is one of the European countries which has been most susceptible to the penetration of modern formats. Portugal has more than 100 large-scale shopping centers, with the capacity to receive simultaneously more people than there are in the entire country, and more are still opening. On the other hand, it is estimated that 13 thousand shops of traditional independent retail have already gone out of business[5], a number which has been increasing in the last couple of years due to the economic recession.

[4] In the first convention of independent traditional commerce held in Portugal in 2005, sponsored by MAKRO, Nielson showed that only 4% of inhabitants shop solely on modern types of retail, against 12% which buy exclusively in traditional ones.
[5] Data from the same convention.

One of the reasons for this can be the absence of a strong commercial legislation. Planning documents have devoted little attention to economic activities (Fernandes, 2007), and commercial planning is mostly limited to licensing large stores and controlling opening hours (Salgueiro, 1996). Control is reactive, never pro-active, and small 'traditional' establishments are mostly left to chance, or rather, to the market. Furthermore, the departments that regulate the city and create its laws are different from those which regulate economic activities (UACS, 2002). The organism that supervised commercial activity, the 'Observatory of Commerce', closed in 2002[6], so no more public studies were published on the sector[7]. Because of this lack of restriction in commercial planning, the eagerness for development has led to many mistakes of an economic and urbanistic nature (OEFP, 2008). On the other hand, commercial urbanism in Portugal is mostly dependent on European structural funds, and most studies have shown that there is a lack of integration between public and private actors, and a lack of dynamism from smaller promoters. Another reason can be that studies linking commercial activities and the morphological landscapes of Portuguese cities seem not to exist. Portuguese commercial studies have been led by a triumvirate of geographers (Fernandes, Salgueiro, Cachinho) which have tackled commerce according to their background, that is, presenting spatial/historical analyses of commercial evolution. Fernandes (1994), along with Balsas (2000, 2001) have focused on retail-led policies. Mendes (2004, 2005) has contributed to RLT literature and sales modeling and Allegri (2010) has presented an interesting study on the physical layout of shopping centers and arcades in the city of Lisbon, the single contribution to the morphological sense of commerce. Existing studies on Space Syntax in Portuguese cities do not focus on the commercial sector. Consequently, there is a variety of specific studies on the commercial field but a lack of integration between them and a lack of an overall assessment of the sector, which leads, paradoxically, to a lack of available data.

Meanwhile the modern commercial formats have mainly concentrated on the Western coast of the country, in the catchment area of Lisbon's and Oporto's metropolitan conurbations. For this reason, these two markets are now completely saturated. Accordingly, medium-sized cities have suddenly caught the attention of developers, as ripe unexplored markets. Because they still present a strong traditional retail inheritance, and their hierarchical organization structures have held longer, medium-sized cities are perfect scenarios for testing urban commercial policies. In larger cities the uncontrolled outburst of modern commercial formats resulted in a 'trend' that went too far. In Portuguese medium-sized cities, this did not happen, so the controlled commercial equilibrium between the traditional and the modern may prove to be much more beneficial to the city.

At the same time, medium-sized cities have been noticed in the literature, for different reasons. Their definition has not been consensual, and their role has changed accordingly (Marques da Costa, 2002). If in the 1960s they had a mere functional/demographic connotation, in the 1970s they meant quality of life away from large cities. In the early 1980s their roles as 'intermediaries' stood out. These cities started to be regarded as places able to correct regional unbalances and promote regional and economic development, but this view was still very hierarchically oriented (Ferrão *et al*, 1994; Almeida, Valença, 1995). In Portugal, medium-sized cities were seldom the object of research. If in other countries such as France state policies allowed for major investments in infra-structures, social facilities and accessibilities, in Portugal these occurred much later (Ferrão *et al*, 1994). The first Portuguese municipal programs to address medium-sized cities and induce their dynamics only

[6] By Decree-Law nº 217/2002 of October 22nd, 2002

[7] Private studies by Cushman & Wakefield or Nielsen have appeared since then, but obviously focus on the economic performance of the sector. INE, the national statistics institute, provides some statistical data.

appeared in the 1990s. PDM and PROSIURB[8] helped to bring the focus to sustainability, whilst strengthening the urban network. Nowadays, medium-sized cities appear as centers of knowledge and resources, attractive for investment. European funded programs such as POLIS XXI, InteligentCities or CIUMED approach a network-based territory and further promote medium-sized cities, as their role in the global economy increases, and they are (or aim to be) places of opportunity, innovation, specialization and globalization.

1.2. RESEARCH SCOPE AND CONCEPTUAL DISCUSSION

The first thing that this thesis acknowledges is that commerce is not (always) a dependent variable and has, by itself, city-shaping capabilities. Almost 100 years ago, commerce was already being called an 'art' (Pessoa, 1926), and the city 'child of commerce' (Pirenne, *cit in* Fernandes *et al*, 2000). It may be exaggeration to consider commerce a 'father' and a work of 'art', but these terms were not randomly chosen. To be a 'father' means knowledge, precedence and influence. To be 'art' means independence, creation and inspiration. If commerce has *inspired* a vast literature background, and has extended its *influence* to a vast array of research disciplines, it is because it can have *precedence* as an *independent* variable, and can assist in the *creation* of *knowledge* about the city. Retail no longer simply follows rooftops, it can also follow the '*anticipation of future rooftops*' (Beyard, 2009), that is, it can make city.

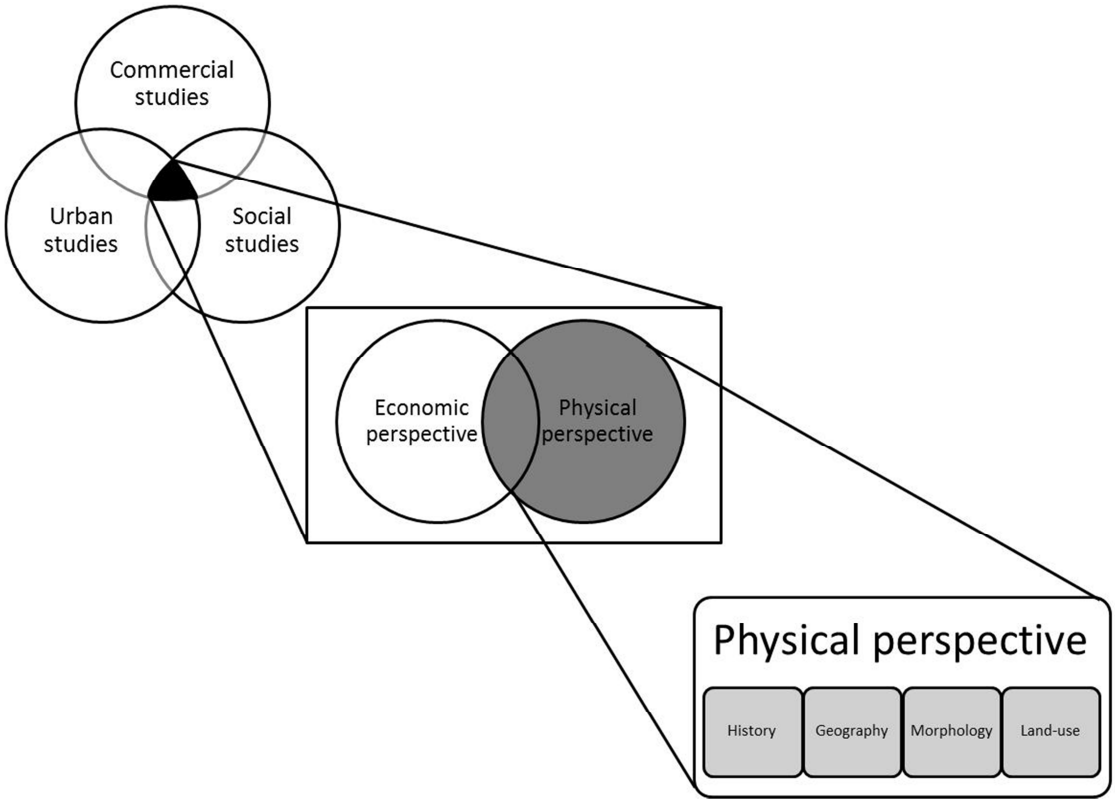


Figure 1 – Thematic framework of the research

[8] PDM is a Municipal MasterPlan which cities were bound to prepare in the early 1990s, whilst PROSIURB was a program implemented in 1994, with the purpose of consolidating the urban system by promoting strategic non-metropolitan urban localities, and by controlling the implementation of the PDM.

Cities change and evolve. But so does commerce. And these changes are neither random (Levy, 1999) nor independent of one another. Furthermore, they depend on a third element: the consumer. Because it would be impossible to achieve some coherent contribution considering all aspects of commercial studies, there was a need to situate the thematic universe of the thesis where these 3 groups of research meet (Figure 1). Nevertheless, the social aspects of shopping were not given the same amount of importance. To understand the consumer, the shopper, one would require extensive surveys concerning their needs and their shopping and mobility patterns, which were not carried out. But, because '*in retailing, everything is based on buying consumers*' (Skogster, 2006) the analysis of commerce cannot be independent of social conditions. Van Nes (2005) stresses that '*shopping is an economic activity essentially relating to the consumers' spatial behavior in a built environment*', so it was precisely through choices and perceptions in mobility (Space Syntax) that the social component was integrated in this research.

In the background it was established that the study of commerce and city was mainly associated to two distinct points of view: the economic and the physical perspective. The economic perspective falls out of the range of this investigation, not only because it considers commerce as a consequence of the city, but also because it deals with mathematical models which are mainly preoccupied with interpreting market conditions. The relationships to the external environment, to the location mix and to the consumer are only briefly considered as catalysts for the optimization of sales. One criticism to RLT as a way to understand the geographical dispersion of commerce is that it seldom considers small retailers. These are either pre-established, being in the same location for years, or use rules of thumb in their location choices. They can even locate in cheap available spaces, as is the case of some 'creative' and 'alternative' activities, going against any market logic or modeled pattern. Obviously, if these stores are successful nonetheless, the reasons are not entirely independent of the market conditions, so the economic focus should not be disregarded altogether. The theoretical background to current retail modeling (Clarkson *et al*, 1996) is also common to the background of the physical interpretation of commerce.

The physical perspective is the most logical way, for a planner, to interpret commerce. Most commercial transactions occur facing a public space ('the street'[9]), even if it is a semi-public space[10]. So the elements that define *that* space may have more relevance to the understanding of commerce than that which is usually assumed. Intuitively it is perceived that commerce is connected to the formation, organization and dynamism of public spaces. If the background shows that there have been economical and even social proofs of this connection, it stresses that there is a lack of physical evidences. Whilst historians and geographers debate shifts in location according to specific contexts, the morphological aspects of commerce – the morphological sense – has not been given enough attention (Conzen, 1980; Axenov *et al* 1997; Van Nes, 2005; Sarma, 2006; Villain, 2011). The acknowledgment of this fact opened an investigatory path that this thesis proposed to follow.

Rossi (*cit in* Lamas, 1989) said that city form corresponded '*to the way its architecture is organized and articulated*'. But current studies on urban morphology argue that form is much more than a narrow architect's concept. Karaman (2001) defines a place according to three elements: topology, morphology and typology, Levy (1999) defines urban morphology as the study, not of the 'historical' but of the 'modern' urban fabric, and Moudon (1997) presents three principles of morphology: form, resolution and time. Morphology is not just the study of form. It's the study of form and function over

[9]Polhemus (1994) wrote that '*the street is both the stage upon which drama unfolds and the bottom-line metaphor for all that is presumed to be real and happening in our world today*'.
[10] Whyte (1980) argued that '*street is being put almost everywhere except at street level*'.

time, in a given context. It's the study of *form and structure*. It is through this 'new' perspective already being used in the field of urban morphology that this research intends to look at commerce.

In a city the form changes slowly but the function can change rapidly. The methodology must define how to measure each element and how to integrate them. Concerning function (commerce) it seemed logic that only establishments with a physical presence in the city should be considered. Logistic platforms and e-tailing (web-commerce, tv-sales) were not considered. Their impact is economical and in transport logistics, and is less connected to the morphological elements of the city. Nevertheless, the web-connection of each store was taken into account. On the other hand, the temporal element of commerce could not be inserted into the methodology, because of lack of data[11]. In this case, the age of buildings was used to overcome this problem.

Concerning form, existing literature regarding the morphological analysis of commerce is generally focused and closed. This means that each study considers its own set of variables and neglects the whole. Geographical pattern comparisons do not consider the interior environment of the store, and those which do, do not consider, for example, the external environment (streets and blocks). Each study only uses one method of comparative approach, seldom divides the stores by activity or type, and usually dwells exclusively on one city or city area. For example Joosten and Van Ness (2005) reach the conclusion that in Berlin shops are located preferably in full block typologies, and discard all other variables. Although this correlation may be true for Berlin, it is easy to question its validity for other scenarios. Those studies which decrease their resolution and look at regional contexts loose specificity and only produce overall patterns for each city. The study of the macro-scale (either of commerce, either of morphology) is much more common than the study of the micro-scale, so there is a need to integrate them both (Moudon, 2002). There is a need, as well, to take into account the various types of morphological research already established, and use them together in more than one city, something that has not yet been done. Only then can the full scope of the symbiotic relationship between commerce and city be interpreted, and only then can the research make sure that the relationship measured is not an isolated incident, created by specific local conditions.

The choice to study medium-sized cities occurred for two reasons, already discussed in the background. First Portuguese medium-sized cities appear as particular commercial markets, balancing a central traditional heritage with the slow penetration of modern and large scale formats. And second, because of their increasing role in the urban network. Although many interior cities and regions are facing low economic, social and cultural periods (Marques da Costa, 2002), they are not '*mere miniature reproduction of larger conglomerates*' (Ferrão *in* CCRC, 1995). Changes in the forms of consumption, in mobility and in information technologies affect the character of these cities, either for good, or for bad when endorsing, for example, spatial dispersion (Daniani, 2006). New facilities, if not monitored, can also impact most adversely upon the middle order centers, creating a spiral of decline (Thomas, Bromley, 2002).

So there is a need not only to understand how commerce and city are morphologically linked, but also, as planners, to work for the strengthening, through commerce, of medium-sized cities. According to Lowe (2004) 'place building' is now entwined with 'retail planning policy'. By itself (through Public-Private-Partnerships, European incentive programs, or individual investments by promoters), commerce has already proved that it can command physical development, even surpassing planned development[12]. In these times of political and economic instability and decreases in consumption,

[11] As Tallen (2003) and Smith (2007) stress, the lack of data in spatial analysis is a constant problem.

[12] Like, for example, the rise of suburbia: '*Edge cities are the product not of urban planners who know how people should behave, but developers who know what people want and how they act*' (Dunphy, 2006)

where public authorities suffer the pressure of communities for more sustainable environments and economic growth, the role of commercial activity cannot be neglected. Schmit (*cit in* Fernandes, 1993/4) said that commerce could not be decreed because '*it creates itself, develops itself or declines according to economic laws*'. But if a symbiotic nature between commerce and the morphological elements of the city *is* proved, then the economic laws are not the only ones to dictate commercial behavior. And if so, although planning should not interfere with market logics, commerce can indeed be decreed, at least to some extent, through morphological changes in a city.

Fuller (*cit in* Ratti, 2004) said '*reform the environment, stop trying to reform the people. They will reform themselves if the environment is right*'. If, substituting the word 'people' for the word 'shop', the sentence still makes sense, then this research, as well, makes sense.

1.3. RESEARCH QUESTIONS AND HYPOTHESIS

Taking into account what has been described in the background, scope and conceptual discussion, three strategic objectives serve as motivation for this thesis: (i) to prove that the introduction of morphological variables can enrich the understanding of commercial activity in cities, which so far has been mainly characterized by geographical and economic variables; (ii) to overcome the lack of data on commercial activity and the specificity of existing analyses by introducing a work methodology based on the integration of the various fields of research, by studying more than one city, and by laying the foundations for a unique GIS-based research database; and (iii) to propose, bearing in mind the particularities of the Portuguese context, guidelines for future commercial planning policies and commercial urbanism projects that take into account the specificities of the form and structure of cities, and can, ultimately, contribute to the regeneration and sustainability of urban spaces.

Accordingly, the **research questions** are as follows:

1) What elements of the form and structure of cities, particularly micro-scale morphological characteristics of the built-environment, contribute to the location, characterization, and performance of commercial spaces? Are these characteristics, in turn, affected by the commercial spaces themselves?

2) How can a GIS database be designed in order to accommodate the various elements that characterize the form and structure of cities and, at the same time, promote integration between the various fields of research and increase the knowledge on commercial data?

3) How do Portuguese spatial planning instruments deal with the location and control of commercial spaces? Can the morphological understanding of commerce inspire guidelines for future planning regulations so that commercial spaces may be more aptly used as an integral element of the 'regeneration thesis'?

A research **hypothesis** can be thus formulated:

> ***Micro-scale morphological elements, that partially constitute the form and structure of cities, can affect (and be affected by) the location, characterization and performance of commercial spaces, and their assessment, in conjunction with pre-established commercial***

research and the development of a GIS database, can promote increased knowledge on the sector's trends and (morphological) affinities, and therefore produce a proper framework for future planning guidelines supportive of commercial urbanism.

1.4. METHODOLOGY

In order to test the research hypothesis, the methodology is based on: first, a literature review, second on an extensive data collection in four Portuguese medium-sized cities, third on a creation of a database using GIS software, fourth on an overlaying of several established techniques for aggregating, treating and comparing the collected data, and fifth on a qualitative and quantitative analysis of the outcomes.

The literature review, mostly done in the first year of research[13], has three distinct phases. First it focuses, individually, on the three major thematic elements concerning this research: city, commerce, and consumer. The aim is not to be extensive (there are other studies that focus specifically on each) but to develop brief analyses that not only supply context, but also define what elements of each entity should be measured in the empirical stage so that the proposed connection can be established. The literature review then tries to understand that connection between city and commerce, by establishing a time-line of research ranging from the fields of geography to economy and finally to morphology. This not only puts the present research into focus, by revealing the literature gaps that need to be filled, but also contributes with existing analysis' techniques that were subsequently used in the empirical analysis. To this is added a background on the planner's point of view. The objective is to discover how commerce has been used as a city-shaping instrument, through commercial urbanism projects, downtown regeneration schemes and urban retail policies. The consolidation of this theoretical research is essential for later laying the foundations for future planning measures, based on the outcomes of the empirical analysis, that not only are coherent, but also complement the common practices and are adequate to the specific Portuguese context. Accordingly, the literature review is concluded with the contextualization of the Portuguese scenario, focusing on commerce (hence characterizing the sector and revealing its trends) on commercial policies (the existing commercial legislation and the financed projects) and on medium-sized cities.

The literature review provides the necessary background for the subsequent empirical analysis. The first part of the empirical analysis consists on selecting four medium-sized cities as case-studies. The selection is made considering criteria such as number of inhabitants, size, location and importance in the urban grid, permeability to new commercial formats and previous existence of urban or commercial urbanism projects. After having selected the four cities, a historic-geographical-commercial-morphological background was researched for each, before going to the terrain. The research area was limited in each city by the boundaries of the urban perimeter, as expressed in each municipal plan. The second part of the empirical analysis consists on the creation of a database concerning each individual commercial establishment in each of these four cities. To create this database, as other sources of data proved inexistent, a thorough field work methodology was carried out, in the course of one year (roughly 2011). Every single store was seen, catalogued and photographed, from the outside if that was sufficient or from inside if not. Collected data includes

[13] The report containing the first approach to the literature review and to the research methodology was presented in front of a jury in the 21st of June 2010, after one year of research, according to the requirements of the Doctoral Program by the light to the new Bologna process.

elements of each store (name, activity, sub-activity, type[14], structure[15], web-connection[16], relation to other stores[17], or if it is closed or empty), of the building the store is in (number of floors, land-use[18], building age), and of the surrounding morphological environment (streets and blocks). In the case of streets, Space Syntax segment maps were also created based on a self-devised methodology of conversion of road-center lines. This data-base was built in a GIS platform (ArcGIS 9.3). The last stage of the empirical research consists on the exploration of this unique data-base, namely by adopting existing methodologies which had never been used in the same study together, nor had been used in more than one city at the same time. These concern the treatment of intrinsic commercial data both in a spatial/hierarchical context, and in a morphological/syntactical context.

Finally, bearing in mind the theoretical and the empirical analysis it is possible to present conclusions and recommendations. These are based first on a joint morphological/commercial understanding of cities, with an attempt to justify whether the research hypothesis was a valid one or not. This being asserted, contributions can also be made to the particular fields of commerce (breaking myths), geography (retail hierarchies) and morphology (relationship between commerce and urban environment). Lastly, it is possible to discuss both planning and commerce in Portugal, particularly in medium-sized cities. This should enable some degree of progress in this particular field of planning and stimulate further discussion about commerce's role in the city, planning policy and planning practice.

1.5. THESIS STRUCTURE

This thesis is structured in ten Chapters. The present chapter, Chapter 1, wished to introduce the literature background and the motivations of the research theme. It also presented the research scope, questions and hypothesis, and a discussion of the conceptual and methodological frameworks that guide the research. The following three chapters present the literature review. Chapter 2 introduces each of the three main research themes that contextualize the dissertation: commerce, urban (morphological) studies and social (shopper) studies. It stresses how seldom bridges have linked these individual fields, while discovering elements for a common analysis. Chapter 3 presents how the study of commerce and city has been merging in economy, geography, morphology and planning literatures. This knowledge, along with the one obtained in Chapter 2, allows for the establishment of the elements needed to proper measure commercial activity. Chapter 4 concludes the literature review by contextualizing the Portuguese commercial and planning scenarios. Chapter 5 is the turning point. Chapter 5.1. not only is the bridge from the theoretical to the practical analysis, it also forms an arc, along with the Introduction (Chapter 1) and the Conclusion (Chapter 10), that justifies, explains and ultimately consummates this research project. The remaining sub-chapters reveal the working methodology, from the selection of the case-studies, to the data collection, to the construction of the database, to finally the approach to the case study analysis. The case study analysis is then presented in Chapters 6 to 9, in which the collected data is explored and compared, between and within cities, and between and within city areas, by the overlaying of research methods. Chapter 6 presents the case studies, through their historical, geographical and statistical characteristics. Chapter 7 contains a

[14] If 'modern' or 'traditional'.
[15] If 'individual', 'chain', 'franchise', 'outlet' or 'discount'.
[16] If it has site, facebook or other. The ability to purchase online was not considered, just the existence or not of a web-platform that gives information concerning the store and allows product browsing.
[17] If 'door to door', when there is another shop sharing a wall, or 'single standing' if not.
[18] If the buildings have just commercial occupation or have residential or service occupation as well.

geographical approach which allows for the characterization of the physical distribution of commercial spaces and the creation of hierarchies. In Chapter 8 these ‘dots on a map’ are given a third dimension. Commercial spaces are defined according to their inherent characteristics such as activity, integration or store management type. Commercial hierarchies and city areas are then characterized in the same way. The case-study analysis is complete with Chapter 9, the centerpiece of this investigation, where commercial spaces are further given a fourth dimension, namely through the morphological characterization of the buildings, blocks and streets they are in. Throughout it is taken into account that this dimension is indissociable from the previous three. Each constitutes a layer that is looked upon in conjunction to all others. Finally, Chapter 10 discusses the main findings regarding the symbiosis between commercial activity dispersion and characterization, and the form and structure of Portuguese medium-sized cities, offering conclusions about the research and recommendations for city policy, planning practitioners and future research.

"To trace the evolution of retail in the city, taking into account time and space, is to witness the growth of places of sale unconnected to the production facilities, to witness the diversification of establishments and items sold, to recognize the increase in the number of establishments and watch them cover all the urban fabric, to find retail weaving streets, squares and centers, to watch it make a public city and then deny it, when it takes refuge in closed spaces"

(Salgueiro, 1996)

2

CONTEXTUALIZING THE CITY, COMMERCE AND THE SHOPPER

2.1. DEFINING THE FORM AND STRUCTURE OF (MEDIUM-SIZED) CITIES

2.1.1. THE ESSENCE OF A PLACE

The physical place called 'the city' is much more than a mere aggregation of form. It is a place of gathering, social interaction and concentration of economic capital and political power. Although information technology has diluted in some fields the need for a physical backdrop (for example in the stock market), all urban and human interactions require spatial support. The form, the structure and the spatial configuration of a city (based on a pre-meditated plan or not) make city living possible by providing a context, filled with meaning. Function further strengthens this meaning, which is perceived by the city-users, influencing their decisions on how to move and how to act (Salgueiro, 1992). These decisions can, in turn, shape spaces by influencing physical form[19] and dictating function[20]. It is this interaction between the user and the space that defines what the city is and what it can be.

Therefore, cities are not static elements. They are not 'artifacts' (Karaman, 2001) where heritage, identity, culture, economic and social values, and a 'sense of place' are engraved in the landscape, providing an unchangeable context. These elements rather provide 'layers' which overlap and help to interpret how the city has changed and evolved through time, functionally, economically, morphologically and symbolically, as it continually adjusts to new paradigms of sustainability, imageability and livability. Cities are then 'organisms' (Moudon, 1997), whose processes seem quite

[19] For example, green spaces have been designed without pedestrian paths, so that planners can first see which routes are preferable by users.

[20] As mentioned in the Introduction, choice locations by 'creative' or 'alternative' activities, retailers using rules of thumb, and even squatters can change land-use patterns, going against the market logic.

complex, involving feedback and multiplier effects, and interaction between different scales (macro e micro) (Hillier, 1996a).

Morphologically, they evolve '*fitting, piece by piece, changes in their form*' (Lamas, 1989). This means that older elements of the built-environment can remain from on stage to the next and are not easily modified (Talen, 2003). Cities rather add than replace. For Poete (*cit in* Lamas, 1989) these constant motifs assure the formal continuity of the city, leading to the concept of '*permanence*', later developed by Lavedon (*cit in* Lamas, 1989). The most likely elements to persist are monuments and other historical landmarks, road-ways and the land-structure.

The incremental changes occur slowly at a small scale, when the form reveals itself inadequate to the existing context (Lamas, 1989), and accumulate over time producing patterns neither geometrical nor of functional simplicity (Hillier, 1996a). They can occur at three levels (Lamas, 1989): street level (building facades, sidewalks, traffic), neighborhood level (streets, buildings, blocks, land-use) and territorial level (new urban zones, infra-structures, facilities and services). When the accumulation of small changes reaches a boiling point, the city lives a short but intense period of transition, before settling again to a long period of stability (Fernandes, 2003).

The way the city grows and expands can be twofold: spontaneous or rational. If it is spontaneous, the slow and incremental nature of the process allows the growth to be based on the same building process in vogue at the time, coherently integrating the new construction into the existing fabric. If it is rational, that is, based on a plan, the dependence of an authority figure allows the result to have an operational, spatial, functional and even a geometrical logic. Either way, although the physical and spatial structure of cities appears to be a rather disorderly outcome of a long history of vast small unrelated changes (Hillier, 1996a), the urban fabric does not have a random evolution (Levy, 1999), because there is a logic inherent to the rules of transformation. This logic, set against a contextual backdrop of historical, cultural and socio-economic conditions, constitutes the *essence of a place*.

Karaman (2001) divides the essence of a place in three components: topology, morphology and typology. Topology relates to land forms (natural elements), space (how physical objects are distributed) and settlement patterns. These depend on the spatial framework and the orientation of buildings (wide or narrow, open or closed, dispersed or compact). Lozano (1990) has established three dualities when grading settlement patterns: unbuilt space/built form; continuous/discrete and repetitive/ unique. Morphology (which is inclusive of topology) studies spatial boundaries as a means to define '*environmental character'* (Karaman, 2001). It analyzes the question of how settlements '*stand, rise and open*' (Norberg-Schulz, 1979), integrating physical characteristics, social requirements and environmental aspects. It studies building forms (height, width, size and shape); materials, colors and light; and environmental patterns (accessories such as textures, fenestrations and decorative objects). Finally typology studies type (particular stereotypes of rooms or buildings; considering spatial and functional aspects), activity patterns and circulation patterns.

The interdependence between these three components forms the 'language' or the 'imageability' of a place. Each place is defined by a form, a function and is the outcome of a context.

2.1.2. THE STUDY OF URBAN MORPHOLOGY

2.1.2.1. Concept

The research discipline that has been closest to ascertaining the 'essence of a place' is the discipline of *urban morphology*, which is not exclusive of the 'morphology' component seen above. When it

appeared as a field of research in the 19th Century, it was linked to geographical studies, and it was concerned with the study of urban form and the distribution of different functions in a city. Now urban morphology has evolved, and is regarded as the outcome of different disciplines, such as architecture, urbanism, history and sociology, of mutual influence (Gauthier, Gilliland, 2006). The patterns of form are still analyzed, but not in isolation. Not only are they connected to other indicators of a functional, social, economic and technical nature (such as transport networks, land use and market economics) (Scheer, Petkov, 1998), they are also considered in a temporal scale (Lamas, 1989). This integrated approach has been named 'morphogenetic approach' (Levy, 1999; Moudon, 1997).

Moudon (1997) defines urban morphology as the '*study of city as a human habitat'*. This makes sense, not only because it takes into account the organic nature of the city, but also because the city is materialized by the environment man has made for himself, either in terms of form, either in terms of the relationships (economic, social) therein. It is not the study of the 'historical urban fabric' but of the 'modern urban fabric' (Levy, 1999). This means that urban morphology approaches the city as an entity in a constant dynamic state, guided by rules of transformation. The city is not simply the outcome of its heritage, but the consequence of the influence of that heritage in future building processes, land-uses and urban syntax (relation people-spaces). These mechanisms of creation, evolution and transformation of the city's landscape originate leaps from one specific state to another. Urban morphology not only analyses these static states of physical form unity (called 'morphological periods' by Whitehand, 2007), but also the 'leaps' and the reasons why they happen, because there is measurable, physical evidence that can be read and interpreted in the built environment (Scheer and Scheer, 2002; Gauthier, Gilliland, 2006).

By defending that the city can be read and analyzed through changes in its physical form, Moudon (1997) established the three principles of morphology[21]: (i) form (buildings and streets, linked to open spaces, plots and land parcels); (ii) resolution (in four levels: building/lot, street/block; city, region); and (iii) time. That is, the element, the scale and the moment. Hofmeister (2004) further divides and relates the first two principles, speaking of, for example, age, style, height and orientation of buildings, construction materials, shape of roofs, and housing densities and types.

2.1.2.2. Schools of urban morphology

The 20th Century had three main schools of urban morphology: the British, the Italian and the French.

The British school is also called the Conzenian school (Whitehand, 2001), because it was established by Conzen (1960, 1975, 1980), a German who later worked in England. His heritage was that of the study of urban form in Germany at the beginning of the 20th century. In this country, from early on, the relationship between the urban structures and the urban functions were major concerns (Hofmeister, 2004). The evaluation of where and why urban places had come into existence was quickly discarded in favor of the study of the urban place itself. Bobek (1927) speaks of open spaces (squares and meeting points), 3-D building fabric, street patterns and transport networks. Researchers were also concerned with the functions of the urban space and not only with its morphological appearance.

The most important tool was the town plan[22]. Schlüter (1899) presented a groundbreaking paper about the ground plans of towns (distinguishing, characterizing and explaining urban landscapes) and

[21] Robertson (1999) and Scheer and Scheer (2002) define other similar subdivisions.

[22] The town plan is still important. Recent works by Fernandes (2002) and Oliveira and Pinho (2006) redress this importance in Portuguese cases.

Geisler (1918) color-mapped the town of Danzig according to building-use and number of stories. Beaujeu-Garnier (1983) later stated '*in a way, the city's blueprint is the summary of its history, by studying it you may follow the various stages of its development*'.

Conzen acknowledged the importance of cartography and tried to understand the city in historical-geographical terms. The studies should show how the layout of the town had been formed, how it changed over time and what components characterized it. This way the process of urban development could be explained[23], and the concept of 'morphological frame' was forged. This concept explains that the way in which forms are created act as a long term constraint to the subsequent change. Each distinctive period of form coherence and permanence is called the 'morphological period'. Each morphological period is constituted by a number of 'plan units'. These are groups of buildings, open spaces, lots and streets which form a cohesive whole either because they were built at the same time, within the same constraint, or underwent the same transformation process[24] (Moudon, 1997).

To measure the townscape, Conzen proposed a tripartite division (Conzen, 1960; Whitehand, 2001, 2007): (i) town plan (site, streets, plots, block plans and buildings); (ii) building fabric (3-D form); and (iii) land and building use. The combination of these three elements forms a 'morphological region' (Conzen, 1975). Each region should have a unity in terms of form that distinguishes it from others.

'*A ground plan is long lasting but building utilization is ephemeral*' (Whitehand, 2007). Therefore, the 'town plan analysis' should integrate two elements: a historical expressiveness (as the asset value of a city is above the contemporary functional value) and a morphogenetic priority (taking into account the persistence and lifespan of each element).

Recent works of the British school (Whitehand's being the most prominent) have examined the ways in which these values can be used in the management of historic and contemporary townscapes, and have tried to push the limits of urban morphology into urban economics and social studies, researching the relationship between the city, its inhabitants and the dynamics of the building industry. Despite these goals, the truth is that the British school has focused essentially on (geographical) cartographic representation, venturing only occasionally in interfaces with architecture and planning. The site of the Urban Morphology Research Group of the University of Birmingham[25] confirms that notion, by stating that their goal is to '*study the geographical aspects of urban form*'.

By contrast, the Italian school is characterized by a more organic approach (Levy, 1999). It was pioneered by Saverio Muratori in the 1940s. In attempting to formulate a critical framework that could explain the creation and transformation of urban form over the centuries, Muratori developed an operational history for Venice, Rome and other Italian cities (Cataldi *et al*, 2002). This would provide context for the integration of new architectural works in the syntax of the urban fabric. Although he later found that usually there were no links between old and new architectural forms (Cataldi *et al*, 2002) he looked upon towns as organisms and collective works of art. New buildings and forms should be part of the culture of a place, and therefore should be planned in a sense of continuity.

The work of Muratori was continued by Gianfranco Cannigia (Cannigia, Maffei, 1993). He considered 'building types' as the elemental root of urban form (Moudon, 1997). This form was indissociable of the historical process of its formation, and should be analyzed in terms of morphological periods. When interpreting built objects, the spatial and the temporal correlations should co-exist. These correlations were based on four components: elements (buildings), structures of elements (urban

[23] Leading to concepts like the 'burgage cycle' or the 'fringe belt', explained by Whitehand (2001, 2007)
[24] The sub-discipline of micromorphology analyzes individual plots or particular areas within these.
[25] http://www.birmingham.ac.uk/research/activity/urban-morphology/index.aspx

fabric), system of structures (regions or districts) and organisms of systems (entire city) (Cannigia and Maffei, 1993).

The Italian school defends that not only buildings are the outcome of a learning process of adaptation of previous building types, but that the built form is modified according to changing social, political and economic conditions, forming a 'typological process' (Cannigia and Maffei, 1993). In periods of change, attention should be given to geographic differences, in order to interpret which forms of one period are substituted, maintained or suppressed by those of the next (Whitehand, 2007).

The Italian school offers a renewed theoretical foundation for urban planning and design which engages long-standing city building traditions. The relationship between decision-making and urban form should permit an understanding of how numerous separate decisions combine to create regularities on the ground.

The literature has focused less on the French school. It is mainly architecturally-oriented, although, in a certain way, reacts against that and against the way modernist architecture ignores the historical processes (Moudon, 1997). Based on the Versailles School of Architecture, it has generated extensive methodological knowledge for the analysis of urbanization processes and related architectural models. Much emphasis is placed upon the importance of built space for sustaining social practices – the relationship between the built landscape and the social world is dialectical, with each shaping the other.

Gauthier and Gilliland (2006) have created a Cartesian map classifying the different schools of urban morphology in terms of either cognitive or normative contributions, and internalist or externalist approaches. Cognitive studies aim to produce knowledge, providing explanatory frameworks and developing theoretical and analytical tools. Normative studies articulate a vision of the future when formulating an approach to urban planning practice, responding to the question of 'how the city should be planned or built'. On the other hand, the internalist approach regards urban form as a relatively independent system that evolves as a consequence of its internal dynamics. The externalist approach regards the urban form as the end product of a process driven by political, anthropological, geographical, economic, historical and perceptual determinants.

Both Conzen and Muratori are classified as 'internalists' and 'cognitives'[26]. Later works by Conzen and Cannigia have started to drift to the 'normative', while follow-ups of the Conzenian tradition (Whitehand) have been more and more concerned with the impact of social and economic factors on the evolution of urban form, being therefore 'externalists'.

In recent years the three schools of thought, and more specifically the visions of Conzen and Muratori, have been converging in the literature. Since 1996, the International Seminar on Urban Form (ISUF) has joined architects, geographers, planners and historians of various backgrounds and has influenced considerably urban landscape management. Using data from the various schools, Moudon (1997) has summarized the aims of urban morphology in three categories: (i) descriptive and explanatory (theory of building – how cities are built and why); (ii) prescriptive (theory of city design – how cities should be built); and (iii) access the impact of past design theories on city building, and debate the relationship between the idea and what is really practiced (what should be built vs. what has indeed been built). The three theories Lynch (1981) devised to measure cities; 'functional theory', 'decision theory' and 'normative theory' correspond exactly to Moudon's categories.

[26] And so is, for future reference, Bill Hillier, in the study of Space Syntax.

The study of urban form in Portugal is portrayed in Oliveira and Pinho (2006). They describe the field as recent and limited, attracting modest resources and involving a reduced number of researchers, mostly from Lisbon and Oporto Universities. Inspired mostly by the British and Italian schools, the objectives, analysis periods and research locations of these studies are very heterogeneous, although they are associated, in most cases, to the particularities of each city under analysis. The authors have found that the most studied element is the relationship between streets and buildings, although some studies also dwell on the complex characterization of building types.

2.1.2.3. Measuring form and structure

Summarizing the study of urban morphology, Levy (1999) states that it has the '*idea that a particular logic has dictated the organization of the urban fabric in different periods, that some categories remain constant, that certain aspects are permanent, that there are rules of transformation over time that dictate changes to the fabric, and that the organization and development of the fabric are not random, but follow laws that urban morphology tries to identify*'. Each zone, with particular characteristics and a historical background, changes due to the influence of four major categories: social factors, economic factors, governmental (planning) factors and, increasingly, technological factors. Two questions immediately arise: how to measure urban form and how to measure the influence of the exterior factors upon it. Scholars of urban morphology have tried to answer the first question.

Using the various classifications present in the literature, discussed above (Conzen, 1960; Lamas, 1989; Cannigia and Maffei, 1993; Moudon 1997; Karaman, 2001; Whitehand, 2001, 2007), it is possible to create a scheme with the elements of analysis necessary to measure urban form and structure (Figure 2). The morphological characteristics of each element (which has a typological function and pattern), are set against a geographical backdrop (topological dispersion). This is measured at three different levels, from the macro to the micro scale, and in a temporal scale.

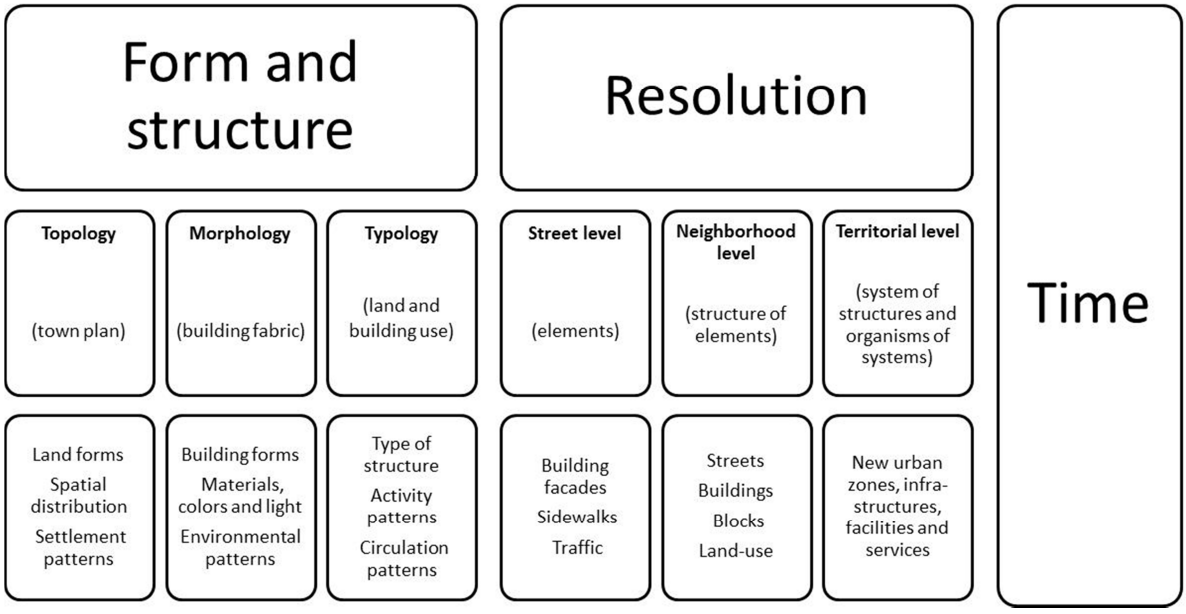


Figure 2 - Required elements to measure the form and structure of a city, according to urban morphology literature

The qualification of cities or city areas through each of these components is presented, for example, by Tallen (2003). The 'aggregate city' is characterized through statistical data. The 'geographical city' is characterized through various geographic dimensions such as measurements of compactness, accessibility or connectivity. The 'elemental city' is characterized through its built, material qualities, and through its form and pattern. Rather than being put into a category, the measure of the form and structure of a city should take into account all the elements above, in order to be thorough and coherent. Yet this is neither a simple nor a consensual task, and that is the reason why the literature tends to separate the methods of analysis. Direct measures of urban form are seldom used due to the lack of widespread access to data, the difficulties in cataloguing and quantifying it, and the lack of techniques to geocode and spatially aggregate it for the analysis of large urban areas (Smith, 2007). The same happens when considering the functional aspects of the urban scenario. And even if a methodology is devised, it will never cease to be of a subjective nature, because it is not viable to implement an urban model with all the urban characteristics. The researcher must choose what is more valuable to his research and therefore worthy of measurement. But because the spatial analysis of urban scenarios needs to be sufficiently detailed to capture the physical properties of particular spaces and extensive enough to represent variations across sufficiently large urban areas, the measurement of form and structure may be of a somewhat limited nature (Talen, 2003). Complex models have the problem of only functioning well in small areas due to the weight of the information required. On the other hand, widespread models contain poor data precision and consider many territorial generalizations.

In the field of morphology, the visual representation through city models has been the most consensual approach. Yet Jacobs (1961) expressed in her ground-breaking book of modern planning that planners still interpreted cities as two dimensional problems of disorganized complexity, and not real cities. Nevertheless, the study of the grid on a cartographical support has been the principal method used since the birth of the discipline of urban morphology, as seen above (Salgueiro, 1992). Town maps are important tools, as they represent a summary of a city's history (Beaujeu-Garnier, 1983; Fernandes, 2002). Changes in the direction of streets, in the size and shape of buildings, and in materials and architecture, serve as indicators that help trace different stages of development in cities (Hofmeister, 2004). Observation and redrawing of town maps of different eras (Oliveira, Pinho, 2006) enables spatial and temporal comparisons, observation and interpretation of existing situations, and planning forecasts, because each city has a mixed grid, formed by the overlaying of different elements from different historical periods.

Presently, models have become increasingly complex and more akin to the real city. Computer technology as allowed for visual-software aids (mainly GIS software), and these show great promise in the treatment of morphological data, as space (viewed three-dimensionally) can easily be analyzed in relation to the forces that shape it (Moudon, 1997). Even so, the same problems seem to remain. A detailed knowledge of the urban form has become an integral part of decision support tools in planning, but the level of detail is still superficial, due to the information required and the computing capacity needed. The measure of the form and structure of a city seems continually to be the study of geographical patterns. Conzen (1980) lamented, in the US context, the death of empirical work on town morphology, in favor of a more accessible study of the spatial structure of land uses, which is, in his words, '*amorpohological*'.

According to what has been stated in the introduction, a choice has been made to apply this measuring methodology to Portuguese medium-sized cities. Before discussing the background of commercial activity, a brief contextualization of medium-sized cities is therefore presented.

2.1.3. ABOUT MEDIUM-SIZED CITIES

2.1.3.1. Conceptual timeline

The literature on medium-sized cities is consensual when it states that this is a theme that seldom has been approached by urban researchers. In recent years however, with the change in paradigms regarding the urban structure, the role of medium-sized cities has become different, and the importance awarded to them has increased. If their merits have not yet been proven, they at least present enough potential to have an increasing number of followers among researchers and specialists (reviewed in Alexandre, 2003).

What is not consensual is their definition. Ever since they started to appear in planning literature and practice in the 1960s, the criteria used in their definition has continually changed. Figure 3 summarizes the evolution of these criteria.

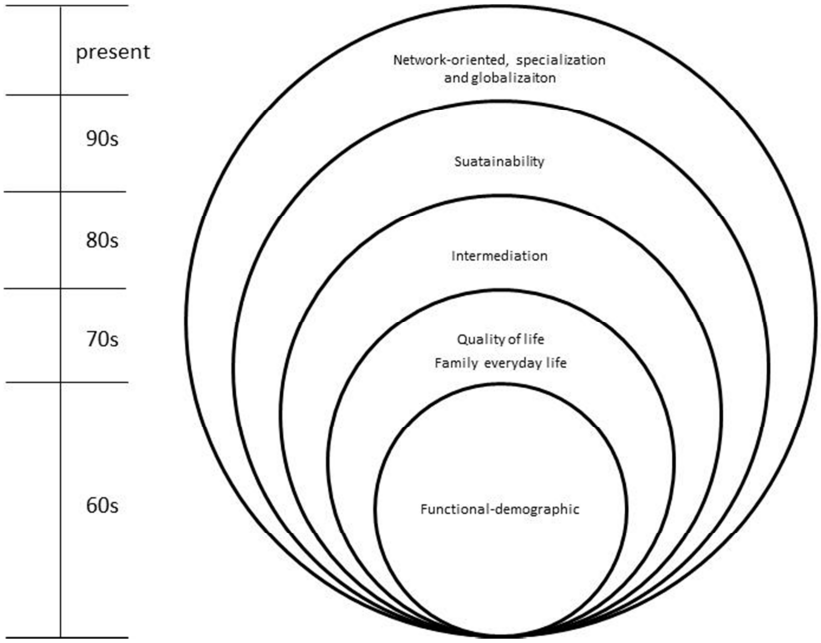


Figure 3 - Evolution of the criteria used to define medium-sized cities (adapted from Marques da Costa, 2002)

The term 'medium-sized cities' was forged in the French *milieu*. Located outside the direct influence of the most important 'centers of command' (Fernandes *et al*, 2000), they should not be confused with peripheral or edge-cities, often with the same size and dimension. In the 1960s medium-sized cities first achieved some importance in urban research when they were presented as centers capable of serving the intermediate levels of the urban hierarchy, and able to correct regional unbalances and to promote regional and economic development. This fitted into a hierarchical Christallian vision of the territory[27], and originated from the rise of new concerns over the territorial structure and the economic growth. Medium-sized cities were associated with external economies which were important to grasp, because they were the only ones large and strong enough to both relieve some stress from the major cities and produce economies of scale, guarantying a just distribution of benefits to less endowed territories (Ferrão *et al*, 1994). If on one hand this hierarchical view of the territory branded medium-

[27] Christaller's Central Place Theory is explained in Chapter 3.

sized cities in terms of urban policies, on the other they were further restrained, because their definition was almost exclusively based on demographical and dimensional values. This gave origin to a conceptual problem that still exists today. Countries have different scales, so the size and population of their medium-sized cities is different, which makes them behave differently. Therefore a single definition and strategy for medium-sized cities cannot be devised if only demographic variables are considered. Table 1, extracted from Marques da Costa (2002) shows how the demographic definition of medium-sized cities in European countries in the 1980s was extremely varied.

Table 1- Comparison between the demographic size of the largest agglomeration and the demographic size of 'medium-sized cities' in some European countries (source: Marques da Costa, 2002)

Countries	Medium-sized cities Scale of dimension (inhabitants)	Largest agglomeration (inhabitants, 1985)
Germany	150 000 – 600 000	3 437 290
Denmark	< 100 000	1 336 855
Spain	30 000 – 300 000	2 976 064
France	20 000 – 100 000	9 319 367
Greece	50 000 – 100 000 and 10 000 – 50 000	3 072 922
Italy	50 000 -200 000 and 100 000 – 300 000	2 693 383
Portugal	20 000 – 100 000	2 561 225
Ireland	50 000 – 100 000	915 516
United Kingdom	150 000 – 600 000	6 393 568
Sweden	50 000 – 200 000	1 570 320

With the economic crisis of the 1970s, medium-sized cities used their resources to become attractive alternatives to larger conglomerates, therefore strengthening their position (Marques da Costa, 2002), and adding qualitative values where once were merely demographic and quantitative ones (Lajugie, 1974). They presented the advantages of growth, development and urbanization (at a local level), without the disadvantages of large scale and subsequent diseconomies (Toinard, 1996; Carvalho, Sequeira, 1999). Medium-sized cities were no longer just elements in the hierarchical structure. They were still second-level territories, but now they were also defined through cultural and social parameters, and became essential to the equilibrium, organization and functioning of their regional scale hinterlands and to the growth of socio-economic environments (Almeida and Valença, 1995; Ferrão *et al*, 1994).

As the perception of the new role of these 'metropolis of equilibrium'[28] grew stronger, the central administration started to give more attention to urban-oriented policies capable of optimizing their resources. In France as well as in other countries, state policies allowed for major investments in infra-structures, accessibilities, and social services and facilities. Such an intervention, however, did not occur in Portugal until much later (Ferrão *et al*, 1994). Lajugie (1974) and Marques da Costa (2002) cite policy making reports for medium-sized cities made in the 1970s, which were concerned with the

[28] A term originated in the French literature cited, for example, in Damiani (2006)

improvement of living conditions, rehabilitation and the re-equipment of urban areas. For example, the report presented to the Economic and Social Council (*cit in* Lajugie, 1974) states that medium-sized cities should:

- Constitute alternative centers of employment in industry and in the tertiary sector for those who migrate from surrounding rural territories;
- Offer lodging and facilities to their inhabitants;
- Have public services (in education, health, sport, leisure and culture) capable of offering high quality urban living;
- Possess communication and accessibility infrastructures which assure the connection to the higher levels of the urban hierarchy but also to the surrounding rural territories;
- Assure regional cohesion, not excluding the surrounding rural territories.

The 1980s were characterized by growth. The various phenomena of urban expansion, internationalization of the economy, and increase in competition and consumption, favored medium-sized cities. They became 'intermediary cities' (Gault, 1989) of an innovative network structure, with a much more qualitative definition than before (Camagni, 1993; Marques da Costa, 2002). And even though their regional role was diminished due to the increased 'proximity' of the larger cities (Santos, 1979) their geo-strategic position was reinforced. They benefited from the decentralization of populations and activities to become poles around which the social and productive systems were organized. New centralities emerged due to the appearance of new markets, new transport networks, and new inter-regional and inter-national co-operations. The notion that these cities were the engine for regional development ensued.

After a long period of expansion, the 1990s brought the focus back to the city itself and to its sustainability. The concept of 'medium-sized cities' can now be considered in two scales of development: the urban scale and the regional scale. The first scale is intrinsic. Medium-sized cities, free from the disadvantages of both larger cities (growth of rents and land values) and smaller ones (absence of external economies) (Serra, 1998), have made efforts to present local-based dynamics, mobilizing resources and agents in order to achieve sustainability in their development processes. The second scale relates to the new models of spatial interaction of which medium-sized cities are part. There is now a network-based territory (Marques da Costa, 2002), and, according to Maillat (1995, *cit in* Matos *et al*, 2005) there should exist a coherence between the territorial system of production and the system of medium-sized cities that shapes a certain region.

Although many still believe that medium-sized cities are yet too small to assume a relevant role in the urban system, they have become strategic vectors in its restructuration, consolidation and modernization. The network of medium-sized cities has been growing steadily, taking advantage of the symbiotic attraction between territories, the generation of services and employment and the natural proximity to rural areas (Almeida, Valença, 1995). Several recent programs supported by the European structural funds, such as 'Intelligent Cities' and 'RUCI'[29] have strengthened this network-oriented context, although it is still too soon to assess their impacts. If standard processes are not repeated and if each particular city can have its own individuality[30], then the principles of competition should allow specialized and flexible cities to benefit from specific contexts, and so, theoretically, surpass stronger cities (Alexandre, 2003).

[29] Urban Networks for Competitiveness and Innovation, part of POLIS XXI.
[30] A concern expressed by João Ferrão in an interview to the newspaper 'Diário de Notícias' in 1/8/2005

Hierarchical and demographic definitions are now obsolete. Presently it is a conjugation of a variety of indicators such as the degree of urbanization, the dispersion of the population, the economic and social development, the administrative and political organization, the depth of inter-urban relations, the number and quality of existing infrastructures and facilities, the standards of quality of life, and, most of all, the role in the urban system (Lajugie *et al*, 1979; Marques da Costa, 2000) that determine whether or not a city should be considered as medium-sized.

2.1.3.2. Advantages, disadvantages and challenges

Medium-sized cities are discussed in the literature by authors who believe them to be essential to the future equilibrium and development of the territorial structure. They are presented as the perfect place for top-down and bottom-up development policies to meet, because they are large enough to have scale economies and regional and international projection, without the hazards and disadvantages of large city-centers. At a local scale, medium-sized cities present, according to Tornqvist (1995 *cit in* Matos *et al*, 2005), DGOTDU (1997) and Alexandre (2003):

- Viable and sustainable centers, with environmental, social, cultural and economic amenities for good quality of life;
- An increased 'human dimension', leading to a larger sense of identity and to less social frictions and costs;
- Attractive residential environments for qualified segments of the active population;
- Above average research capacity and levels of qualification of the workers;
- Close commitment of the public institutions to city life;
- More openness, theoretically, to public participation, and to experimenting new practices of management and governability;
- Major recent investments in industry, services and activities;
- Places for innovation and social change.

Consequently, medium-sized cities are, at a regional scale, places with:

- Good networks of internal and external communication;
- Attractive and competitive prospects for companies, originating diversity in job opportunities;
- Greater flexibility, more direct and less complex decision processes, more fluent processes of social solidarity, synergies and practices;
- Increased balance and sustainability, with greater potential for more open relationships with surrounding territories, especially rural ones.

Even so, Alexandre (2003) calls attention to the fact that not always medium-sized cities have the necessary infrastructures, facilities, accessibilities and qualified functions capable of generating the scale economies that are taken for granted in the larger cities. Sometimes local actors do not have the necessary expertise or technical structures to stand out. And even if they have, there may not be enough critical mass in knowledge and resource generation, and there may be difficulties in accessing the principal channels of information and capital. If medium-sized cities are dependent of a single economic sector, and have little cultural and social diversity, this makes them fragile and susceptible to eventual crisis or market fluctuations.

Although the definition of medium-sized cities and their surrounding context has changed, the challenges that presently face them have not changed much since the 1974's ESC report mentioned above. Grouped in networks, medium-sized cities articulate both with local economies and with the exterior market, boosting regional affirmation and competitiveness, and constituting elements of organization and dynamization of the territory. The strategies for these cities should stress their reputation as places of innovation, attractiveness (social and economic) and concentration of knowledge and culture, and their reputation as places to be – dwell, work, visit and live.

This is done through the implementation of economic-related mechanisms and social strategies, and through the use of models and instruments of territorial and strategic planning. According to Alexandre (2003) these should be both offensive and defensive, focused on a sustainable and suitably coordinated development and symbiotically integrated with the surrounding territories.

2.2. DEFINING THE COMMERCIAL ACTIVITY'S FRAMEWORK

2.2.1. A BRIEF HISTORY OF COMMERCE

DGCI (1989) defines commerce as '*all activities which take place in a professional way concerning an intermediation of goods and services in the market*'. Because it is one of the oldest activities, if not the oldest, that the human race has been performing in an urban context with a high level of regularity and involvement (Sinha, 2003), it is impossible to dissociate the historical time-line of commerce with that of the city. Due to commerce major port cities blossomed, nations bonded, knowledge passed between civilizations and the seas were crossed. Initially commerce was seen as a mere stage between production and consumption, of lesser importance (Fernandes *et al*, 2000), because the classic economists did not consider it as a wealth generator. Now more than ever, shopping is linked to street life and urban liveliness, is considered a bridge to culture and to urban leisure, and is part of social interactions and symbolic communication (Amir, 1998). The pattern of 'traditional' stores is the outcome of an historical heritage which is still present in many European medium-sized cities and location choices for modern formats came as obvious responses to existing contexts. Because of this, commerce is probably the most important land-use in the 'typological' component of form and structure. Not pretending to be extensive, what follows is a brief contextualization of the parallel evolution of commerce and city, so that present day commercial activity can be understood, and the literature review on Chapter 3 can have a proper framework.

2.2.1.1. From the early settlements to the Industrial Revolution

The human race started to live in close proximity, forming early settlements, because this facilitated interaction (exchange of knowledge, sharing of natural resources), trade (food storage, local markets, specialized workers) and allowed for the improvement of amenities (reduced transport costs, running water, sewage disposal). Early on commerce became one of the focal points of the city, and therefore required centrality and easy accessibility. As most mobility patterns consisted on short, on-foot movements, the commercial function was restricted to small, confined spaces (Fernandes *et al*, 2000), constituting 'compact cities' (Fernandes, 2003). The Greek agora and the Roman forum are two examples of such spaces, as is the market square in medieval cities. The oldest streets were laid out considering topological features such as surface relief, height and distribution of water bodies (Hassinger, 1910; Karaman, 2001). When the terrain was mountainous, hill settlements ran parallel to the topographic contour. When it was plain, the development was linear or concentric around the shore

or a forest (Karaman, 2001). These natural notions, however, were soon overlapped by both political and religious powers, constituting the first manifestations of urban planning and management.

In Roman towns the main axes were perpendicular, forming a cross (a religious pattern), with the main square appearing at the intersection of the main North-South and East-West axes (Salgueiro, 1992). First it was a consequence of the widening of the main streets, then it evolved to a built square of increasing size (Hofmeister, 2004), becoming the main interaction point. First necessity products were still being sold by travelling salesman at a daily basis, so the square hosted a periodical fair or market, often relying on the construction of temporary structures. Then permanent market halls were built, but they were just covered marketplaces. Some cities had more than one main square, to accommodate the trade of different commodities. Many of these squares faced the church, and the fairs were associated with Sunday festivities and pilgrimages. The ecclesiastic powers, however, prohibited trade on Sunday (Salgueiro, 1992), a tradition that still holds today in 'traditional' retail. It was in these squares or in close-by streets that the first real shops (in a permanent building) appeared. They dealt only with one kind of article, and most of the times adjoined the producer. Natural concentrations of specialized artisans appeared in certain streets.

These towns, which grew according to the growth of commerce and manufacturing, presented a grid-like pattern of small dimensions. The form was dependent of the city's role (defensive, administrative). The wall was a defensive barrier, it separated built space and rural areas, and it also influenced the direction of the streets[31] (Lamas, 1989). Administrative buildings acted as centers, and could distort the geometrical patterns, because they had gravitational pull. Trade buildings located around administrative and judicial ones, in order to capitalize on the growing movement, whilst residential areas stayed on secondary streets. Other degrees of streets were later added to complete the grid, constructed in a more arbitrary form, performing the necessary corrections and connections. The orthogonal pattern was easy to draw, created a good economical division of the plots, and permitted the introduction of a square or a monument without disrupting the existing scheme (Salgueiro, 1992).

After the Medieval ages, the overseas trade originated by the Discoveries became a great source of riches and prosperity, especially for Portuguese sea-side towns. The increase in activity created an increase in population and also a need for craftsmen and workers, which led to a rural exodus. The urban form expanded more freely, as cities became more associated with permanent living. A mix of a rectangular and a radiocentric grid covered the remains of the orthogonal roman grid. According to Gaspar (1969) this grid would be geometrical when a reasonable number of inhabitants and a strong enough central authority coexisted to impose a group-plan. Military and religious facilities (castles and monasteries) also exerted considerable influence over the surrounding areas. The disperse nature of the cities was abandoned in favor of a '*more intimate morphology*' (Lamas, 1989). Medieval cities were characterized by a main street, connecting the extremities of the wall, a main square in the middle, and a few parallel and perpendicular streets to the main axis. The plot system was characterized by the front, the building and 'a very prolific back lot' (Lamas, 1989).

It was in this context that the artisan and the retailer proliferated. Buildings with ground floor shops directly facing the sidewalks revolutionized the role of 'the street' in the city. Furthermore the market place emerged as the main space for gathering and trade. It freed itself from the shadow of some landmark (church, administrative building, entrance of the city walls), to gain a more open, central and public role. Sometimes the market square stayed in the same physical place. It was the city that grew

[31] At least one main road was oriented in the direction of each of the city's gates, and the other roads were perpendicular to them.

in its direction, or around it, making it central. This is the first prove of commerce's ability to influence urbanization processes.

The economic development and the increase in traffic flows influenced the creation of wider streets. These became attractive to retail activity, and, as a consequence, the first major clusters of commerce and business appeared (Salgueiro, 1992). By the end of this epoch the form became mainly dependent of the road design, and a variety of shapes and images appeared in the city, apparently in disorder.

The Renascence and the Baroque periods[32] were characterized by new aesthetic conventions, which promoted the affirmation of architecture and a new kind of urban planning (Salgueiro, 1992). Due to the demographic and commercial growth, new neighborhoods and streets appeared, streets and squares were enlarged, and the old and the new city were united through the tearing down of the city walls. The majority of the growth was linear, with the square plot prevailing as the element of composition of the city (Lamas, 1989). There was a better understanding of the social and economic realities, and the differentiation of space and land use became more evident.

As residential areas scattered, the need for a similar intensification and dispersion of commercial activity became more pressing. From central confined spaces, commerce expanded through the main arteries, forming ribbons that pierced the city. First necessity goods and other high order establishments became an important part of these expansion ribbons, with food-related activities being the most prolific. Other types of establishments, more noisome and space consuming, concentrated in particular streets[33]. Although the building format containing both the shop and the manufacturing studio still existed (Glennie, 1998), most retail shops were specializing, not only in products but in sales, no longer manufacturing, and selling the goods made by others. In central districts the land-use was organized by floors. Commerce occupied the ground floor, offices the first floors, and homes the top floor (Lamas, 1989).

2.2.1.2. Industrial and 19th Century cities

The Industrial Revolution induced a second rural exodus. The increase in population and numerous social changes were supported by a massive urbanization process, changing the structural and spatial concepts of the city. The 'industrial city' (Fernandes, 2003) maintained urban design concepts of the past (open public spaces and geometrical patterns), and presented major improvements in social amenities (infra-structures, facilities and houses). But the appearance of the railway led to radical transformations in the dimension, scale and form of the city. The limits of the city became imprecise and a 'suburban city' emerged.

The suburb immediately became fashionable. More land was available at lower prices, it had low density and none of the inconveniences of the industrialized city, and it was close to rural areas but only one train ride away from the city center (Lamas, 1989). The railway track became the most important vector of development. Cities grew, mostly unplanned (Salgueiro, 1992), in a grid-like fashion along it. The sudden burst of demand and the need for quick growth led, for the first time, to a conflict of interests between public and private spheres concerning urban design. The city expanded not due to a coherent organization of the urban space, but through an outburst of construction. The same patters were repeated without any urbanistic or aesthetic preoccupation (Lamas, 1989).

[32] And also the Pombalino Period, in Portugal.
[33] Many of these streets were named after the activity that was performed in them, and some still keep that name today: Masonry Street for example.

Salgueiro (1992) stresses that most of these development schemes where only characteristic of larger urban areas. Many medium-sized cities did not increase in size in the Industrial revolution, simply because the revolution didn't reach them. But although their growth was small, they had similar changes in terms of form as the larger cities (streets were enlarged, new residential neighborhoods were built, etc.). The extinction of religious orders also assisted this process. Large religious buildings, for example, now belonging to the State, could be demolished to correct a street or make a square. Medium-sized cities were characterized by one principal street (connecting the station to the center and to other attraction poles, such as a school), and it was here, near the center, that the commercial activities were located.

The Industrial revolution not only helped to increase the number of inhabitants in cities, it also helped to increase the average income of families. Consequently, commercial channels expanded (Glennie, 1998). The manufacturer and the seller became completely independent of one another, and commerce settled in one fixed permanent location. Better in-city transportation and permanent shops with windows facing wider and cleaner streets made the act of shopping a popular and casual activity, and an integral part of everyday city-living (Fernandes, 2003). Commerce concentrated in the historical center and in radial ribbons, whilst sanitary reasons helped to eliminate many disperse formats of traditional retail. The local market, however, was maintained, but permanent structures, with hygienic conditions, were constructed. Many important retailers which had a permanent store in the main street kept a stall in the market (Green, 1982). Suburban locations were reached through deals with itinerant travelers, who acted as go-betweens.

Commerce expanded both horizontally, in ever growing commercial ribbons leading to outer rings of the city, and vertically, going beyond the use of the street level floor. First, higher floors were used solely in a storage or administrative capacity, then they became part of the store. This was the prelude of the 'department store', which appeared in the early twentieth century. In France, some shopping streets were covered, creating the first 'arcades'.

The changes in the production, distribution and storage of products resulted, on one hand, in the broadening of available products for direct purchase, and on the other, in the specialization of establishments. This led to changes in the spatial organization of stores, as many establishments of the same kind clustered (Glennie, 1998). Commerce reached an importance in the city that it never had before. The store had cultural importance, and it was a gendered, class-conscious space, socially relevant as a locus to 'conspicuous consumption', and as a site for purchasing, spending, enjoying, digesting and displaying (Rendell, 1998). Consumerism had just been born.

By the last stages of the 19th Century less attention was given to urban fabric (Hofmeister, 2004) as the focus was on growth, location and functions. The geometric grid, by practical reasons, was favored almost unanimously until the turn of the century (Galantay, 1975). The radiocentric grid was also used in cities with uncertain topography or with a great dependency of a central place. This round form is characteristic of Portuguese cities (Salgueiro, 1992).

2.2.1.3. 20th Century cities

In the beginning of the 20th Century shopping evolved from a necessity to a practice. The industrial sector was continuously increasing the amount and variety of manufactured products, and the rising income of families allowed more spending. In city centers commerce was mostly concentrated in main central streets (today's high or traditional shopping streets) of linear form (Davies, Baxter, 1997). This was complemented with small shopping concentrations in residential areas and, slowly, with small

arcades (first in France) and department stores (first in the UK). In America, as early as the 1920s, the first supermarkets appeared, followed by the first 'shopping districts'. These were business districts serving large-scale, out-of-town residential developments. The novelty was that the various shops and services were operated as a single unit. In 1931 what is considered the first planned shopping center was constructed in Texas[34]. It consisted of only one large-scale building, with storefronts facing inwards, and with a single management office. The inward focus led the attention away from the street, and the 'curb appeal', the exterior design and the urbanistic integration were neglected (ICSC, 2006). In all these new commercial formats, the variety which constituted the appeal of the 'shopping street' was presented for the first time under the same roof, and many times in a self-service format. Food retailers, because they sold first necessity goods near residential locations, were the first to embrace these new concepts. The ability to produce economies of scale (lower prices, product/price comparison and extensive product range) permitted a greater attraction of consumers (Guy *et al*, 2005). The first shopping centers to experiment with a mixture of shopping and entertainment appeared in the 1940s.

After two world wars, the relationship between place and individual changed (Lefebvre, 1991), which led to inevitable changes in the 'place' itself. According to Roberts *et al* (1999) the new scale and organization of domestic life and of the economy would make impracticable the return to traditional forms and practices. Consequently, two distinct trends emerged: the suburbanization and the specialization.

The processes that led to suburbanization were numerous. In some cases, the need for accessible buildings with large footprints in amenable surroundings led to the construction of small scale urban ribbons along main axes out of city centers or around peripheral mass transit stations. With the relocation of business and activities, these ribbons became 'commercial ribbons' and the main thoroughfares from the city center to rising peripheral areas. Mostly without planning, the suburbs became auto-based and the improved accessibilities aided decentralization. The growth in the tertiary sector in the centers was another reason for the relocation of residential uses to peripheral locations. Yet, soon after, the most common commercial formats accompanied the residential expansion and relocation in search of open space, people and accessibilities. At the same time, banking, financial, legal and other services were forcing many long-established shops out of early modern shopping districts. Slowly downtowns became associated with older and traditional activities, and with administrative, financial and political services. The city center became just one more center among many others (Fernandes, 1994/5).

In America, the suburban model became known as 'Edge City' (Garreau, 1991). Edge cities evolved quickly from a wide irregular grid characteristic of rural areas to a dense geometrical grid, of average parcels much larger than those of the city center. This grid was most of the times influenced by notable buildings (shopping centers or big office spaces) in the premises (Scheer, Petkov, 1998). Because of the size of the lots, a coherence between shapes, sizes and orientation of buildings was much more difficult to achieve. In Europe, planning regulations and commercial policies, cultural differences, the organization of the urban network, and the historical and traditional background of cities prevented the implementation of the edge city model, or at least made it much more confined. The suburbanization process grew more naturally. It was divided in three types by Salgueiro (1992): (i) exurbanization (suburban expansion of great dissemination), (ii) counter-urbanization (tendency for dispersion) and (iii) rurbanization (in former rural areas). Urban spaces developed from the conversion of rural areas in an oil-stain pattern, especially in axes with greater accessibility to the inner city

[34] The Highland Park Shopping Village in Dallas, Texas, developed by Hugh Prather.

(Salgueiro, 1992). The dispersion of economic activities, workers and dwellers, and consequently of the urban fabric, derived from the increase in individual mobility, the decrease in peripheral land value, the changing pattern of industry (particularly the development of the construction industry), the increase in local power and also, after the 1960s, the return of emigrants to native rural lands. By this time large residential developments were constructed dispersedly outside major cities (but close enough so as to benefit from infrastructures and transportation). Their individual (and sometimes illegal) genesis contributed to the incoherence of the suburban pattern.

If the city, in the 1960/70s (earlier in America) became the 'expanded city' (Fernandes, 2003), the so-called 'commercial revolution', along with the globalization and the internationalization of the economy, altered the entrepreneurs paradigms, and created a rupture in the geographical models of commerce and in the specialized production of goods. Chain and multinational stores developed revolutionary business models. 'Consumer needs' started to have increasing relevance. But it was the large-scale, multi-commercial format that constituted the greatest leap in the history of commercial activity, and surpassed the traditional street in terms of economic retail power. For some, however, the new commercial formats are just updates, not competitors, of traditional ones, molded to new eras of society. Schiller (1986) defines three stages of the 'commercial revolution': (i) the appearance of multi-commercial formats in a continuously rising scale (arcades, department stores, supermarkets, megastores, hypermarkets, shopping centers, power centers), completely changing the interaction between trade and the city, raising many questions (Levy, 1999); (ii) the growing impact and independence of regional and sub-regional shopping centers away from major metropolis; and (iii) the appearance of new commercial formats, such as electronic commerce (Box 1). To these Whysall (1995) adds a fourth: shifts in the social structure, which change consumer preferences and consumer behaviors.

The first stages are inevitably associated with the rise of suburbia. First these new developing towns were dependent of the main city center (traditional) shopping district, so they welcomed closer establishments where they could purchase the same variety of products. Then, with the increase of mobility and accessibility, a larger regional clientele could be attracted (Gillette, 1985). In the 1950s, Austrian architect Victor Gruen and James Rouse were responsible for the conceptualization of the modern format of the 'mall' or 'shopping center'[35]. These were meant to be fully enclosed and controlled environments, with careful store planning (range of activities and location of anchor stores). The planning of the interior design (made to resemble European downtowns) and of the cultural, social and artistic activities therein tried to re-create the atmosphere of city centers and as much non-retail urban functions as possible (Gillette, 1985). Shopping centers became '*more like downtown than downtown itself*' (Architectural Forum, 1956) and they fulfilled the needs of the shoppers in a way that downtown and old suburban centers could seldom do (Gillette, 1985). By creating a neighborhood effect and hosting public events, they induced a sense of identity, in a pleasant, flexible and convenient manner. This '*carnival-like atmosphere*' (Breckenfeld, 1971) represented '*a massive organization of the urban community*' (Times Magazine, 1956, *cit in* Gillette, 1985).

[35] The Southdale Centre in Edina, outside Minneapolis, opened in 1956. It is considered by many American scholars as the first modern regional mall.

Box 1 – Electronic commerce

In the 1970s, the first 'direct' commercial channels (without intermediaries) started to complement, complete and eventually to substitute conventional channels (Balasubramanian, 1998). Immediately, this caused and impact, because it diluted the historical role of location as a source of enduring competitive advantage. Eurostat 3[36], following OCDE's guidelines[37], defines e-commerce as a '*transaction of goods and services between computers mediated by Information and Communications Technology (ICT) networks, although the payment or delivery of the products may not necessarily be made through these channels*'. Initially B2B (business to business) electronic commerce was the only one performed (Figure 4), using electronic data transfer devises: telexes, faxes or even telephones. This marked the beginning of the global market. In the late 1980s, early 1990s, B2C (business to consumer) appeared, with the invention of electronic messaging and file transfer. European initiatives such as TEDIS (from 1988 to 1995) helped to divulge the new systems. According to Currah (2002) early modern formats, such as vending machines, mail orders and telesales produced changes in the urban landscape due to *desintermediation* (factory to the home processes, without passing through the shop) and *reintermediation* (new consumer interfaces). But it was the invention of the World Wide Web that revolutionized e-commerce, creating a new dynamic (but not necessarily entirely virtual) space of consumption (Keeney, Curry, 2001). Not only could a world-wide public be reached without effort, but the presentation, order, purchase, distribution and delivery of the products became increasingly easier (IEFP, 2001). The internet became a marketplace for suppliers, store-owners and consumers, and the website became the store (ANACOM, 2004). If in the late 1990s it was assumed that e-commerce would completely substitute both traditional and modern physical commercial spaces[38] (Cope, 1996, De Kare-Silver, 1998), it is now regarded, not as a competitor, but as an edge for existing retailers (Graham, 1998), which adapted instead of being replaced (Currah, 2002). For Swyngedouw (1992), e-commerce had no influence whatsoever in the structure of traditional retail, but actually the sales of physical stores could increase because the consumer was able to browse products online (e-procurement) before making a decision and purchasing (Mathwick *et al*, 2001; OdC, 2001f). E-commerce allows store owners to establish a distinctive brand identity without resorting to a network of franchises and chain stores (Currah, 2002) and to face logistical and promotional challenges whilst working at a distance, leading to increases in expertise, innovation, productivity and efficiency (OdC, 2002a; ANACOM, 2004). This may allow small and medium-sized companies to be competitive in the global economy, yet Goldmanis *et al* (2008) suggest that small establishments like travel agencies, bookstores and auto-dealers will suffer more with the massification of online purchasing. Pure internet retailers, on the other hand, do not possess the advantages of established retailers (brand name recognition, pre-existing supplier chains and distribution facilities, ability to accept returns at the store), yet they have an almost unlimited stock (conditioned not by the shelf, but by the warehouse – Dodge, 2001) and can constantly update their products according to supply or demand. Weber *et al* (2008) also stress that e-commerce uses less primary energy and produces less CO_2 emissions than physical commerce. Currah's study (2002) in Toronto shows that the physical support places of pure internet retailers (warehousing infrastructures, package and distribution facilities) have remained geographically integrated with the city's commercial landscape. The disadvantages of e-commerce lie on the dependency of technology, causing maintenance costs and need for specialized labor. Also, access to internet is still not available to all. Most consumers still prefer interface with store employees and wish to touch and experiment the product before purchasing. There is a sense of loss of privacy, security, and cultural and economic identity. There was also, until recently, a lack in proper legislation. Maybe this is the reason why, according to Eurostat, as of 2008, only 10% of ICT use by enterprises is devoted to e-commerce. And although most stores have websites, only 10% allow for purchase online (Eurostat; CEC, 2009). Even so, 1/6 of the world population uses the internet regularly, and if in 2006 only 10% of users had shopped online at least once, presently that number is 85%, which amounts to 875 million people (ACEP, 2008).

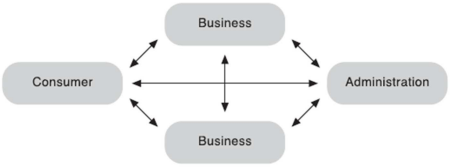


Figure 4 - Types of electronic commerce (source: ANACOM, 2004)

[36] http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/

[37] Organization for Economic Co-operation and Development: http://www.oecd.org/home/0,2987,en_2649_201185_1_1_1_1_1,00.html

[38] The cover of Time Magazine of July 1998 featured Yahoo! creator Jerry Yang and read 'Kiss Your Mall Goodbye: Online shopping is faster, cheaper and better'.

Meanwhile, in European city centers, supermarkets became more common, as well as small commercial arcades, mainly on the ground floors of residential buildings. Most commerce, however, was still local, promoted by family-owned micro-companies, due to closed economy policies and regulations on prices. The sector had a contained growth, due to lack of competition and innovation. In the early 1970s, the first in-city shopping centers[39] appeared, occupying expansion areas of the main tertiary centers (Salgueiro, 1992). They did not have anchor stores, such as a large supermarket. Instead, they were neighborhood-oriented, presenting, for example, bookshops, hairdressers, cinemas or restaurants.

These arcades occupied derelict ground floors or garages of residential buildings (abandoned or occupied by low profit functions), or else the interior of blocks through an 'infilling' process. They functioned as prolongations of the street, and that is the main reason why their success was short-lived. According to OdC (2000b), the architectural and urbanistic quality of these projects was very poor, there was no planning of the shopping mix, and the security conditions were bad. The ICSC report (2006) adds that developers did not anticipate neither future growth nor consumer comforts (no parking facilities, no flexible opening hours, no seating areas, no ample restrooms). In the same decade, because of the appearance of these new formats, the first traditional retail associations appeared, in order to achieve competitive prices.

In the 1980s, the increase in consumption led to an inevitable increase in the size and diversification of multi-commercial formats and to better design projects. The profile of the investors changed. More multi- and inter-national companies with new commercial strategies appeared (Salgueiro, 1992; OdC, 2000b). This led to new location patterns. From the inner ring of the city and the main nodes of traffic, multi-commercial formats started to occupy more interior locations, in denser residential areas away from the center. In medium-sized cities, their influence was wider, attracting more mobile population. In the 1990s, there was a great diffusion of shopping centers, mainly through the remodeling of pre-existing hypermarkets. There was a process of '*affinage*' in the commercial landscape, as a few low order units closed and others, of a nobler stocking, opened and modernized. Because of the growing interest of investors in these mega-projects, their architectonic, urbanistic and commercial quality was largely improved, and a greater focus was given to professional management and marketing. By simple market logic, units of lesser size likewise improved.

Presently, the shopping center has become the most striking landmark in a city's commercial landscape. But it is also a landmark of the city's own landscape[40]. Inquiries show that first people go to the shopping center to stroll or to go to the cinema, and only then to shop. The social and economic turnover capacity of shopping centers has turned them into crucial elements of the urban realm.

In the 20th Century the city became another place entirely. With 'mobility' as the fourth dimension (Lamas, 1989), the urban form evolved from being well-defined, dense, compact, continuous and associated to a certain place, to become diffuse, loose, discontinuous, with undefined physical boundaries and part of a territory (regional, national or even international). Cities now belong to a polycentric network which functions as a whole, due to the globalization process (Sassen, 1994).

[39] Now called 'first-generation' shopping centers.

[40] The American power-centers include churches, schools, post-offices, municipal departments, libraries and museums. The 'Mall of America' power-center has 0.39 million square meters of area, with only half devoted to retail. It contains various nightclubs and restaurants, a 28 thousand square meter amusement park, and it hosts countless cultural and musical events. In Portugal, slogans for shopping centers reflect the need to associate shopping with urban living: '*a city within the city*', '*the historic center of the city*' (Amoreiras Shopping Centre); '*the center of the new city*' (Olivais Shopping Centre); '*a small city and not a big building*' (Colombo Shopping Centre).

Owing to land consolidation, plots no longer have a structuring role and constructed space no longer corresponds to the plot[41] (Levy, 1999). The residential needs led to a 'vulgarization' of urban morphology, and the various morphological elements ceased to coexist in the urban structure. Levy (1999) states that the closed fabric system of the city was transformed into an open, fragmented, peri-urban fabric with spread and disrupt elements, unrelated to each other and without spatial or formal relationships. Therefore, current urban planning aims at filling the fragmented urban areas rather than expanding them, and the focus is once again on the downtown, and on its revitalization. Modern and large scale formats, of increased quality and well integrated in the urban fabric, have started to be used, more than ever, as inductors of new urbanizations and stimulators of local retail. At the turn of the Century, after being a necessity, an excuse to convey knowledge and culture, an economic asset, a social instrument and a catalyst for development, commerce gained a new role. It became a planning instrument.

2.2.2. MODERN COMMERCIAL ERA

2.2.2.1. Changing Perspectives

In the last few decades, commerce changed and adapted once more. Most changes are a natural consequence of the evolution of the sector over the last century (supply), whilst others are adjustments to the new paradigms of consumption that characterize the 21st Century (demand). Where once was an organizational (hierarchical) model constituted by retailers in small establishments, located in the streets and squares of greater movement in the historic center, there is now an intricate web of distribution forms, of various formats and types, in different locations (and sometimes just web-locations). There is no longer a distinct, textbook definition that differentiates between different kinds of commerce (ICSC, 2006). Furthermore, changes in the economic cycles, in political and market policies and in underlying conditions such as mobility and social patterns (wider gaps in social strata, ageing of the population, diminishing households, migration) have had implications both for retailers wishing to establish themselves and for buying consumers looking for a consumption experience (Hankins, 2001). Not only have consumers better economic and mobility possibilities, they have more and easier choices, as the offer becomes geographically balanced and more adjusted to the demand patterns. Consumers can now do a '*territorial zapping*' (Cluzet) and indulge in '*a la carte*' habits (Desse, both *cit in* Fernandes, 2003).

Cachinho (1994) discusses the four main changes in modern day commerce, based on what has occurred in the city of Lisbon: (i) concentration of capital; (ii) changing type of establishments and transactions; (iii) alteration of the ambience of consumption and (iv) changing patterns of location[42].

The first point expresses the increasing concentration of places of sale. In the latter part of the 20th Century, larger multi-commercial establishments have increased their share, both in sales area and in sales turnover. Commercial companies are reducing in number, but in average each has a larger capital. There are more mergers and associations than before, and the number of franchises and chain stores is increasing. Borchert (1998) also stresses that shops are, in average, three times the size they were thirty years ago. Despite this growth, the same author calls attention to a paradox. There are only

[41] Architects call this phenomenon 'the freeing of the plot'.

[42] Wang and Song (2008), analyzing retail changes in Chinese cities express the same type of changes (realignment of the ownership structure, diversification of retail functions, emergence of new retail formats, increasing concentration of capital, rapid expansion of retail chains, spatial restructuring and suburbanization) proving that this was a world-wide phenomenon.

half the stores, for the same amount of houses, than there were thirty years ago[43]. Consequently, if shopping floor-space is increasing in absolute terms, it is decreasing in relative terms. Locally there are fewer stores, even though the overall commercial area is increasing. The same thing is happening in demographic patterns. The number of inhabitants and of families is increasing, but locally, there are fewer people per house and per neighborhood. This means that the global commercial market has more sales area, more potential consumers and consequently more turnover capacity. Yet at a neighborhood scale, there are fewer shops, fewer consumers and less money spent. Borchert's paradox may well justify the attraction and success of large scale shopping centers and the decline of the neighborhood store.

The second and third points are concerned with the 'commercial revolution' already discussed in the previous sub-chapter. According to Davies and Baxter (1997) the new commercial formats have not replaced the older patterns completely. Instead, they have added to the complexity of the commercial structure in the city. The traditional sequence of producer-distributor-seller has been disrupted. Many companies now use a vertical integration, handling all the stages between production and consumption, gaining efficiency, competitiveness, and logistic advantages. As people search for the '*global product in a local space*' (Hankins, 2001), the store-product becomes the store-project (OdC, 2001b). Promoters ponder much more than the prevision of economic turnover in the catchment area. They now ponder quality and originality of products, marketing strategies, selling channels (internet, mobile) and store image and design in order to survive against direct competition (Moreira *et al*, 2006). Promoters are also aware that any decision needs constant update. Furthermore, there is an increasing notion that stores need to either increase their variety of products[44] or else to specialize[45]. Borchert (1998) states that to stay in the middle is to die.

If 80% of all purchases are performed by only 20% of the costumers, and if it is five to ten times more expensive to gain one more client than to keep an existing one (OdC, 2001c), client fidelization is crucial. It's not about selling one product to the greatest number of clients, as before, but about selling to a single client the greatest possible number of products, in a long-term relationship (OdC, 2001d). If, on one hand, '*malling*' (Hankins, 2001) has homogenized consumption practices, on the other, shoppers are less conformed with the established patterns and search for quality and differentiation in products and services. In a sense, the client share is more important than the market share.

Because of the concentration of capital, store ownership has also changed. Multi-national stores achieve higher competitiveness by differentiating in terms of products, specialization, label choices and price. The increase of shops with the same image and configuration also allows for a common base of logistics, marketing and internationalization, easier to implement. Variants such as 'franchises', 'outlets'[46], 'department stores'[47] and 'discount stores' capitalize on these business models, presenting particular ranges of products and prices for demanding consumers. Branches such

[43] And only one third of food-related stores, according to Borchert (1998).

[44] Imitating the shopping center model, like Chinese shops who sell everything from clothing to paint, post offices that sell books, supermarkets that sell more than food-related products, etc.

[45] Many alternative shops specialized in, for example, vinyl discs, comic-books, surf-related products or traditional pastry, have been appearing in downtown areas with increasing success. Clusters of bars and art galleries have also appeared, generating an important momentum for cities.

[46] See OdC, 2000c. The 'outlet' appeared in America, reaching Europe in the 1990s. It is a factory store that sells surplus products out of season, but with major discounts. This format has been successful when attracting consumers from a wider regional area. Studies in France state that 70% of all purchases in outlets are made by inhabitants from other regions. Outlets permit diversification in and requalification of regional commerce. They are now beginning to be located in city centers, with results yet to determine.

[47] Such as 'Corte Inglês', which constitute updates of the same format that appeared in the early 20th Century.

as those of 'luxury retail' (Cushman and Wakefield, 2009a) also try to appeal to particular niches of society. Mendes (2005) uses food-related stores in order to give an example of the variety of sales points available to the consumers according to price and range of products (Figure 5). This variety of choice clearly illustrates a system organized not on competition, but on compatibility.

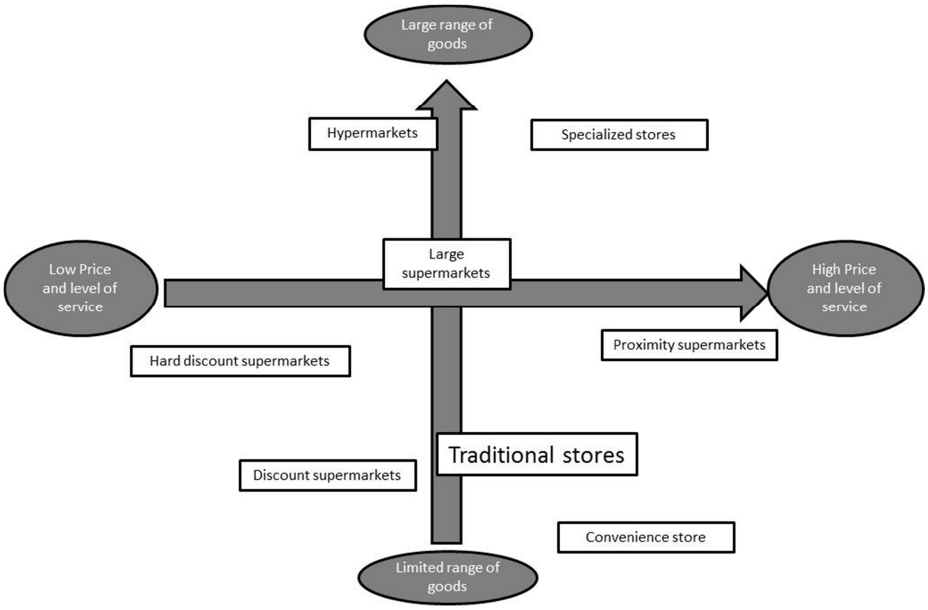


Figure 5 - Typology of sales points of food-related products, according to price and range (adapted from Mendes, 2005, p.7)

But it is not only stores and companies that alter and diversify their ambiences. Localities also sell themselves, by changing, adapting, investing and promoting. Consumers not only consume products, they also consume landscapes. The asset of a 'mythic historic city' (Crewe, 1994) for example, attracts both investors and consumers, increasing the potential of the commercial and service sectors. People will shop if the environment is right.

The last point discussed by Cachinho concerns commerce's changing patterns of location. Not only are these patterns a consequence of the parallel evolution of commerce and urban fabric, discussed above, but they also depend on the theories of commercial location (RLT), which will be discussed in the following chapter. The decentralization of demand, the evolution of lifestyles, the changes in mobility patterns and in urban morphology, and the modernization of commerce itself all influence its location.

2.2.2.2. The changing nature of the commercial street

In a perfect market scenario, the system that characterizes the modern commercial era should be based entirely on compatibility rather than competition. Obviously, this does not happen. Modern formats exert a well-known pressure on traditional retail, but this does not mean that older formats have become commercially obsolete. It does not mean, either, that the traditional formats' decline as commercial destinations is a direct consequence of the appearance of edge-of-center superstores. Thomas *et al* (2004) stated that retail parks were strongly competitive rather than being benignly complementary to traditional shopping centers, but two of the same authors, Thomas and Bromley (2002) point out that it is still being disputed whether superstores enhance the attractions of the center, compete with the existing facilities or are completely neutral. Furthermore, an inquiry made in 2000

(OdC, 2000b, 2000d), shows that people go to the shopping center to go to the restaurant and to purchase home, hygiene, culture/leisure and non-fresh food products. If we consider that traditional downtown retail is also characterized by fresh food-related, non-food related, and personal products, then there is not a direct linear relationship between the purchases in superstores and the purchases in downtown stores. But what is true however, is that traditional formats are *indeed* declining, in terms of volume transacted and jobs offered, whilst the overall amount, considering all forms of commerce, is increasing. The causes may well be in society's and commerce's changing perspectives, rather than the direct appearance of a competitor.

The traditional street, associated with familiar, neighborhood-oriented, small forms of commerce, has a strong relationship with the surrounding urban space. This relationship is not only physical, but also psychological, because traditional retail is part of the average person's perception of downtown, and part of the daily habits of a large slice of the population, especially the eldest. The closeness, quality and reliability of the service, and the personal relationship with the client used to be assets, but now the 'site' has lost its status with the upgrade in mobility patterns, and modern formats have lost much of their initial impersonal nature. On the other hand, traditional retail has lost centrality, vitality and has not kept to date with the demands of the commercial revolution. Peripheral population (and center population as well) started to use peripheral commercial facilities instead of the center. Then the center itself saw a 'corporisation' or 'gapification'[48] of its main street (Hankins, 2001). Many traditional firms cannot maintain surplus value and finally abandon their main street space, substituted by newer firms that can absorb rent costs and remain profitable. Commercial gentrification processes may occur (Satterthwaite, 1983), and many main streets, aided by commercial urbanism projects, have become almost like 'open air shopping centers'. The 'gentrification' can be positive, as the tertiary sector slowly re-gains importance, and generates value, in a derelict city center. Many downtown main streets have gained a new commercial life by day and an entertainment life by nigh. If this has pushed residents towards new neighborhoods (Salgueiro, 1992) that loss is compensated by the increase in land values, the growth of demand and economic power, and the promotion of a new image[49]. But that loss also affects traditional retail.

The dead unlettable space left by outgoing tenants constitutes weak elements in the system of shopping linkages[50], which can result in decreases in shopping attraction and pedestrian flows, social costs and even environmental problems (Thomas and Bromley, 2002). Whilst in the center these have quickly been occupied, in the suburbs, due to the offer surplus, this has not entirely happened. The closer the spatial integration, the greater the interaction and viability of the shopping environment. The traditional street is therefore much more open to spin-offs of the main axis than are peripheral sites.

Some traditional tenants, however, led by younger and dynamic promoters, have updated their own store formats, 'gapifying' the street from within. These have been able to introduce changes in the type of establishments, transactions, and ambiences of consumption without changing ownership or location. Unfortunately, these are a minority. The literature points to the lack of vitality and action of traditional owners and retailers as one of the main problems of traditional centers. It is usual for traditional retailers to state that the proximity, competitive price and variety of products of the modern formats are the cause for their decline. Maybe they cannot compete, but maybe they are just unwilling to try to adjust. The truth is that the actors are ageing, they don't have the necessary qualifications and

[48] Term used by Hankins (2001) to describe the process in which large, national and multinational firms, such as the Gap, are displacing local retailers in the heart of towns.
[49] Commercial urbanism projects and downtown regeneration schemes are discussed in Chapter 3.
[50] For an extended study on shopping linkages see Thomas and Bromley (2002).

fear the competition, family businesses hesitate before investing in up-to-date business models and digital technology, and there is no wider sense of planning and management. Actually, in Portugal, 89% of commercial companies are self-owned and 96% have an independent management system. Varanda's (2004) study on social networks reveals that the retailers more likely to produce changes in their establishments are the ones who belong to associations, because they have more openness and a higher degree of interaction. But only 1% of companies are associated with shopping centrals and 9% with retail cooperatives (OdC, 2000f). And even the commercial associations seem to be taking a passive stand[51], capitulating to the demise of traditional commerce, and claiming government support without being pro-active. The demands of traditional retailers succeeded in tightening the legislation for the implementation of large scale-formats, and in reducing their opening hours, but these were poor wins, because both large-scale entrepreneurs and consumers are willing to adapt. Success stories of traditional retail revitalization through the use of European structural funds are also few, mainly because there is a need for an investment in the part of traditional retailers. Surveys in Portugal concluded that, as of 2001, 59% of retailers did not wish to elaborate a business plan and 58% did not wish to apply to an incentive program (OdC, 2001c). On the other hand, private commercial led downtown rehabilitation schemes are viewed with suspicion, and the willingness to approve them is many times hindered by the idea that they will destroy the local economy.

The market has changed. The consumers have changed. Values have changed. Yet traditional retailers still wish to be successful using outdated formats and models, as if no paradigm shift had occurred[52]. This leads to slow progress, to an absence of cooperation and coordination and, consequently to a limited degree of retail revitalization. If only one or two shops in the street modernize, the efforts are meaningless. Social strategies, if efficient, could strengthen economic strategies. Furthermore, especially in Portugal, the 'gapification' of the commercial street is more difficult due to rent regulations. Many traditional storekeepers have outdated rent contracts, with the right to remain as long as they pay the symbolic rent value. A great financial effort is needed for an older shopkeeper to accept the annulment of his contract. Furthermore, the old contracts have high-value trespassing clauses. Therefore, a modern entrepreneur has to pay much more than the rent-value of a shopping center to be established in the main street, if he has to pay compensation to the old tenants and trespass two or three older stores in order to make room for his large-scale store[53]. Moreover, the modern entrepreneur regards downtowns fearfully, as unfamiliar territories (Frieden and Sagalyn, 1989) in terms of site assembly, building design, financing and parking, many times preferring the security and profit-guarantee of shopping centers. Consequently, modern formats turn away from the street, leading to its stagnation.

But the '*street should not be abandoned*' (Jacobs, *cit in* Gilette, 1985), but rather managed in terms of amenities, in order to give it additional life. Modern day downtown commerce should fulfill this need, but the truth is that many times it does not. People are intimately linked to the city center, but when the time comes to make a choice they just use it as a reference and then proceed to shop at a large-scale facility. First the shopping center imitated the city center, but now it is the other way around. If in the 1980s shopping centers could be the antidote to the formless outward spread of the city (Gilette, 1985), now they can fulfill the role of uplifting the city center. Their case, obviously, is not consensual. Guy (2005) summarizes the issues surrounding large-scale formats development in cities (Figure 6).

[51] Despite several attempts to work with each of the commercial associations of the four cities analyzed in this research, none showed an interest, and none was able to supply any sort of supporting data.
[52] Fernandes *et al* (2000) say that '*traditional retail means everything and nothing*'.
[53] Information taken from an article in the newspaper 'Hipersuper', July 11th 2008

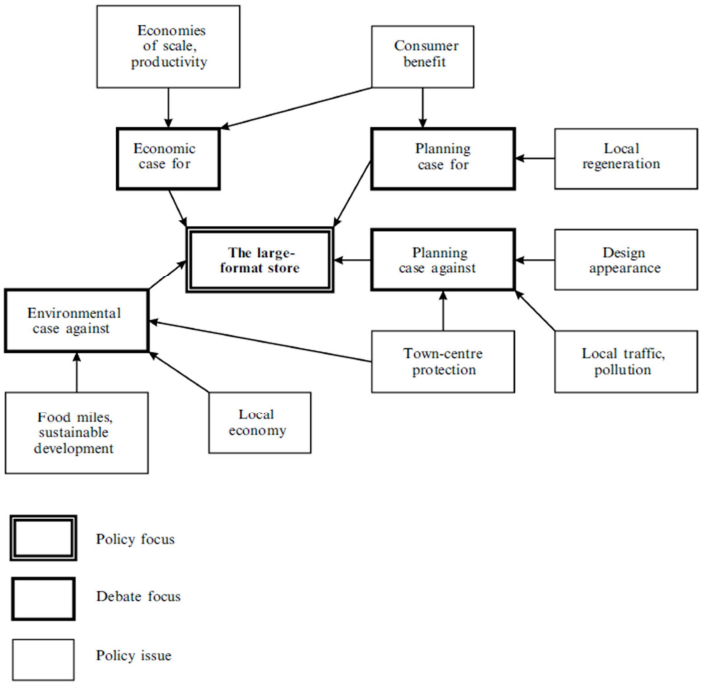


Figure 6 - Issues surrounding large-format store development (source: Guy, 2005)

On one hand there is an argument that the construction of large scale commercial spaces in expanding urban areas has led to the spatial dispersion of independent and proximity commerce, causing a decrease in the scale and the mix of the offer, and consequently in the capacity of the market to be competitive. Local economies (urban and rural) are harmed, and large-scale developments can be '*self-contained fortresses*' (Triester, 1981, *cit in* Gillette, 1985), denying the street. If city centers prove to be inadequate to meet the market area requirements of development projects, this lack of vision and the surrounding competition may lead to underused commercial spaces or white elephants. Furthermore, shopping centers do not mean more jobs. There can just be a relocation from the closing traditional stores.

On the other hand, there is what the literature calls 'the developers' argument'. Large-scale facilities are viewed as vehicles to achieve social and economic goals. They allow for more efficiency (economies of scale, more profit and employment capacity), more competitiveness (wider range of goods, improved logistics and services, and lower prices), and more innovation. According to Gillette (1985), the challenge is to adapt commercial principles so as to enhance rather than sacrifice the social and aesthetic diversity, contributing to land remediation, control and regeneration. This argument also stresses the spill-over capacity of shopping centers, favorably influencing traditional formats, which may acquire, consequently, new functions and rhythms, by organizing, specializing and modernizing themselves. This is the idea behind downtown retail-led regeneration schemes, which will be discussed in the following Chapter. Yet developers argue that planning policies do not fully recognize the existing potential of shopping centers and therefore are preventing the development of efficient and competitive stores. Furthermore Thomas and Bromley (2002) have showed that the flow of pedestrian traffic may be from the center stores to the superstore, and Roberts (2005) stresses how these schemes can be prejudicial to the local economy. Once again, there is no consensus.

Either for good or bad, the modern formats have introduced a new dynamic to the main street. Traditional retail has resigned to a position of a reflective, specific buy, or a day-to-day problem solver, whilst the large facilities reflect an impulsive, leisurely buy, but also necessity shopping for the

week or for the month. An intermediate scale, especially concerning food-related products, has also invested in proximity strategies, competitive prices and quality of goods and services, threatening small proximity commerce whose main asset is specialization and brand association. In many European countries, small and medium-sized supermarkets such as Pingo Doce, Lidl, Mini-Preço or Schlecker not only are taking the market share from small grocery shops, they are also beating larger formats, such as hypermarkets (Figure 7). This can be a sign of the success of return to downtown strategies, with more people and more commercial facilities boosting proximity retail once again. Yet this proximity retail is not to be confused with traditional retail. It has traditional retail's advantages of location and personalized services, but follows business models more in agreement with the new commercial formats. It is this model of store, along with the 'gapifyed' shops, that presently characterize most main commercial streets.

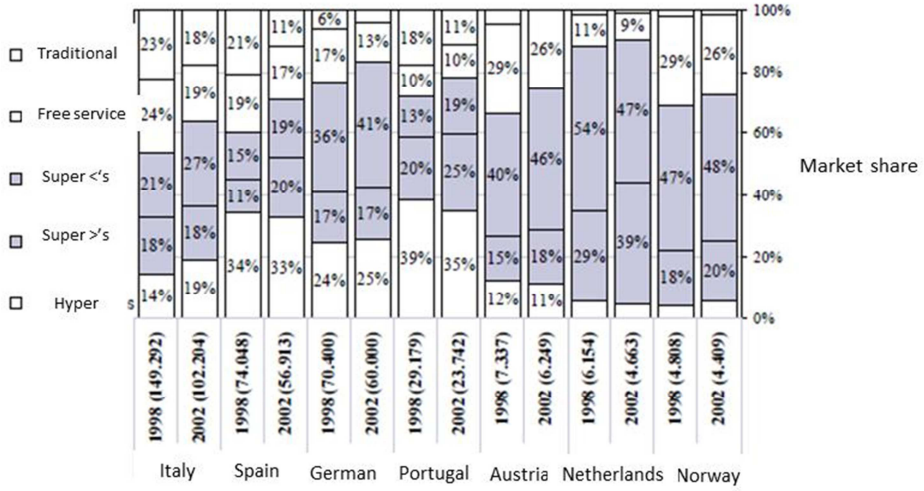


Figure 7 - Volume of sales by type of store in a sample of European countries (adapted from Mendes, 2004. Number of shops per country in brackets)

But competition does not occur only between commercial formats. It also occurs between city centers. This happens particularly in medium or small sized cities in close proximity. Here, where commerce is essential to the survival of communities, especially the rural isolated ones, the desertion of rural and suburban spaces and the appearance of modern formats have major effects that must be considered. According to OdC (2000d), as cities diminish in size, the clientele of traditional street retail is obviously larger, but the clientele of hyper and supermarkets is the same. Only big box developments were shown to have less relevance in medium and small-sized cities. But in Portugal, in 2000, only few of these cities had large-scale shopping centers. That is not the case today.

Lamas (1989) declared that the street, the square and the neighborhood were totally abandoned, substituted by the tower, the door-to-door continuous construction and the city block. Today we know that this is not entirely true. The free space left by the commercial, residential and business activities when they exited the center in the late 1980s, early 1990s, has allowed for a new wave of metropolitan expansion (Coupland, 1996). As the most common urban functions disperse, a spatially specialized metropolitan layout emerges, with the edge and the center having complementary roles (Roberts *et al*, 1999). The mobility between suburbs many times surpasses the mobility to the city center, and the polycentric urban structure allows for diversity, choice and competitiveness. It is the loosely structured but overlapping functional specialization of cities that gives them the resilience and adaptability to

long-term economic change (Roberts *et al*, 1999). According to Fernandes (1994/5), the advantages of polycentrism are faced against the need for a regenerated city center.

But the main street still retains the central role in the modeling and structuring of form, even in the modern metropolis (Levy, 1999; Roberts *et al*, 1999). It is the most enduring part of the city, and it's retaking its importance as a space for face-to-face interaction, transactions and creativity (Bianchini, Landry, 1995). Martins (2010) stresses that street commerce only has a future if it can efficiently and intelligently explore its assets, namely client fidelization and personalized interaction, exclusive, fresh and handmade products, cheaper prices, etc. But most modern commerce already possesses these characteristics so a middle term is needed. Innovation should exist but without entirely deleting the pre-existence. The traditional functions have not eroded. They have been updated. Open air shopping centers are new public squares, supermarkets and malls replaced department stores, market streets became covered markets, etc (Levy, 1999). The downtown main street may probably never again be the main supplier of families, but it has a new economic and social role. And people will always need interaction no matter how advanced the ICT become, and they still have an attachment to main street commerce, although they favor the large-scale formats. If on one hand, as it becomes easier to work and shop from home, people travel more, and sometimes farther, to go to meeting and shopping places (Graham, Marvin, 1996), on the other shopping centers never comprised more than 5% of the total number of shopping spaces (Tubridy, 2006), and, in Portugal, only 4% of the population purchase exclusively on modern commercial types[54].

2.3. A BRIEF DEFINITION OF THE SHOPPER

Whatever choice is made in terms of commercial location and format, it will only be successful if it attracts first, movement, and second, shoppers. Commerce is, above all, an economic activity, so no matter how lively and interesting a place is, if no purchases are made, it cannot be sustainable. In the words of Skogster (2006), in retail, '*everything is based on buying consumers*'.

The act of shopping is (still) a search process. The shopper wishes to make the right purchase decision and derive emotional satisfaction from it (Tauber, 1972). Presently, this emotional, non-monetary, value seems to be as important as (and sometimes even more important than) the functional value of the buy (Sinha, 2003; Ziethaml, 1988). Actually, consumers are spending fewer resources on first necessity goods, such as food and clothing, and more on health, cultural/entertainment and educational items (Melo *et al*, 2001). Consequently, modern day shoppers contradict the traditional principles related to the acquisition of products, namely proximity, convenience and price. This is yet another reason for the shoppers' tendency to look for modern commercial formats rather than the high street traditional store. Furthermore the present shopper exists in a new social, economic and mobility context. The population is ageing (therefore proximity services and personalized interfaces are relevant), men and women work alike, and with varying schedules (therefore shopping habits change), the degree of education of most people is higher than before (therefore there is a demand for more quality and information about the products), the power of consumption and the willingness to consume have increased exponentially, as well as the average overall accessibility, and new target markets emerge (such as teenagers, children, sportsmen). The ICT also allows for a quicker and comfortable product browsing, price comparison and even, ultimately, purchase. Therefore the new consumer is unfaithful, demanding, time-maximizing, much more insightful and expresses his identity through his

[54] Data presented by Nielsen in the first convention of independent traditional commerce, sponsored by MAKRO, held in Portugal in 2005.

consumption patterns (GECIC, 2005). But at the same time, his view is clearly non-hierarchical (Fernandes *et al*, 2000). He is unaware of the complex processes behind store location, shopping hierarchies and linkages, and product supply and display. Commercial planners must therefore use cognitive approaches to understand the shopper's behavior and choice pattern.

While shopping, the shopper will instinctively go through a process where he searches, discovers, sees, and sometimes touches and feels the product before making his selection and purchasing. Since the 1950s, in commercial literature, shoppers have been classified according to the type of choices they make in each step of the shopping process. For example, they can be classified according to the time they spend (fun/leisure shopper with time to spare; work shopper wishing to do fast purchases in a small time frame), according to the way they choose to browse and decide (internet, catalogue, in the store), or according to their social stratum/spending capacity. The earliest work is credited to Stone (1954), who divided shoppers into four categories (economic, personalizing, ethical and apathetic[55]). Later on, Lesser and Hughes (1986), for example, have gone as far as 11 shopper types, including 'coupon savers'. Sawicki (1989) presents 5 kinds of shoppers that may appear in a newly renovated city area, according to their origin in the city, their willingness to spend in the new area and their previous shopping habits. Recently, Sinha (2003) and Sinha, Uniyal (2005) present literature reviews on shopper classification, whilst proposing their own behavioral segmentation.

According to Sinha and Uniyal (2005), the relationship the shopper develops with the store, in terms of affinity to the products sold and to the store's physical format is the most important influencing factor. If the store does not provide a compelling reason to visit, in the shopper's perspective, the amount of purchases per visit is likely to go down (Zeithaml, 1988), and then the visits themselves will diminish. Format acts as a major differentiator, serving as an asset against direct competition and raising new expectations in the shoppers. But for a storekeeper this is not straightforward. Each individual perceives the environment in a different way, so the behavior displayed may vary under the same circumstances. Different individuals have different behaviors at the same store, and respond in different ways to the same phenomena, such as a publicity stunt or a window display. On the other hand the same individual has different behaviors at different stores. The study by Sinha (2003) reveals differences in a shopper's decision towards the same product, but at different stores. An individual is also likely to be affected by the shopping context. If he is alone, for example, he will act differently than if he is with friends. Belk (1974) stresses the importance of a social surrounding. Other consumers' behavior can influence a certain shopper, because they act as an interactive dimension, even if there is no direct personal contact. This co-awareness and co-presence of other shoppers is important, because a space that attracts a greater number of people also attracts interest, overt shopping behavior (window shopping) and consequently buying (Amir, 1998), ultimately affecting the commercial viability of the sites (Thomas, Bromley, 2002).

According to Pine and Gilmore (1999) the ultimate source of distinction between retailers is consumption experience. Consumers search according to their own preferences but at the same time they are willing to be influenced, because they can easily adapt to new experiences. A change in the store context creates an environmentally-induced emotional state that has a positive association with the stereotyped in-store behaviors of shoppers (Tai, Fung, 1997; Otnes, McGrath, 2001). Therefore marketing mix is also fundamental (Connolly, Firth, 1999), associated with promotional campaigns and the experience provided (Sinha, Uniyal, 2005). But brand awareness is not enough. According to

[55] Economic shoppers would evaluate the store on its offerings in terms of merchandise and prices; personalizing shoppers would develop relations with the salespersons; ethical shoppers shopped to help the 'little guy' and apathetic shoppers showed a lack of interest in shopping.

Underhill (1999) shoppers take much more into consideration the information they themselves acquire at the store or when window-shopping, instead of relying in out-of-store marketing communication. In recent years however, web-tools have been having a major impact on the knowledge the consumer can acquire beforehand. Furthermore, a consumer can only be influenced to a certain extent, so his own preferences also influence and change the store's layout, marketing, product stock and display, and ultimately, according to Gregson *et al* (2002) the store's location. A study carried out in the Portuguese city of Leiria (GECIC, 2005) divides consumer's preferences into eighteen parameters, as follows:

- Pleasure and fun while strolling
- Beautiful and pleasant environment
- Security and protection
- Commodity and proximity
- Simplicity and tranquility
- Comfort and well-being
- Time-maximizing and quickness
- Flexibility and convenience
- Amiability and consideration
- Information and support
- Ambience and animation
- Quality, prestige and identity
- Nostalgia and tradition
- Diversified and exotic offer
- Liberty, autonomy and novelty
- Ecological and natural products
- Responsibility and trust
- Good price/quality relation

Melo *et al* (2001) also present the valued and not valued attributes by shoppers, according to types of commerce.

Table 2 – Valued and not valued attributes by shoppers, according to types of commerce (adapted from Melo *et al*, 2001; original source: Pereira, M.; Teixeira, J. (1999). *Horários e funcionamento dos Centros Comerciais - Situação Actual e Prospectiva*)

Types of commerce	Valued attributes	Not valued attributes
Traditional street retail	Quality, proximity, interface	Prices (high), opening hours (short), car-access (deficient)
Municipal markets	Quality, variety	Opening hours (short), car-access (deficient)
Supermarket	Variety, quality, opening hours, proximity	Prices (high), interface (deficient)
Discount	Prices, opening hours	Quality (lack of), interface (deficient)
Hypermarket	Variety, opening hours, prices, car-access, parking	Access for public transport (deficient)
Shopping centre	Quality, variety, opening hours, car-access, parking	Prices (high)

In the first list it can be seen that the items concerning the consumption experience are much more valued than those of offer and price range. Only when asked to divide shopping types by specific, measurable attributes, do shoppers show preference for high quality, low price products in a variety that allows them comparison before purchasing, and for accessibility and proximity. Actually, a report by the European Commission (Ipsos Belgium, 2009) shows that shoppers are generally satisfied by the

existing retail offer except in terms of the price/quality ratio of products. The report also stresses that consumers are less committed to particular retailers and are more open to continually explore new alternatives. Proximity retailers, which depend on a steady clientele, are the ones who suffer the consequences of this consumer trend. They are also the ones in which opening hours appear as more relevant. Fresh food retailers, in particular, such as fruit and vegetables sellers, appear as the ones with which consumers are most dissatisfied.

Accessibility and proximity are terms related to mobility. If before consumers shopped at the corner store because it was closer and convenient, they now go to edge-of-town shopping centers because it is almost as close (they locate near free-way nodes) and as convenient (free car parks with direct access). When in a downtown, shoppers are guided by other people's movement patterns, and by instinctive choices. They will more easily stay in a straight-line pedestrian shopping street with an appealing layout than they will venture through backstreets. Shopping relates to '*the consumers' spatial behavior in a built environment*' (van Nes, 2005). If there is movement in a shopping space, then the chances of selling are increased, even though the quality, price and range of the individual product will later determine the actual sale. Therefore, one way to interpret the shopper's behavior is through the analysis of his potential movements. Space Syntax researchers[56] have explored this relationship between shoppers' movement and purchase, based on the principle that stores located in the axes (streets) with more movement potential (because they are central and highly connected to the city street network) are more likely to be successful (Hillier *et al*, 1993; Hillier, 1999; Porta *et al*, 2007). Accordingly, studies such as Sarma's (2006, 2007) in New Delhi try to compare a street's aptitude for to- and through-movement[57] with the type of shopping and of shoppers therein. In the case of shoppers, Sarma reaches the conclusion that high-end, more mobile social groups follow the global properties of space (meaning that they consider the entire city in their mobility choices), while the low-end groups follow the local properties of space (meaning that their movement notion is much more confined). Middle order groups follow both global and local properties.

Studies of Space Syntax can be interesting when interpreting movement choices by shoppers, and why some spaces appear to be more lively and successful than others. But the justifications for Space Syntax patterns are in the morphological construction of space and not (directly) in its social and economic values, which are psychologically attached, by the shopper, to the commodities available (Sarma, 2006). A space may have the *potential*, but it may not have that potential optimized. Even so, the literature, save some exceptions (such as Tecklenburg *et al*, 1994) has already found good correlations between Space Syntax patterns, pedestrian movements and shopping success.

Inquiries and direct observations seem to be the best ways to collect data concerning shoppers' patterns. Interviews can make decision-makers understand why shoppers are entering a particular store, what products they are looking for, what elements they value and from how far they have come. Installing cameras and using video and RFID analysis[58] (Girgensohn *et al*, 2008) can help determine movement patterns inside the shops or even in the streets. Store variables can also be manipulated in order to test changes in sales patterns (Sinha, Uniyal, 2005). All these analyses are, obviously, time consuming, and require a great amount of resources. Nevertheless, if a store wishes to be successful, the developing of market studies concerning the shopper are essential to create winning strategies.

[56] Space Syntax will be more properly explored in Chapter 3.

[57] To-movement refers to the street as a destination, whilst through-movement is related to a street's role as a passage way to another location.

[58] RFID stands for 'Radio-frequency identification' and consists on the use of radio-frequency electromagnetic fields in order to transfer data from a tag attached to an object, for the purposes of automatic identification and tracking.

O'Neill (1991) defines the three pillars of the decision making process: the shopper, its behavior and the physical environment of the store. Once again, the store format appears as the most important element. Considering that one part of the store format is its outward appearance and location, it can be concluded that shoppers are also influenced by the morphological scenario of the store in their decision to act. To this a storekeeper should add a proper ambience, service, price and marketing according to the behavioral segment of the shopper it most wishes to attract, in order to become attractive, induce longer durations and increase spending (Sinha, Uniyal, 2005).

But the role of the shopper is not only to follow the trends stores try to impose. He is not only part of the outcome, he is also part of the process. Because of the cultural and social shifts, because of the downtown retake by generation x-ers and ex-suburbanites, because of the demands for a distinguishable urban and shopping experience, shoppers were also a crucial element in the return of commerce to downtown areas (Hankins, 2001). Their demands and tastes have affected the forms of commerce, and consequently, have also affected the form of the city.

2.4. RAISING BRIDGES

Aristotles (*cit in* Marques da Costa, 2002) argued that to form a city it was only necessary to create a place where an equilibrium between the physical, the human and the functional dimensions could be achieved. Corbusier (*cit in* Marques da Costa, 2002) added that to govern a city it was only necessary an equilibrium between growth, activities/functions and daily living. Both authors reveal that the dynamic behind cities is achieved by average citizens, performing functional activities, in a backdrop of form and structure. When considering the particular case of commercial activity, the act of 'buying and selling' constitutes the function and the shopper completes the triangle as the human element. Together, morphology, commercial activity and shopper generate an important momentum for the growth of cities. Although this symbiosis is implied in the understanding of cities, it has seldom been discussed in the literature, and it is not systemized in any known model.

The city has been described as a place of countless interactions that result in constant changes, originated through planned or unplanned (market driven) choices mostly made by policy makers and economically empowered decision-makers. But Whitehand (2007) suggests that these actors have poor awareness of the city's interrelated forms and of the historic-geographical process, and that there is a lack of integration and a low degree of communication between them in the comprehension of urban form. According to Kuraman (2001), the morphological characteristics are considered as an essential element in post-modern discourses, and their evolutionary patterns are crucial to the understanding of the city. But urban morphology is no longer the study of simply the physical architectural element. The evolution of form and structure over time is also concerned with *typology*, that is, land and building use, and circulation patterns (Figure 2). It is precisely the typological component that Whitehand (2007) also suggests is missing in morphological studies. In analyzing the '*morphological sense of commerce*', two elements should therefore be added to the conventional study of urban morphology, namely in the 'typology' component: commercial activity patterns and shopper's movement patterns.

Presently commercial activity is much more than a mere transaction of goods. It holds the status of the most important social function, which lingers regardless of the contextual social, economic, demographic and political changes. But in order to linger, commerce also adapts, consequently changing its patterns. Commerce can be a reactive or an active element in the urban structure. Usually it is both, simultaneously. When it is reactive, it mutates in order to keep pace with the changes in the

exterior environment and in consumer's preferences. When it is active, because of its entrepreneurial nature it can impose changes on both these elements. Accordingly the commercial pattern changes, in terms of location, format and activities, influencing the economic performance of the market. While geographical and economic studies have dwelled on commerce's reactive nature, urban planning studies have focused on its active nature. Slowly, urban morphology studies have tried to explore both natures. Furthermore, the choices an individual makes as a city user condition both the urban environment and the distribution of activities. Although it may be argued that the process can also work the other way around, for Hillier (1996b) the movement economy is the beginning of everything else. Without movement, spaces would lose their liveliness and security, and shops would lose their market share. Shopper's movement patterns have been one of the main components of Hillier's Space Syntax theory.

If morphology has changed because it has expanded beyond the physical, commerce has also changed, because it has gone beyond the spatial (geographical) and beyond the economical to incorporate a functional and institutional significance (Heinritz, 1998). According to Procopick and Djalo (2008) it is this mutable nature of both entities, along with the ability they have to work around each other, that enables commerce and city to keep their vitality and viability. This is crucial in order to attract movement and investment. Cities are opting for a strategic planning (Damiani, 2006) and consumer-led interventions, because they are interested in combining the existing multiple forms of commerce (Troitiño, 2000) in order to benefit from spin-off amenities and consequently restructure their urban spaces. These strategic potentialities also interest medium-sized cities, whose economy is strongly dependent of their commercial landscape, and which have been affected by the commercial primacy and the increasing commercial capacity of larger cities (Thomas, Bromley, 2002), whilst having gained, at the same time, an importance of their own.

"No matter how good its offering, merchandising or customer service, every retail company still has to contend with three critical elements of success: location, location, location."

(Taneja, 1999, *cit in* Porta *et al*, 2007)

3

INTERPRETING AND MEASURING COMMERCE IN THE CITY

3.1. FROM GEOGRAPHY TO ECONOMY

3.1.1. A PLACE IN SPACE

The pattern of commercial spaces in a city has never been the consequence of chance. In Medieval cities, trade was located near administrative buildings in order to capitalize on growing movement. Later many commercial streets were formed because of the need to capitalize on the economic and attraction advantages of proximity[59]. In the early 20th century Hotelling (*cit in* Davies, Baxter, 1997) observed that ice-cream stalls chose to concentrate in the middle of the beach in order to be able to reach the entire market, rather than disperse and dominate only a small portion of it. Inevitably, all retailers make a location decision before establishing themselves in the city. The 'best possible place' is associated to the most suitable market conditions (physical, economic, social and logistical) that the retailer can afford, and consequently to sales and profit. Therefore location choices have always been of utmost importance to retailers. And because commercial businesses usually have higher rent-paying abilities than any other function in the city[60], they can successfully compete for favorable locations, forming measurable patterns as they make their selections (Kwan-yiu, Kong-sut, 1971). In the early 20th century, when commerce finally received recognition as an important economic activity in the city, scholars realized not only that retail location choices were crucial to the success of the establishments, but that, supposedly, the patterns formed assisted the city's performance. According to Nelson (1958) '*the pattern of a city's land use is a major determinant of its economic efficiency and social amenity*'. Consequently, commercial and urban studies where first joined through the analysis of retail location.

The first studies on this subject were of a geographical nature, in which hierarchical models of the city's retail geography were obtained through spatial and clustering analyses. Yet these studies were

[59] According to Nelson (1958) the lower the economic generative power of the activity, the more important it is for it to cluster. Huang and Levinson (2011) try to explain, through an agent-based model, why retailers cluster.
[60] 'Commerce' is the second largest economic activity, following 'industry'. For obvious reasons, industrial facilities usually locate outside main city centers.

only concerned with the outcome of the retailer's choice (the physical location of an establishment at a given moment), and not with the causes that led to that choice. For many centuries, in order to find the best appropriate location, retailers had been using instinctive knowledge, rules-of-thumb, or simply followed other already established retailers. But since Nelson's 1958 breakthrough book on retail location, companies have been applying increasingly complex mathematical and geospatial models in order to find the market's best locations. These formal techniques constitute the 'Retail Location Theory - RLT'. Until recently, the RLT has only been a concern of retailers and economists who wish to determine market behaviors in order to maximize their profits. According to Burnaz and Topcu (2006), these theories are now also being applied by urban scholars in order to interpret commercial activity patterns.

Both economic and geographical interpretations of retail location consider that cities are built through market processes. Accordingly, commerce has a *reactive* nature, and commercial patterns are a consequence of the promoters' decisions, which are always assumed to be market-driven. Until the late 1980s, most retailers were only conditioned by broad planning directives, so retail location processes were, for the most part, uncontrolled, which led to many critics in the literature. For Hernandez *et al* (1998) the city's commercial pattern was a consequence of a '*whim of decision makers*' and Harvey (1973, *cit in* Whysall, 1995) stated that '*the rich can command space, whereas the poor are trapped in it*'. This means that retailers with less economic capacity have more responsibility in their decision concerning location. Berman and Evans (1983) compared this decision to marriage. Once chosen, a retailer is tied to a given location for 20 to 25 years and divorce can be very expensive, if not impossible. On the other hand, according to Nelson (1958), more powerful companies, usually owning more than one store, reevaluate all their locations almost every year, relocating some units to better locations and eliminating poor ones. According to Lee and McCracken (1982) there are three critical stages promoters should consider: 1) when the shop enters the market; 2) when it becomes aware of the surrounding environment and the existing competition (and so may or may not change its location) and 3) when it assumes a final position. If RLT is used beforehand, the second stage can be eliminated and the first and third stages become the same. When the market conditions change, these theories assume that the shops reenter a new scenario, so they return to the first stage and reassess their location.

By using exclusively market variables in the process of retail selection, both intrinsic commercial data and morphological conditions of the environment are excluded from the models. Consequently, the economic and geographical perspectives dwell only on the topological and typological components of form and structure (Figure 2). The city, considering Tallen's (2003) subdivision (Chapter 2) is regarded as the 'aggregate city', because it is entirely measured through statistical data. The aggregation of shops forms distinct patterns that can be modeled, and these patterns are later compared either with market-related data (RLT) or with other socio-economic, land-use and transport patterns.

Presently, the spatial re-configuration of cities has been understood as a consequence of the concentration of commercial activities in certain specific points (Proocopiuck, Djalo, 2008). But according to Kompil and Çelik (2006) many public officials and decision makers are concerned with the undesired spatial and socio-economic consequences of these various restructuring processes and enduring commercial transitions. If it is true that the geographical understanding of commerce can help to interpret and regulate the processes of urban, social and economic development (Salgueiro, 1994; Shan, 2004), it is also true that in the formation of the geographical layout these processes are mostly not taken into account. As early as 1958 Nelson was already expressing that, in the end, a retailer performed a location choice based on business volume estimates alone, and that the other

socio-urbanistic factors were only taken into account to narrow down the existing options. Nelson adds that promoters would always be concerned with public plans regarding demolitions or new constructions such as residences, parks or schools that would affect their estimated business growth, but that was the only established connection between urban planning and commercial planning. Commerce was considered to be an exterior element to urban shifts, which only acted after-the-fact. Nelson assumes that '*the emotional aspects of a location can be important to the success of a store or a shopping center as the more obvious characteristics of convenience and access*'. But he fails to answer his own question: '*But can stores or shopping centers be as important to the emotional aspects of location?*'. If the pattern of shops affects favorably the '*economic efficiency and social amenity*' of urban spaces, then these spaces can become 'good locations' for future companies as well, completing a virtuous urban cycle. If shopping patterns affect unfavorably the surrounding urban environment, as was the concern of Kompil and Çelik (2006), it would be of no less importance to assess their impacts. This link is missing in geographical and economic studies.

3.1.2. THE VALUE OF LOCATION

Presently, 'location' is much more than a physical place on a map. It is a juxtaposition of syntactic, social and economic aspects such as centrality and accessibility, visibility and popularity, attraction and spill-over capacity. A location is valuable if it responds to the needs, real or not[61], of both retailers and consumers. Instinctively, retailers try to deliver operational advantages in the physical interaction with consumers, at the same time as they aim to gain an increasing share of the market and be profitable in terms of sales. On the other hand consumers respond to the inherent advantages of each store (location, format, price, reputation) at the same time as they look for a consumption experience.

Some aspects of a 'location' seem to be taken for granted, as the effect of distance on land value and on the frequency and concentration of activities, and the occupation of a place by the use that will guarantee the greatest profit[62]. But these notions are being questioned. Centrality, for example, now does not necessarily mean 'downtown', as an increasingly number of areas outside historic centers are displaying definite features of centrality, either due to accessibility conditions or to the concentration of activities (Axenov *et al*, 1997).

Location, and location value are explained by a vast array of variables. Krugman (1999) divides the forces that affect the spatial distribution of economic activities in two groups: centripetal (related to pure external economies – market size effects and spill-overs) and centrifugal (related to pure external diseconomies – immobile factors and land rents). In the particular case of commercial activity, Nelson's first approach (1958) divided value assessment of a site in eight principles: (i) adequacy of the trading area potential; (ii) accessibility of site to trading area; (iii) growth potential; (iv) business interception capacity; (v) cumulative attraction; (vi) compatibility; (vii) capability to minimize the competitive hazard; and (viii) site economics. More recently, a series of authors such as Axenov *et al* (1997), Hernandez *et al* (1998) and van Nes (2005) have tried to catalogue the variables that shape the commercial spatial market, consequently affecting planning and decision making. They have divided these variables into those which affect the external and the internal environment of retail geography. Concerning the external environment, location value is influenced by public policies, namely planning regulations, development programs and planning techniques. Commercial performance is also affected by the economy as a whole and the requirements of each business in particular, through market needs

[61] Publicity or a trend, for example, can produce artificial needs in the consumers.
[62] This is the principle of the 'bid-rent theory'. See Box 2.

of supply and demand, competition, activity mix, marketing and investment choices. Lastly technological improvements can also affect the market value of location. In recent years they have even diluted the need for a physical commercial location. Concerning the internal environment of the commercial market, and as noted by RLT research, local site characteristics seem the most important variables. Each place is located in a given city area with a particular level of urbanization, a particular degree of centrality and accessibility, a particular function in the urban network, a particular size and market specialization, and with particular commercial necessities. Consumer related variables, such as their spatial distribution, their movement patterns, their consuming preferences, and their levels of purchasing power are also very important. Urban environment conditions such as the decline or renewal of surrounding neighborhoods, the suburbanization processes, and the demographic, transport and land-use patterns may also influence location value. Furthermore, a set of requirements that originate from inside a particular company condition the perception of what is a 'good location'. Each company has a given economic potential, a given business model and an attitude towards profit, growth and risk, a particular style of decision making, a defined target-market, a pre-established supply network, a given connection to a network of stores, and a particular degree of openness to the information and technological culture. Finally, location is also dependent of the spatial distribution of direct competitors and other stores, as well as of micro morphological conditions. For example, a store choosing to locate in an 'intercepting position' (between two anchor stores, in street crossings) has more possibilities of attracting the attention of consumers.

For decades models have been trying to conjugate as much as these variables as possible so that each particular company can determine the values of locations that best suit them. Axenov *et al* (1997) ask three major questions concerning this choice: (i) What are the requirements of the different branches with respect to the location of their facilities? (ii) How can these requirements be accommodated within the existing urban framework? and (iii) How do different branches compete for certain locations? The same authors give an example of commercial spaces located along transport routes. Under otherwise equal conditions, commercial concentrations have the tendency to follow the main transit automobile transportation routes and metro lines, which act as gravity centers. Considering just variables related to the street, concentrations depend on the transit function (the straighter the route links the center and the periphery, the more important it is), on destination (where does the route ultimately lead), on competition (if there are any other routes that lead to the same place), on links and accessibilities (intersection with other routes) and on actual traffic.

3.1.3. SPATIAL ANALYSIS

3.1.3.1. The hierarchical organization of a place

The distribution of commercial spaces in a city forms a measurable pattern that can be structured into a hierarchical model. This rather simple assumption gave birth to the first form of retail geography to appear in the literature, which used spatial analysis and clustering techniques to divide the city into several commercial areas of distinctive characteristics.

The bases for commercial hierarchies' theories were the existing theories on urban structure, consisting of models recreating the division of space according to activities and land-uses. The earlier works appeared in the 1920s. Park and Burgess (1925), two founders of the Chicago School, divided the city into a 6 ring concentric model, from a hard-core consisting of a central business district (CBD) to an outer, commuter/suburban zone. Land values decreased outward from the CBD.

Box 2 – The four background theories of retail location

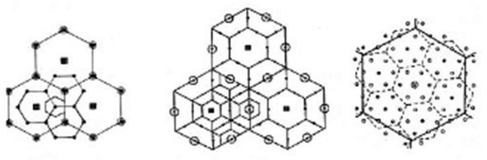


Figure 9 - Geographical representation of Christaller's Central Place Theory (source: http://www.cp3plan.com/aboutus.html)

According to Clarkson *et al* (1996) the theoretical background to current commercial modeling is based on four major theories: the Central Place Theory (CPT), the Spatial Interaction Theory (SIT), the land values theory and the principle of minimum differentiation. **CPT** is considered the first great theory on location that could also explain commercial activity dispersion. It was formulated by Christaller (1933), after he noticed, in the German context, that towns of a certain size were roughly equidistant. CPT considers cities as central places (fixed points) which supply a certain amount of goods to the surrounding population according to their size, nature and distance to other cities. The concept of 'threshold' represents the minimum population required to support a given function, while 'range' represents the maximum distance a consumer will travel to purchase a good. Because, theoretically, the price of an item would increase with distance, each consumer would choose the closest (most central) location for the specific type of buy. Small order centers would have low order goods, because these are frequently bough and have a low threshold and range. Larger centers would serve larger areas (higher range) in terms of high order goods (which require greater thresholds), at the same time as having, as well, a local clientele for low order goods. This creates a system of centers of various sizes that can be represented through the use of geometrical shapes (Figure 9). The greater the center, the larger the area of influence, and the more functions and establishments present. When a given center reaches its limit, a series of secondary centers are added. This theory uses a series of simplifications, such as considering evenly distributed resources, proportionate distances between centers and equal transportation costs in all directions. Christaller also introduced variations to his theory, according to market, transport and administrative principles. These simplifications met, over the years, with critics in the literature. Many doubt if the theory can ever be adapted to 'the real world', as the costs of distance have decreased (and sometimes have even been eliminated) and the layout of centers does not comply with the assumptions of the theory. Kivell and Shaw (*cit in* Skogster, 2006) stress that the CPT has a high degree of abstraction when it assumes that the consumers and their needs are identical, that the distribution of population is even, and that shoppers will do single purpose shopping trips to the nearest center. Krugman (1998) adds that Christaller is not considering imperfect competition and that he seems to be describing planning solutions rather than market outcomes. Even so, Borchert (1998) still defends CPT, even if in the modern commercial era threshold and range values have changed. '*I shall always have to go to the supermarket*', he states. For him, only mobility conditions have to be redesigned. Authors such as Eaton and Lipsey (1982, *cit in* Sarma, 2006) have made such redesigns. In this particular case, these authors make the models less geometrical and more economic, by considering that the clustering of firms selling heterogeneous goods at a given place can be obtained through a model based on profit maximizing firms and cost minimizing consumers. The second major theory, **SIT**, is based on the hypothesis that consumers are willing to trade-off the deterrent effect of distance for the attraction of alternative shopping areas. This is made possible by the new mobility paradigms and helps explain why consumers choose to travel farther (to shopping centers, for example), to obtain products they can sometimes get at the corner store. This is the basis for a series of gravitational models which were inspired by Reilly's (1931) and Huff's (1964) works. If at first the size was the only variable which was considered to induce attraction, latter temporal, demographic and market-related indicators were introduced into the models. The **land values theory**, which is usually known as the bid-rent theory, was first presented by Haig (1926a, 1926b) and states that urban sites are occupied by the activity capable of paying the highest rentals. Retail geography therefore depends on competitive bidding. This theory considers a perfect economic market scenario and fails to consider inherent logics of the urban, social and commercial scenarios. For example, in certain shopping districts or shopping centers, high order anchor stores pay the lowest rentals or none at all, even though they are in the best locations, because promoters wish to assure the attraction factor. If a commercial downtown street is transformed into a pedestrian street the rent value will lower because of poor car access, even though the street may become more attractive to shoppers. Notions of tradition, aesthetics, prestige or just plain ignorance or whim can lead some actors to make choices against market logics. On the other hand, the highest-bidder rule may cause gentrification or tenant-mix problems. Lastly, **the principle of minimum differentiation**, originated by Hotelling (1929), simply states that stores in the same market sector that cluster together will have a superior performance and achieve higher profits. Yet Hotteling's model has never been considered consistent, something which led Eaton and Lipsey (1979) to remark that '*the Hotelling model is not able to explain the local clustering of firms (…) Indeed, once the assumptions are relaxed very slightly in the direction of realism, Hotelling's model predicts that no two firms should be clustered together*'. According to Clarkson *et al* (1996) recently the introduction of uncertainty and risk-reducing behavior into Hotelling's model has much improved the accuracy of the principle.

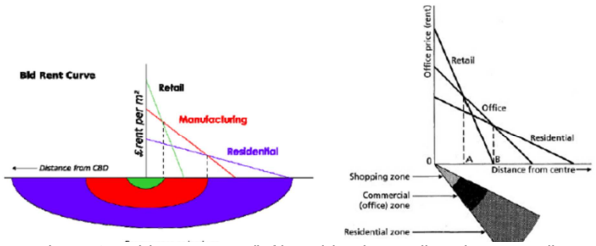


Figure 8 - Bid rent curve (left) and land use allocation according to bid rents (right) (source: Jingnan, 2009)

Hoyt (1939), after studying 142 American cities, proposed a similar urban land-use model centered on a CBD, but with the difference that the various zones radiated from the CBD rather than surrounding it in concentric circles. This way zones could expand outwards, mainly along transportation routes. Commercial establishments, for example, would expand from the CBD along business thoroughfares. In 1965, Peter Mann combined both the Hoyt and the Burgess model to develop the model for the typical British city.

After groundbreaking theories such as Christaller's CPT[63], Proudfoot, in 1937 (*cit in* Salgueiro, 1992; Cachino, 1994; Davies and Baxter, 1997) was the first to adapt these hierarchical elements to the intra-urban commercial structure. He divided the city's commercial structure into five types of concentrations: (i) CBD (characterized by greater concentrations and attraction); (ii) outlying business center (characterized by variety and also attraction); (iii) principal business thoroughfare (constituted by commercial streets and ribbons benefiting from passers-by); (iv) neighborhood business street (reachable on-foot from the home); and (v) isolated store cluster (like, for example, industrial areas). Isolated stores, regardless of location, formed a sixth group that Proudfoot discarded in his analysis.

In 1960, Berry (*cit in* Salgueiro, 1992; Cachino, 1994; Davies and Baxter, 1997; Borchert, 1998) stated that '*the CPT has yet to be systematically incorporated into planning models*'. Consequently he also tried to divide the city's commercial structure into morpho-functional groups. He chose tripartite division: (i) nested hierarchical centers (CBD and regional, community, neighborhood and convenience centers); (ii) commercial ribbons (uniting these centers); and (iii) specialized areas.

Since Berry's model, a series of other hierarchical structures have been proposed in the literature that take into account new retailing forms, the changing nature of the commercial street, the growth of large-scale commercial facilities and the changes in the shopper's perceptions. More recently, authors have abandoned the hierarchical system and have focused on type of functions and commercial establishments. Such is the case of Shoumaker (*cit in* Fermandes *et al*, 2000), and of Brown and Jones (both 1991, *cit in* Davies and Baxter, 1997) in the American context. Brown presented a non-hierarchical classification divided into 12 categories, based on 4 spatial forms and 3 functional categories, whilst Jones based his typology of retail areas upon a dichotomy between centers and strips. Nonetheless some authors still approach the hierarchical models, such as Levy and Weitz (2006, *cit in* Burnaz and Topcu, 2006). Their classification only allows for three basic types of locations for commercial places: CBD, shopping centers and freestanding locations.

If many of these models may be considered obsolete due to the changing patterns of commercial activity, the truth is that many cities still retain the heritage of many of them, especially when particular areas of the city are analyzed in isolation. Nonetheless, the hierarchical classification only considers commercial areas as a whole, rather than using a store-by-store analysis. Shops are grouped according to a spatial or activity criteria, and within that criteria are considered as having the same weight, regardless of intrinsic characteristics. Hierarchical models also do not seem to be interested in the reasons for shop dispersal, nor in the connection of commercial patterns to other economic and socio-morphologic characteristics.

In the hierarchical organization of a city, the CBD should always be, supposedly, the most important commercial area. Small cities usually have only one center, but larger cities have one main center and then a series of smaller proximity centers (for first necessity goods in residential areas[64]) and middle

[63] See Box 2.
[64] M1 retail category. See Chapter 3.3.

order centers (for supermarkets, pharmacies, banks[65]) serving a clientele larger than the neighborhood but smaller than the city. The importance and functional composition of a central area varies with the dimension of the urban area. And as the importance and level of the center increases, so does daily commercial activity (Salgueiro, 1992). In this scenario the CBD should be the most accessible area, with all types of commerce available; specialized, high order and low order. The need for concentration that derives from competition and the market saturation led to the construction in height and many CBD assumed bell-shaped profiles. Wider main streets with greater mobility received these larger buildings and high-end shopping in the ground floors, whilst secondary narrower streets, bounded by the intersection of two major roads, received less noble activities and small shops. Some traditional and high-streets also kept their importance, although the commercial centers of the CBD have mostly been relocated to nearby more modern streets. The recognition of variety of elements that constitute the modern day CBD led Burnaz and Topcu (2006) to state that it can be regarded as unplanned, because the arrangement of commerce does not follow a pre-set format and only depends on history, trends and even a certain amount of luck.

When the hierarchical layout is reorganized, the internal structure of these centers changes. The decentralization processes of the late 20th Century, in which low order functions were made to migrate, allowed for empty space that was assumed by shops and services of higher order. In accordance with the bid-rent theory, these high-order functions were able to absorb non tertiary zones and occupy new neighborhoods. The decrease in the number of inhabitants led to the decrease of first necessity retail, which many times constituted links between the center's centers. Consequently the CBD became more concentrated and there was less integration of the commercial facilities therein.

Commercial ribbons are regarded as the hierarchical elements that make the connection between the various smaller centers of the main center, and between these and the periphery (Cachino, 1994). Davies and Baxter (1997) present an extensive literature review of the American highway oriented ribbon. In that country these ribbons became important due to the growth of low density suburbs, whose residents depend of the car for almost every journey, including simple first necessity shopping. In Europe, however, the American model is rarely found. According to Salgueiro (1992) commercial ribbons are formed because of the necessity of accessibility and space by functions that do not have the possibilities of occupying the CBD. Therefore they constitute main arteries that are directly linked to the city center[66], and present good traffic fluidity and ample parking space. Because they are intersected by influence areas of the city's inner commercial centers, they rarely present typical functions. Instead their main asset is specialization and activity clustering. The degree of specialization of the activities depends of the road hierarchy[67].

According to Cachinho (1994) the dispersion of commercial activities and the linear expansion through commercial ribbons led to the development of new poles and to functional specialization. Population decentralized and so did the commercial sector (Glennie, 1998), enriching the suburbs. An inversion occurred. As the center 'peripherized', the periphery acquired attributes of centrality (Ascher, 1998). According to Fernandes *et al* (2000) the passivity of the city center resulted in a lack of modernization and also in the not releasing of space, so major commercial innovations occurred on peripheral areas. The shopping center is the culmination of that commercial innovation. Early 20th Century cities already possessed hierarchies of department stores, but the appearance of the shopping center in the suburbs changed the paradigms of the location of multi-commercial formats. Because the

[65] M2 retail category. See Chapter 3.3.
[66] Often these arteries are straight roads.
[67] If the ribbon is a direct extension of a city-center road, if it is a highway, etc.

attraction of such spaces overcame the distance element, Spatial Interaction theories[68], namely through retail gravitation laws, became very much interested in models of distribution of shopping centers. These need large available space, consequently they normally locate in accessible suburban rings, near residential middle class areas. A dominant and attractive shopping center should be able to draw a disproportionate market share, significantly reducing the sales at smaller surrounding centers. Only when the conditions of class and dimension are similar, does the location value become relevant (Salgueiro, 1992). Obviously, shopping centers of central neighborhoods will outperform those in residential areas or in the suburbs if they sell the same type of products and supply the same experience. That is part of the reason for the success of in-city shopping centers.

But shopping centers are perhaps the commercial elements more at risk in the commercial hierarchy. Smaller individual shops can easily change location or increase or decrease their store area according to shifts in the hierarchical structure of cities. But shopping centers cannot. Until today however, with a few exceptions, shopping centers have proved to be powerful enough to produce attraction, market share and centrality. The changes in the structural order have affected the lower ends of the hierarchy instead. Urban planning and new commercial formats again prefer larger and main centers, so the hierarchical levels are decreasing in number, their separation is more clearly defined and they are farther apart. According to Borchert (1998) the consequence is a gentrification process and a collapse of the traditional hierarchy. The modern hierarchy is, according to the author, determined by the differences in consumption potential between cities and the knowledge and decisions of the larger distribution chains that practically own the territory.

3.1.3.2. Measuring commercial patterns

Bearing in mind the city's overall commercial hierarchical models, from the 1970s onwards a series of studies started to use a more focused, street-by-street and store-by-store analysis. The purpose was mostly to determine geographical retail patterns, so only a few studies went beyond the spatial interpretation of store location and hierarchical clustering. When they did, they improved the model with other components, such as simple store data. In earlier studies 'activity type' was practically the only differentiating component used.

In order to measure and determine the geographical commercial pattern, a working database had to be created. Works such as Kwan-yiu and Kong-sut's (1971) in Hong Kong, Guy's (1976) in Reading, England, and Lee and McCracken's (1982) in Denver, USA, were pioneers in terms of retail geographical data collection. They faced the same challenges that still exist today, namely to decide which variables should be collected, which city area should be considered, and what type of commercial establishments should be taken into account. Lee and McCracken considered only supermarkets in metropolitan Denver, while Kwan-yiu and Kong-sut tried to consider all but hawking activities in the entire Hong Kong Island. Guy considered establishments in which one could buy goods and services without a previous appointment, with the exception of clubs, cinemas, gas stations, garages and itinerant markets.

The databases were constructed using field surveys or else by consulting referential documents, such as telephone books. Guy (1976) surveyed the entire city, collecting, for each establishment, the address, the name, the opening date and the activity performed. Instead of collecting the opening dates Lee and McCracken (1982) used older telephone books in 5 year intervals to determine the spatial

[68] See Box 2.

evolution of the commercial spaces in the previous 20 years. Kwan-yiu and Kong-sut (1971) also made a shop survey, street by street, collecting for each establishment the type of commodities sold and the type of frontage. These authors went one step ahead by also making inquiries to the consumers, asking where they came from, what was the purpose of their trip, what were they buying, which mode of transport they used, what was their travel time and what was their shopping frequency in that area.

The elements that these and other authors collected enabled them to produce maps of commercial evolution and consequently they were able to create commercial hierarchies through the use of clustering techniques. Lee and McCracken (1982) used the nearest neighbor technique[69] to determine the supermarket clusters in Denver. Guy (1976), who argued that nearly all commercial functions occurred in a clustered pattern (only the degree of that clustering would vary), determined commercial clusters according to self-imposed restrictions. For example, each cluster in the center should have about 8 stores at a maximum distance of 40 meters from each other. But Guy himself was the first to recognize that the hierarchical classification based solely on type of store and location was little effective. In Guy's approach, each of the clusters found by spatial analysis was enriched by store data (size, floorspace, turnover, activity), allowing the researcher to observe where each particular function was concentrated, and the shortcomings of each area. Other mathematical models, such as probability distribution functions, quadrant analysis and average minimum distance from consumer to outlet could also help to define the hierarchical network. Kwan-yiu and Kong-sut (1971) enriched their model in a similar manner. The clusters were not only a consequence of spatial dispersion but also of morphological and intrinsic characteristics of the commercial areas (activities, accessibility, extent of market areas, number of customers served). They divided Hong-Kong into 14 zones, taking into account that the existence of the areas of commercial agglomeration was a reflection of the distribution of the population and of their mobility and spending habits as consumers, and was also conditioned by the historical pattern of urban growth. The hierarchy was then based on the distribution of stores, the estimated number of potential customers saved (not lost to competitors) and the type and nature of service offered (range, quality and price).

The above authors conclude that, in spatial analysis, clustering is a consequence of complementary or cumulative attraction. Convenience goods present relatively dispersed patterns. They try to maximize costumer accessibility and preferably locate near interception spots. For this they pay higher rents, but have, at the same time, very little need for advertising. Although convenience stores try to minimize competition, they usually cluster in groups of two or three, so as to enable comparison shopping. On the other hand shopping goods are highly clustered, due to the need of price, style and quality comparison. They follow the principle of cumulative attraction. Comparison and competition is an asset for improvement and attraction. Specialty goods may follow similar principles, but because they are associated to fewer, planned trips, their location is less important, there is lesser need for accessibility and their pattern is more dispersed. The business is mostly generated by the store itself, and the low investment on rents due to their more peripheral location may be spent on advertising. Neighborhood centers provide a wide, but limited range of goods, unlike high order centers which cater to almost every need. Clusters and stores decrease as the distance from the center increases.

Despite these conclusions, this type of analysis had a limited morphological scope. Stores were characterized mostly by their number and type of activity, and the morphological comparisons were

[69] Nearest neighbor (also called single linkage or shortest distance) is a method of calculating distances between clusters in hierarchical clustering. The distance between two clusters is computed as the distance between the two closest elements in the two clusters.

either none-existent or poor, mostly unrelated to specific, micro-scale, characteristics. Of the examples above, Lee and McCracken (1982) do not make any pattern comparison, Guy (1976) only compares store location with store variables, and Kwan-yiu and Kong-sut (1971) ultimately only set the commercial hierarchies against consumer data (consumer travel patterns and potential expenditure). The low amount of variables is then not able to explain all the perceived phenomena. Kwan-yiu and Kong-sut (1971) for example, stress that some store locations could not be explained by any of their proposed processes. Furthermore, the types of commerce and their spatial and temporal distribution can be so varied that it can be hard to include them in the same hierarchical system. Lastly, the definition of store type has also changed, because of increased product-mix, so the categories used can also be outdated. Because of all these reasons, studies of this nature have only since then been present in the geographical literature. For example Axenov *et al* (1997) define the hierarchical system of St. Petersburg based on the number and type (per branch) of shops. After determining the spatial distribution[70], they compare the store map with a simple hierarchical characterization of areas (housing areas, historic center, industrial areas). Wang and Jones (2002) define the retail structure in Beijing, based only in store characterization (number, type, location, sales, floor space, workers) and go no further. Shan (2004) and Goodwin and Gong (2005) use a similar approach in Hefei, China and London respectively. Cachinho (2002, *cit in* GECIC, 2005) has done likewise in the Portuguese medium-sized city of Leiria (Figure 10), and Fernandes and Martins (2003) in Street of St. Catarina, in Oporto.

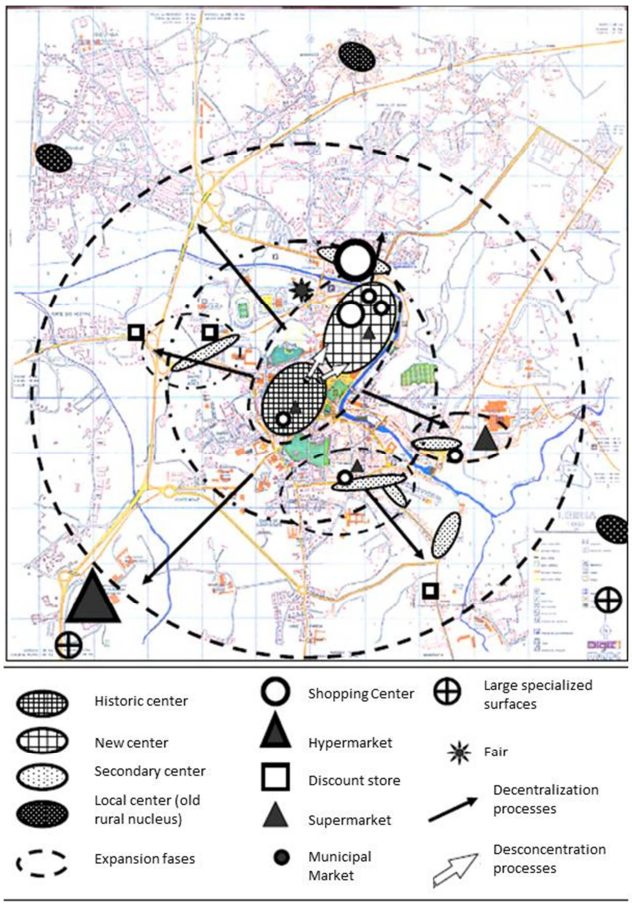


Figure 10 - Spatial organization of commerce in Leiria (adapted from Cachinho, 2002; *cit in* GECIC, 2005)

[70] Recent studies determine the spatial distribution of shops in the same fashion: field work data collection complemented with other data sources such as Census, Statistic Bureaus, telephone books, etc.

Cachinho's work, for example, is more concerned with the overall dynamics of geographical evolution than with the particular micro-scale characteristics of both commerce and city. His diagram, nonetheless, resumes the process that drove commerce from a well-defined central area to a new center where the major shopping areas are located. Secondary centers expand the limits of the city, and have also particular types of commerce, such as discount stores and hypermarkets.

Because in this research geographical commercial patterns are interpreted as a spatial process, the growth of GIS-based methodologies has significantly increased the interactive capacity of the analysis. Research centers such as CASA[71], in London, have increasingly used GIS-software in order to model and interpret commercial evolution, patterns and hierarchies. Furthermore, provided sufficient data, applications in GIS-software can include the visualization of commercial sales performance metrics (sales per square meter, market share and market penetration) and of demographic and costumer data. Urban Landscape Models (ULM) such as the one used by Yoshida and Omae (2004), combine GIS and 3D to provide an increased, morphological perception of the urban environment. Conventional GIS frameworks have the problem of presenting only static representations of reality. New methodologies, such as Geovisualization (Hernandez, 2007) add a dynamic temporal analysis, so that change can be, literally, visualized. 4D mapping transforms decision support from a static uni- or bi-dimensional space where data is imprinted into a highly dynamic environment that facilitates interactive exploration and permits the creation of digital movie files. ArcGis, CLEO and the Iris Explorer Visualization are three programs that nowadays present these and other geospatial potentialities. Pereira (2009) has made a literature review of existing specific softwares for imputing commercial data (including, for example, AFICOM, developed by Spanish researchers in a GIS platform) and proposes a theoretical methodology for the construction of a commercial map in Web GIS.

3.1.4. GEOGRAPHICAL PATTERN COMPARISONS

3.1.4.1. Retail location theory

RLT appeared, as a discipline of research, due to Nelson's 1958 breakthrough book on retail location selection. This was the first methodology concerning the dispersion of commercial activity that did not have as the main outcome retail's spatial analysis. Unlike spatial analysis, which perceives the location of commerce as an established fact, RLT is preoccupied with the reasons why stores locate in a given place. Yet these reasons are regarded as entirely economical. Retailers select their future locations with the idea that, if they make the right choices, they have more chances of increasing their market shares and maximizing their profits. Accordingly, the output of RLT models is the expected turnover of a given store in a given location.

Initially, the models were analogue-based, relying in rules of thumb, past experience, heuristic procedures and empirical observation techniques. Only after the gravitational (SIT) models of Reilly (1931) and Huff (1964) did RLT researchers start to use advanced mathematical formulations. Market share was calculated using variables such as buying power, distance between customer and store, and measures of attractiveness. Slowly, in order to minimize the risks involved with rapid store expansion due to the likewise rapidity of urban growth, the models became increasingly complex and added more store and costumer variables. Nowadays RLT has become an explicit element of corporate strategies,

[71] Center for Advanced Spatial Analysis (http://www.bartlett.ucl.ac.uk/casa). CASA is currently analyzing the commercial spatial development of London since 1971. As the work is still in progress there are no available results.

and the techniques go from checklists to sophisticated algorithms and from simple analogy forecasts to very complex spatial interaction models with many exploratory variables. If on one hand more geocoded data is available (Reed, Barry, 1999), and information techniques are more powerful and less expensive (Hernandez *et al*, 1998), on the other more attention is being given to strategic thinking, and so the social and eventually the morphological and the planning facets of commerce could be (but rarely are) incorporated into the models.

Clarke *et al* (1997) define three major phases in the implementation of a RLT model. First, a background work on spatial analysis should be done, in order to understand shopper and hierarchical retail patterns. Cities are not all alike. In theory, the smaller the city, the smaller its influence area. This results in less market potential, less functions and less clustering in the center, causing commercial dispersion. On the other hand, in larger cities a dispersion of goods and services of first necessity also occurs (Fernandes *et al*, 2000), because there is a need for smaller centers near residential areas that are farther from the main center. These centers can complement or compete between themselves. Therefore the definition of the application area must come first (Rogers, 1992), followed by the selection of the variables and the choice of outcomes of the model. Second, the data must be collected, the RLT methodology must be selected and the model must be built. Geographical literature refers the building of geo-demographic classifications, the growth and refinement of spatial interaction modeling and the development of geographical information systems (GIS). In the third phase, developers should consider land-use planning and current public policies concerning retail location before making a decision. Recently these phases are complemented by a fourth, related to marketing strategies, where 'place' and 'image' substitute the outdated definition of 'location'.

Presently, RLT has been used as a research tool and a planning methodology, not only by entrepreneurs wishing to find rentable locations, but by urban scholars wishing to find a justification for commercial patterns (Burnaz and Topcu, 2006). But to consider this is to assume the reactive nature of commerce. That is why, for the most part, the outcome of RLT models has not changed. They still perceive commerce as an after-the-fact consequence of the city's market conditions. Accordingly, commerce only relocates according to the maximization of sales and links to morphological conditions are rarely established. Clarke *et al* (1997) also add that RLT methods do not approach what is behind the location decision processes, do not link macro and micro scale analyses, and do not consider the impact of new technologies, unrelated to location, in sales and market shares. Furthermore, RLT considers only new establishments trying to enter the market or pre-established retailers wishing to change location. But the market is also characterized by old pre-established stores that *do not wish* to change their location and also by closures, acquisitions and refittings that inevitably alter the commercial landscape. Hernandez *et al* (1998) also call attention to the fact that the facilitated access to data and new technology may produce '*data rich but information poor*' studies, and that even though there are many RLT techniques, most studies do not apply them correctly and the outcomes are not deeply taken into account in the final decision making process.

According to Clarke *et al* (1997) low-level tactical decisions and high-level strategic thinking should co-exist in RLT processes, which are, ultimately, a mixture of '*art and science*' (Mendes, Themido, 2004). This means that share, size and network geography alone cannot explain all procedures because each company has its own internal dynamics and strategies of competition that determine the response to threats and opportunities, and ultimately affect location selection (Jones, Simmons, 1990). The same pre-conditions and the same methodology may lead different companies to different location choices. Furthermore, a multi-criteria approach is needed, because the blind application of a model's output may result in a methodology that works theoretically, but not practically. Site selection is not an

objective science (Rogers, 1992). Subjectivity and error will always be reduced by the application of more advanced and integrated methods but the ultimate choice must consider market, spatial, social and urban conditions as well.

Consequently, there is no 'best RLT method', and a conjugation of techniques is often cited as the best option, although this requires resources that many retailers don't possess. Discriminant analysis for example is considered as a good method for narrowing the initial location choices, before using another model, whilst the use of GIS-software can complement an existing model by allowing a spatial perception of the market scenario. Drezner and Drezner (2003) present a methodology for evaluating and complementing existing models' performance under changing market conditions, so that the probabilities of failure under the new conditions (therefore not taken into account in the earlier model) are minimized. Rust and Donthu (1995) developed a method of estimating the effects of omitted variables in simplified models.

An overview of existing RLT models, over the past sixty years, is presented in Box 3 and is further complemented by a table in Annex 1. Because this does not wish to be an extensive review of each model, suggestions of other articles are given. Not all models are discussed, but the ones that have been omitted can be related, by similarity, to a given one presented. Most models, because they were expanded and improved, have become, in their own right, entire schools of research. The dates concern their first appearance in the literature. The cataloguing of methodologies into categories roughly follows Mendes and Themido's (2004) proposition, but other types of organization have been proposed in the literature, such as Chasco's (1997, *cit in* Yrigoyen, Otero, 1998), which is also presented in Annex 1. Yrigoyen and Otero (1998), Mendes and Themido (2004) and Reynolds (2005) present extensive literature reviews on RLT, whilst Hernandez *et al* (1998) make a simple comparison of location planning techniques (Figure 11).

Technique	Subjectivity	Cost	Technical expertise required	Computing and data requirements	Typical application level
Rules of thumb	▲▲▲	▲	▲	▲	✪ ★ ☆
Checklists	▲▲	▲	▲	▲	★
Analogues	▲▲	▲	▲	▲	★
Ratio	▲▲	▲	▲▲	▲	★
Multiple regression	▲	▲▲	▲▲▲	▲▲	★ ☆
Discriminant analysis	▲	▲▲	▲▲▲	▲▲	★ ☆
Cluster analysis	▲	▲▲	▲▲▲	▲▲	✪ ★ ☆
Gravity/spatial interaction modelling	▲	▲▲▲	▲▲▲▲	▲▲▲	✪ ★ ☆
Expert systems	▲	▲▲▲▲	▲▲▲▲	▲▲▲▲	✪ ★
Neural networks	▲	▲▲▲▲	▲▲▲▲	▲▲▲▲	✪ ★

Key:
Low ▲
Medium ▲▲
High ▲▲▲
Very High ▲▲▲▲
✪ Strategic
★ Monadic
☆ tactical

Figure 11 - Comparison of location planning techniques (source: Hernandez *et al*, 1998)

Box 3 – RLT Models

Analogue-based methods are based on common sense, on previous experience and on empirical observation techniques, following the principle that stores in a given environment will behave as others have in similar circumstances. Hernandez *et al* (1998) revealed that 100% of the surveyed retailers admitted to have used rules of thumb at least once, but only 13% use them exclusively. These include observations, surveys, checklists and trial and error (Lilien, Kotler, 1983). Analogue-based forecasts and site-ranking attempt to eliminate the subjectivity of rules of thumb (Applebaum, Cohen, 1961; Thrall, 2002). Pre-defined groups are created based on a set of attributes, and the characteristics of a new store are compared with these, so that forecast intervals can be obtained. Nelson's (1958) Principle of Compatibility used pre-existing tables to similar purposes, and defended the optimum grouping of compatible uses. These methods were more apt to traditional retailers without resources, had an excess of subjectivity and an inability to consider simultaneously the impacts of multiple variables (Rogers, 1992). Inspired by Newton's law and the CPT, Reilly (1931) presented the first **gravitational** model, based on economic theory. The size of a commercial area would increase consumer utility and consequently the gravitational pull, whilst the distance to consumer and to competition would do the opposite. Catchment areas could then be drawn. Huff's SIT model (1964) allowed for an unlimited number of competing centers and a varying distance decay parameter. Lakshmanan and Hansen (1965) measured size as 'floorspace' and distance as 'travel time'. According to Eppli and Shilling (1996) SIT models were able to explain approximately 70% of the variation in actual sales at regional shopping centers. The Multiplicative Competitive Interaction Model by Nakanishi and Cooper (1974, *cit in* Yrigoyen, Otero, 1998) added additional elements to conventional SIT models, such as temporal, competition and demographic variables, to more clearly define the attractiveness of a center. Yet these models proved difficult to calibrate with multiple variables, were not prepared for the changes in social and mobility patterns and most of them only worked for 2 locations simultaneously. Eppli and Shilling (1996) further defend that nowadays 'distance' is surprisingly of little importance in explaining commercial sales. From the 1970s onwards **analogue-based regression** models used equations, logit functions and algorithms where store turnover or market share (dependent variable) was calculated through the sum of a number of (independent) variables multiplied by coefficients developed in the model building process (Simkin, 1989; Rogers, 1992). Discrete Choice Models (Ben-Akiva and Lerman, 1985; Horowitz *et al*, 1986) use specialized software to arrive at a probabilistic outcome, for example, the utility a consumer may derive from a certain store. This utility can be expressed as a linear additive function of the stores' attributes (Lancaster, 1966, *cit in* Yrigoyen, Otero, 1998). Because these models are aspatial, others such as 1983's Competing Destinations Model, developed by Fotheringham (Hu, Pooler, 2002) added accessibility variables. The output is the number of interactions (measure of accessibility) between the various possible destinations. This model is useful to determine whether competitions or agglomeration strategies should be applied. Data mining (Krause-Traudes *et al*, 2008) extracts implicit and potentially useful information from existing data by using methods from statistic, artificial intelligence, machine learning and pattern recognition. Reed and Berry (1999) combine data-mining with spatial modeling. Dynamic spatial models, whilst based on regression, use data to create spatial patterns and hypothetical scenarios. These methodologies are applied by retailers with highly segmented market appeals and with various sale points. They are highly sensitive to data collection and treatment, they only consider sites in isolation and the outcome is, usually, another variable for interpretation. **Discriminant analysis** has been used since the 1960s as a site screening tool or as a decision system for relatively low investment risk situations (Rogers, 1992). Unlike regression, these methods analyze store performance in order to create groups characterized by a set of variables. One function is then developed for each group. Variables for a new site are inserted in the discriminant functions and whichever produces the highest score corresponds to the sales group to which that site should be allocated. The Automatic Iteration Detecting (Morgan, Sonquist, 1969) was developed for problems with a high number of variables in multiple scales. The technique performs a sequence of binary splits of a given sample, continually separating the groups into two subgroups that maximally account for criterion-variable variance at any given stage. These analytical steps are useful in creating clusters of elements with similar characteristics, and are used as an initial screening devise. Tree-building algorithms follow the same principles. These methods are sensitive to data collection and have large computational requirements. **Multi-criteria decision** techniques apply powerful algorithms to compute outcomes using data from many disciplinary sources. Analogue forecast models (Mendes, Themido, 2004), that may be considered as updates of analogue models, rank sites through multi-criteria systems and then compare them with existing databases. Saaty (1996, *cit in* Burnaz, Topcu, 2006) developed the Analytic Network Process, which uses the principles of tree building and clustering, but substitutes hierarchies for networks. A pairwise relationship matrix between elements and then an analytical network model are created. Inspired by Darwin's Theory of Evolution, **genetic algorithms**, developed by Holland (1975, *cit*

in Mendes, Themido, 2004), have a fitness function that evaluates the solution domain. If the initial condition is not verified, the algorithm runs again in improved conditions. Only the more suitable (fit) solutions survive, and give their best assets to future generations (iterations). The fitness function can correspond, for example, to a sales forecast model. **Voronoi diagrams** had been used as early as 1644 by Decartes and 1850 by Dirichlet until they were applied by Voronoi in 1907 and received their current name. Given a number of fix points, all other points in space are associated to the closest fix point. Therefore space is divided in diagrams centered on those fixed points. In the 1980s it was applied to the commercial scenario, where the polygon represents all space that is closest to a given store than to any other competitor. In this way the catchment area and sales forecasts can be calculated (Boots, South, 1997; Gonçalves, Mendes, 2002). Like gravitational models, the process is made more complex by changing the formula to allow a trade-off of distance for other variables representing attractiveness. Polygons then represent areas of attractiveness of a given store. Higher order diagrams allow for each polygon to be influenced by n stores in the system (Sack, Urrutia, 2000, *cit in* Gonçalves, Mendes, 2002). Lastly, **GIS** modeling has given a spatial perception to many RLT models. It crosses digital(ized) cartography with quantitative data, so that physical space can be interpreted considering the socio-economic factors that shape it (Pinho, Oliveira, 2007). Because spatially related information can be easily manipulated, the ensuing maps allow for both low and high risk applications such as hot-spotting, market mapping, site screening, catchment area identification, customer profiling and competitor analysis (Hernandez, Biasiotto, 2002). The functions required for site evaluation are not available in traditional GIS packages, but these have, in the past years, complemented RLT models (Mendes, Themido, 2004).

3.1.4.2. Other analyses

Despite their inherent complexity, most RLT models end up making a rather simple geographical pattern comparison. The location (or future location) of a shop is compared with the (economic) value that that location will be able to generate. If the economic layout is mostly the concern of RLT, other recent analyses have overlapped, in a macro-scale, the historical, social and transport layouts with commercial distribution maps.

Authors such as Barke (1997), Kompil and Çelik (2006) and Smith (2006) have compared shop dispersion with the densities of socio-economic variables. Kompil and Çelik, in Izmir, Turkey, have only gone one step further from spatial analysis in a sense that they tried to understand, spatially, the economic consequences of the change from grocery stores to supermarkets/hypermarkets. Lee and McCraken (1982) had analyzed the spatial dispersion of Denver's supermarkets over a 20 year period using the nearest neighbor clustering technique. Kompil and Çelik (2006) also catalogue the dispersion over time of large food establishments (by number, size and location) but then add a comparison layer with real and projected market shares (using dynamic spatial interaction models). Smith (2006), after modeling the greater London area, overlaps a series of layers which include retail, office, services, employment and commuting carbon emissions densities. Other than interpreting the geographical dispersion patterns of these overlaid phenomena, these studies explore little else concerning commerce's inner nature. Barke (1997), analyzing traditional stores in central Malaga, Spain, has explored that nature (discussed below), but he also approaches socio-economic characteristics of the environment in simpler terms when trying to understand why older forms of retailing still persist in the landscape. Accordingly, he has correlated the proportion of 'archaic stores' with variables such as the percentage of second homes, of unemployed or of foreign born. The greatest correlations are achieved with the percentage of people with second homes and with the percentage of people in primary employment. The distance to the provincial capital proves to be insignificant. Joosten and van Nes (2005) have also done a simple comparison of shop patterns and population densities, revealing a limited co-occurrence. Marques (2003) has made, in the Portuguese context, a macro analysis at regional and national level by comparing the degree of concentration of commerce and services with

other densities such as mobility, employment and access to schools. This methodology serves to categorize Portuguese cities, and no comparison between the indicators is achieved.

Commercial distribution patterns have also been overlaid with land-use and transport patterns. Joosten and van Nes (2005), Jingman (2009) and Villain (2011) compare retail location with public transport networks in Berlin, Wuhan (China) and Montréal respectively. Joosten and van Nes draw buffers with 350 meters around normal stops and 550 meters around transit stops. Villain considers distance and whether the stop is in the same or in an adjacent street from the shop. Jingman compares the bus network with the location of large scale stores. In Berlin the authors draw no conclusions as there were metro stations both where there were and where there were not shops in the vicinity. Jingman, on the other hand, finds a correlation between the traditional transport network and the city's commercial centers. In Montréal, Villain suggests that the presence of metro stations boosts local commercial arteries oriented towards convenience or mixed retail activities, which are observed to be within walking distance from those stations. On the other hand, when located along major roads, thoroughfares or highly specialized streets, a metro station does not act, according to the author, as a generator of convenience retail activities. Villain further compares shop location with distance to parks and attractors. When located towards the edge of the street, a park is most likely to disrupt the activity along the commercial artery and the presence of attractors (movie theaters, schools, public libraries) does not automatically generate higher levels of convenience retail activities along adjacent street segments. The first two authors consequently reinforce their analysis by using Space Syntax, but because this already considers the morphological properties of space, it will be discussed below.

Geographical pattern comparisons such as these are usually interpreted in a single city, by the overlaying of statistical and spatial dispersion data in a visual, GIS-based platform. They are concerned with the overall effects to the city's spatial economy, and hence hardly separate between types of commerce and do not consider the micro-scale morphological properties that form the backbone of the city's structure.

3.2. FROM MORPHOLOGY TO PLANNING

3.2.1. INTRODUCING MORPHOLOGICAL PROPERTIES

Only in the last 10 years has the 'morphological' component of form and structure been applied to the study of commercial activity (Figure 2). Authors who have addressed this issue have stated, in the introductions to their works, that urban morphological elements have seldom been used to characterize or interpret commercial activity (Van Nes, 2005; Sarma, 2006), and that there is a lack of knowledge on how urban form affects the spatial distribution of retail spaces (Villain, 2011). In the past, the understanding of commerce has just an economic activity clouded the importance of urban environment conditions as an influencing element of the sector's performance in the market. But in the last few years, according to Axenov *et al* (1997) this importance has suddenly been recognized. Location is perceived as more than a place on a map, and more than a wealth-generator due to the surrounding market conditions. Location is also characterized by building fabric, circulation patterns, layout and design. Accordingly, the planner's perspective on commerce, through commercial urbanism projects, has already evinced that the improvements on physical space may produce attractive environments able to induce shopping. But Nelson's (1958) question '*But can stores or shopping centers be as important to the emotional aspects of location?*' remains, for the most part, unanswered precisely because of the failing bridges between commercial and morphological studies. If morphological studies were lacking typological components, commercial studies, focused on

topological and typological elements, lack a morphological perspective (Figure 2). By analyzing store location through morphological patterns, the city, considering Tallen's (2003) subdivision (Chapter 2) becomes the 'elemental city' because it can be characterized by its built, material qualities.

The initial works considering the symbiosis between the morphological properties of space and commercial activity appeared, once again, in geographical/historical literature. But the major concern of these studies was to develop time-lines of the city's evolution, so the patterns are described in broad-strokes and are not interpreted. Commercial dispersion changes are presented on one side, demographic, urban and political contextual changes are presented on the other, and no links are made between them. Fernandes (1993), for example, in his doctoral thesis, has made, as the title aptly suggests, an extensive *geographic approach* to the evolution of commerce in the Portuguese city of Oporto. Yet for each chapter representing a temporal period there are two subchapters: one concerned with the demographic and urban alterations that the city suffered during that time, which is meant to supply *context*, and another which presents the geographical dispersion of commercial activities. Obviously the contextual changes can justify some shifts in retail geography but no direct cause-consequence effects are given at a micro-scale. Tokatli and Boyaci (1999) have done a similar approach in Istanbul. Although the title of their paper refers to the '*changing morphology of commercial activity*' the interpretation of each temporal period of the city's evolution mostly refers to the spatial dispersion of commercial activities in a backdrop of social and political changes. Only occasionally are references made to streets, floors and building types, but these are presented in a general sense, and with the exception of some multinational stores which have occupied purpose built or derelict buildings, no direct connection is made between particular stores and their surrounding morphological context.

If the above analyses have been made at a territorial level (Figure 2), most morphological research on commerce has focused on the neighborhood level, particularly on buildings and blocks. Yoshida and Omae (2003) for example, working in 4 square kilometers of Tokyo, have used the city block as a unit of research, trying to identify its properties and the relationship to land-use (including commercial activity). For that they have developed a three-dimensional ULM, using orthorectified aerial photographs and GIS datasets, complemented with data collected in-situ. Structural elements of the block are considered to impose over architectural aspects and so a series of morphological properties are calculated for each block using algorithms applied to the ULM. These are i) surface area per projected area; ii) volume per projected area; iii) building to land (BTL) ratio; iv) mean height of buildings; v) surface area of buildings per unit volume of buildings; and vi) mean volume of buildings. The variables are used to construct scattergrams, where similar blocks are clustered together, or false color composites[72], based not only on these variables but on land-use. The authors prove that commercial blocks have particular morphological characteristics that can be categorized. Considering, for example, the volume and surface area per projected area, commercial blocks have a much wider range than residential blocks, and most of them have larger area, larger volume, bigger heights and greater BTL ratio. Mixed blocks have an intermediate position between entirely commercial and entirely residential blocks. Blocks of small volume are proved to be few in commercial zones. The authors note that buildings with low cubic content are economically pointless in commercial zones where a high floor area ratio is permitted, and the exceptions are residential patches or car parking spaces. Joosten and van Nes (2005) also give a great amount of importance to the influence of city blocks on the dispersal of shops. The hypothesis of their study is that the pattern of shops is a

[72] False color composites are created by choosing the variable which best describes each kind of building and then making a color gradient accordingly.

consequence of the intrinsic characteristics of the city. Accordingly, they overlap a map of Berlin's shops[73] with a series of other spatial characteristics, trying to uncover which presents the greatest correlation. Dispersal patterns such as population densities, metro stops location (discussed above), and street configuration patterns (through Space Syntax) were dismissed by the authors because they presented a limited co-occurrence with shop dispersal. It may be wondered that, if an element does not correlate with another, than there is a conclusion that can be drawn: *that they do not correlate*. Consequently it may be proposed that the opposite of one of the elements may present a strong correlation with the other. However, the authors do not follow this line of thought. For example, they dismiss street configuration patterns and location of metro stops because there are examples of both co-occurrence and no co-occurrence with store location, but they never ask why those co-occurrences appear in certain places. Instead, because they have found a strong co-occurrence of shops in full block typology areas, they consider that as the only influencing factor in store dispersal. Accordingly, stores are located in blocks characterized by high floor space index[74] and build up street sides. The authors further state that shops prefer medium-density zones and smaller blocks, usually near main junctions or along the main streets. However, chain-store and shopping centers tend to be located in non-block typologies.

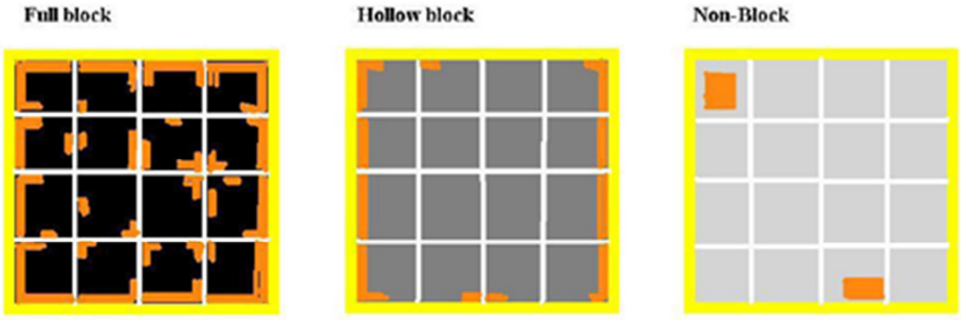


Figure 12 - Typical shop dispersal pattern within different block typologies in Berlin (source: Joosten and van Nes, 2005)

On the other hand, streets have been the object of Space Syntax analysis, which will be discussed in the following subchapter. Villain (2011) however, working in Montréal, compares store location with a street analysis that does not involve Space Syntax methodologies. She first divides commercial spaces in 'convenience' and 'specialized' retail, producing a street classification that only takes into account the shopping occupancy and the retail density. Then she compares this with two morphological concepts: 'street permeability' and 'relative position'. The first consists on the average distance between intersections on both sides of the commercial street. The second consists on a division of streets in 'centrally' or 'peripherally' located. Villain's morphological characterization of the urban environment only takes into account these two concepts. The author's conclusions express that streets with higher level of permeability primarily favor convenience goods and mixed retail activities, serving local catchment areas. These types of retail are also most likely to be centrally located within the morphological unit. Comparison and specialized retail seem, for the author, to be less dependent of street permeability, and are not related to centrality.

Finally, studies made at street level have been even less frequent. One example is the already mentioned study by Barke (1997). Working in small localities near Malaga, Spain, Barke has analyzed

[73] The study covers an area of 130 km^2 and the maps of store location where drawn while bicycling through the city. Not all streets are covered and no store characteristic other than location was collected.
[74] Coinciding with Yoshida and Omae's (2003) findings.

a series of morphological characteristics inherent to the store, namely the size of the windows, if it is purpose built or is in a mix-use building, and if it has storage facilities. Barke also scored the stores according to the quality of their window display and whether they were self-service. Correlating these variables with population densities and the distance to Malaga city, Barke was able to categorize the localities he studied and ultimately conclude about retail modernization in these areas, which was the purpose of his paper. Nevertheless, concerning these morphological characteristics, he was able to make some interesting assessments. Mono-functional buildings (commercial use only) are a sign of modernization, and are distinctive, in terms of exterior architectonic layout, in comparison with the traditional commercial landscape of Andalusia. The same happens with the size of shop-windows and the openness of the store to the street. The newer the store is, and the less intimacy is established with the consumer, the more need it has of advertising itself. Also, shop windows make comparison shopping easier. All the morphological variables are highly inter-correlated, with the exception of the number of self-service establishments. This indicator seems to be independent of all others. The other variables are highly correlated with population size, and more so with the population of the municipal territory than the village nucleus itself. That is, the indicators are more correlated with the catchment area population rather than the local one. It is interesting to note that both the morphological and the economic modernization of retail are dependent of the same indicator: population. Distance to Malaga is negatively related to the indicators, and consequently to the modernization of retail. This can be explained because, in theory, farther localities possess less population and commercial innovation takes more time to reach them. In the Portuguese context Allegri (2010) uses the architectural point of view to analyze the evolution of the physical layout of shopping centers and arcades in the city of Lisbon. The size and interior complexities of the layout (without hindering the user's perception) obviously increase with the years. No other contribution to commercial street level morphological analysis seems to exist in Portugal, other than commercial urbanism projects, which will be discussed below.

The above studies which have introduced the morphological component of form and structure into retail analysis generally focus on one city and do not have the extensive retail characterization that many geographical studies do. The concern seems to be mostly the analysis of the layout of buildings and blocks, whilst the land-use mix, the position in the network and the circulation patterns are usually discarded. The studies focus either on the macro or on the micro-scale, but never on both.

3.2.2. SPACE SYNTAX ANALYSIS

3.2.2.1. Theoretical background

Geographical and economic studies approached, using Tallen's (2003) subdivision (Chapter 2), the 'aggregate city', and earlier morphological studies approached the 'elemental city'. A characterization of the 'geographical city', a city measured by spatial dimensions such as measurements of compactness, accessibility and connectivity was missing. Furthermore, considering the elements which define form and structure (Figure 2), a convenient method for interpreting 'circulation patterns' in the typology component had not been achieved either by commercial or by morphological literature. Nor were 'streets' at neighborhood level and 'traffic' at street level resolution dully covered by existing research.

In the 1970s, Hillier formulated the Space Syntax theory[75], based on the idea that space is the intrinsic aspect common to all facets of the city. Because '*space itself has structural properties*' (Hillier, Hanson, 1984) cities are not the outcome of social and economic aspects alone, but of the process of building as well. Even though cities are built over distinct periods of time each with particular contexts, most have taken the same form throughout history and absorb new patterns of activity distribution without dramatically changing this form (Hillier, 2006). Hillier suggests that it is the architecture of the urban grid, namely the pattern of angular and geometric relationships between connected linear spaces, and not metric distances, that constitute the link between the supporting physical structure of the city and the function. Accordingly, it is this intuitive knowledge that guides people's movements around the city. Considering that 'commerce' is the functional aspect, Space Syntax theory expresses that the urban grid is the shaper of retail geography (Hillier, Vaughan, 2007), and regardless of distance parameters, buying powers and goods and price competition (which exert attraction nonetheless), shopping is ultimately associated with the consumer spatial behavior in the built environment, that is, to his circulation and movement patterns (van Nes, 2005; Penn, Turner, 2005). According to Hillier *et al* (1993) configuration, movement and attractors are the three determinants of the way in which shops locate in the urban environment.

The Space Syntax model is constructed by using a graphical representation of the urban layout, which constitutes an objective description of its morphological structure (Teklenburg *et al*, 1994). All public space is considered continuous and is then divided into axial lines which constitute an axial map. The city is thus represented as a line graph having the fewest number of longest straight lines that pass through all spaces, and complete all rings (Sarma, 2006). This representation does not consider elements of attraction nor makes assumptions about origins and destinations and path planning (Penn, Turner, 2002).

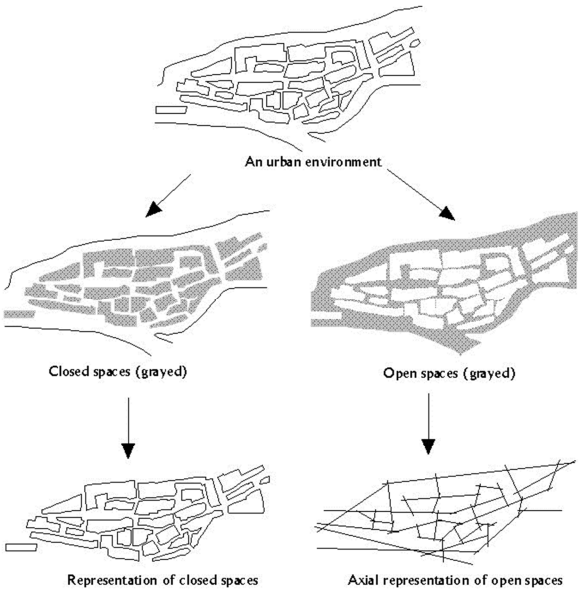


Figure 13 - From the urban environment to an axial representation (source: Jiang, 1998)

The resulting configuration, the axial map, is able to describe characteristics of individual spaces relative to all other spaces in the system. Accordingly, a global or a local analysis can be obtained. A

[75] The original model was formulated at the Unit for Architectural Studies, University College, London. This subchapter is not meant to be a long essay on Space Syntax, so the collective works of Hillier, as well as those of Teklenburg *et al* (1994) and Sarma (2006) are suggested.

global analysis considers one given line related to all others in the system. A local analysis considers one given line related to only some other lines in the system, according to a pre-established distance. Distances are calculated as the number of times a user turns (moves from one line to the other) according to various definitions: metric (shortest path), geometric (least angle change) and topological (fewest turns). In Sarma's study (2006), the least angle change provides the best correlation between movement and the urban grid. Actually, Hillier and Vaughan (2007) defend that angular geometry achieves better results because people navigate with the perception of how the alignments of the grid are connected to each other, rather than considering actual metric distances. According to the authors, 60 to 80% of the differences in movement flows can be accounted by the configuration of the grid itself. The potential flows are identifiable mathematically through the application of the Space Syntax models.

The application of the models is based on two theories, the Theory of Natural Movement and the Theory of Movement Economy. The first provides an alternative to the gravitational model (Sarma, 2006). It is concerned with two types of movement, to-movement and through-movement, associated to two measures: 'integration' and 'choice' respectively (Hillier *et al*, 1993). To-movement considers all possible origin-destination pairs within a system. Every line is considered to be, simultaneously, both an origin and a destination. Some lines are likely to feature on more topologically shortest routes than others and are, therefore, considered more accessible. Because the properties of the axial lines can be expressed in numbers (Tecklenburg *et al*, 1994), their aggregate weight will be more than other less accessible lines. Consequently, the outcomes of the models will reveal these differences in the centrality of the lines. This measure of global accessibility is termed '*integration*'. Integrated lines are highly accessible and have a greater probability of being used than less integrated lines. These are called segregated. On the other hand through-movement is a choice measure. It considers the same origin-destination pairs, but accesses the degree to which a given line lies on shortest paths between these pairs (Hillier, Vaughan, 2007). Lines that are crossed more often than others are more 'chosen' to reach any given destination, hence they reveal an aptitude for passing-through movement. The model will reveal that their 'choice' value (betweenness) is higher than other, less passed-through lines. According to Dalton and Dalton (2007) this is purely the result of the configuration of the urban grid, namely the way in which individual components of the urban fabric such as main streets, side streets and squares form an interrelated structure. Hillier *et al* (1993) further state that if configuration, movement and land use are in agreement, and all other things being equal, then configuration must be given causal primacy. If the main property of the urban grid is to privilege certain spaces over other for through-movement, commerce, which is a movement-seeking activity, will try to locate along those privilege areas. According to Sarma (2006) natural movement is closely related to the spatial property of global integration. Movement is produced by the grid rather than special attractors. But the movement generated by the grid will attract attractors. Hence the Theory of Movement Economy is formulated (Hillier, 1996b). Activities and land uses that seek and benefit from movement, such as commerce, gravitate to location which the grid has made movement rich, locally or globally, or to the vicinity of such locations, while others will naturally seek low movement locations. This creates a cycle where attraction and movement continually increase. In this way, the settlement mix-use pattern naturally evolves towards a seamless network of busy and quiet areas, where the busiest will be in the most integrated lines. When movement rich processes become sufficiently intense, it will feed back on the grid to improve local accessibility, reducing the scale of the grid. According to Hillier (1999) while the theory of natural movement has a regularity, the theory of the movement economy tries to account for the process by which the apparent affinity between grid structure, movement, land uses and even building densities arise in naturally evolved urban grids.

Space Syntax's most common outcome is a colored axial map, representing the city as a gradation of integration and segregation (or measures of choice) according to the scale (global or local) previously selected. Other than the most instinctive visual aid, spatial patterns can be represented numerically, so a comparison with social, demographic and even economic phenomena can be achieved. The difficulty of converting the city into an axial map can be minimized if instead of using axial lines, road center lines are converted. Turner (2007) addresses this issue, but proves that using road center lines without any treatment results in a series of inconsistencies, such as topological links that are missed. Nevertheless, the author suggests that, in certain conditions and with the adequate treatment, road center lines can have high correlation coefficients with measured movement data. Dhanani *et al* (2012) have come very recently to similar conclusions. Neither the Open Street Map (OSM) nor the Integrated Transport Network (ITM) present significant dissimilarities from the Axial Map at a global scale, but at a local scale the differences are more perceptible, hence the need for care and proper treatment. Locally, the OSM will perform better than the ITM, because OSM, like the axial map, represents the street rather than the road network and therefore is more congruent with urban built form and may include pedestrian routes. But the ITM is much more consistent and may be more reliable than the OSM. The authors stress that road center lines, so long as traffic is simplified and pedestrian paths are included can have the potential to '*provide a robust and replicable model that both: captures spatial configuration for individuals as they use and understand their local environment; as well as reflects the configuration of the local environment within the context of an entire city*'. Traffic simplifications can include the elimination of traffic islands (such as roundabouts) or, in the case of two-way large roads where traffic in each direction occurs in separate lanes (such as free-ways or large avenues), the substitution of the two-separate segments the street model will provide by a single one. OSM and ITM will obviously perform better in metric than in geometrical and topological distances.

On the other hand, Ratti (2004) debates the validity of Space Syntax models by discussing a series of what he calls 'inconsistencies'. One relates precisely to the choices that the researcher must make when drawing of the axial map lines and choosing the map's size. For example the edges of the axial map produce effects that are unreal, because the lines will appear unconnected except by one side. Space Syntax also makes simplifications in terms of morphological information when it discards metric distance and the three-dimensional perception of the environment. Social, monetary, marketing and technical reasons may explain the success of a given store and all of these reasons are unrelated to movement. Space Syntax also does not take into account land-use, and although Hillier has proposed adding additional fictional streets to the axial map in order to add weight to certain areas (for example to represent commerce) and in consequence manipulate integration and choice values, Ratti has doubts about the validity of this process. Place Syntax (Stähle *et al*, 2005) may be an alternative to measure the attractiveness of specific places, like shops.

3.2.2.2. Assessing store location in the grid

Although Space Syntax analysis is becoming a popular tool in the morphological interpretation of cities, the applications which consider commercial activity are rarer and have mostly appeared in the last 10 years. They have been associated with the proliferation of GIS-based software and if, in 2002, Jiang and Claramunt argued that there were still ongoing computational problems in the conjugation of the GIS potential with the modeling capacities required for these researches, today most of these problems have already been overcome.

In 1985, Martins concluded that the active population in the tertiary sector had a strong correlation with the urbanization rate (0,85) unlike the active population in the secondary sector (0,14). Today Space Syntax defends that the clientele as well, through their inherent movement, can also largely account for the configuration of the space itself and of the built densities and land-uses therein (Hillier, 1996b). Hillier's approach to commercial activity has mostly been theoretical, based on the theory of movement economy. Because people exploit the potentials space gives them (Hillier, Iida; 2005), the movement choices are made according to the intelligibility of the street grid. Activities which depend on movement will follow the grid's logic. Because land uses change slowly along particular lines of movement (Hillier, 1996b) there will be, as well, a gradation according to the necessities of each particular activity which depends on the grid. Commerce and other activities are thus spatially correlated. But Hillier (1996b) also stresses that, because shops can attract but not change the integration value of a given segment (in Space Syntax terms), the justifications for movement are not in the land-use, but on how the urban system is spatially structured.

Van Nes has been one of the most prominent authors in the practical application of Space Syntax methodology to interpret commercial location. She concurs that it is the configuration of the grid that decides where shops tend to locate and what pattern (linear or convex) they present (van Nes, 2001). According to the author, shopping areas are only successful if they are among the highest integrated streets, that is, if they are located in a street part of a dense structure with a high number of axial lines connected to it, so that it can be reached from a short distance from a great variety of origins. This is the reason why clustering is effective for most shopping areas. Bad local grid conditions, on the contrary, lead to negative development and even closedown. In this paper, the author tries to determine how changes in the road network (in this case the introduction of ring-roads) in four English cities affect the distribution pattern of shops. If the grid changes, the values of integration change so, according to Space Syntax theory shop location would change as well. Initially, before the introduction of the ring roads, van Nes noted that the central shopping areas were located along the most integrated axial lines, or along the second most integrated with the highest densities, and that the retail pattern presented a linear shape. After the construction of the ring road, the highest integrated lines shifted to better-connected streets between the ring road and the city center. The pattern of commercial spaces changed accordingly, from a linear to a more convex and compact structure. Stores in less integrated street had the tendency to close. '*Apparently, it is not the ring road that attracts the establishment of new retailers and shops, but the way in which the ring road is connected to the urban grid on which it was imposed*' (van Nes, 2001). If the ring road is well integrated into the existing network, then few differences in shop dispersion will be noted. If not, if the ring-road cuts streets that led directly from the periphery to the downtown and makes them less integrated, then the shops in the road section outside the ring have more tendency to close. According to this author, the most successful shopping streets appear in segments a few 'steps' away from the ring road.

The same author has used Space Syntax to establish commercial hierarchies. Working in Amsterdam, van Nes (2005) categorized shopping areas according to their degree of connectivity to the city's street grid. The author established two types of patterns: linear (in traditional urban areas, along certain streets and accessible on foot), and clustered (car-based). High connectivity or high density is a condition for vital shopping areas. Car based shopping activities depend on meso scale connectivity while pedestrian based shopping depends on micro scale connectivity. The hierarchy, considering three elements of analysis (urban scale of the built environment, the street net and the degree of connectivity to the vicinity), is then divided into eight elements: (i) local shopping street; (ii) area shopping street; (iii) markets; (iv) main shopping street; (v) specialized shopping street; (vi) nightlife streets; (vii) area shopping centers and (viii) regional shopping centers. The higher the density of

streets in the vicinity, the more intense is the shopping street in terms of number and variety of shops. The size of shops seems to depend on the degree of connectivity to the vicinity, and the strategic, topological and metrical location in the area and in the city as a whole. Like Hillier, van Ness concludes that larger configurable changes to the grid seem to affect the shops' disposition, and that '*all seems to depend on connectivity – both on the local and meso scale in a built environment*' (van Nes, 2005). But in the same year, as mentioned, Joosten and van Nes (2005) used Space Syntax in Berlin with far different results. They overlapped a map of Berlin's stores with several axial maps depicting global and local integration. Yet the co-occurrence found between the combination of global and local integration and the presence of shops was, in this case, week. The authors justify this statement by saying that there were both shopping areas in streets with poor integration and areas lacking shops with high integration values. Instead the authors stress, as discussed above, that full block typologies influence shop dispersal.

More recently, Jingman (2009) has also tried to acknowledge that the relationship between spatial structure and commercial activity is embodied in the concept of accessibility. He compared the road and bus network (using Space Syntax) with the location of large scale retail stores in Wuhan, in China, hypothesizing that the development and emergence of these establishments is correlated to locations that are relatively well connected in the road network. The author created a geo-database in ArcGis, imputing store location and their major attributes. With the resulting map he was able to analyze existing commercial clusters, and divide the city in global, local and sub-local centers. Then the author applies the Space Syntax methodology but with an important difference. He states that most commercial streets, formed through naturally clustering processes, are 300 to 1.000 meters long. In average they are about 600 meters long and 1.000 meters is the limit threshold to avoid the market overrun and loss of vitality. If a commercial street is long and straight, but has most stores in only a portion of it, traditional Space Syntax methodology would diminish its importance. Therefore, the author makes a segment analysis instead, by dividing the major commercial streets into smaller segments. Maps of global and local integration are thus created, and the local and global centers, as well as the most important bus stops and routes are spotted. Correlating store dispersion maps with Space Syntax maps, the author concludes that urban physical space and urban functions are mutually influenced. The city's commercial centers exactly correspond with the city's syntax centers. This happens, according to the author, both at a local and a global scale. Other findings suggest that almost all large-scale stores are directly located within the sub-local syntax centers, in places with high road local integration, that is, connected to major thoroughfares and bus routes.

But the literature suggests that configuration not only affects store location, but also the type of commerce and the type of shoppers as well. In India, Hossain (1999, *cit in* Sarma, 2006) understood that commercial spaces whose sales (movement) were generated by their own attracting potentialities had the tendency to be clustered together, although surviving in isolation. On the other hand, functions whose movement was just attracted coincidentally were more dispersed, although in spatially strategic locations. These were more affected by competition and changes in movement flows. Later, Sarma (2006) presented '*the social logic of shopping*' in New Delhi by comparing store location and shopper categories with Space Syntax analysis. The nature of the movement (measures of integration and choice) influences the category of shopping and the types of shoppers (income class). The distance from which the movement originates (size of the grid) affects the social and economic values attached to the market. So, as trip length increases, movement patterns will reflect more the choice, or betweenness structure of the graph rather than the integration or closeness structure. M1, first necessity stores, for example, have a positive correlation with choice radius 500 and global choice, suggesting that at some level convenience stores are a global phenomenon in the market. MC, C and S

categories[76] do not correlate with choice (through-movement), unlike high-end multipurpose shopping, which is very much correlated with global through-movement. On the other hand, where movement is local, lower end multipurpose shops develop, which leads the author to conclude that distance is directly proportionate to social and economic class in terms of movement and in terms of shops.

Other models have shared with Space Syntax the structural interpretation of urban space. Penn and Turner (2002) developed the Visibility Graph Analysis (VGA), which is a Space Syntax based agent simulation, used to determine an agent's choice of movement through space. The authors discovered that the 'random' next step analysis was the one that proved to correlate best with human movement, corroborating Space Syntax theoretical background. An agent will continue to move forward along linear space when the majority of visible nodes within his view cone lie ahead. Therefore it can be proved that spatial morphology acts on movement mainly through linear arrangement. So it is at junctions or places where '*ahead*' seems harder to define that people pause and look around before moving. This confirms van Nes' (2005) statement that people move by choosing the easiest to orient routes through the street grid.

The Multi-centrality Assessment (MCA) model proposed by Porta *et al* (2007) offers an alternative to the Space Syntax model by inverting the position of links and nodes. Therefore in the MCA model streets become the links and intersections the nodes. It tries to define 'street centrality' through measures of closeness, betweenness and straightness, and the relationship of that centrality to the densities of commerce and service activities in the Italian city of Bologna. The MCA model assigns a set of centrality values to each street segment. Then, using the Kernel model[77] the centrality values associated to the street network and the points of commerce are put into the same spatial form, and thus can be compared. Retail and service activities in Bologna concentrate in areas that enjoy better centralities. The results point to global betweenness (choice) as having the strongest correlation with commercial activity of all scales. They also correlate, in a slightly lesser extent, with global closeness. Initially concentrations of activities are slow in responding to the improvements in centrality in terms of global straightness or local closeness, but get more intense after the centrality passes a certain threshold. Betweenness centrality and density of activity follow a power function, that is, very few places enjoy the best locations and thus command a high concentration of business in contrast to the vast majority of urban space.

Teklenburg *et al* (1994) present one of the few works concerning Space Syntax and commerce that doubts the strong correlations between high accessibility and store location. Above, it was already seen that that correlation could not be perfectly found in Berlin (Joosten, van Nes, 2005). Teklenburg *et al* (1994) state that in the Dutch suburban case shopping location does not coincide with the most integrated lines. In the downtown, the busiest shopping street is in one of the most integrated lines of the axial map, but the major department stores are located in segregated to medium integrated lines. They established that in most cases where the most integrated lines for pedestrians did not coincide with the major store locations there was a co-occurrence of pedestrian and intense vehicular traffic. Therefore they deduced that highly integrated lines for pedestrians are potentially attractive locations for shops, and only when these lines coincide with intense vehicular traffic, medium integrated lines may become more attractive. The authors also use Space Syntax in the design of shopping centers and shopping districts. They suggest that Space Syntax should be used only in the global phase of design

[76] Multipurpose-Comparison (clothes, jewelry), Comparison (Home appliances, electronics, automobiles), Single Isolated Purchase (cinema, hotels, services) respectively. See Chapter 3.3

[77] The Kernel surface modeling is a mathematic 3-dimensional algorithm tool available, for example, in ArcGis which compacts a given spatial data into a set of points in Euclidian space (see Thrall, 2002)

concerned with layout, because it is able to give information on accessibility and movement choice, hence providing a set of reference points for following stages. The authors further suggest that parts of the urban space that are unattractive due to their position in the urban grid may be made more attractive by allocating stores to them. This is the principle of the planner's perspective, which is discussed in the next subchapter.

3.2.3. THE PLANNER'S PERSPECTIVE

3.2.3.1. Interpreting form and function in the urban structure

At the dawn of the shopping center era, Gruen and Smith (1960) defended that well planned large scale commercial spaces could exert a highly favorable and invigorating influence on the surrounding area and that, on the other hand, a well-planned surrounding area could add, in large measure, to the prosperity of the shopping center. This conviction was contrary to that of Nelson's (1958), two years before, who assumed that '*the emotional aspects of a location can be important to the success of a store or a shopping center as the more obvious characteristics of convenience and access*' but was unsure if stores or shopping centers could '*be as important to the emotional aspects of location*'. This symbiosis between form and function has mostly been an assumption that has rarely been proved. Geographic and economic approaches have only been concerned with the influence the surrounding area (the location) can have on the success of commercial establishments. In some way, morphological approaches have followed the same path. Space Syntax analysis assumes that store success is a consequence of the grid's structure (once again location) and only a few studies have approached the morphological consequences of commercial spaces. But because the assumption that stores can affect location has always been present, it has not been discarded altogether in the literature, and small clues to this assumption have constantly been given. The above mentioned authors, Gruen and Smith (1960), for example, already talked of the vicious circles that could be generated as a consequence of not planning the insertion of shopping centers in the urban landscape. Not only the center's performance could be hindered, but also urbanistic consequences could arise such as the incompatibility of land-uses and the social dereliction of the area. Actually, the lack of a general non-planning has been the major problem of balancing form and structure. The commercial pattern, by being, as mentioned above, a consequence of a '*whim of decision makers*' (Hernandez *et al*, 1998) has mostly grown in an egotistic fashion, that is, it has been a consequence of profit-related decisions by individual entrepreneurs and private commercial companies. Commercial planning was mostly inexistent (Guy, 1994), it was part of a global planning that mentioned commerce occasionally (Borchert, 1998), and urban planners had a little understanding of commerce (Nuno Portas *in* CCRC, 1995) or treated it as a second rate activity (Fernandes *et al*, 2000). Consequently, the eagerness for profit and development associated to limited planning restrictions led to many mistakes of a commercial and urban nature (OEFP, 2008). The relocation of major commercial establishments to peripheral locations is one of the best known examples and had a proven influence on the decline of many downtowns. Consequently, the public influence on commerce has been mostly concerned with the licensing of large stores, namely by controlling their number, their location and their opening hours. This was made as an attempt to avoid downtown exodus and prevent competition for traditional retailers, but neither strategy has actually proved successful, because of the changes in supply and demand, which affected conventional paradigms.

Presently, as mentioned earlier, the vision for 21st Century cities is one of sustainability, concerned with a network-oriented structure of specialized and globalized cities. Viable and sustainable cities must have a certain amount of characteristics (economic performance, lively open spaces, appealing

image, proper management and maintenance) and suddenly commerce appeared as the appropriate economic, social and morphological tool to achieve such goals (UACS, 2002). Commerce's *active* nature and city-shaping potential suddenly interested planners and promoters, and the first downtown-retake and commercial urbanism strategies appeared, aiming at reconciling the old and new commercial formats so as to maintain economic cohesion. In the last 10 years this interest has been foremost in commercial planning practices. In 2000 the European Congress on Commerce and City, held in Lille[78], was keen to understand '*how, and under what conditions, the evolution of commerce in Europe can contribute to the renaissance of European cities*' (Balsas, 2001). A series of Congresses of the Urban Commerce have also been taking place yearly. In 2004, in the fourth edition held in Barcelona, the intervening parties (mostly city center retailers) produced the Manifest of Barcelona. This document demanded of public officials a city as a space of social, cultural and economic relations, conditioned by urban form, by spatial and human organization, and open to the participation of the different actors. They demanded a street-oriented city, neither close nor diffused, but one with '*streets and squares, with facades, with store fronts and services, agreeable, and ideal for strolling and finding*'. Two years later, the Memorandum of Oporto defined the European city as a pole for the development of regional and national economies, and able to sponsor social cohesion and cultural and civic identity. Accordingly the European city (a '*city of services*' and '*hospitable*') would depend mostly on two agents: retailers and politicians. Of politician retailers demanded a careful integrated investment based on the premises above established, proper legislation and openness for partnerships. Of themselves they called for integrated projects, better qualifications and willingness to associate, work together and innovate. Of the public (consumers) they requested that the city should be fostered so that commercial activity could proliferate.

These manifests represent a willingness to invest on commercial activity as a key to the revitalization of cities, but at the same time denote a certain lack of initiative, in a sense that most of the thoughts are not put into practice by the retailers themselves and the burden is set on the shoulders of politicians, planners and promoters. This lack of dynamism by commercial retailers has already been discussed in the previous chapter. The public sphere itself has also had difficulties in coordinating planning commercial strategies. In Portugal, for example, the departments that regulate the city and create its laws are different from those which regulate economic activities (UACS, 2002). This lack of coordination at a higher level needs to be overcome and has been the reason why the first initiatives of downtown regeneration belonged to the private sector, namely through retail-led strategies using in-city shopping centers as anchors. Yet this may be even more prejudicial to the city. If stores return to downtown alone, without a surrounding urban renewal approach, without improvements on urban design, transport planning and social amenities, then commerce will fail to generate the momentum cities need, and so they will fall in the vicious cycle above mentioned. Guy (2004), for example, demands the rethinking of the commercial strategy, so that the '*town-center first, come what may*' may be replaced by a wider, integrated scale. On the other hand, planning policies must be careful, because they must neither preserve the existing commercial interests, nor hinder the competition between retailers and between suppliers (Dias da Silva, 1997).

Furthermore it is also fair to ask if there is really a strong influencing flux between commerce and city and whether, using Nelson's words, commerce can influence the emotional aspects of location, and so be an effective tool in the regeneration of urban centers, or if it is just an imposition that the literature and wishful thinking are determined to obtain. Commerce may not be the remedy for all evils (UACS, 2002), but if it is part of a strong enough integrated strategy, the influence in surrounding urban spaces

[78] This was the second edition of this Congress. The first was in Malaga in 1999.

has already been proved. It is, at times, able to make them livelier, dynamic, competitive and attractive. Consequently, it may be assumed, for now, based on the literature, that commerce may follow the city's context in a first stage, but city spaces may be more prone to survive depending on the success of their tertiary tissues.

3.2.3.2. The regeneration thesis

The planner's perspective on commerce has mostly been concerned with the regeneration of downtowns. European downtowns (most containing shopping areas) generally locate in medieval districts, and the present layout of public space coincides with the historical patterns of streets and squares (Teklenburg *et al*, 1994). Until the early 1990s these centers presented economic declines, characterized by falling turnovers, derelict physical environments and the increase of vacant spaces (Whysall, 1995). Because the land value decreased in the center, a new lucrative hypothesis appeared for promoters. According to Roberts *et al* (1999) this led to a wave of renaissance of the urban landscape with higher functions claiming industrial buildings and older residential areas for upper middle income housing and new forms of commerce. At the same time, as the unemployment increased, and attractiveness and land-values reduced in the center, opportunities for specialized economic growth and cultural diversity appeared, and so lower order functions were also able to find a place in space. Many vintage, discount and second-hand stores and other 'creative' activities started to occupy the city center. In either form, the initial response to the decline and vacancy of commercial facilities in the inner-city was mostly individual, applied by promoters with limited investment and limited development capacity.

Yet as early as the 1950s, in the United States, the principles of a larger, retail-led regeneration were already being established, and would inspire, according to Whysal (1995), the 'regeneration thesis' of the 1990s. The idea was that large new stores could be used as catalysts for wider shop regeneration. According to Gillette (1985) there was a notion that the type of commerce characteristic of the suburbs could be used to revitalize commercial downtowns and improve social and civic life. The principles were expressed by three measures, stated in the periodical Business Week in 1955 (Gillette, 1985): (i) improve the flow of traffic and the productivity of the land; (ii) separate pedestrian from automobile traffic; and (iii) integrate commercial with non-commercial activities. Gillette (1985) also mentions another magazine of the same year, Women's Wear Daily, which stated that the solution to downtown shopping areas should be to '*eliminate obsolete buildings and create homogenous, connected entities whose plans would be grouped in logical order to minimize walking distances, providing ample and potential parking, conceiving underground road systems and creating landscaped courts*'. This is a clever premonition of open air shopping centers in downtowns.

Although from the 1970s until the 1990s the concern of most promoters (and planners), both European and American was to control the construction of large scale commercial facilities, perceived as prejudicial to traditional retail, outside the center, some attempts had already been made to introduce this type of facility in the inner city. From the 1960s onwards covered shopping facilities began to appear within British town centers (Instone and Roberts, 2005). The 'festival marketplaces' appeared in the second half of the 1970s in America. The first was the Faneuil Hall Marketplace in Boston which had food and retail specialty items. The Water Tower Hall in Chicago had not only stores but services and residences. According to Sawicki (1989) these two examples marked the return of the shopping center to its urban roots, and both constituted proves of the attractiveness and regenerative power of larger facilities with multiple land-uses. Even today authors like Grant and Perrott (2011)

defend that it is the land-use mix of commerce, services and homes that most contributes to community vitality, economic vibrancy and urban efficiency.

Nowadays, the 'regeneration thesis' uses a mix of these strategies. Many success stories, as will be seen bellow, are centered on large-scale commercial schemes, but the traditional, or at least the in-street perspective of commerce is still taken into account, and the public sphere, with management initiatives and financial incentives, can produce partnerships with an economically capacitated private sector. Historically, local governments have been subsidizing retailers through the building of town squares, the improvement of sidewalks and streets, the provision of parking and the passing of restrictive bills to larger and modern formats. Yet it is being debated whether this is the most appropriate form of planning for downtowns. On one hand there is the amount of liberty that should be given to the private sector. If they can freely command location, according to the RLT principles, then commercial planning becomes inexistent. But the economic incentives the public sphere can provide to induce private sector growth, endorse partnerships and create a stronger sense of place for a distinctive downtown have already produced high opportunity profits and physical, economical, employment and business-oriented regeneration. On the other hand it is still being questioned whether the 'regeneration thesis', through incentive programs and physical design solutions, is enough to compete with the existing complex market forces. In the 1980s Gillette (1985) asked if an urban mall was really compatible with the needs of the surrounding city. Whysall (1995) questioned whether the superstore could have sufficient momentum to spill economic dynamic and movement (clientele) to the traditional shopping street and the above mentioned study by Thomas and Bromley (2002) expressed how the spill-over was from the center stores to the superstore. The maxim '*town center first, come what may*' questioned by Guy (2004) is also questioned by Robertson (1999) and Instone and Roberts (2005). Robertson studied methodologies for downtown revitalization in small-cities in America and discovered, in surveys to the population and decision makers, that commercial strategies (centralized commercial management, indoor shopping centers and pedestrian malls, for example) were poorly rated in terms of those wished for revitalization projects. Other physical strategies, such as historic preservation, main street approaches, pedestrian improvements and waterfront and office development were much more popular. The author goes as far as to state that pedestrian malls are fast becoming dinosaurs in the vocabulary of downtown development. Instone and Roberts (2005) show how retail-led downtown revitalization schemes which introduce large facilities dependent on large catchments and car-borne access can be prejudicial to surrounding traditional local centers and can exacerbate the problems of weak local markets, unable to cope with competition. Actually, Whysall (1995) proposes that regeneration occurs not because of a positive spin-off from the superstore, but as a result of the effort traditional retailers do to compensate for the negative impacts the superstore exerts on their trade. Furthermore Instone and Roberts (2005) also stress that members of disadvantaged communities may be excluded from prestige town center retail schemes by cost and difficulty of access and/or by the actual cost of the goods and services therein, which have been inflated due to high business rates, lease and operation costs and wages. The addition of more modern commercial floorspace in downtowns can be used to counteract this effect, but according to Bonneville and Bourdin (1998), this can do more harm than good. Often the problem is an excess of supply of commercial properties over a declining level of local demand. In an increasingly competitive context, the authors declare the need to prevent an excessive number of stores in any given location, whilst the range and mix of activities should be optimized. Uncontrolled commercial implementation in the city center can also cause a shift in the center of gravity of the CBD with consequences to the functional organics of the city. And, in the extreme, Monbiot (2000) completely opposes shopping centers in the city, because he considers them the antithesis of progressive city development. Urban

regeneration programs, he argues, have been subdued to serve the needs of private companies. Consequently these investments lead to policies of social and commercial exclusion.

3.2.3.3. Planning policy and planning practice

Despite the above mentioned criticism, the regeneration thesis, mostly through commercial urbanism practices, has gained sufficient importance to be considered paramount in European urban strategies. In short, these intend to find public, private or public-private solutions for regulating and balancing commercial dispersion, as well as the appropriate tools, incentive programs and integrated partnerships that can aid the process. The European Congress on Commerce and City (Balsas, 2001) has presented three main strategic directives for the launching, financing and implementation of urban regeneration processes through commercial development: (i) urban regeneration operations anchored in the restructuring of a commercial area or a shopping center; (ii) town center management initiatives; and (iii) national programs to promote partnerships and investment programs.

The first directive stresses that the stimulation of city center trade should be considered as the most important parcel of most regeneration projects. Retail policies should capitalize on the success of local projects, as a way to boost local economies (Lille Métropole, 2000). This idea appeared in the 1990s, and European planners where influenced by the American success stories of the previous decades. First food-related establishments like hypermarkets and supermarkets and then early superstores tried to become the suitable anchors city centers needed. Whysall (1995) suggests that it was proved that smaller shops needed these new establishments to survive, but that these were mainly constructed over pre-existing infrastructures and so only had a limited impact beyond the initial one. Even so, there was a notion that new superstores and services in the city center where already assisting job creation, economic development and community attractiveness (Eliot, 1982 *cit in* Whysall, 1985; Daniels, 1991, *cit in* Lowe, 2004). In the 1990s, the tightening of planning policies oriented commercial planning towards a regeneration-led focus (Guy, 2002). Cities witnessed the implementation of open air shopping centers, the modernization of public markets and the construction of big box developments in close proximity to transport hubs. Apparently learning from the mistakes of the so-called suburban re-urbanization (Lowe, 2004), and attempting to capitalize on downtown's new opportunities, promoters were quick to form partnerships with local authorities. In return for being able to construct and explore store space in places where the planning system did not allow before, promoters used incentives for property development to improve sites and provide infrastructures such as new roads, transport nodes and pedestrian paths. Most literature concerning retail-led urban renewal and its contribution to city center regeneration is British (Whysall, 1995; Lowe, 2004, 2005; Emery, 2006). These studies recognize that without the large-scale in-city shopping centers, responsible for enlarging and modernizing the shopping of the central areas, most regeneration projects would not have taken place at all. Besides extending the shopping circuit, these projects also enhanced the city's cultural quarter (including public animation projects), created environmental improvements (lighting, street furniture, repaving), and erected new landmarks (statues, architecturally relevant buildings) which enriched the city's identity and the navigation intuitiveness of the area. The connection that the projects wished to maintain between large malls and the surrounding elements of urban space could permit, in Gillette's words (1985) the establishment of a particular form of '*urban agora*'. The Bullring in Birmingham, for example, proves this statement. It is the city's largest downtown regeneration project to date, occupying an impressive 105.218 square meters and opening up, in a square, around a pre-existing 18th Century gothic church (Emery, 2006).

The impact on traditional retail that these projects generated was also less than could have been expected. In Southampton (Lowe, 2004, 2005), after the opening of the West Quay shopping center the city center kept the market share of its hinterland rather than losing it to other peripheral locations. In Birmingham (Emery, 2006) there was a 40% increase in city center retail offer after the opening of Bullring, and the city's commercial center became England's most successful retail destination after London. Even Thomas and Bromley (2002) who proved, working in Llanelli, that it was the superstore that benefited from the movement of center shops, admitted that the commercial urbanism program showed sufficient signs of being able to generate a reversal in the city's and in traditional retail's tendencies. Due to the superstores, overall food-retail improved but, however, the competitiveness of non-food products did not[79]. Lowe (2005) proved that the introduction of the shopping center caused, in a first stage, an increase in the level of vacancies and tenant relocation, but the vacancies were subsequently filled with new entrants (Lowe, 2005). In Southampton the existing shopping linkages and commercial pattern trends were reinforced and there was an important increase in pedestrian traffic. Lowe also stresses that the project generated a trigger-effect that attracted other big projects to the market, interested in capitalizing on the success of West Quay. In Birmingham, the impact of Bullring was reflected in job creation (8.000 direct jobs), increased tourism and increased use of public transport. After being a suburban product, the shopping center became essential to produce city center-like dynamics (Chung *et al*, 2001). To many downtown inhabitants, it has assumed the function of the local convenience store (Whysall, 1995). Revitalization processes are now strongly dependent on the scale, quality and location of these facilities and of the associated spin-off shopping linkages they create. Shopping centers, these authors argue, have become part of a consensual vision of what is appropriate for downtowns[80].

The second directive presented in the European Congress concerns town center management initiatives. Urban regeneration strategies have brought to downtowns new actors, new activities and new timetables, which have to be integrated. Most promoters had experienced legal, environmental and competition challenges elsewhere, and had worked relatively in isolation. When they become interested in city center projects, because of the possibilities of sponsorships and financial incentives, and the ability to take advantage of specific ride markets, they face other challenges (of integration or of working around the architectural heritage) to which they are usually not used (Balsas, 2001). In this context, reports like the one by Geste-Idev (2000) stress the influence public spheres can have by developing planning considerations fundamental to the success of developments, namely by making strategic plans, analyzing proposals, helping with site selection, concerting financial arrangements and being responsible for maintenance and management. Concerted action plans can be developed, which permit the enhancement of the attraction of regeneration projects by stimulating anchor projects, improving environmental, cultural and leisure amenities, promoting and marketing the center's image and regulating restrictions over design and leasing arrangements. For example, parking spaces are referred as an element that should be of the responsibility of local authorities. If there is an excess of car circulation in major shopping axes, then this may dissuade pedestrian shopper movement. But if car access is altogether withdrawn, shoppers will prefer more peripheral but more accessible locations. As Roberts *et al* (1999) state, urban spaces have become '*commodified*', easily the street and the shopping center can become like anywhere else. Town center management initiatives have the mission

[79] It can be argued that Llanelli is a small English city, unlike Southampton or Birmingham, and so less capable of generating economic momentum.

[80] In 1984, in the American context, Lemov (*cit in* Gillette, 1985) was already proclaiming that shopping centers had '*rekindled sparks of life in their cities and, in return, became celebrations of the vibrancy and diversity of city life*'.

of avoiding this '*commodification*' at the same time as they integrate the various actors and act as a catalyst for commercial urbanism.

The last and third directive suggested by the European Congress calls for a high degree of political commitment in commercial regeneration strategies. According to Geste-Idev's report (2000) these strategies balance a large number of actors, influence the city's morphology, building and transport planning, have long operational time frames, require heavy public financial burdens and need to be in sync with current planning directives. In this scenario, government intervention should conveniently plan and promote platforms and programs, developing appropriate politics for commerce and helping to implement them. This is mostly a position of management, whilst seeking to promote partnerships and foster investment, mainly with private promoters, individual or not. Economic-empowered private entrepreneurs have both the investment capacity and the know-how, and are willing to follow guidelines and develop derelict areas in turn for exploring licenses. Public-private partnerships (PPPs), according to Balsas (2001) were then in vogue, because the multi-sector, multi-agency, locally based, strategically design better adapts to changing conditions and better faces the problems and challenges of modern-day cities. On the other hand, smaller entrepreneurs can be aided by appropriate funding programs, such as URBCOM, developed in Portugal, which will be discussed in Chapter 4. In conjunction these measures foster downtown regeneration according to three groups that Balsas (2001) discusses: (i) retail development and preservation; (ii) national programs for modernization and revitalization of old commercial centers; and (iii) improvement of adjoining amenities and infrastructures (such as transport management).

Public regulation of commerce started in the medieval ages, when ecclesiastical powers prohibited commerce on Sunday. Later the regulations were mainly addressed to food-retailers, in terms of sanitary and health control (Glennie, 1998). In the 20th Century other restrictions appeared, around storage conditions, quality of goods, integrity of the weights and measures used and trading prices. These public directives where always restrictive for already established retailers and always oriented to the protection of the consumer. It was only when the new commercial formats appeared, and the first effects started to be felt both by downtown and downtown retailers, that new retail policies started to be oriented to the restriction of retail location and size, in an attempt to preserve the presumed commercial and social advantages of pre-existing centers (Thomas, Bromley, 2002). According to Guy (2005) this planning specifically oriented to new commercial developments had the difficult task of balancing the interests of the private sector, the population and of the decaying downtown retailers. Nowadays, theoretically, planning has to guarantee the economic performance of retailers, their health and safety, but also be able to generate employment, domestic wealth, promote international trade relations and, on top of that, be able to catalyze retail development to downtown regeneration. It is more than clear that existing retail policies cannot achieve all of these goals.

In Europe, two of the most developed commercial planning legislations are the English and the Dutch, which will now be briefly discussed. The Portuguese commercial legislation and planning context is discussed in Chapter 4.

In the UK planning regulations are made by locally based public sector agencies under guidelines set out by the central government. Until the mid-1990s, unlike most countries in Europe, commercial policy did not restrict competition, choosing instead to maintain an innovative and competitive commercial sector. This was, however, prejudicial to traditional and other lower-end store formats. Accordingly, in 1996, the Planning Policy Guidance Note 6 (PPGN 6) was developed, mostly concerned with the prohibition of construction of out-of-center commercial facilities (Guy, 2005). This was not, however, a strict decision, because if promoters could prove, by a series of legal proceedings,

that there was no viable location for that same project downtown or that there was a 'need' for that particular store in an out- or edge-of-town location[81], then they could proceed with their investment. According to Guy (2005) this ambiguous argument originated many dubious approvals of projects. After 1999 this policy, known as '*town-center first policy*', became extremely popular, and investments increased. Yet it was still being very much debated. A celebrated report by McKinsey (1998) revealed a productivity gap in UK retailing because this planning restriction prevented economies of scale and allowed the survival of relatively inefficient shops. According to Guy (2005) some areas became dependent of only a small set of large stores, and land prices increased exponentially, because suitable in-town sites for superstores were scarce and therefore much sought after. If on one hand the vitality and viability of town centers was in some way safeguarded, on the other multinational domestic and foreign retailers had difficulty in expanding their UK network of stores, which had consequences in the economic market. Several versions of the PPGN 6 followed, with an increasing urban regeneration-led focus. Guy (2005) still maintained that the guidance of the program was sometimes obscure, out of date, and needed revision, and that it clearly contributed to the decline of off-center development of superstores and retail parks. On the other hand Instone and Roberts (2005) praised the definite version PPGN 6: Planning for Town Centers that was approved in 2005. According to this policy, the applications to extend large shops can be refused, but on the other hand is no longer necessary to prove the 'need' of a new commercial establishment. It also recognizes the economic advantages of large-scale formats and instructs planning authorities that efforts should be made to find suitable sites (in and out of town). In conjunction with this policy shift, local authorities and town center partnerships have developed, according to Instone and Roberts (2005), initiatives such as the appointment of town center managers[82], the emergence of town centers Business Improvement Districts, pedestrianisation and traffic-calming schemes, and increased car parking provision. These policies have been complemented by a degree of positive promotion of the traditional shopping center (Thomas, Bromley, 2002). Despite all this, Guy (2005) still has doubts about how government policies are formulated in the UK and by whom. According to him the negotiations between departments of decision-makers are secret, the influence of interest and pressure groups difficult to determine and communications with government departments are unilateral. He adds that one way to satisfy all interests is to produce ambiguous and vague policies, apparently appealing to both sides, which turn out to be hard to implement in a consistent manner. The constant rewriting and the indecision in UK policy making lead Guy to exclaim that it doesn't matter just *what* the policies are; the knowing of the *how*, the *why* and the *who* should also be essential.

According to Evers (2001) the Netherlands presents an old fashioned commercial structure with a large number of small scale shops per capita concentrated in urban areas. There were hardly any planning restrictions until the 1970s, when new commercial formats started to appear outside the hierarchical system and traditional retailers started to lose their market share (Spierings, 2006). Then the first restrictive guidelines appeared, prohibiting commercial developments in urban peripheries with the exception of small branches or particular specialized stores (selling explosives for construction for example). Like in the UK, a study proving that the location of the new store did not affect the pre-existing hierarchical system had to be presented. These policies became less restrictive over the years, but the so called PDVs (peripheral, large scale locations) were never able to build enough capacity to compete with city centers. Demand continually changed but Dutch supply did (or rather would) not. According to Evers (2001) the Dutch central government mistrusted municipal

[81] The 'need' had also to be proved for in-city projects.

[82] Since 1991, the UK has an Association of Town Centre Management, which enables the sharing of experiences and the formation of managers.

competence, and so the compact city policy was maintained, trying to protect the vitality of the center but originating increases in land value, major car use and major stifling in the dynamism and competitive capacity of the commercial sector, as European Common Market investors had little change to enter the Dutch market. Because dynamism was needed, but there was a wish to maintain the traditional core intact, the GDVs were created, which worked as pressure valves. These were national guidelines which defined 13 specific urban nodes in the country for the creation of large-scale shopping facilities. Shops had a limit of 1.500 square meters, had to be easily accessible by public transportation and be within range of or adjacent to existing commercial locations, and were still subject to a pre-study of viability. The KDVs (small scale retail centers) on the other hand were allowed to expand, because they were not considered to pose a threat. Another McKinsey report (Evers, 2001) accused the planning regulations of creating a scarcity in the land market, increasing prices of commercial sites, hindering peripheral commercial innovation by the lack of regional shopping malls and discount retail parks, and holding back economic performance, productivity, competition and employment in the sector. The Netherlands subsequently suffered increasing international pressure from large commercial chains and internal pressure from groups that wanted the decentralization of authority to municipal and provincial level. While the rest of Europe was restricting and centralizing, the Netherlands deregulated and decentralized (Evers, 2001). Local authorities became responsible for policies at a local level, a provincial supervision monitored regional effects and national authorities generated general policies and guidelines and intervened in national projects. These policies however, did not produce a disproportionate increase of out-of-town developments, and Dutch planning and practice was able to maintain, to a certain extent, the hierarchy of city centers associated to complementary out-of-town shopping centers. Consequently, the trend has once again been to re-regulate. These new regulations are designed to ensure that the finely-meshed structure of centers is not damaged (Spierings, 2006). This structure is controlled at a national level, assuring that new commercial locations are not developed at the expense of pre-existing elements of the commercial structure. Consequently, the Dutch hierarchical commercial structure has been strengthened by planning policies. New locations are only erected if they fulfill a complementary and supporting role to the city center and do not threaten the economic position of the urban core (Spierings, 2006). Commercial planning ideologies, along with public and private partnerships, guarantee both strength and persistence of the city center.

Fernandes *et al* (2000) reviewed commercial policies in other European countries. What can be perceived by these and the examples above is that specific policies for the distribution and optimization of both traditional and modern commerce are rare. Most policies tried to protect traditional retail but at the same time did not present specific measures for its upgrade so that it could meet current standards of supply and demand. Greece and Italy, Fernandes *et al* (2000) say, were the only European countries with specific policies for small traditional retail, and consequently were the only countries which presented an increase in the number of these establishments. And although the authors lament the fact that the number of these establishments is decreasing in the other European countries, it can be discussed if the protection of traditional retail is indeed a good thing, considering the handicap most of it has represented for downtown development. Meanwhile restrictive policies on large scale formats assisted the decline of downtown, and only recently, with the general acceptance of the 'regeneration thesis' are these policies being revoked. The truth is that the term 'policy' is probably being misused. Most European countries do not have a specific policy, but rather a set of measures, or guidelines, that are implemented over the years. Commerce is, as Borchert (1998) suggested, still part of a global planning that only mentions it occasionally. The same author asks whether commercial planning is prepared for 21st Century commerce. It would seem not. There is still

a large dependency on public subsidies (Balsas, 2001), and most measures and even commercial urbanism projects exercise a form of positive discrimination that is still defending traditional retail, a valuable historical asset of cities but whose present importance is yet to be proved. As Fernandes *et al* (2000) suggest, these focused policies are more than often not enough, simply because they are not adjusted to changing commercial needs. If there are no regulations, this enables the strongest to survive and diminishes the range of supply. If the planning, however, is rigid, the less able survive and innovation and modernization are hindered. The answer lies somewhere between the rigid and the permissive state. According to Balsas (2001) decision makers must consider an integrated and pro-active view so they can understand what planning for commerce can do to revitalize city center areas. And in this perspective, the public decision makers play an important role (Fernandes *et al*, 2000; Shan, 2004). A strong public action and financial support is indispensable for the implementation of commercial regeneration strategies in a first stage and for the return of private investment in a later stage. A French report which tried to interpret commerce in 10 European cities (*cit in* Fernandes *et al*, 2000) reveals common tendencies in planning measures: (i) commerce is assumed as an integral part of regeneration schemes; (ii) access is fundamental (transport networks and commerce restructuring should be planned side by side); (iii) commerce's spill-over capacity should be used as an instrument for other endeavors (tourism development, creation of cultural and leisure facilities, promotion of mixed land-use); (iv) commercial areas should be priorities in urbanism and planning and should be well integrated in the urban landscape; (v) local actors should be used in association with large international chains; (vi) local administrations should be the key-coordinators of the projects; (vii) PPPs should be promoted; (viii) organisms of town center management should be created; and (ix) commerce should be used to increase the quality of the urban environment and its capacity for revitalizing derelict areas should be reinforced. Lastly Musso (2010) analyzes public policies that can be adopted in order to support small retail firms in town centers and countryside small towns in Italy. It is proven however, that the Town Center Management directives he proposes are not dissimilar to those of the larger cities discussed by the authors above. Some of his proposed measures concern physical regeneration (streets, sidewalks, car-free public spaces, facade of stores), the control of opening hours, training programs for retailers, and promotion, communication and public animation initiatives.

The theoretical background for the 'regeneration thesis' proves to be firmly established in the literature. A general planning practice however, is still to be widely accepted. For that policy makers need to establish firmer directives, the actors need to find a consensus, and the willingness for a long-time investment in downtowns and commercial regeneration initiatives needs to be generated.

The particular case of Portuguese commercial urbanism projects is discussed in Chapter 4.

3.2.3.4. Assessing impacts

Considering that commerce has an *active* nature, the implementation of a new commercial facility will cause a series of social, economic and morphological consequences to the surrounding urban environment. RLT understood these consequences in an economic sense, meaning that the impact of a new store was considered in terms of the changes it caused to the market's logics, namely shifts in shares and catchment areas. But to understand the influence that commercial establishments can actually have on regeneration schemes then the impact on all fronts, rather than just the economic, must be assessed. Unfortunately, this is much more difficult to achieve and consequently it is rarely seen in the literature. Economic impacts are numeric and direct, and so can easily be interpreted. The

same does not happen for the other types of impact, so because of their subjective nature, a consensus is hard to find.

Of course that, for example, the implementation of a large scale shopping center will cause a much more perceptible impact on the commercial hierarchy than an individual store. But that impact is uncertain. If some accuse shopping centers of being the instrument that hindered the traditional main shopping street, others consider it as the main instrument of the 'regeneration thesis'. But it must be noticed as well that even in countries that restricted the construction of shopping centers or only allowed them as complements of the commercial hierarchy, the same kind of problems affected downtown nonetheless, such as the loss of population and the declining turnovers of traditional stores. Therefore, the problem may not be in the instrument (the shopping center) but in the way the instrument is used (wrong choice of location, commercial mix or planning policies). This may well be the cause for the lack of an established consensus on whether shopping centers are useful or not to the city, whether they segregate or enhance the land-use mix, whether they compete or complement the existing structure or whether they help the decline or the revitalization of central areas. The GECIC report (2005) has tried to categorize the positive and negative impacts of shopping centers (Table 3).

Table 3 – Potential impacts of regional shopping centers (adapted from GECIC, 2005)

Parameters	Positive	Negative
Located in city center	Anchors for city-center revitalization; Modernize commercial activity; Increase city-center usage; Elevate the area status	Compete with street retail; Lower the status of near commercial centers
Located in edge of town	Create new polarities in suburban areas; Increase choice opportunities for suburban populations	Compete directly with the city center; Contribute to the decline of the city center; Concentrate commercial activity in one single area
Relationship with small retail and traditional commercial areas	Contribute to the modernization of the commercial tissue; Increase sales of adjoining streets	Contribute to breaks in sales or closure of smaller units; Support the growth of chain stores and monopoly; Discriminate small retailers; Reduce commerce in secondary streets in the edge of the city center
Shopping center and public space	Create comfortable, safe and climate controlled spaces; Modernize and revivify derelict spaces; Innovative spaces in terms of architecture and design; Promote public space requalification and commercial *affinage*	Create artificial environments, without authenticity; Private, pseudo-public, spaces; Deny or contribute to the decline of the public city
Shopping centers, consumer practices and life-styles	Increase choice opportunities for particular segments (young and adult of medium and medium-high social classes); Potentiate social interaction	Favor car-based consumers; Exclude less favored groups (old, handicapped, lower social classes); Limited offer (stereotyped chain stores); Promote alienation; Break with traditional bonds

It can easily be perceived that most of the negative impacts relate to the fact that shopping centers go against what is regarded as the traditional way of shopping and of designing the public city. If 'traditional' does not mean obsolete, then 'change' does not necessarily entail, as well, a bad thing, both for commerce and the city. The same report never reaches a consensus. If shopping centers affect in a positive away adjoining commercial streets, they can lower the importance of adjacent centers. They can increase the commercial mix of a given area, but if the type of the new offer coincides with that of the existing one, small retailers will not be able to compete. They can increase the number of jobs available, but those jobs may just have been relocated from the pre-existing traditional shops that have closed meanwhile.

Another specific type of commercial establishment whose impacts has been studied in the literature is the 'public market'. Although in larger cities this format is decreasing in importance, it is still one of the assets of medium-sized cities. A report by Econsult Corporation (2007) suggests that public markets may be a unique niche for economic and social benefits, and that their positive impacts can include: (i) improved access to quality food; (ii) marketing opportunities for family farmers; (iii) improved social interaction in urban neighborhoods; (iv) increased social cohesion; (v) employment opportunities to local communities; and (vi) creation of entrepreneurial environments able to increase small business formation and enhance community economic development. To achieve these impacts and gain a relevant position in the commercial hierarchy, the authors suggest that the answer is the economic sustainability of public markets. The report aims, consequently, to design a tool that may help individual public markets to best determine their appropriate multiplier effect, and reduce consumer leakage to other communities. After identifying the market and vendor type, the model calculates potential indirect and induced expenditures of specific public markets generated by direct spending inputs, therefore calculating vendor and market multipliers. This is, of course, a variation of RLT, and although the authors admit that additional local impacts can be produced by, for example, visitors and tourists, these are not implemented in the model. Finally the authors state that the local economic multipliers appear to be generally largest in medium-sized cities, able to support local markets and vendors, but also farmers of surrounding rural areas. This impact on medium-sized cities by the presence of rural producers is proved, in the Brazilian context, by Assis *et al* (2006). City center commerce can have a more than 50% increase in fair days, not only because of the spill-over from visitors of the fair, but also because of the purchases made by the fair merchants themselves.

More specific impacts on the entrance of a new store in the market have been developed in the English context. This is a consequence of the planning legislation, which expresses that new establishments are required to prove their 'need' to city centers before they are approved. With PPG6, this need was expressed through a numerical calculation of commercial expenditure by the amount of floorspace (RHPC, 2008). This was, once again, an economic assessment. Since the PPG6 was replaced by PPS6, the question is now, according to Roger Tym & Partners (2009), '*what is the appropriate level of additional retail and leisure floorspace at any given place without harming the vitality and viability of existing town centers (including centers beyond the region)*?'. English reports have consequently tried to assess the amount and type of floorspace that could act as a counter magnet to out-of-town commercial development (RHPC, 2008) and could promote, at the same time an appropriate distribution of commercial locations in relation to housing and employment areas. But although these reports define that they wish to go beyond the assessment of commercial need and economic impact, most of them have problems in succeeding. They only make brief considerations on the impact on land use (analyzing pre-existences and supposing how they can be influenced) and on jobs and community, without the depth and technical focus of the analysis of the economic impact. Pedestrian flows, for example, can be estimated, but the analysis of other elements such as the perception of safety and

occurrence of crime, and the state of town center environmental quality, physical condition and character only consist in assessing existing situations, before the change occurs.

Documents such as Atisreal (2005), England & Lyle (2007), Donaldsons (2005), Pegassus Planning Group (2008) and Macroplan Australia (2008) (on the Australian scenario), present these impact analyses. The first step consists in determining the scale of the research, and the inherent trade area. If it is sufficiently large it may prove difficult to characterize in detail, and if it is focused, then the scope of impact is diminished. Similar approaches to store data collection as the ones that have been discussed above are then performed. Stores are divided into types and clusters according to the necessities of the study. Consequently the need for a specific type of commerce is measured. This need is established by comparing forecasts of the growth of expenditure available in the catchment area (using population growth and average spending as variables) with forecasts of store turnover and floorspace availability. Planning restrictions are used as guidelines and in some studies the forecast performances of competing centers are also introduced in the model. Next an availability analysis of locations is performed. According to RLT principles, the most suitable and advisable location is found according to the market share, performance estimates and the economic impact on competing centers. These estimates, along with some clarification on community net benefits of the proposed development, are sufficient, according to legislative directives, to prove the impact upon the so called '*vitality and viability*' of the city. Those benefits include estimates on whether the existing commercial tissue can withstand the trade diversion, on the effect on future public or private sector investment, on vacancy levels created in the primary shopping areas, on overall consumer expenditure, on rent-values and on land-use mix and range of services. Furthermore it can be determined if the new commercial space produces diversity, if it increases land-functions and attraction, if it enhances consumer choices in a close-to-home location, and if it is a catalyst for investment, employment and regeneration. Unfortunately these reports express these needs, but do not offer solutions for their measurement.

On the Portuguese context, few impact studies of this nature have been performed. Two, GECIC (2005) and Melo *et al* (2001) have tried to assess the impact of commercial establishments, namely shopping centers, considering also social and urban variables and not merely economic ones.

The ultimate object of GECIC (2005) report is to find what is the best of three proposed solutions for a new shopping center in the city of Leiria. The analysis is made through an 'index of competition' which has a safety clause concerning traditional retail, in order for it to remain unharmed. A set of variables is taken into the model, each with a given weight. The solution which has the highest score is, theoretically, the best. The variables include parking conditions, security conditions, size of the facility, accessibility conditions, final cost of construction, proposed commercial mix, jobs created, entertainment and animation perks proposed, type of target costumer and finally a somewhat ambiguous variable of 'urban integration'.

Melo *et al* (2001) also tried to categorize shopping centers according to a large number of internal and external variables. The internal variables are the number of stores, the total area, the public spaces available, the location, the type of management unit, the type of commercial mix, the design, the planning and the architecture, the nature of the anchor store, the parking facilities, the number of chain/brand stores, the amount and quality of the food stores, the entertainment/animation perks available, the product price range, the themes displayed, the marketing strategy, the jobs provided, the services provided, the profile of the shop-keepers, the opening hours, the security and comfort provided and the resilience it presents. On the other hand, the external variables are the target consumer's average income, shopping habits and mode of transport used to reach the center, the type of promoters/investors, the type of commerce performed in the area, the current commercial

legislation on planning, licensing and opening hours, the accessibilities to the center, the type of industry in the area, the credit and lobbying capacity and the surrounding urbanization rate. Each variable is given a certain weight, although it can be argued that this decision, for most variables, is utterly subjective. The model then performs a multi-criteria approach to compare these elements. The authors suggest that the variables that most explain the system (hence the quality of the shopping center) are the type of management unit, the product price range, the themes displayed and the resilience. The most instable variables, that is the ones whose variance most affects other variables are the location, the nature of the anchor store, the consumer shopping habits, the type of promoters/investors and the type of commercial dispersion/mix. The authors also suggest that the influence of resilience, of the type of promoters/investors, and of the consumer's shopping habits and incomes is increasing.

3.3. MEASURING COMMERCIAL ACTIVITY

Summarizing the understanding of commercial activity presented in Chapters 2 and 3, it is possible to create a framework with the elements of analysis necessary to measure each store (Figure 14). Obviously, any study concerning commercial activity has to start with store cataloguing and pattern measurement, a methodology which has not significantly changed since the earlier works on hierarchical retail geography and location modeling. Stores are defined firstly by their name and by the products sold. The division of stores according to the items they sell presents the first choice the researcher has to do, and defines the categories, and sometimes the clustering groups, he will later possess for analysis. Most studies have catalogued stores according to a wider 'activity' which is divided into several 'sub-activities'. For example, a store selling 'Fashion' items (the activity) can sell products from 'clothes' to 'shoes' to 'fashion accessories' (the sub-activities). Such an approach is done, for example, in an earlier work by Guy (1976) and is also, presently, the choice of the Portuguese legislation on commerce.

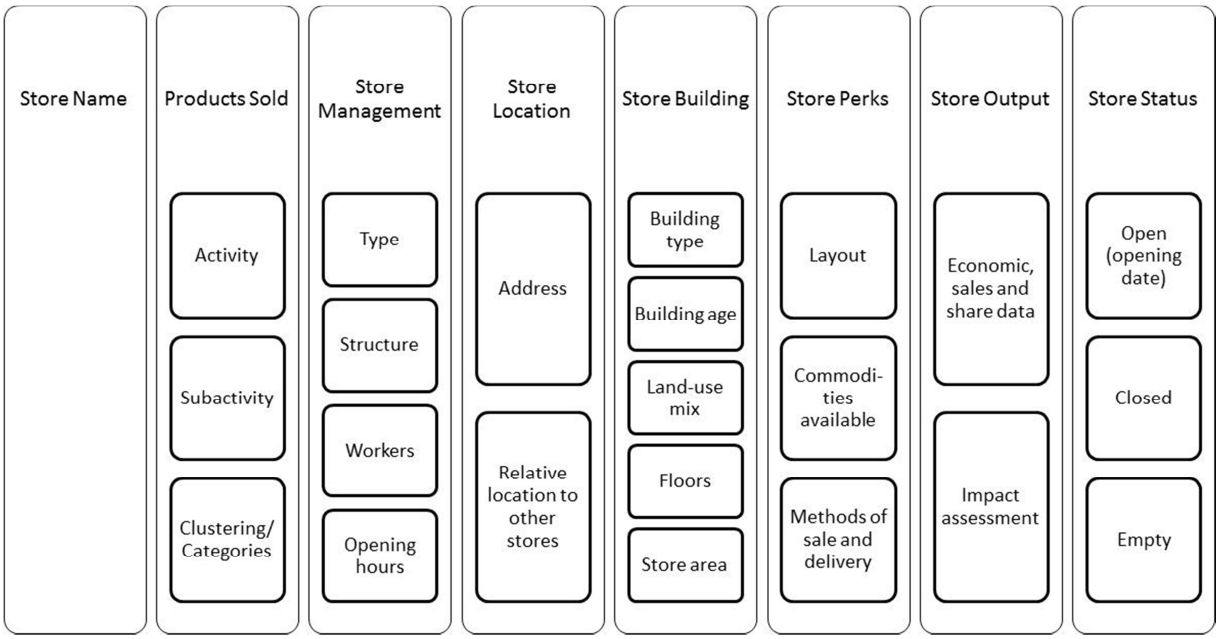


Figure 14 - Required elements to measure a given store, according to commercial literature

Portugal's *Portaria* nº 418/2009 of April the 16th divides, in its Annex V, commercial activities into 8 major categories: (i) Food & Beverages; (ii) Fashion; (iii) Home; (iv) Home appliances and electronics; (v) Leisure and culture; (vi) Hygiene and personal care; (vii) Restaurants & Cafés; and (viii) Services and other activities. The same document allocates more than 100 sub-activities to these 8 activities. But each of these sub-types of commerce, even if belonging to the same 'activity', has different roles in the commercial hierarchical structure, and hence disperses differently in the city and originates different assiduousness by the shoppers, ultimately affecting, in different ways, the economic, social and morphological functioning of space. On the other hand, stores categorized under different 'activities' may behave similarly. Consequently, some studies have grouped the vast amount of sub-activities into specific categories related to the different roles the shops perform. Not only does this division become expedite when considering time-consuming models based on the large variety of shopping formats in the city, it also overcomes a difficulty that may arise in the above division, namely modern stores that have more than one 'activity'. One of these divisions in 'retail categories' is presented by Sarma (2006) who has updated a model by Eaton and Lipsey (1982) (Figure 15). The subdivision is based on product necessity and the need for price comparison. As the author stresses, a consumer is much more susceptible to compare prices when buying a car than when choosing where to have a cup of coffee. M1 types of store represent first necessity goods and should (supposedly) be found within walking distance. Previously, Guy (1976) had also divided the various products into functional classes, namely accessibility, intermediate and comparison.

M1 (Multipurpose 1)
Restaurants
Beauty Shops
Drug Store/Chemists
Barbers
Dry Cleaners
General Stores
Grocer/Baker/Fishmonger/Butcher
Cafés
STD/ISD booths
Photocopier
Cigarettes

M2 (Multipurpose 2)
Banks
Music Stores
Book Stores
Florists
Liquor Stores
Shoe Repair
Gift and Novelty
Candy and Nuts
Hobby, Toys and Games
Miscellaneous Food
Film Developers
Stationery
News Dealers
Cyber Cafés

MC (Multipurpose-Comparison)
Sporting Goods
Jewellery
Travel Agencies
Men's/Women's/Children's Clothing
Shoes
Miscellaneous Apparel
Department Stores
Cameras
Sewing and Tailoring
Variety Stores
Luggage
Accessories
Opticals
Tableware
Mobile Phones

C (Comparison)
Household Appliances
Radio and TV sales and repair
Used Merchandise
Auto and Home Supply
Hardware
Paint and Wallpaper
Furniture
Drapery and Upholstery
Car Dealers
Floor Coverings
Miscellaneous Home Furnishings
Building Materials
Garden Supplies
Electrical Repairs
Jewellery Repairs
Real Estate Agencies
Computer Sales and Service
Electronics Sales and Repair

S (Single Isolated Purchase)
Hotels and Motels
Movie Theatres
Photography Studios
Printers
Billiard and Pool Halls
Drinking Places
Car Rental
Bowling Alley
Car Wash
Carpet and Upholstery Cleaning
Dance Halls
Coin Operated Amusement Devices
Amusement Services
Medical Consultancy
Other Consultancy
Courier Services
Financial Services
General Trading Business
Paging Services
CA/Architect/Civil Conctructor

Figure 15 - Retail categories (source: Sarma, 2006)

In order to produce hierarchical models of commerce the knowledge of store location is, obviously, paramount. But location is not just the address. When considering the characterization of stores the surrounding commercial and morphological environment should also be taken into account. Both the geographical (location, clustering and pattern comparison) and the morphological (street, block and building characterization) perspectives for interpreting and measuring commerce in the city have already been discussed in this Chapter. But these elements can be complemented by others, when collecting store data. A commercial street analysis, for example, reveals that stores are physically related to each other in different ways. Often, especially in main streets and in large residential buildings, stores can be grouped into rows of continuous 'door-to-door' spaces, whilst elsewhere they are 'isolated', that is, they do not share a wall with another commercial establishment. Not only is the relationship to other buildings relevant, but the characterization of the store's own building reveals important differences between stores, even if they are of the same category. Stores depend on the building type and of the land-use mix that building possesses. They can be located, for example, in a shopping center, on the ground floors of a residential building, in a service block or in a purpose built building. The store building will also have certain morphological characteristics (for example stores may or may not be facing the street), a certain height (number of floors) and a certain age and architectonic style that may condition that store's layout and openness to the street. The store may occupy a floor, part of a floor or the whole building so both store area and storage area are also variables that can be collected.

A second stage of analysis concerns the intrinsic characteristics of the store. Stores have a given structure and a given business model. They can be individual, or else part of a chain or a franchise. They can also be factory stores (outlet) or discount stores. Another, more subjective division may be according to 'type', that is, if they are 'modern' or 'traditional' stores. Fernandes *et al* (2000) have made a quite clear distinction of both types of commerce (Table 4). Yet this division can be debated when considering modern day commerce in cities. What is true is that, nowadays, 'street commerce' and 'traditional commerce' do not have the same meaning. Multinational chains can be located in pedestrian main streets and be door-to-door to stores established there for half a century. Many existing commercial establishments have updated their products, their store format, their business models and their interaction with the street, whilst keeping their name and location. New entrepreneurs have also recently been entering the market individually presenting alternative types of stores in downtowns. So it seems debatable, for example, when Fernandes *et al* (2000) associate independent retailers and family owned business solely to traditional commerce.

Other points are also debatable. Many residential buildings of recent construction present commercial arcades in the ground floor, and these are not 'traditional'. Many stores at the edge of the urban perimeter have not been influenced by the momentum of regeneration and have maintained their 'tradition' whilst center stores have modernized. There are specific, modern stores, with single, specialized, functions, whilst many traditional home-related stores where known for '*having-everything*'. Another up-to-date type of division between Portuguese 'traditional' and 'modern' commerce should be established in the literature.

Other characteristics of store management include data concerning the workers as well as the opening hours. These can also be regulated by public authorities. Planning, as seen, can also influence store location, store type and structure, and even store output. The store output, in terms of economic turnovers and impact assessment has already been the object of detailed analysis in this Chapter.

Table 4 - Traditional and modern attributes of retail (adapted from Fernandes *et al*, 2000)

Parameters	Traditional	Modern
Store format	Small specialized or wide-range stores; Markets; Fairs; Large warehouses; Commercial arcades	Large, food-related surfaces (supermarkets, hypermarkets, discount stores); Large specialized surfaces; Shopping centers; Megastores; Convenience stores
Sales type	Counter sale; Relationship between consumer and sales-person; Wandering-sale format	Free service; Automatic sales format; Long-distance sales format; Virtual stores
Dealer type	Small retailer; Independent retailers; Small companies (single establishments)	Great distribution chains; Franchising systems; Societies and branch networks
Management strategies	Family-own business; Passive and reactive techniques; Lack of well-defined growth strategies	Strategic management (capitalist); Reactive and pro-active techniques; Scale economies; Cost reduction; Variety of formats; Variety of offer; Aiming at new markets
Location: places and principles	City center; Main city arteries; Residential neighborhoods; Proximity (neighborhood); Centrality; Convenience (proximity)	Edge; City center; Great urban arteries; Accessibility; Parking; Convenience (opening hours)
Store function	Places for trade; Places for shopping and supply purchase; Single function spaces	'Merchandise spaces'; Places of experience and consumption; 'All-in-one spaces'

The physical and interactive characteristics of the store are, more than store management, a concern of commercial, and especially shopper, literature. Layout and characteristics of product display impact on the shopper's decision and can represent a trademark of the store. These sales methodologies also concern the choices the store performs in terms of methods of sales and delivery. These can include the possibility of home delivery and the possibility to receive payments made by credit-card. But the most popular method in the modern commercial scenario is the store's web-connection. It now stands as an important tool not only for promoting the store and reaching a wider clientele, but also for selling directly the products. Store characterization further depends of the commodities available. These can be as vast as the existence of esplanades or parking spaces, the possibility of acquiring a discount or client card or the existence of a children's playground. Obviously the commodities are also dependent of the store's location and land-use mix. Stores in a shopping center, or even in a commercial street will be able to supply greater commodities to their customers than isolated stores in residential streets.

Lastly, measured stores can have three statuses: open, closed or empty. Closed stores are those which still maintain their layout, the advertisement on the outside and sometimes their products visible, but are closed due to health, financial or restructuring reasons. Empty stores are those in which the store

space is not occupied by any activity, and is sometimes derelict and abandoned. For open stores and closed stores which are being restored or restructured it is important to know their opening dates for the creation of commercial evolution maps. Furthermore if any of these stores performs restructures to the store space, the store building or to the surrounding environment, then those changes will obviously affect the morphological composition of that particular shopping area.

Most legislation which regulates the approval of commercial space construction or restructuring[83] specifies that store keepers need to supply a large part of this information concerning store measurement to the decision-making authorities. Furthermore most reports that analyze the generated impacts have collected this information as well. But although public departments are privileged because they possess the greatest databases of commercial data, they have never treated or catalogued this data conveniently, nor have they properly used it in their planning and decision-making processes. Private companies, although their knowledge is more limited (related to their particular enterprises), also do not use their information beyond the range of research nor share it with the decision-makers. Nowadays, commercial and planning decision-making, but for some commercial urbanism projects, concerns a large number of public and private stakeholders who seldom agree, seldom share information and have different interests. On the other hand, the four major areas of research: geography, economy, morphology and planning have, for the most part, worked separated from each other, because the outputs of their research are different. What most failed to realize is that the inputs are the same, and that the outputs may be crossed and compared. A paradox occurs. Although most of these actors, decision makers and researchers have thoroughly explored the potentials of commercial activity, and have established comprehensive techniques for measuring and interpreting it, there is a common notion in the literature that there is still a lack of existing available data on commercial spaces. This can only be explained by a lack of integration between departments of research, and between public and private actors. More than often researchers need to start at the first step: field research store data collection, that is, they need to start with '*location, location, location*'.

[83] In the Portuguese context this legislation is the DL 21/2009 of January the 19th.

"Portugal is still regarded as a 'nation of small retailers'."

(OdC, 1999a)

4

THE PORTUGUESE COMMERCIAL CONTEXT

4.1. OVERALL SECTOR TRENDS

4.1.1. RECENT EVOLUTION OF THE COMMERCIAL PATTERN

The proliferation of overseas trade originated by the Discovers of the 15th and 16th Century probably elevated Portugal to the status of greatest commercial nation in the world. Yet, over the centuries, with the loss of the colonies and because of the county's size and wealth-generating potential, this notion was lost. Portuguese cities are not very big when compared with other European countries, the natural wealth is mostly related to production, and the country has had a great tradition of an economy based on the primary sector. The fishing, farming and other primary activities, associated with a focused and locally-oriented selling structure through small shops, fairs and markets, helped to form an idea that Portugal was (and in the view of some still is) a '*nation of small retailers*' (OdC, 1999a). One amusing example is the Portuguese seller Sr. Oliveira da Figueira, a recurring character in Hergé's Tintin comic book series who has always a vast range of items for sale and uses a never-ending persuasive sales-talk. His portrayal follows more closely the third-world salesman type than the actual reality of the Portuguese retailer, but reflects a stereotyped view of Portugal and of Portuguese commerce.

It is indeed true, however, that the elements which defined the 'commercial revolution' penetrated Portugal at a later stage. Until 1974 the country lived under an authoritarian regime which undermined the possibility of foreign investment and commercial innovation. According to Cachinho (1994) it is not possible to precise exactly when the commercial revolution started because in the beginning of the second half of the 20th Century Portugal had poor economic power, it occupied a peripheral position in the global market, had limited commercial interactions with other countries and the spending and mobility potential of its population was very limited. Almost until the end of the 1970s, the Portuguese hierarchical commercial structure was still predictable and regular, and was mostly based on traditional formats. Most cities had a main street which accounted for almost all of the shopping spaces, complemented by a secondary structure near main residential areas. Slowly, the new formats entered the market[84], but most where still integrated in the well-defined tertiary structure. If abroad

[84] The first commercial arcade in Portugal was Apollo 70, in Lisbon, which opened in 1971. It had a movie theater, a bowling alley and several snack bars.

(for example in England – Davis *et al*, 2006) new formats such as the first supermarkets and commercial arcades started to move to large car-accessible, out of town locations, looking for clientele, space and a way to relieve center congestion, in Portugal these establishments remained in central areas, occupying the interior of blocks or ground floors and garages of residential buildings, as was discussed in Section 2.2.1.3. In larger cities, namely Lisbon and Oporto, these establishments eventually found their way to peripheral urbanizations, edge-roads and commercial ribbons, relying on passing clientele (GECIC, 2005). In medium-sized cities, according to Melo *et al* (2001) this expansion was none-existent or much more restrained, because of low car-usage, activity and job concentration and the existence of increasing derelict space in city centers, a consequence of rural exodus and poor economic conditions.

In the 1980s the first large scale commercial establishments started to enter the market consistently and the number of super and hypermarkets increased (Figure 16). Yet the spatial organization of commerce in Portuguese cities remained mostly unaltered. The new formats were used to intensify the commercial importance of existing areas, such as neighborhood centers or secondary commercial arteries. The Boavista neighborhood, for example, considered nowadays as one of the 'new' centers of the city of Oporto, gained increasingly commercial and service importance in the 1970s/80s due to the opening of two shopping arcades in service buildings: Brasília and Dallas[85]. Only a few establishments chose to follow the city's expansion and were integrated in new urbanizations, creating new commercial zones. A still smaller number started to be located in main suburban roads. Comparison shopping, for example, requiring more space, economies of scale and competitive choice, exited city centers, choosing (or forming) commercial ribbons.

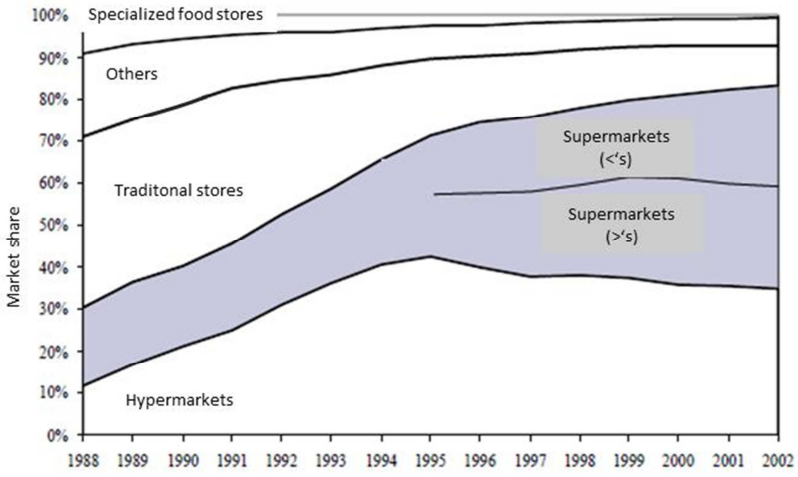


Figure 16 - Market share evolution by type of food-related establishment (adapted from Mendes, 2005)

In the 1990s Portugal witnessed a massive proliferation of large and medium-sized shopping centers, mostly located in accessible out-of-town locations. Due to their increasing size, attraction and capacity to generate large catchment areas, and also due to the size of the country, promoters saw no need to disperse shopping centers. Until the 2000s, mostly all of them were located in the areas of influence of

[85] Brasília, which opened in 1976, is still open today. Even though the movie theater is closed, the commercial activities and functions have changed, and only one third of the available shopping spaces are occupied, it is still a landmark in one of the city's main squares. Dallas, which opened in 1984, had a more troublesome history and unable to cope with the changes of the commercial sector in the 1990s, and presenting legal, structural and security problems, it has been closed since 1999.

Lisbon and Oporto, slowly shifting the commercial center towards the periphery. The city center started to lose importance in the hierarchical structure. As the periphery gained attributes of centrality, commercial activities still lingered in main streets and in the most relevant residential neighborhoods of the center. Yet, according to Dias da Silva (1997) the exclusion process was already in progress, and lower-end commerce was already shifting to less important streets is the network. The author, working in the city of Lisbon, proved that in the 1990s the decline of downtown initially was not characterized by the closure of smaller establishments, but by a decrease in sales, the physical decline of store space and by social consequences such as layoffs and lack of initiative by the promoters. In a survey dated from 1995, Silva (*cit in* Dias da Silva, 1997) was already able to prove that despite hierarchical changing conditions, Lisbon downtown retailers were unwilling to change their location (Table 5). Eventually, those that did not change it either closed their establishments or were forced to change their activity or range of products. Furthermore, contradicting Space Syntax literature, 6,1% of retailers considered that a move to a location with less flow of consumers would be an advantage, because in that way they supposed they would escape the increasing competition of commercially concentrated areas. None of the new established retailers thought likewise.

Table 5 – Considerations of inquired retailers about the location of their establishments (adapted from Silva, 1995; *cit in* Dias da Silva, 1997)

Sub-sample	Doesn't consider another location	Considers move to a better location		Doesn't know	Total number of answers
		With more movement	With less movement		
Lisbon	**74,4**	**14,6**	**6,1**	**4,9**	**82**
Old stores	95,2	0	4,8	0	21
1900s stores	83,3	12,5	4,2	0	24
New with old nucleus	47,1	23,5	17,6	11,8	17
New	65	25	0	10	20

Even so, according to the Portuguese Observatory of Commerce the proliferation of the new commercial formats in Portugal did not significantly change the structure of the commercial pattern. In 1999 (OdC, 1999b), 50% of multi-commercial spaces were located in city centers, 30% were in outer rims or expansion axes and only the remaining 20% were in the periphery. A study made in the following year (OdC, 2000b) shows that most (43%) of the large scale formats are actually local centers in the form of extended commercial galleries or smaller first and second generation shopping centers, imbued in the city's hierarchy. They locate in residential neighborhoods (in the ground floors of multi-family buildings), in suburbs with low commercial indexes or in crossroads of major road lines. 42% are commercial condominiums and only 6% correspond to the large-scale shopping centers of regional importance. These are located near major roads at the edge of great urban centers and present, as mentioned above, vast influence areas. The Portuguese periphery, with the exception of shopping centers and specialized commercial ribbons, is only characterized by an average type of proximity retail, which appears mostly according to necessity and hence originates an irregular

pattern. According to OdC (2000b) large scale multi-commercial establishments still prefer the west coast-line of the country (Lisbon and Oporto influence areas) but have been expanding quite clearly to the interior. On the other hand commercial arcades and commercial condominiums remain essentially in the northern part of the country and in the south (in Algarve), whilst neighborhood arcades and small shopping centers locate mostly in the metropolitan areas of Lisbon, Oporto and Leiria.

As mentioned in Section 2.2.2.2 food-related stores which occupy intermediate positions in the commercial hierarchy, namely neighborhood supermarkets, have increased their points of sale and their market shares in city centers. Figure 16 shows that Portugal follows the trend of other European countries, and that the supermarket's importance in the commercial hierarchy has increased considerably, being able to attract local movement and taking market shares both from traditional stores and larger, multi-product stores like hypermarkets. The Portuguese commercial landscape is nowadays also characterized by a series of 'outsiders' such as Chinese shops, which are only occasionally considered in the literature. OEFP's (2008) report, for example, considers that Chinese shops have very little impact on Portugal's commercial structure, and that when the economic crisis is overcome they will become merely '*picturesque*'.

The saturation of the markets of the two greatest metropolitan areas in the country (Lisbon and Oporto) as well as the pressure from the main (national and international) distributors, mostly concerned with food-related retail, led to the exploration of medium-order urban centers. This has already happened in other countries, such as in France (Cushman & Wakefield, 2009b) where the development focus is shifting increasingly towards smaller schemes in secondary and tertiary cities. In Portugal these have had only a recent suburban expansion and an even more recent penetration of modern commercial formats and international and multi-national chain stores. Consequently, the center hierarchical structure is mostly unharmed, and can be upgraded more easily. The GECIC (2005) report has analyzed the commercial pattern of Portuguese medium-sized cities and has translated it into six layers:

- a main center with recent expansion axes, where the main establishments of non-daily commerce are located, as well as the main service companies and public administration services;
- secondary centers of recent formation;
- neighborhood nucleus, which have a great variety of commercial establishments, usually outdated and supplying first necessity goods;
- a great amount of food-related stores in residential areas;
- various small scale shopping centers and commercial arcades located both in the city center and in the immediate periphery, contributing for the expansion of the city center;
- others, which include markets, fairs, hard-discount stores, specialized services, outlets and, occasionally, large scale shopping centers.

Most Portuguese medium-sized cities now possess, or have under plan or construction, at least one large scale shopping center. According to GECIC (2005) this recent trend has had a crucial role in the modernization of city center commerce, in decentralizing commercial activity, and has affected the established pattern of medium-sized cities. The retailers present at the VI Congress of Commerce and City, held in Oporto in 2006 were not pleased with the proliferation of this type of establishments in medium-sized cities. According to them, the approval of these developments would surely destroy the

traditional network and would hinder the attractiveness of medium-sized city centers. There are, however, no proofs that this has happened to Portuguese medium-sized cities, but most of them have only received the large-scale shopping centers in the last couple of years.

4.1.2. THE SECTOR IN NUMBERS

In Portugal there are not many studies which are concerned with the interpretation of the commercial sector. The 'Observatory of Commerce', meant as an organism able to supervise commercial activity, was extinct in 2002, by Decree-Law nº 217/2002 of October the 22nd. From 1999 to 2002 this Observatory was able to deliver a series of up-to-date statistical and analytical studies on commerce which revealed the sector's trends at the turn of the century. The supervision of commercial activity was transferred to the General Board of Economic Activities (DGAE)[86], but the same type of comprehensive research was discontinued, replaced by a single yearly data report, many times outdated (Fernandes, Martins, 2003). More recent data concerning commercial activity can practically only be obtained consulting the National Statistics Institute (INE[87]), although this data is mostly not interpreted and, as Fernandes and Martins (2003) state, it seldom focuses on the local scale. The Census can also provide information on land-use, but the 10 year hiatus between measurements seems excessive for a volatile activity such as commerce. Sporadically, private sector reports performed by, for example, Cushman & Wakefield or Nielson, appear, but these are mostly concerned with the economic performance of the sector in the market and are mostly focused on specific retail types.

Following the pattern of most European counties, the current Portuguese commercial scenario is characterized by a great diversity of formats, activity branches and types. But unlike most European countries the small, family enterprises with a limited social capital constitute the greatest type of establishments, and there is a strong disequilibrium in terms of spatial distribution. A report by OdC (1999a), which divides European countries in four groups according to their overall commercial sectors, situates Portugal in the second, along with Spain and France. These countries are characterized by a high number of hypermarkets, when compared with the average of other European countries, by a high number of overall stores per inhabitant, and the main products sold belong to the groups 'food, drink and tobacco'[88] and 'textile, clothes and shoe-wear'[89].

According to INE (2004) of all the companies in Portugal, 37.5% are commercial companies, and three quarters of these are situated along the country's shore line. As of 2001 (OdC, 2001a) half of the country's commercial offer was located around the metropolitan areas of Lisbon and Oporto, with Oporto and the surrounding region (North) having the greatest share. More than half the commercial offer is located in, or at the edge of, major urban centers (Figure 17).

Consequently commerce is an essential activity to Portuguese economy, strongly contributing to the Gross Domestic Product (GDP) and the Gross Added Value (GAV), although the contribution to these indicators is decreasing. The contribution of commercial activity to the GDP, for example, was 15% in 1992 (Silva, 2000), but only 11,7% in 2000 and 11,5% in 2006 (DGE, 2006). The contribution to the GAV was 20,3% in 2009 (INE, 2011).

[86] http://www.dgae.min-economia.pt/
[87] www.ine.pt
[88] According to INE these items corresponded to a 29.6% and 27.2% of the sales in, respectively, retail and wholesale establishments (INE, 2011) and to 69,4% of the sales in larger Portuguese commercial units (INE, 2009)
[89] According to INE (2009) these items correspond to 25.7% of the sales in larger Portuguese commercial units.

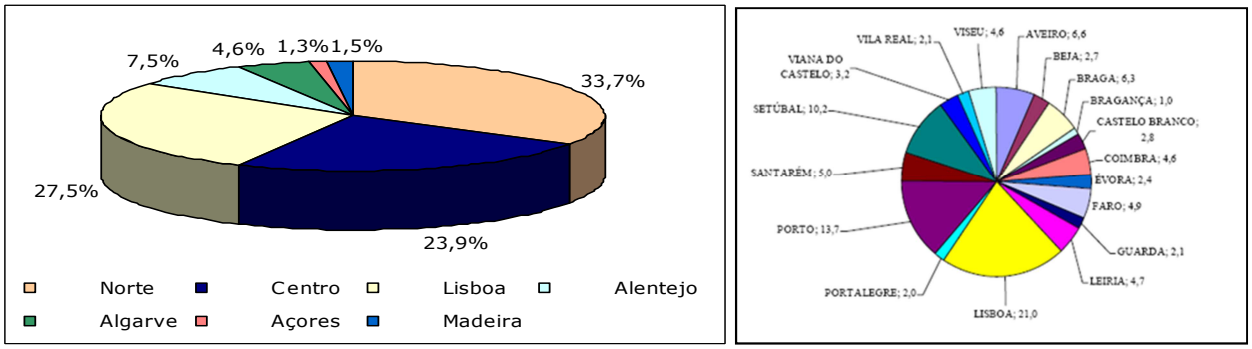


Figure 17 - Distribution of commercial companies by regions (right; source: INE, 2004) and by districts (left; source, DGE, 2006)

Commerce accounted, in 2006, for 15,7% of existing jobs (DGE, 2006) and in 2009 for 21,6% of all jobs in the business sector (INE, 2009). Work in commercial activity includes work in various forms of commerce (retail, wholesale, international trade) and in various capacities (sales, management, logistics, transportation). As of 1997, of the more than 600 thousand people working in the commercial sector, 64,1% worked directly in retail (Silva, 2000). According to OdC (2002b) this number decreased to 60% in 2002, although the number of workers in the commercial sector had become more than 700 thousand. By 2009 (INE, 2011) the number of workers was 802.114. Because most companies in Portugal are small or medium-sized, they mostly possess a small number of workers. If in 1997 there was an average of 4 workers per commercial company, in 2004 the number was 3,4 (INE, 2004) and in 2009 it was, considering only retail companies, 2,9 (INE, 2011). 95% of all commercial companies (97,5% considering only small companies) have less than 10 workers. Because the total number of workers in commercial activity is increasing, it can be deduced that there are more commercial companies, or at least more commercial establishments, even if with a fewer number of workers each.

Unfortunately, it is not easy to discover the evolution of the number of commercial spaces (stores) in Portugal, especially in terms of traditional retail formats. The studies of INE and DGAE mostly speak of commercial companies and not of establishments, and private studies mostly focus on specific types of retail, such as food-related establishments (Figure 16) or large-scale formats. According to INE (2011) in 2009 there were in Portugal 250.552 commercial companies, a 5.9% decrease from the previous year, but this fails to give an insight on the commercial offer physically available to the consumer. Nielsen, a private company, has made a survey for the first convention of independent traditional commerce[90], and, although unable to provide the overall number, estimated that 13 thousand shops of these types of establishment had already closed due to the changing conditions of the commercial market. The food-related sector has been one of the most affected, due to the increasing popularity of super and hypermarkets. Prior to 1987, the food retail sector consisted of 45.000 small family-oriented shops and within 5 years most of these abruptly went out of business. According to Eustace (1991, *cit in* Tokatli and Boyaci, 1998), by 1991 three major groups dominated the market with a 57% share. Today Portugal seems to have kept this trend, and not only presents an above average presence of stores per inhabitant, it also has an above average presence of large scale

[90] Held in 2005 and sponsored by MAKRO.

formats and shopping centers. According to PriceWaterhouseCoopers (2005) the European average concerning large scale food-establishments is 15 hypermarkets and 150 supermarkets for every 1 million inhabitants. In Portugal, INE (2009) stated that in 2007 there were 2.309 units of '*relevant dimension*'[91] (UCDR), a number which increased to 3.031 in 2009 (INE, 2011). Considering a population of 10 million and that food establishments are over 60% of the country's stores, it can be supposed that Portugal's average concerning food-establishments is also superior. These UCDRs have also represented a sign of retail modernization. 60.8% of these have opened after 2000, and only 3.2% have opened before 1990. Furthermore, in the 1990s, the number and area of multi-commercial facilities has doubled[92]. If before these were mainly neighborhood commercial arcades or small scale shopping centers with a limited dynamic[93], the introduction of the 'large scale shopping center' revolutionized the Portuguese landscape. This became the most popular multi-commercial format (Figure 18).

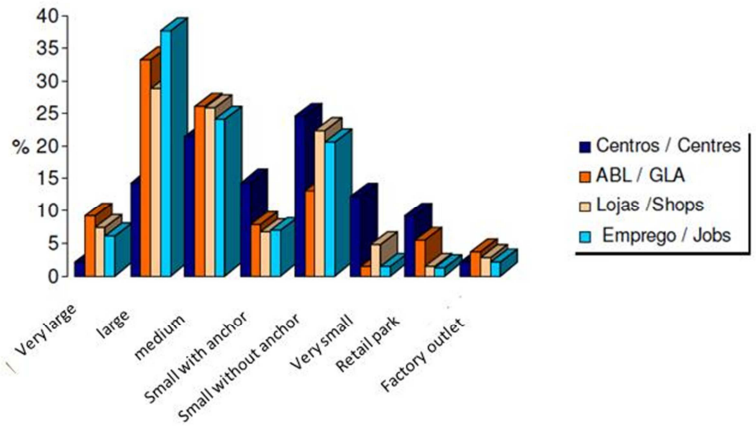


Figure 18 - Characteristics of the different types of multi-commercial facilities belonging to the Portuguese Shopping Center Association (APCC) (source: APPCC Member Survey, 2008, *cit in* Pereira, Teixeira, 2008)

In the 1990s, 26 new shopping centers, in average, opened every year, each with an average of 38 stores and 3.055 square meters of built-up area. In 2000, according to OdC (2001g), 453 were operating in the country. Of these, almost one fifth were large-scale. From 2007 to 2008, there was a growth of 10% in terms of number of shopping centers, shops and employment (Pereira, Teixeira, 2008). From 2008 to 2009, the growth was 6,1%[94]. Presently, there are about 105 large-scale shopping centers in Portugal, with a total area of 3.4 million square meters[95], and able to produce 70 thousand direct jobs and more than 200 thousand indirect ones. Furthermore they are able to receive simultaneously 10.2 million people. Portugal has 10.5 million inhabitants, which means that, in the extreme, practically the entire population can visit the shopping center simultaneously, something that

[91] A store is considered of 'relevant dimension' if it complies with the specificities of point 1, article 4, of the Decree-Law DL 218/97 of August the 20th. For example, food-related establishments are of 'relevant dimension' if they have more than 2.000 square meters or if they belong to a company that has, nation-wide, more than 15.000 square meters of store space.
[92] Because shop size has also increased, there has been a reduction in the number of shops per shopping center.
[93] According to OdC (2000b), as of 1999 only 20% of promoters of multi-commercial facilities admitted to have planned the commercial mix of their centers.
[94] Newspaper 'Diário de Notícias', September the 9th, 2009
[95] Newspaper 'Expresso', July the 4th 2009

is virtually impossible in any other country. In an interview given in 2009[96], António Sampaio de Matos, president of the Portuguese Association of Shopping Centers, believed that there was still more room for growth in the sector, mostly due to the unexplored markets of medium-sized cities. Actually, more than 15 openings of large scale shopping centers occurred in 2010 and 2011, but less than half were in the greater metropolitan areas of Lisbon and Oporto[97]. Consequently the most important medium-sized cities have had grand-scale openings in recent years. 'Espaço Guimarães' opened in 2009, 'Leiriashopping' opened in 2010, 'Forum Sintra' opened in 2011 and 'Évorashopping' is scheduled for 2013, to name just a few examples. Important Portuguese commercial promoters still defend that there is room for growth and that for every 190 thousand inhabitants there is economic viability for the construction of a large-scale surface. But, considering that Portugal has 10 million inhabitants, this would amount to 55 large-scale shopping centers. Portugal has double that number. This means that there is an excess in shopping center offer in the larger cities[98]. Furthermore, medium-sized cities have, in average, 40 thousand inhabitants, so there is a disequilibrium in the large-scale commercial offer in Portugal. That may be the reason why the number of openings has been steadily declining in the last couple of years. Medium-sized cities and their areas of influence hardly would handle more than one large-scale shopping center, and so the market is once again becoming saturated. The impending economic crisis may also be a justification. For example, only 6 of the 35 commercial spaces with license approved in 2008 began construction in that same year. But even with the economic crisis, according to the above mentioned newspaper articles, the shopping centers only had a break in sales of 10%. A Portuguese goes to the shopping center, in average, once a week, and in 2007, 500 million shoppers visited shopping centers and spent 10 billion euros[99]. Before the slight break in sales due to the decreasing power of purchase, shopping centers had been presenting steady rises of global sales. According to INE (2009) this was due to the increase in sales of non-food products.

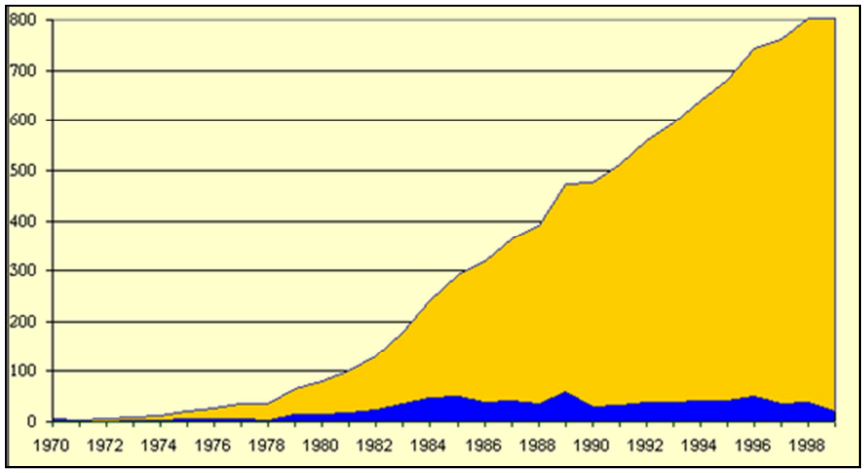


Figure 19 - Number of inaugurations per year (blue) and accumulated frequencies (yellow) of multi-commercial establishments in Portugal, from 1970 to 1999 (source: OdC, 1999b)

[96] To the newspaper 'Expresso' on the 4th of July, 2009.
[97] Newspaper 'Diário de Notícias', September the 9th, 2009.
[98] Even so, when Dolce Vita Tejo, in the outskirts of Lisbon, opened in 2009, it registered 150 thousand visitors on its first day, despite the noticeable problems of security due to its enormous size and location near a troublesome area.
[99] A billion is considered as a thousand millions.

All these factors affect the performance of traditional retail. The excess of offer of multi-commercial formats in the metropolitan areas of Lisbon and Oporto produces an unwelcome competition that most retailers are unable to cope with. In medium-sized cities, their established roles in the hierarchy are questioned with the successive openings of large-scale facilities. Furthermore, with the economic crisis, energy and raw material's costs increase, there are more restrictions to credit for the development of projects, there is a greater concentration of investments, and there is a reduction of the return of investment, a consequence of the decrease in consumption and the lowering of prices due to increasing competition. According to Cushman & Wakefield (2009b) the solution is a '*flight to quality*', associated with commercial urbanism projects.

Today it is hard to look at the Portuguese commercial landscape and see a '*nation of small retailers*'. Portugal is at the forefront of shopping center investment in Europe and presents an attractive market for innovative promoters. According to data from the European Shopping Centre Development (Cushman & Wakefield, 2009b), in the first semester of 2009, for example, only four European countries (Russia, Italy, Poland and Turkey) had a greater increase of shopping center area than Portugal[100]. In Eastern Europe, the surplus of supply has caused an impact on shopping center occupancy. In Portugal this has not happened. Large scale shopping centers still retain close to 100% occupancy, and the consequences of this should theoretically fall on street retail. But large scale shopping centers constitute less than 10% of all UCDRs, and UCDRs only constitute a small slice of all existing commercial spaces. If there are over 3 thousand UCDRs, there are more than 153 thousand companies working in 'retail'. 13 thousand of these companies may have closed due to the economic recession and the competition from the multi-commercial formats, but that corresponds to less than 10%. Despite 'traditional' retailer's claims and despite the obvious success of the large scale formats in Portugal, the vast majority of the commercial offer available in Portuguese cities, medium-sized or not, is still 'in-street' commerce, and follows an obviously different, but still clearly defined hierarchy, such as Figure 10 in Section 3.1.3.2., concerning Leiria, showed. The economic success of these establishments can be debated, but their supremacy in terms of number and area over large-scale modern formats cannot.

The Portuguese market has also been influenced, in the last 10 years and after a slow start, by the appearance of e-commerce (Box 4). Portugal has now almost 4.5 million internet users (45% of the population) and although this is a poor rate compared with many European countries, 8 out of 10 users admit that they have purchased online at least once. The applications of web-commerce have also been felt on C2A transactions and in the business sector (B2B). Although the internet penetration in the country was slow, the mobile broadband penetration has had an immediate acceptance, and it is a common fact that there are more mobile phones than people in Portugal. With the advances in mobile technology allowing for internet access and purchase, the impact of e-commerce should be great. There is, however, almost no literature on this subject. The impact of e-commerce on the Portuguese commercial hierarchical structure has also not been approached, but because only 20% of people who browse websites usually shop online, it has to be supposed that it has not affected considerably the presence of the physical store.

[100] Cushman & Wakefield define a shopping center as a centrally managed, purpose built facility with a Gross Lettable Area of over 5.000 square meters, and comprising 10 or more retail units. Factory outlets and Retail Parks are excluded. The increase of shopping center area in Portugal in the first semester of 2009 was 167 thousand square meters, although 122 thousand corresponded to a single shopping center: Dolce Vita Tejo.

Box 4 – Electronic commerce in Portugal

The Portuguese interest in e-commerce only appeared at the end of the 1990s. In 1996 the Portuguese government defined the Information Society sector as a development priority. In 1997, the Portuguese Association for the Development of Electronic Commerce (APEDI) produced a 'white book', following European Union norms. The prognosis and guidelines for the sector were very optimistic and followed the idea that e-commerce would practically replace physical formats. Consequently this 'white book' is mostly outdated. A 'green book' was subsequently written, and the National Initiative for Electronic Commerce was created[101], defining the framework for the expansion of e-commerce. The 'Internet Initiative'[102] had the aim, among other resolutions, of considerably increasing the volume of electronic commerce in Portuguese business transactions in the following three years. Initiatives like the 'teleport electronic commerce' of the Regional Plan for Employment and Professional Formation in 1999/2000 and the 'local internet initiative' part of Interreg IIB had the same goals. At the turn of the century APEDI was replaced by the Association of Electronic Commerce in Portugal (ACEP) whose goal was to '*study, implement, debate, potentiate, promote, generalize and dignify*' e-commerce. Theirs are the Portuguese e-commerce Congresses, which occurred in 2001 and 2004. Working with UMIC (a public organism concerned with the information society, created in 2005[103]) they have developed initiatives such as the 'week of electronic commerce'. Since November 2008, ACEP has become ACEPI[104], when the field of **I**nteractive publicity was added to the competences of the association. Another entity, ANACOM (the national authority for communications[105]) has been given, since 2003, the role of supervising electronic commerce in Portugal. An inner unit, UMD-CE was created. Today, the major incentive initiatives are the responsibility of the Ministries of the Economy and of Science and Technology. National funding through QREN, and European funding, through QCA III, have also given a great importance to the proliferation of e-commerce, through the Economy (POE), Information Society (POSI) and Knowledge Society (POS_Conhecimento) Operational Programs. POS_Conhecimento allowed UMIC to develop initiatives such as '*i2010*' and '*LigarPortugal – ConnectPortugal*', and UMIC and ACEPI to jointly publish a yearly practical guide for '*buying on the internet*' (ACEP, 2008). At the turn of the 21st Century most Portuguese e-commerce was B2B. In 2000, only 15% of companies used the e-mail to contact with clients and suppliers (IEFP, 2001) and in 2004 only 6% performed electronic sales (ANACOM, 2004). At the same time, only 14.4% of homes had internet access, 66% of the population used internet less than 6 hours a week and only 13.6% of users bought on-line (IEFP, 2001). This study estimated that in 2002 there would be an increase of 300% in internet usage. This may not have happened but the percentage of users who shopped on-line increased from 16.4% in 2003 to 39.2% in 2004, that is, more than doubled[106]. According to ANACOM (2004) there were more buyers (38%) between the ages of 25-34, but more users (40,4%) in the previous age category (from 15-24). By 2007, according to Eurostat[107] 6% of the entire population from the ages 16 to 74 had purchased through electronic commerce, but according to ACEP/IPC/Netsonda[108] that number was 10%. The sector has grown steadily, but much more on B2B and C2A, than in B2C types (Monteiro, 2009). According to CEC (2009) Portugal presents a very strong position in terms of eBusiness, eGovernment[109], and even eCommerce between companies[110], but has very poor rating in eSkills and household connectivity. As of 2009 Portugal had one of the lowest rates of regular and frequent internet users (behind countries such as Romania) and the ICT sector did not play a major role in Portuguese economy. According to ACEP (2008) in 2008 there were about 4 to 4.5 million internet users in the country, which means that there were 8 times more users than there were 10 years before. This coincides with Monteiro's (2009) data, which refers 41.6% of internet users in the country and a 78% growth between 2000 and 2009. According to this author, Portuguese is the sixth language on the internet (although owing largely to Brazilian Portuguese), 8 out of 10 internet users

[101] By the Resolution of the Council of Ministers nº 94/99 of August the 25th.
[102] By the Resolution of the Council of Ministers nº 110/2000 of August the 22nd.
[103] UMIC was created according to Decree-Law DL 16/2005, of January the 18th, and is now regulated according to Decree-Law DL 153/2007, of April the 27th. The goals of UMIC are to coordinate policies concerning the information society and to promote and support knowledge-gaining actions in the sector.
[104] http://www.comercioelectronico.pt/
[105] http://www.anacom.pt/
[106] Data taken from the 6th Anual Study UNICRE/Vector 21, '*Os Portugueses e as Compras na Internet*' (The Portuguese and Online Shopping), 2004-2005.
[107] http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/
[108] Data taken from a 2006-9-11 article available at http://www.umic.pt/
[109] 100% of government services for companies can be performed online and 83% of government services for the public can be performed online. (CEC, 2009)
[110] According to data from http://www.umic.pt/, in Portugal 19% of the companies sell online (EU average 16%), and 20% buy (EU average 28%). 24% of companies use the internet to deliver and receive packages (considering only small companies, this number rises to 49%).

have purchased online at least once and 7 out of 10 have searched products online before going to the store. Yet according to ACEP and Netsonda (2007) only 0.9% of surveyed shoppers admitted always to shop online after product-search and only 19% say that they often do. Only 2.6% admit never to visit internet sites, so over 75% of surveyed shoppers see the products they are looking for online before going to the store. Online shoppers purchase mostly trips and lodgings (39.4%), books, journals and other learning and reading materials (33.7%), and clothes and sporting equipment (25.5%). According to Monteiro's study, which did not include search sites such as Google, the most visited sites in Portugal relate to buying and selling (miau.pt and leiloes.net in first and third place), to purchasing entertainment (fnac.pt and worten.pt, in second and fourth place) and items for the home (ikea.pt in fifth place). But at the same time these sites do not register the greatest amount of internet sales, because they are used mostly for product search. Products searched and bought online have the tendency to be more expensive specialized items. Recent surveys in the first trimester of 2009 (ACEP, Netsonda, 2009), show increases in electronic sales, in the number of clients that shop online and in the number of companies that make investments on e-commerce.

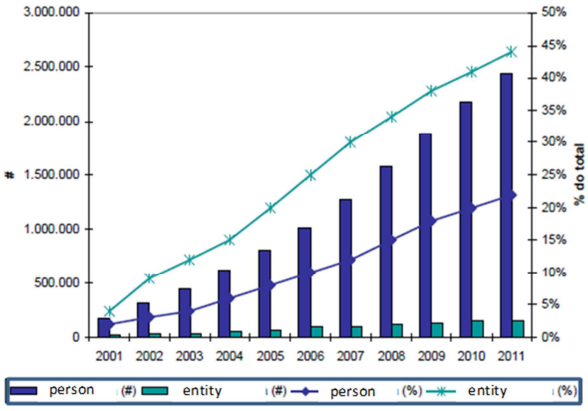


Figure 20 - On-line shoppers in Portugal (source: IDC/ACEP/NETSONDA, 2007; cit in Monteiro, 2009)

4.2. PLANNING FOR COMMERCE

4.2.1. COMMERCIAL LEGISLATION

The influence of the Portuguese administrative powers in commercial planning has always been scarce. Like most European countries, and as described in Section 3.2.3.3, in the Medieval Ages shops were not allowed to open on Sundays, and in the following centuries health, sanitary and quality restrictions were imposed to the products and to the selling places. Many non-fix retail establishments were object of a tight control and were even persecuted. Urban development pressures also led fairgrounds, road-shows and travelling salesman to out-of-town locations. The first large scale planning in Portugal occurred in Lisbon, after the 1755 earthquake. Street and even land-uses were subject to careful organization, and some principles of commercial urbanism were applied (Balsas, 2000). In the first decades of the 20th Century, the first specific commercial policies introduced rigid time-tables for commercial activity, forced shops to close on Sunday afternoon, and decreed that prices should be previously fixed and be legible, inside or outside the store, in order to eliminate the traditional hackling.

Few restrictions were added to these until the 1980s. By this time most European countries started to implement restrictive measures, especially concerning the limitation and location of large-scale formats. But these formats only later appeared in Portugal and when they did they stayed mostly in or around major city centers. Consequently little or no restrictions were devised. According to Fernandes

et al (2000) the restrictions applied in Portugal were practically limited to a bill which prohibited the approval of large-scale commercial facilities over 2.000 square meters. The authors stress that the only consequence of this procedure was that many shopping centers and large-scale stores were built with 1.999 square meters. Others stores simply chose to be divided in two distinct parts[111]. In the 1990s Portuguese authors were claiming that planning was treating commerce as a '*second rate activity*' (Fernandes *et al*, 2000) and that urban planners had a little understanding of commerce (Nuno Portas *in* CCRC, 1995). Commercial planning, according to Salgueiro (1996) was limited to the licensing of large stores and to the control of opening hours. It was a reactive planning, responding to existing situations and never presenting preventive approaches or mechanisms for correctly implementing and managing commerce. The focus on large developments also left uncontrolled and unregulated the small commercial companies that represented (and still represent) the majority of commercial spaces in the country. The lack of specific planning policies on commerce started to be more felt with the proliferation, on the 1990s, of multi-commercial formats.

In the early 1990s the central government encouraged Portuguese cities to prepare and adopt a Municipal Plan (the PDM). This document, which municipalities have used and updated since then, was crucial to the development of regional and local planning. In medium-sized cities, where the fixation of population and activity was a major issue, the PDM were crucial to stimulate their social, cultural and economic potential, appealing to a horizontal, rather than a vertical, organization of the territory. Unfortunately planning for the commercial sector was, and still is, mostly forgotten in the PDM. Commercial activity is referred only in broad strokes. The PDM divides the areas inside the urban perimeter according to their use (agricultural area, industrial area, urban area, area able to accommodate new construction, etc). Only in some cases is the type of land-use conditioned in urban areas or in areas able to accommodate new construction. In other cases, there can be particular impositions, such as forcing the existence of some amount of commercial area in the ground floor of buildings of a certain height, inside a certain radius from a particular residential zone, or according to a given number of inhabitants. The PDM then stipulate restrictions to the store (total and storage area) and to the surrounding urban space, namely in terms of the number of parking spaces or green zones that should be made available with the construction of a given commercial space, according to size. Apart from these broad restrictions, the specific location and activity dispersion decision for commercial spaces is mostly left to the promoters. This is the reason why Fernandes (2007) states that '*planning documents devote little attention to economic activities*'.

If location and type are mostly left to market logics, the licensing of commercial establishments has had specific legislation. This licensing is under city jurisdiction, and depends on the decree law applicable to all urbanization and edification (DL nº 555/99 of December the 16th, republished as the Law nº 60/2007 of September the 4th), on the conditions of local planning (PDM or PP[112]) and, if the commercial establishment is considered as a UCDR, on special government approval. Besides these general specifications, there are two special regimes for licensing particular commercial establishments. The first is DL nº 259/2007 and it concerns establishments that may present health and public safety risks. All food-related establishments are included, but there are also others that may present a liability. The licensing of these establishments is subject to health inspections and to

[111] Even today, for example, Worten presents two parts, one concerning entertainment and technology, and the other home appliances, in order to decrease the area of the overall store.
[112] A PP (*Plano de Pormenor*) is a Detailed Plan for a specific city area.

declarations, by the promoters, assuming responsibility and guaranteeing that all legal requirements were taken into account. The second is the DL nº 21/2009 of January the 19th (which reviewed the former DL nº 12/2004 of March the 30th). This document stipulates the legal regime for the installation and modification of commercial establishments and commercial conglomerates. According to the document, the main goal is to '*assure the spatial insertion* [of commercial establishments], *according to a set of parameters which promote an adequate territorial planning, take into account environmental preservation, promote existing urban centers and contribute to the multiplicity of commercial offer and the diversity of supply*'. Commercial spaces wishing to receive a license for opening or restructuring are subject to an evaluation which depends on the activity, on the jobs offered, on whether it's a new or existing group, on whether it's a new or existing building and on its energy class and materials used, on the store perks offered and on the location. These criteria are defined by Portaria 418/2009, and the decision and evaluation process is done by COMAC (Commission for Commercial Evaluation), for every NUT III region on a monthly basis. The regulation of the entire process is done by the General Board for Economic Activities (DGAE). Unfortunately, this document only regulates establishments with an area over 2.000 square meters or those which belong to a company which has 30.000 square meters of total commercial area in the country, that is, it ends up being a restriction for large scale establishments. Once again, this regulation is only reactive; it regulates the approval of proposed establishments on locations proposed by the promoters. Smaller stores and smaller companies are out of the range of this decree, which means that their 'approval' results not from an evaluation or decision process but from the fact that promoters simply comply with the land-use specifications of the PDM and communicate their intention to the local authorities.

Other decree laws regulate price and competition, working conditions, noise specifications, hygienic control, security measures, construction quality and the resistance to fire and other risks. Opening hours are still regulated by 1996 legislation, namely the DL nº 48/96 of March the 15th, with specific alterations mentioned in DL 126/96 of August the 10th. Opening hours for UCDRs are regulated by Portaria 153/96 of May the 15th. UCDRs themselves are regulated by DL 218/97 of August the 20th and DL 370/99 of September the 18th. Other specific types of commerce are also regulated by particular decree laws. Commerce done in a non-sedentary fashion, mostly through fairs, for example, is regulated by DL nº 42/2008 of March the 10th. Electronic commerce, on the other hand, was firstly regulated by a series of dispatches from the Council of Ministers, namely through the National Initiative of Electronic Commerce (Resolution of the Council of Ministers nº 115/98 of September the 1st), the associated guiding document (Resolution of the Council of Ministers nº 94/99 of August 25th) and the Action Plan for the Information Society (Resolution of the Council of Ministers nº 107/2003, of August the 12th), Currently e-commerce is regulated by the DL 7/2004 of January 7th (reviewed by the DL nº 62/2009 of March the 10th), a decree which was based on the Directive 2000/31/CE of the European Parliament and the guidelines for the regulation of the information society in Europe's internal markets established by the European Council on July of that same year. Other decrees have been published concerning electronic commerce such as the DL nº 57/2008 of March the 26th, which regulates disloyal commercial practices, the DL nº 95/2006 of May 29th, which regulates contracts not made face-to-face (made through the web), and the Directive 2002/58/CE which safeguards the privacy in electronic communications.

Other laws unrelated specifically to commerce also affect the performance of the sector. Rent laws, as discussed in Section 2.2.2.2 are outdated and protect traditional and pre-established retailers, making it

extremely difficult for a new promoter to enter the historical center market. Studies like Cushman and Wakefield's (2006) stress that these laws hinder innovation and development. The same report suggests that, besides not regulating small companies and stores, Portuguese legislation also does not regulate the expansion of already existing shopping centers and commercial arcades, offering a market niche for promoters.

Ultimately Portuguese legislation is yet to properly integrate commerce and its planning. The local planning documents regulate the distribution of land-use in a general sense, and that may lead to unwelcomed containment or overt dispersion of commercial spaces. For example, the imposition that buildings with a certain height, regardless of location inside the urbanization area, should have commercial spaces, again regardless of type, can result in a distortion of the commercial hierarchy and in a break of shopping linkages. The planning documents may condition the offer of space, or the amount of it, but they cannot influence, inside urban areas or in those able to accommodate new constructions, neither building dispersion, activity dispersion or even if that commercial space will be occupied or not. Planning does not actually plan because it does not propose, it only controls proposals, and these only of large-scale establishments. Small shops are free to locate where they please, as long as the area and the building they wish to occupy falls into the category of urban space able to receive commercial land-use. The UACS (2002) study in the city of Lisbon, for example, proposed that a Chart for the Zoning of Commercial Activities should be constructed in order to structure commercial activity in accordance with other urban land-uses, the population distribution and the network of accessibility, and in order to coordinate the implementation of new commercial spaces and the investment in the sector. Yet something like this has not been produced by any public authority.

4.2.2. COMMERCIAL URBANISM PROGRAMS

Public planning documents and the Portuguese commercial legislation have left to private promoters and to the market logics most of the decisions about commercial activity. On one hand this is positive because it can promote competition and stimulate innovation. On the other, as mentioned in Section 3.2.3.3, permissive planning guidelines may lead to a diminution of the range of supply and enables the strongest and more economically empowered to survive. If downtowns would suffer the consequences of the commercial evolution regardless of the planning restrictions, the lack of them could accelerate that process. This logic seems to have prevailed in many Portuguese cities. High rents, problems with rent policies, the permissiveness of construction in edge- or out-of-town areas, the lack of control in activities and ranges of products, the non-existence of any form of RLT at government level and the disperse availability of commercial space in downtown areas, associated with the population exodus and the degradation of available downtown housing surely contributed to the decline of the Portuguese downtown and of the high street commerce, and to the lack of interest of new, multi-national and international brands to be located there. But Portuguese cities had an undeniable asset: themselves. They present '*beautiful, traditional and historical assets*' (Balsas, 2001), that is, they have historical centers with an appealing medieval (military or ecclesiastical) heritage and an appealing built landscape. The good weather, the touristic interest, the proximity to residential areas and the attractive pedestrian environments[113] could, if properly managed, rekindle the

[113] Assets referred by Cushman & Wakefield (*cit in* online newspaper Hipersuper of July the 11th 2008)

interest in downtown areas of the same multi-national and international brands and consequently help stimulate the growth and the regeneration of the streets, and ultimately of the cities.

It was the urban planning reinvention of the 1990s (mostly through the PDM) that helped to stimulate the interest in rehabilitation and revitalization of certain spaces or activities. PROSIURB, a program implemented in 1994, supported the execution of the PDM and had the aim of consolidating the national urban system. PROSIURB constituted the first test to the implementation of policies involving financial stimulus for the regeneration of downtowns, although it was not a very successful test. Mostly concerned with medium sized cities[114], PROSIURB failed in part because in order to apply, cities had to create strategic plans to complement the PDM, yet these plans were regarded as a means to an end, as a way to ensure funding, and so were hastily done and were not conceived for a long time frame. The physical execution of the program was also poorly successful, because the private sector could not be a beneficiary, and the incentive was only 15% for projects co-financed by structural funds and 50% for the rest. Many municipalities and public promoters were not able to pay their share. The introduction of private actors proved to be paramount, yet because of this, commercial implementation became less associated with public and planning authorities.

Before the 1990s, commercial street recovery was mostly done through small projects of pedestrianisation or public animation, which, according to Fernandes (1994/5), were rarely adequate to the necessities of the streets. This scenario was supposed to change with the implementation of the new planning directives of the 1990s, but as seen both the commercial concerns of the PDM and the PROSIURB were very limited. As Fernandes *et al* (2000) state, the technical intentions and the declarations of the Portuguese government were present, but the truth is that the executions was failing, either because the planning documents were not focusing properly on commercial activity, or the public actors lacked the necessary funding. Commercial urbanism projects in Portugal only really started with the arrival of the European structural funds. These financial arrangements had the goal of restructuring city areas by relying on the attractive and wealth-generating power of commerce (its *active* nature), whilst using it as an instrument of urban planning. This was mainly a top-down approach. The first QCA (Community Support Framework), which occurred from 1989 to 1993, had a specific program for commerce, the SIMC (System of Incentives for Modernization of Commerce). This was the first program in Portugal able to supply funding for city center requalification and image renewal, although it is seldom discussed nowadays and little data on it exists. It was the similar program in QCA II (1994-1999) that proved to have much more acceptance and widespread application in Portuguese cities. According to Fernandes (1994/5) PROCOM constituted the first recognition by public authorities of the major impact commerce could have on city living, and according to Balsas (2000) it arose from the necessity of having a clearer policy on commerce, following many protests from traditional retailers at the beginning of the decade. Aiming at modernizing commerce, promoting commercial policies and development, and reanimating historic centers, PROCOM subsidized small and medium-sized businesses of traditional shopping districts between 40 and 75%, so that they could update their stores, increase comfort and attraction in the store and in the surrounding public space, conceive animation projects and perform market and shopper

[114] PROSIURB was mostly concerned with four types of medium-sized cities: (i) the ones not belonging to both the metropolitan areas of Oporto and Lisbon; (ii) the ones who could act as catalysts for surrounding areas; (iii) the ones who could have a major role in international networks of cooperation and interchange, (iv) and the ones important at a sub-regional level who had shown a considerable degree of cohesion, interaction, complementarity and autonomy.

surveys. Not only individual retailers, but also commercial associations and unions could apply. Without losing each shop's individuality, the goal was to enhance the commercial street's main characteristics, and to promote a more focused approach on the client, on specialization and on cooperation, in order to achieve greater competitiveness and market performance. According to Fernandes (1994/5) this could gain commerce the independence it needed to become a strategic element in the economic and social spheres of the city, a relevant part of its culture, leisure and tourism, whilst also being connected to its historic and morphological grains. The concept of 'open air shopping center' was discussed for the first time in Portugal through the PROCOM. Between 1994 and 1999, 3.493 individual applications for PROCOM were received, and around 280 million euros were spent. Of these 135 million came from the private commercial investors (OdC, 2001h). According to Fernandes *et al* (2000) some interesting interventions occurred and there was a greater visibility granted to strategic planning and independent retail. The same author (1994/5) presents three case studies in the Portuguese cities of Matosinhos, Vila do Conde and Penafiel, Moreira *et al* (2006) present a case study in Évora, and Balsas (2000) in Aveiro and Coimbra. Even so, it is Balsas (2001) that states that the participation rates of independent retailers was relatively low[115] and the contribution of PROCOM to city center revitalization could be questioned. The author stresses that the advantages of the program were not conveniently promoted to small retailers. Furthermore, he defends that there was a lack of entrepreneurial spirit in them, that they had a short term vision, only considered the initial expenditure they had to do, and regarded the subsequent construction work to their stores and to the street, and the pedestrianisation of the streets (hence less vehicular traffic) as major setbacks. Balsas also states that the retailers only sought investment for their particular projects and were little interested in integrated approaches and multi-retailer cooperation. According to Fernandes *et al* (2000) the problems for PROCOM's relative lack of success could also be in the system. The municipalities and the DGCC, the public organism for commerce and competition, did not cooperate and agree, and the interaction between public authorities, entrepreneurs and commercial companies was rare, which showed a lack of professional and integrated management. Furthermore, PROCOM's legislation was similar for the entire country (so local specifications were discarded), the execution schedules were tight and the financing did not arrive on the stipulated dates. According to the authors, the selection of eligible areas in each city was done most of the times without proper logic, which could result in forced modifications or in a forced increase of commercial area that was not needed and lacked elsewhere. Most of all, the authors stress the short-termness of the interventions and the lack of mechanisms to assure the continuity of the projects once the funding ceased. This dependency of public subsidies made the sector less competitive and less willing to take risks and innovate. This would appear to be a European-wide problem, because abroad, even though the incentives were much higher, the lack of participation was also felt.

More recently, the QCA III (2000-2006) had a similar incentive program, the URBCOM, supervised by the Economy Operational Program. According to Moreira *et al* (2006), the program had the goal of promoting the development of cities and other localities of medium-size dimension, whilst assisting a more balanced territorial organization and creating and developing synergies between commerce and heritage conservation. Following the same structure as previous programs, URBCOM fostered applications from individual companies, promoted the establishment of management structures and supported knowledge gaining actions for professionals (OdC, 2001h). Along with the applications,

[115] For example in Moreira *et al*'s (2006) study in Évora, only 46% of retailers in PROCOM's intervention area entered the program.

strategic commercial areas under scope of the program had to present a global and integrated study in which not only the commercial, but also the economic, urban, management and promotional perspectives needed to be addressed. Besides these global projects for specific areas, URBCOM also accepted individual applications by commercial promoters. In the great Lisbon area alone 45 projects for specific areas were approved. In the North 35 were approved[116]. Because the projects are recent and have been executed over the past few years, there are yet few critical works on URBCOM's results. But what can be perceived is that, because the differences to PROCOM are not many, the same problems may arise. At the same time, a large number of commercial streets in various cities around the country have seen their commercial environments improved. But ultimately, the focus of commercial urbanism projects, the so called '*modernization of commerce*', is precisely *that* improvement to the exterior physical elements (street, parking spaces, shop windows, lighting fixtures, urban furniture) with the aim of creating attractive environments able to induce shopping. By focusing on the 'facade' these projects neglect the 'whole'. Commercial central streets are chosen for recovery and made of pedestrian-use precisely because *they are* commercial central streets and for no other reason. Activity and market studies are not performed and the spatial, economic and social conditions are mostly not taken into account. Retailers use the funds to support the restructuring works they could not afford, and not to boost their direct commercial performance by applying modern management tactics, performing market studies or updating their interfaces with the consumer.

Presently Portugal possesses two programs of commercial revitalization still operating, MODCOM and MERCA. MODCOM is in its fourth stage. In the first three 2.611 individual projects were approved, corresponding to a public support of 64 million euros. This program, like the previous, is mostly concerned with the modernization of commercial activity, particularly in commercial centers with a majority of independent proximity retail and in rural areas. Promotional actions are also supported. The incentives are between 35 to 40% of a maximum of 40.000 euros or 60% of a maximum of 60.000 euros when the project involves promotional activities. The MERCA initiative is part of QCA IV (2007-2013) and is pointed at small or medium-sized enterprises of commerce and services. It started in 2009 but, unlike the other programs, it does not directly finance retailers. The approval of the applications results in the reservation of funds in several other QREN operational programs and systems of incentives. Once again, these programs are very recent so there is little data concerning them and there are no studies analyzing their performance.

4.3. LOOKING AHEAD

If in 2000, Balsas (2000) said that in Portugal during the 1990s the concept of commercial urbanism had been almost totally associated with the special projects of PROCOM, the same could be said in the 2000s for URBCOM and today for the MODCOM and MERCA initiatives. Large scale private investment in downtowns, commerce-wise, is mostly isolated, and is mostly not entwined with other initiatives in the surrounding urban space. The 'Forum Aveiro' in Aveiro's city center and the 'Gran Plazza' next to the most famous commercial street in Oporto are two examples of city center shopping centers of relative success in themselves, but which have not generated the city-wide dynamic of, for instance, the Bullring in Birmingham, because their implementation (besides being much smaller in area) was only slightly connected with other initiatives, public or private. On the other hand, the small

[116] Data available in the official sites of each region's Coordination Commissions.

scale investment on commercial, and ultimately urban regeneration, does not arise from an initiative of promoters or retailers, but from an initiative of the European commission to which Portuguese retailers may or may not respond to, leading to a disperse application of the funds. When retailers do respond, it is perceived that they seldom use the financial support in a creative or even in an integrated way. Most projects still operate at an individual basis, commercial associations have fragile technical structures, there is a large dependency of the allocated financial resources, there is no long term economic or management planning, and there is still ineptitude and inaction in most, or at least many actors.

In this scenario the proliferation of large scale or multi-commercial establishments and the decline of individual traditional ones seem to be the logic consequences, and that is indeed what appears to be happening in Portugal. But the numbers can be deceiving and the excess of large scale commercial establishments in larger cities hides the fact that the small individual store is still the major type of commercial establishment in the Portuguese landscape, that is, Portugal is still a '*nation of small retailers*'. Commercial companies have increased in number, in overall turnover and have only decreased in number of workers. What may have changed is the distribution of wealth between the large and the smaller companies, and the type of entrepreneur and the type of establishment, but that is a consequence of the times and of the consumer's changing preferences. Portugal still has an above average number of stores per inhabitant, which reflects the importance of retail transactions in Portuguese economy and daily-living. This importance is also recognized by promoters, public officials and the retailer's themselves. Politicians and public planners seem to regard the modernization and stimulation of downtown commerce, municipal markets and fairs as the key to city center revitalization and economic growth. If this is a political technique for appeasing and pleasing their constituency or a true conviction, it is hard to know, but either way the mechanisms chosen by Portuguese city-makers do not seem to be fulfilling their promised goals. Cities are actually not aware of the amount of commerce they possess, of its variety, of its spatial organization, and of its links to the surrounding morphological realm. So any subsequent planning will be necessarily out-of-focus, even if it is well intended. Furthermore, it is a planning lacking dynamic initiative and which incurs in a particular paradox. Small scale establishments are, indirectly, positively discriminated because large formats are conditioned, but at the same time that discrimination seems pointless because the smaller shops are not properly regulated, controlled, promoted or even directly protected by planning measures, and they are not positively reacting to commercial urbanism projects, at least in a way able to generate momentum for Portuguese cities. If integrated strategies are the key to successful revitalization processes, then big private investments in large scale multi-commercial facilities need to be integrated with small scale public-private investments in smaller stores and spill-over investments in the public environment. It is always difficult to bend economic interest, large or small, to planning interests. In Portugal, the commercial sector is still very much an economically controlled sector, and planning is constantly marginalized, as most Portuguese authors suggest.

Consequently works on Portuguese commerce in a planning perspective should stipulate first a proper catalogue of commercial spaces, second a set of RLT-related laws in terms of commercial location, and activity and type dispersion, and third a stimulus of public-private partnerships concerning the 'regeneration thesis'. Salgueiro (1992) stressed that many modern schools prefer to interpret the processes rather than the results, that is, the way to plan change is to act in path that leads to that change. Considering this perspective, the outcome is the romanticized view of commerce as a community equipment able to generate wealth, movement and dynamic environments. The path is

constituted by the understanding of commercial patterns and hierarchies in the Portuguese landscape (that is, a proper knowledge of *all* types of stores), an assessment of current laws and the recognition that they do not cover the entire field of commercial planning, and an understanding of the association, the symbiosis, between the function (commerce) and the form and structure of cities, as a crucial element to achieve the outcome. Only then can it be understood how the usual planning solutions of commercial urbanism, often discussed in the literature, such as mix-uses, integrated policies, allocation of structural funds, increases of functionality and attractiveness, public transport planning, and promotion, marketing and management, can be implemented and made to work.

Medium-sized Portuguese cities have, in this regard, an asset that the cities in the metropolitan areas of Lisbon and Oporto do not. The penetration of large-scale multi-commercial facilities in the market occurred *after* many commercial urbanism projects were already in place in main streets and the cities themselves were already part of urban networks, funded by European incentives, focused on promoting their assets. The '*true*'[117] medium-sized cities, which are not '*mere miniature reproductions of the larger conglomerates*' (Ferrão *in* CCEC, 1995) have still mostly unharmed commercial hierarchies, have well established commercial centers and have been able to balance new and old formats. If now they are being penetrated by large shopping centers, the opportunity arises not only to contribute to their commercial understanding (which in Portugal is very little when compared with Lisbon and Oporto), but also to avoid a repetition of the same mistakes in commercial urbanism strategies and planning regulations. With the current economic crises, the areas which present more concentration of expertise, wealth and resources are more likely to survive. Smaller cities, like smaller shops, suffer the consequence of their size and the competition from their larger counterparts. Smaller cities, like smaller shops, both in majority in the Portuguese context and essential to the equilibrium of the country and to the surviving of surrounding less endowed regions, need new planning paradigms in order to stay competitive and generate enough momentum to overcome their difficulties, so that that equilibrium is not shattered.

[117] A term used by Cachinho to describe the Portuguese medium-sized cities outside the large metropolitan areas of Lisbon and Oporto.

5
CASE STUDY METHODOLOGY

5.1. FROM THEORY TO PRACTICE

The literature review of Chapters 2, 3 and 4 has presented the economic activity known as commerce as an ever-changing and multi-faceted element of the urban structure, whose nature has been significantly altered in the last decades. This has happened for various reasons, which relate to the sector's own internal environment but also to its external environment, namely as a consequence of economic, social and even urban changes of which commerce is utterly dependent. Yet it was generally assumed that, of all the elements that characterize the form and structure of cities (Figure 2), commerce was only related to the 'activity patterns' in the 'typology' component. That is, the study of commerce, and of its inherent impacts, was considered as a study of geographical location. To this 'location' an economic value was associated, which depended on the surrounding market conditions. Ultimately the value generated by the location would, theoretically, produce impacts on the surrounding forms and functions. But an extensive literature review, as the one that has been developed in this research, firmly establishes that commerce does not depend solely on 'geography' and 'economy', and that commercial characterization does not end with 'location' and 'activity'.

Figure 21 tries to summarize the literature review by explaining that the symbioses between commercial activity and the form and structure of cities is not exactly straightforward. Connecting the two extremities (form and structure and commercial activity) the elements of analysis are composed of various resolutions and vary according to the established field of research. Activity patterns, for example, dependent on store location, have been explained by geographical literature, which mostly operates at a territorial and neighborhood level. These are intrinsically connected, through RLT, with store output, which is explained by economic theory, that operates at the same resolution. Economy and geography can also be connected (dotted arrows) to products sold and store management types, because they either explain or catalogue them, mostly through pattern comparisons. But there are other store characteristics that can be explained, or at least depend to some extent, on the form and structure of cities, which have been individually approached by other fields of research. If the first conclusion of the literature review is that not all variables concerning the commercial activity in cities have been the object of scientific research, the second is that because, obviously, commercial variables are all connected and each influences all others, the different fields of research are also all intrinsically connected, at least where commerce is concerned, but both theoretical and practical studies have failed to integrate this knowledge. The general assumption that there is a lack of data on commerce (Tallen, 2003; Smith, 2007) is a direct consequence of this lack of integration.

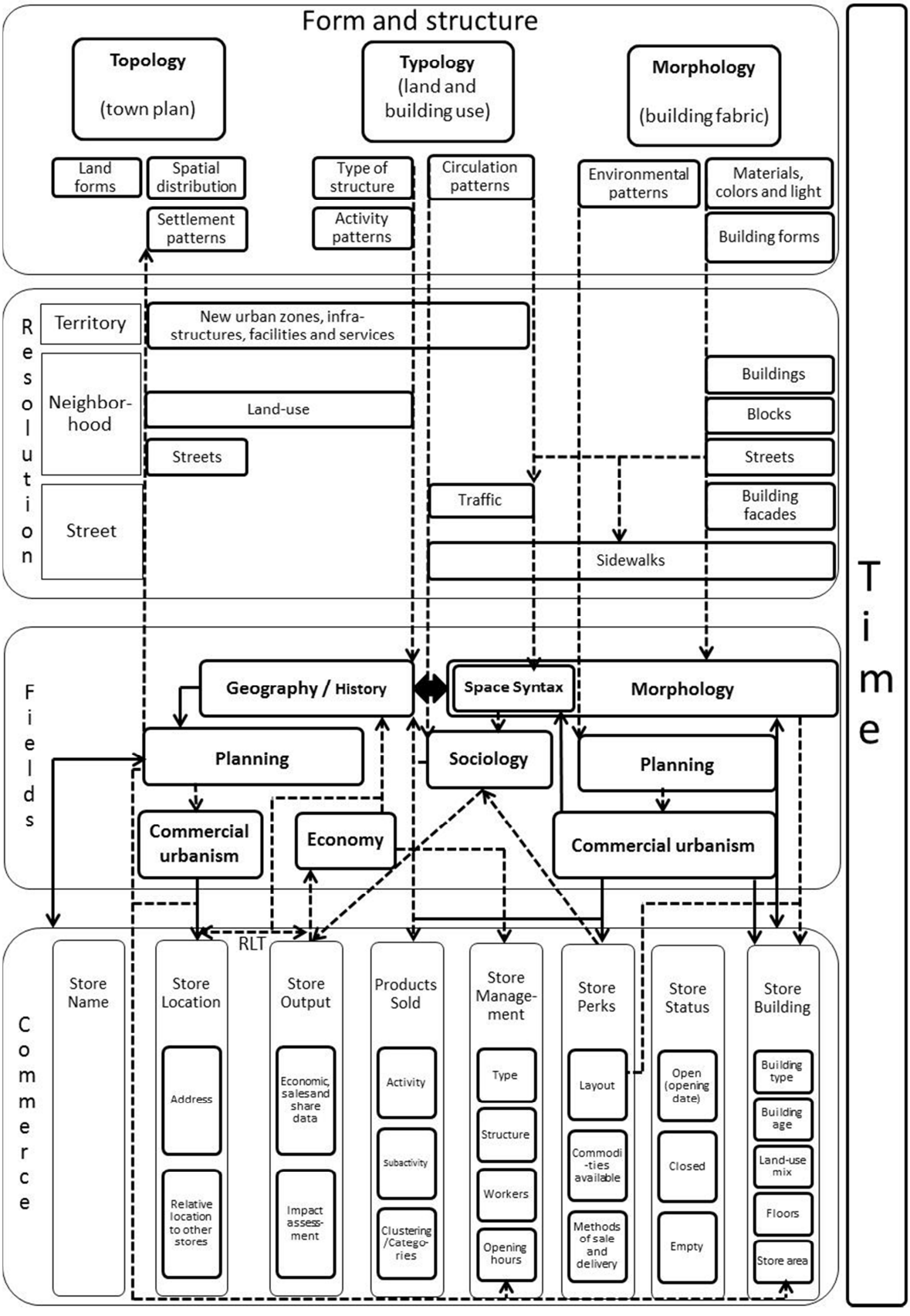


Figure 21 - The symbioses between commercial activity and the form and structure of cities

The inputs of the various fields of research have the same basis. The analysis of '*location, location, location*' for one, is common to all, that is, commercial location is the starting point for most research and it is still the most important commercial variable. Despite the proliferation of web-commerce, the physical interaction between the space of consumption and the public space still determines most of the store's success, in terms of share, movement, spill-over and status. But the value of 'location' is increasingly less dependent of its geographical position and more of its *morphological* insertion. This occurs because position and distance are substituted by other elements that represent, to a consumer, measures of attractiveness. These elements may be social, may be economical but they may also be related to the characteristics of the building fabric, the street network and to transport and circulation patterns. This is the deduction that has been presented lately in the literature. Authors such as Axenov *et al* (1997), van Nes (2005), Sarma (2006) and Villain (2011) have called attention to the fact that the 'morphology' component of form and structure has been, until recently, practically absent in commercial studies, and authors such as Moudon (2002) and Joosten and van Nes (2005) have added that the micro-scale focus (neighborhood and street) has also been largely neglected. Even existing urban morphology literature mostly associated the measure of form and structure with the mapping of evolutionary geographical patterns, something which led Conzen (1980) to state that these studies were '*amorphological*'. There is, therefore, the necessity of adding *tru*e morphological variables to commercial studies. First this necessity can be justified by saying that 'morphology' is the element of form and structure that is yet to be introduced into commercial research, and so, at a local scale, elements such as the components of 'store building' and of store form and layout can be directly measured and added to the model. But later, because all components of commerce are connected, it can be assumed that the importance of the 'morphological' element is not restricted to the morphological characterization of commercial buildings or commercial streets. By questioning the validity of this thinking process, authors have eventually started to ask an important, if not crucial question, namely if urban form, or morphology, can affect the spatial distribution of commerce. And again, because the spatial distribution is intrinsically connected with store output and activity dispersion, as existing research in economic and geographical fields has already proved, then it is legitimate to continue to ask whether morphology cannot also affect other commercial components other than location. Ultimately, by following this line of though, it can be proposed that morphology can influence the location, characterization and performance of commercial spaces. This is the third conclusion that derives from the literature review.

The morphological field of research not only characterizes directly the building fabric, but also the circulation patterns in the 'typology' component. The discipline of Space Syntax is paramount for this characterization because it defends that the layout of the grid is the sole variable which influences movement. By assuming that Space Syntax is a valid methodology one important aspect of the shopper's perspective is overcome without having to resort to extensive surveys. Theoretically, more movement means more shoppers which means more sales. On the existence of movement and shoppers depends the success or failure of commercial areas. But even the grid cannot account for all of the shoppers' decisions, therefore the use of surveys proves to be important in addressing other issues related to sociology, namely the sensibility of shoppers to the characteristics of the store, of the brands and of marketing, which translates into consumption patterns, that is, expenditure. The patterns of behavior are becoming increasingly more relevant, because with the increase in consumption capacity and in the use of information technologies consumers became more demanding, more selective and more informed about price comparison and product search. Consumers no longer look

for 'retail', they look for '*retailtainment*'. Even so, shopper surveys are time consuming and require extensive resources. Therefore the use of Space Syntax as the sole indicator of the shopper's movement patterns has already been applied in the literature, not only because 60 to 80% of movement flows can be accounted by the configuration of the grid (Hillier, Vaughan, 2007) but also because, as Jingman (2009) discovered in the Chinese context, the city's commercial centers exactly correspond to the city's syntax centers. This compromise may constitute the fourth conclusion of the literature review, especially when commercial studies have data-collection and survey constrains.

Obvious, the field of Planning should be transversal to the study of form and structure. If theoretically this is true, practically this has not happened. In Portugal, planning has mostly been concerned with the distribution of land-uses at a territorial level and, in the specific case of commerce, with the licensing and control of large-scale establishments and with regulations over opening hours and store area. It may condition the offer of available space for commercial activity, that is, the overall offer of 'location', but not the activity and type dispersion within that offer, nor if that offer will be fulfilled. This originates a fifth conclusion, based on the recognition that the current planning policies are inadequate and even contradictory, because on the one hand they try to protect traditional retail in cities by applying positive discrimination directives, but on the other small shops are mostly uncontrolled, and can practically locate where they please as long as commercial use is permitted. The problem seems to be in the lack of an overall integrated approach in planning for commerce, and in a lack of proper cataloguing and treatment of the extensive databases municipalities possess as a consequence of licensing, supervising and surveying commercial companies. RLT, for example, uses specific store- and consumer-related data to produce a certain type of planning, concerning store location. If planning could apply the same principles, it would have at its disposal data from all the fields of research that analyze commerce, and hence could look beyond location planning to produce a wider, rather than a specific approach to commercial decision-making. This concern has already been debated by Chandonnet *et al* (2004), who defend that commercial planning should go beyond the assessment of what is the best location for a type of store (RLT), or the best store for a specific type of location, by considering an approach involving a comfort-benefit impact analysis on the city. This of course relates to commercial urbanism practices.

Nelson's 1958 question '*But can stores or shopping centers be as important to the emotional aspects of location?*' still remains as the central conundrum of commercial urbanism. Urbanism literature sees in commerce a powerful instrument that, if properly applied, can contribute, in the words of the European Congress of Commerce and City, '*to the renascence of European cities*' (Balsas, 2001). The literature has already found evidence of successful commercial-led regeneration projects, especially in the English context, and these, mostly private investments centered on large scale facilities, have sometimes been more effective than public planned development and than European funded commercial urbanism projects aimed at smaller stores. But if large scale establishments are able to generate enough momentum to influence surrounding form and structure, then it can be proposed that the network of small stores can also have these intrinsic characteristics, even if they operate at a smaller scale. These characteristics may not be properly developed in cities because the allocation of structural funds isn't sufficiently controlled or promoted, because there is unawareness or lack of initiative, because there is no long-term management planning for the period after the cessation of the initial investment, or because there is not, in larger commercial development or urbanism projects, an integrated view concerning the regeneration thesis, because the actors seldom agree and have different, individual, interests. Consequently, the sixth conclusion of the literature review is that if

current planning policies could successfully integrate commercial activity, by introducing specific regulations in local planning instruments and by promoting the dynamism and the integration between public and private actors (PPPs), then their ability to contribute to the regeneration and sustainability of urban spaces could substantially increase. According to Balsas (2000), in this perspective, commercial urbanism should be able to influence **4A** aspects of commerce (full arrows of Figure 21): 1) **A**ccessibility (ability to reach a given commercial space, involving, among others, concepts of location and Space Syntax); 2) **A**ttraction (ability to create a critical mass of uses, activities and perks, through the correct balance of comfort, convenience, customer satisfaction and offer-mix); 3) **A**menities (ability to create pleasant store, building and street environments through design, architectural and rehabilitation techniques); and 4) **A**ction (ability to conveniently and permanently manage, promote and monitor commercial spaces). By influencing these aspects, commercial urbanism can influence movement, actor interaction and ultimately, store performance. Consequently, it can be supposed that, given the right conditions, it positively impacts on urban spaces.

Therefore, the interpretation of the literature revealed six major conclusions that should form the basis of the practical research: (i) that not all variables which may influence commerce have been consistently considered in commercial studies; (ii) that even if they have, they have been considered separately, because there is a lack of integration between fields of research, which leads to a lack of knowledge in local/micro-scale commercial data; (iii) that the morphological component, which has a strong probability of affecting the commercial sector, has mostly been neglected in commercial studies; (iv) that Space Syntax may be a valid methodology for assessing shopper's movement patterns; (v) that there is a lack of adequacy and integration in current planning regulations and practices, that are, in part, a consequence of the above mentioned lack of knowledge on commercial data; and (vi) that commerce's 'active' nature may prove to be a successful instrument of urban planning, given a proper set of favorable conditions.

This set of conclusions is intrinsically related to the research questions presented in Chapter 1, which originated this thesis. The most important decision that was made was to center the practical research in the field of morphology. Not only has this been the field which has received less attention in commercial literature, but also the specific analysis on the *morphological sense* has had a lack of integration within itself (most notably due to the separation between research of the inner and the outer environment of the store) which needs to be overcome. By assuming this, immediately the first research question is formulated:

> *What elements of the form and structure of cities, particularly micro-scale morphological characteristics of the built-environment, contribute to the location, characterization, and performance of commercial spaces? Are these characteristics, in turn, affected by the commercial spaces themselves?*

It would be contradictory to what has been discussed to consider morphological characteristics alone. As has been proved, the fields of research are connected, and to proper characterize the entire scope of form and structure and the entire scope of commerce they should all, to a certain extent, be considered. Therefore, and because '*location, location, location*' is the starting point for all commercial research, the most important link that initially must be achieved is between geographical and pattern comparison studies and morphological studies (large full black double-way arrow in Figure 21). This way, 'topology' and 'typology' are immediately connected with 'morphology'. The overlapping of the established analysis techniques of these two fields of research should produce innovative results. If

geographical and morphological data collection is to a certain extent easier to obtain, because even if there are no prior sources it can be obtained through field work, economic and social data requires extensive surveys, expenditure[118] and sometimes vast resources which are the prerogative of private companies and are not available to the public. Space Syntax can replace social surveys to a given extent, but the economic perspective seems harder to replace. Nevertheless the need to add the economic perspective to the current research can be debated. This perspective is little concerned with the morphological and commercial characteristics of spaces, and measures only store economic outputs, by considering them as a consequence of global market conditions, the expending capacity of the consumers in the catchment area and of economic competition. Other variables, such as 'location', are considered as a by-product of the economic phenomena, and the intrinsic models produced by RLT are not public planning instruments, but rather mechanisms to assure an increase of profits. Furthermore, specific data concerning store output and some elements of store management are very hard to obtain, because they fall under the private jurisdiction of each company, who more than often are, justifiably, unwilling to make that data public. Because of all these reasons, after careful consideration, a choice was made to discard the economic analysis in this investigation. Yet, considering that movement and proper location, integration and planning produces successful commercial spaces, then it can be considered that, indirectly, the economic perspective is safeguarded.

The proper platform for the insertion of the collected data is, undoubtedly, a GIS-based model. This tool should not only house the collected data (hence contributing for its aggregation in a single database), but also allow for its treatment, so that qualitative and quantitative analyses can be carried out. A second research question is thus formulated:

> *How can a GIS database be designed in order to accommodate the various elements that characterize the form and structure of cities and, at the same time, promote integration between the various fields of research and increase the knowledge on commercial data?*

Initially the amount, the form and the type of the variables to insert in the model must be considered. First because not all elements that constitute the form and structure of cities can be translated into variables quantifiable enough for modeling purposes. Therefore choices and restructuring processes must be made so that all selected data fits into the same model and is comparable. Second, because a proper balance of the scale of the data is needed. Excessively detailed data can be hard to obtain and hinder the performance and flexibility of the model, whilst the opposite type of data may be insufficient to answer the first research question, mentioned above. Therefore, as was the case of RLT, there should be a mix of '*art and science*' when constructing a model in a GIS-platform.

It stands to reason that the model must contain four distinct sets of data. The first is eminently *physical*. The background of the model should be constituted by the built landscape of the case study city, namely by streets (represented by lines), buildings or other constructions/spaces (represented by rectangles) and blocks, all able to receive characterizing information. The second is eminently *commercial*. The commercial data concerning each store should be inserted into the respective building. This does not hinder that other specific data related to land-uses (major facilities and landmarks) could be inserted as well, but the commercial land-use is given priority. The third is eminently *organic*. This means that other types of data related to the city's daily processes and intrinsic nature should be introduced as well, in order to characterize, for example, the 'Sociology'

[118] If, for example, data on sales needs to be purchased.

component (Census data on population) or public transport lines. The last is *temporal*. If possible, the data should correspond to distinct temporal moments, so that evolutionary patterns can be produced. By collecting all these components and inserting them into one single model, an innovative and open platform can be created. This means that the platform is not closed to receive new data and can continually be updated. This way the lack of knowledge on commercial data is overcome for future research. But as Hernandez *et al* (1998) stated, what is '*data rich*' may be '*information poor*', so after the platform is built a proper exploration of the database must be executed, by treating the commercial data in a spatial/hierarchical context, and in a morphological/syntactical context. RLT literature has already shown that the junction of modeling techniques with visualization capacities has been crucial to achieve better results on site selection and on the comprehension of the retail location phenomenon. By using the same principles it can be inferred that a substantially richer model in terms of data, treated with methodologies from different backgrounds, can produce a clearer perception of commercial activity, at least sufficiently enough to answer the present research questions.

By understanding the elements of form and structure, particularly those of micro-scale morphology, which influence the location, characterization and performance of commercial spaces, planning guidelines, directly related to commerce and indirectly related, through commerce's 'active' nature, to the regeneration and sustainability of urban spaces, may be proposed. The last research question states precisely that:

> *How do Portuguese spatial planning instruments deal with the location and control of commercial spaces? Can the morphological understanding of commerce inspire guidelines for future planning regulations so that commercial spaces may be more aptly used as an integral element of the 'regeneration thesis'?*

The literature review has already answered the first of these questions by stating that, in Portugal, there is a lack of adequacy and integration in current planning regulations and practices. Because this is a consequence, on one hand, of the lack of knowledge on commercial data, and on the other, of the lack of knowledge on how direct planning regulations on the form and structure of cities can affect commercial activity's performance (and vice-versa), it can then be assumed that, by eliminating this dual lack of knowledge, public authorities will be empowered with the theoretical support to sustain proposed changes to current planning regulations. Consequently, the second question can be answered.

The two last conclusions that can be taken from the literature review are related to the fact that most studies focus solely on one city and that that city is usually a major one in the country. On the introduction to his paper on morphological change and retail modernization in Spain, Barke (1998) stressed that one reason for the underdevelopment of the conceptualization of the morphological change relates to the '*paucity of inter-settlement studies*'. By using one research method in one single city, researchers take the risk of drawing conclusions from isolated incidents based on specific local conditions. The cited example of Joosten and van Nes (2005) in Berlin, who established a connection between retail location and full block typologies, exemplifies how what appears to be a certainty for one scenario may be at least be put into question for all others. In order to try to minimize the uncertainty created by focused spatial research, more than one case study should be considered. The other concern is expressed, for example, by Musso (2010), when he stresses that the greater part of the studies on retail occurs in larger cities. Obviously this is because larger cities will have greater available data on records, are more relevant to study and interpret in the private sector perspective and

are where most research centers are located. But, as the modern retail system is characterized by larger and smaller firms, the territorial retail hierarchy is also characterized by larger and smaller cities. In Portugal, medium-sized cities have practically never been the object of commercial research. This may have been first because their role in the urban network was limited and second because their commercial hierarchies were very traditional and straightforward. But now the literature review has shown that both these justifications have lost their meaning. As mentioned before, Portuguese medium-sized cities now have stronger roles and an increased potential in structuring the territory and promoting its assets. On the other hand their retail hierarchies have suffered recently the penetration of large scale formats, and even before that multi-national and international chain stores had been finding their places in the main commercial streets, forcing a change in traditional retail practices. Even so, the equilibrium between modern and new formats is still only slightly unbalanced, and their commercial heritage has not been spoiled, unlike many larger conglomerates. It is true that the new methodology this research proposes for analyzing commercial activity would function as well in larger cities, but considering the new paradigms of medium-sized cities and their commercial scenarios, they appear as the perfect test-beds for the proposal of innovative commercial policies. Moreover, their commercial dispersion is more limited so, due to time and resources restrictions, and also due to the choice of having more than one case study, the amount of work needed to follow the proposed methodology can be more suitably controlled. In larger cities, this amount would be overwhelming and virtually impossible to complete in the set time-frame by one single researcher and with existing resources. Notwithstanding, the foundations for future research are laid.

5.2. WORKING METHODOLOGY

5.2.1. OVERVIEW

The research questions discussed above originated a research hypothesis, presented in Chapter 1. Considering Portuguese medium-sized cities as case studies, it is proposed that there are elements that constitute the form and structure of cities, most particularly micro-scale morphological elements, which seldom have been associated with commercial research, that can exert some degree of influence (and be influenced by) the location, characterization and performance of commercial spaces. By using a GIS database and applying a transversal view to the fields of research in order to select methodologies and research techniques for aggregating, treating, comparing and interpreting the collected data, it is supposed that a proper assessment of the symbiosis between commercial activity and the form and structure of cities can be obtained, through a qualitative and quantitative analysis of the research outcomes. Consequently, this can add to the knowledge on the sector's trends, contribute to the production of an innovative commercial database that can be used in subsequent research, and assist the construction of a proper framework for future planning guidelines supportive of commercial urbanism.

The practical methodology that wishes to achieve these goals consists of five steps, summarized in Figure 22. The first is the case study selection. Of the array of medium-sized cities in Portugal, a choice is made to select and study four. This number is reached considering that the case studies have to be sufficiently varied so that the imprecisions derived from isolated incidents, a consequence of specific local conditions, can be discarded, and that similar patterns between cities can be considered at least as a valid possibility for extrapolation for other scenarios. At the same time, the number has to be sufficiently constrained, due to the time and resource possibilities of the PhD research project. The

selected cities need to have distinctive backgrounds and characteristics so that similar conclusions can have more strength for extrapolation.

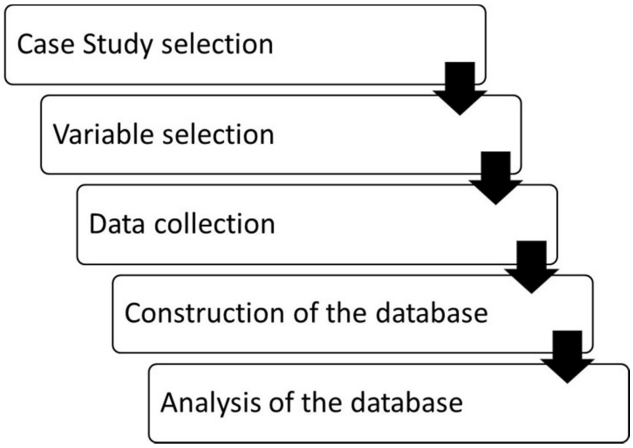


Figure 22 - Practical methodology

The second step is the variable selection. This not only includes the selection of the commercial variables, but also of all other morphological, social, geographical and planning variables that need to be ascertained so that sufficient elements of the form and structure of cities are covered in order to answer the research questions. In this step the variables are also defined and characterized. The third step is the data collection. This includes the methodologies of aggregating the existing information, which comes primarily from three sources: existing research, prior data collections and field work data collection. The first two sources produced little information, so the bulk of the data used in this investigation came from the field work performed. The fourth step is the construction of the database. The collected data was uploaded into a GIS platform (ArcGIS 9.3), a tool that not only has geo-visualization capacities but also allows for the use of data treatment and modeling research techniques. Consequently it is also at this level that a self-designed methodology of conversion of road-center lines into segment lines, for the application of Space Syntax, is introduced. Lastly, the fifth step is the analysis of the database. This, obviously, constitutes the centerpiece of this investigation and is the subject of the next four Chapters. The other four steps are discussed presently.

5.2.2. CASE STUDY SELECTION

As mentioned above, a choice was made first, to study Portuguese medium-sized cities rather than larger cities, and second to select a group of four cities, different amongst themselves. This means that these cities should be evenly dispersed throughout the country, have different roles in the surrounding urban structure, present different urban and commercial hierarchies and be at different stages of modern commercial format's penetration.

The first thing to establish is precisely which cities should be considered as medium-sized. In Section 2.1.3.1. it was already discussed that the definition of medium-sized cities has significantly changed over the last fifty years, both demographically and in terms of the roles they perform. As a first filter, two criteria were used. The first is that only those which Cachinho calls '*true*' medium sized cities were considered. This means that all cities of medium-size dimension in the metropolitan areas of Lisbon and Oporto were discarded. Although they can possess similar size and population, these cities

have different inner structures and different roles (they are inevitably linked to the larger city) which obviously conditions their commercial offer. Much for the same reasons, to which logistic reasons are added, the cities on the archipelagos of Azores and Madeira were also not taken into account. The urban hierarchical structure of these archipelagos is particular, obviously conditioned by their isolation and the size of each island. The second criterion is demographic. Marques da Costa (2002) showed that the European medium-sized cities had distinctive demographic intervals. For Portugal, he estimated that medium-sized cities had between 20 thousand and 100 thousand inhabitants, one of the lowest intervals among the major European countries. But a city should be considered medium-sized because of its context, condition and position in the territorial structure, therefore, the demographic interval should change accordingly. As Correia states (*cit in* CCRC, 1995) Portuguese medium-sized cities can be small cities when assessed in a European perspective, but the roles they perform inside the country are similar to foreign medium-sized cities. Most studies seem to consider the upper limit of 100 thousand inhabitants for smaller countries such as Greece, Poland and Portugal. Spanish studies generally consider 200 thousand inhabitants, but this would not make sense in Portugal, because only Lisbon and Oporto have more than that number of inhabitants. At the same time, 100 thousand inhabitants also seems a little excessive, because very few Portuguese medium-sized cities (like Braga and Coimbra) have over 60 thousand inhabitants. On the other hand, the lower limit of 20 thousand inhabitants seems coherent. This has been the limit used since the 1970s in Portuguese geographic studies concerning medium-sized cities, and it appears to correspond approximately to the barrier between cities of regional relevance and others of 'lower order'.

Considering both the spatial and the demographic criteria (20-60 thousand inhabitants), 20 cities are found, which are featured in the table of Annex 2. Because this was done in the first year of research (2009) the demographic data available came from the 2001 Census. Yet, analyzing the recently published data from the 2011 Census, it can be noticed that the differences in number of inhabitants are few (they generally increased), so it is supposed that the 2001 data has not influenced the accuracy of the study. Analyzing the territorial models in the regional plans, it was possible to see that some cities which did not answer to the initial pre-selection criteria used also possessed the structuring attributes which define medium-sized cities. These were Braga and Coimbra (with about 100 thousand inhabitants) and Elvas, Portalegre, Chaves, Ovar, Torres Vedras and Tomar (with about 16 thousand inhabitants). Consequently, these cities were also taken into consideration and are featured at the end of the Table.

For each of these 28 cities a series of indicators were analyzed and taken into account for the final selection. These are summarized in the columns of the Table in Annex 2. The first was, obviously, the number of inhabitants and the second the geographical location within the country. The selection should cover cities from the various regions (North, Center and South) and include some cities of the eastern interior of the country and others near the western shore line, which are theoretically more developed, because they are near the ocean and are located in the direct line between the cities of Lisbon and Oporto. Then the territorial relevance of each city was considered. For that each PROT[119] (Regional Plans which have been recently under public discussion) was analyzed. A direct comparison between cities of different regions is not possible because each Plan stipulates different criteria. But, for example, it can be noticed that what the PROT Center defines as Level 1 poles can correspond to

[119] Plano Regional de Ordenamento do Território – Regional Plan for Territorial Planning. There are five in mainland Portugal, corresponding to each Region: North, Center, Alentejo, West and Tejo Valley, and Algarve.

the most important cities in other PROT, such as 'cities of regional equilibrium' in PROT North. It could be supposed that this lack of regional coordination could be overcome by analyzing the PNPOT, which is the National Plan for Territorial Planning Policies, but that is not so. The territorial model present in the PNPOT is not helpful because it only shows the way metropolitan areas are connected at national level, and does not characterize, beyond the demographical approach, the hierarchy of cities. The PNPOT rather supplies directives for this definition to be made at a regional level, and that is why each PROT uses its own criteria. Territorial relevance can also be inferred by the consideration of two major incentive programs, financed by the European Structural Funds. It can be supposed that cities which have had PROSIURB projects, in the early 1990s, and more recently RUCI[120] projects approved and implemented, will have their structural capacity and ability to construct inter-regional networks increased.

Moreover, the interpretation of the various incentive programs financed by European Structural Funds, usually denominated as commercial urbanism projects, through the number and nature of projects approved, can produce insightful knowledge into each city's retail modernization capacity and amount of investment that has already been spent. In programs such as MODCOM, or the individual application of URBCOM, it is not a municipality that applies to the financing, but individual promoters. In this case, it is more difficult to assess the impacts of the project because the interventions are small, closed and private, rather than large, restructuring and integrated. Furthermore, almost every city has had at least one individual project approved (that is why in Annex 2 almost every city appears as having URBCOM and MODCOM), but the number is neither a sign of quality nor even of quantity. For example, Aveiro had only one individual URBCOM project approved, but that was a large and integrated investment of about 500 thousand euros, whilst Bragança had 86 projects approved, which only amounted to a total investment of 11 million euros. Global URBCOM projects are more comparable, but the number of cities which had them is much more limited. The MERCA program is still in operation, so there are as of yet no available results.

In 2005, through the INTERREG IIIB SUDOE program, a network for the promotion of medium-sized cities in the European Union called CIUMED[121] was created. Some Portuguese medium-sized cities belong to this network, which can reflect their degree of interest in promoting their assets at a European scale and also their openness for inter-city international cooperation, especially when European structural funds are concerned. For some cities, the separation between 'strong growth' and 'slow and stagnated growth' applied by Carvalho and Sequeira (1999) was also considered.

Lastly, a survey of large-scale multi-commercial establishments was performed. A larger commercial survey was not feasible at the earlier stage of city selection, and the lack of available data on commercial spaces for the average public or even scientific researchers was once again strongly felt. Consequently, the search was limited to larger establishments, whose information was easier to obtain and whose number can show the openness of each city's commercial hierarchy to modern formats. A search process which included internet browsing, consultation of the APCC, the Portuguese

[120] Redes Urbanas para a Competitividade e a Inovação – Regional Networks for Competitivity and Innovation. This is an incentive program, part of the POLIS XXI policy for cities, whose financing of 15 million euros for each city network is assured by Operation Programs under the most recent QREN (2007-2013). Its main goals is to support a common strategy for a network of cities by strengthening their creativity, innovation and internationalization capacity.

[121] http://www.ciumed.org/PT/home.htm

Association of Shopping Centers, and personal informal contacts with some inhabitants of some of the cities produced a list of shopping centers, both large scale and of first and second generations with relevant dimension. It is assumed that this list may not be complete, particularly where the older small scale in-city shopping centers are concerned. It is also relevant to point out that of all the 28 cities presented in Annex 2, only Beja, Évora and Tomar still do not have a shopping center, although all cities have projects under way.

Considering all these criteria, the four Portuguese cities that were selected as case studies for this investigation were Vila Real, Aveiro, Leiria and Évora. As it can be seen in Figure 23, these four cities occupy distinct geographical positions in Portugal. Vila Real and Évora are in the interior North and interior South respectively, whilst Aveiro and Leiria are in the littoral, nearer the center of the country.



Figure 23 - Geographical position of the four selected case-study cities

These cities cover the established demographic range. Vila Real has a population closer to the lower limit of 20 thousand inhabitants, Aveiro has a population closer to the upper limit of 60 thousand, and Leiria and Évora occupy intermediate positions. Despite the fact that each city is a district capital, they serve different areas with different roles in the country's network. The littoral cities of Aveiro and Leiria are Level 1 poles and are the center of larger, denser and more developed urban areas. On the other hand Évora and Vila Real are more isolated and have a greater population dispersion outside the city limits, but constitute, at the same time, poles of regional importance because they are the structuring elements of a vaster, less dense, less endowed area. For example, in the recent PROT North, Vila Real has been promoted as a city of regional equilibrium. This can be the reason why both Vila Real and Évora have had PROSIURB and RUCI projects. They need network dynamics in order to stay competitive, unlike Leiria and Aveiro, which due to their size and their stage of development have the capacity to generate enough attraction on their own. Much for the same reasons, and due to

the disparities between the littoral and the interior in Portugal, Carvalho and Sequeira (1999) have considered Aveiro and Leiria has having strong growth and Évora and Vila Real as having slow or stagnated growth. This of course also translates into the amount of commercial urbanism projects these municipalities have had, and the openness to large scale private investments. Aveiro's municipality has, understandably, invested less in commercial urbanism projects. It has had only one single URBCOM project of 500 thousand euros of investment approved[122], and 79 PROCOM projects constituting 1 million euros of investment. But at the same time it is the city that has more in-city large scale shopping centers (five) and more small arcades and first generation shopping centers. On the opposite side, Évora has had very little penetration of modern formats. The city has only one commercial arcade, the only existing small scale shopping center has been closed for several years, and the large scale shopping center is still in a very early construction stage. At the same time Évora has been the city that has invested more in commercial urbanism projects. It has had 55 URBCOM projects constituting 8 million euros of investment and 45 PROCOM projects constituting 650 thousand euros of investment. Leiria and Vila Real have more balanced commercial distributions. Both cities have had about 5 million euros of investment in commercial urbanism projects (Leiria has had 38 URBCOM projects constituting 5 million euros of investment and 27 PROCOM projects constituting 400 thousand euros of investment, whilst Vila Real has had 16 URBCOM projects constituting 3 million euros of investment and 66 PROCOM projects constituting a million euros of investment). Both cities have commercial hierarchies balancing older formats with an average amount of commercial arcades and first generation shopping centers. And, finally, both cities have one large scale specialized store and one large scale shopping center. If in Vila Real this shopping center, Dolce Vita Douro, has already opened in 2004, in Leiria, Leiriashopping has only opened in 2010, a little over 6 months before the field work took place. This nuance is another reason for the choice of these two cities. Finally, at the time of the initial selection process, Aveiro was part of CIUMED and the other three cities were not. But shortly after, during the course of the investigation, Leiria and Vila Real have entered that network. Only Évora is still not a part of it.

After the selection of the case studies, it was necessary to establish a limit for the study area in each of them. In order to achieve a coherence between the cities, and avoiding the need to define a set of parameters that would justify that limit, a choice was made to use the already drawn 'urban perimeter'. This boundary is defined by each municipality in the instrument of local planning, that is, in the PDM. The only city where this limit was not judiciously used was in Aveiro. Here, the commercial/industrial area[123] that characterizes the outer rim of most cities is, according to the local planning instruments, outside the urban perimeter. But in the other three cities, a similar area is within that limit. Therefore, as a matter of coherence in the comparative study of the four cities, the urban perimeter of Aveiro was slightly expanded.

[122] All the economic data has been retrieved from internet sources of the Ministry of Economy and of the Operational Programs concerning the application of Structural Funds.

[123] Where large scale shopping centers or specialized stores, outlet factories, car stands and other activities that require space are located.

5.2.3. VARIABLE SELECTION AND CHARACTERIZATION

As mentioned earlier, the variables that should be collected and inserted into the GIS model are of a threefold nature: commercial, morphological and organic.

In order to collect commercial data first it is necessary to define which type of commerce will be studied. The criterion used was simple. Every establishment with a physical presence in the city and with the ability of directly selling a good to an average consumer was considered. This includes all types of establishments from traditional stores to large scale shopping centers, from small itinerant carts to large fair grounds. It also includes large warehouses in industrial/commercial areas which possess a sales counter. It does not include, however, larger commercial explorations whose transactions are made by other indirect channels (like industrial supply networks, logistic platforms or international trade), and whose presence in cities is, if any, very limited. It also does not include e-commercial transactions. The impact of these types of commerce is in retail economics and transport logistics, and is less connected with the elements that constitute the form and structure of cities. E-commerce will nevertheless be considered as a perk of commercial spaces.

Using the knowledge gained on Figure 14 and in Section 3.3., it is possible to define the elements of each store worthy of measurement. These are synthetized in Figure 24. Some elements of store characterization, namely concerning private information of commercial companies, were discarded either because they were very hard to obtain or because they were deemed as less relevant to the present research. These variables include store output, management strategies, number of workers and opening hours.

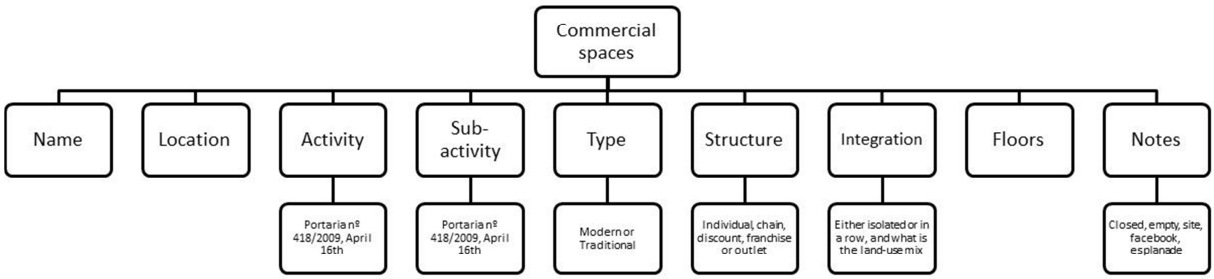


Figure 24 - Commercial data collected in the research

The ‘name’ and ‘location’ of each establishment require no explanation. For cataloguing the ‘activity’, the division presented in the Portuguese commercial legislation seemed the most logical. Therefore, according to the *Portaria* nº 418/2009 of April the 16th, a given store can have one of eight activities: (i) Food & Beverages; (ii) Fashion; (iii) Home; (iv) Home appliances and electronics; (v) Leisure and culture; (vi) Hygiene and personal care; (vii) Restaurants & Cafés; and (viii) Services and other activities. The definition of the ‘sub-activity’ follows the principles of the same document. With the information of the ‘activity’ and the ‘sub-activity’ it is possible to divide the commercial spaces into ‘retail categories’. As mentioned before, this is a more expedite division as it groups ‘sub-activities’ of different ‘activities’ which have the same functions and may behave similarly. Moreover it can overcome the problem of cataloguing one store with more than one ‘activity’. A choice was made to use the five categories proposed by Sarma (2006, Figure 15), namely M1 (Multipurpose 1), M2

(Multipurpose 2), MC (Multipurpose-Comparison), C (Comparison) and S (Single Isolated Purchase). According to the author, **M1** stores are '*establishments that cluster to attract mainly multipurpose shopping; the patrons of these stores will not usually engage in search because expenditures on the goods involved, and quality and price variations between stores, tend to be insignificant compared to the associated search costs*'. These stores are usually the most common in urban areas because they are related to first necessity goods of local accessibility. **M2** stores are practically similar to M1 stores '*in that they cater to multipurpose shoppers, but they need a larger costumer base*'. These include, for example, banks and bookstores. **C** stores cater '*mainly to single purpose comparison shoppers; consumers will perceive some net gains to search while acquiring the goods such stores sell*', while **MC** stores rely '*on externalities created by a combination of multipurpose and comparison shopping*'. Whilst C stores gain weight with 'Home' products, 'car-related activities' and some services, MC have most of their weight due to 'Fashion', 'telecommunications' and 'sporting goods'. Lastly **S** stores are '*establishments that cater to single isolated purchases, i.e. neither multipurpose nor comparison shopping is important for their business. These firms locate in retail business for extraneous reasons*'. If S type services locate in city centers, most S type stores require space and are, theoretically, in outer rims or edge-roads.

Obviously, Sarma's activities do not exactly match with those of the Portuguese legislation. Using the Portuguese legislation as a base, 113 sub-activities were defined and divided into the 8 proposed categories. Only after that were each of the sub-activities allocated to the 5 retail categories. The results are presented in Figure 25 bellow. Each of the 8 activities also possesses an extra sub-activity, namely 'others', to account for stores that cannot be properly defined by the known definitions, because their range of products is either too varied or too specific. The choice of retail category depended on the type of store in question and is different for each 'other' considered.

Discussions about the 'type' of store have already been presented in Section 3.3. It was proposed then that the existing definition on 'modern' and 'traditional' presented in Portuguese literature, namely Fernandes *et al*'s (2000) definition, was outdated. Yet with the changing values of commerce and commercial establishments, the definitions have blurred and overlapped. Older retailers, for example, have updated their store formats whilst presenting the same 'traditional' products. Therefore, any separation between 'traditional' and 'modern' is, inevitably, bound to subjectivity. In this research the dealer type, the location and the function were not considered as elements able to define store type. Instead, a store was considered 'traditional' if it possessed a store look, format and sales type that could be considered as typical *before* the commercial revolution, namely older establishments with counter sale and without perks such as a treated shop window. Even if stores are individually owned, in main streets and with 'traditional' products, but present a 'clean' and 'modern' look, a lighted and careful product display and allow for product browsing they cannot, in fact, be considered 'traditional'. The 'type' can also be 'others' in the case where multi-commercial establishments are concerned or when the activity cannot be ascertained because the store is either closed or empty.

Activity	Subactivity	Category	Activity	Subactivity	Category	Activity	Subactivity	Category
1. Food & Beverages	Health food store	M2	4. Home Appliances and Electronics	Air Conditioning	C	7. Restaurants & Cafes	Bar	S
	Café boutique	M2		Home appliances	C		Beverages	M2
	Tea house	M2		Lighting	C		Fast Food	M2
	Delicatessen	M1		Computers	C		Ice cream parlor	M2
	Frozen products	M1		Electronic articles and materials	C		International cousine	M1
	Candy store	M2		Repairs	C		Cafes	M1
	Herbal store	M2		TVs	C		Restaurants	M1
	Fruits and vegetables	M1		TV and video	C	8. Services and other activities	Car accessories	C
	Hypermarket	M2		TV/video/Hi-fi	C		Bank	M2
	Market	M1		Telecomunications	MC		Post office	S
	Grocery store	M1	5. Leisure and Culture	Sports goods	MC		Travel agency	MC
	Mini-market	M1		Audiovisuals	S		Funeral home	S
	Baker	M1		Articles for parties	M2		Real estate agency	C
	Fishmonger	M1		Toys	M2		Insurance agency	S
	Supermarket	M2		Hunting goods	MC		Needle and thread	MC
	Butcher	M1		Hunting and Fishing goods	MC		Hairdresser	M1
2. Fashion	Fashion accessories	MC		Movie Theater	S		Gas station	C
	Jewel store	MC		Video Club	M2		Articles for hairdressers	C
	Goldsmith	MC		Extreme sports	MC		Copy center	S
	Watches	MC		Discotheque	S		Beauty parlor	M1
	Shoe store	MC		Flowers and plants	M2		Gold buyer	MC
	Clothing	MC		Fotography	M2		Garage	C
	Optics	MC		Art gallery	S		Health club	S
3. Home	Vintage and second-hand articles	C		Musical instruments	M2		Laundry	M1
	Hand-made articles	C		Fun and games	S		Industrial equipment	C
	have-everythings	C		Bookstore	M2		Religious products	M2
	Bricolage	C		Multimedia	C		Pulverizors	C
	Decoration	C		Music	M2		Rent-a-car	S
	Construction equipment	C		Pet shop	M2		Shoe repairs	M2
	Safety equipment	C		Painting	M2		Shoe and key repairs	M2
	Home equipment	C		Press center	M1		Haberdashery	MC
	Home/garden equipment	C		Stationary/news stand	M1		Car stand	C
	Hardware	C		Theater	S			
	Tools	C		Sportswear	MC			
	Home hygienne	C	6. Hygiene and personal care	Cosmetics	M1			
	China	MC		Pharmacy	M1			
	Woods	C		Perfumes	M1			
	Construction materials	C		Natural perfumes and cosmetics	M1			
	Furniture	C		Perfumes and cosmetics	M1			
	Porcelaine	MC						
	Tapestry	C						
	Textiles	C						

Figure 25 - Activities, sub-activities and retail categories used in the research

The store ‘structure’ was divided into 5 categories, depending on the type of company that owns the establishment. Therefore the structure can be ‘individual’, ‘chain’, ‘franchise’, ‘discount’ and ‘outlet’. Stores are described as ‘others’ under the same conditions as above.

Store ‘integration’ entails two different definitions, the relative position to the nearest store and the type of land-use mix in the building the store is in. If stores are ‘*in the street*’, that is, if they are not part of commercial concentrations, they can either be located ‘door to door’ to another store, if they share a wall with it, or be ‘single standing’, if not. The buildings these stores are in can have residential, service or cultural uses as well as the commercial. If stores are part of a commercial concentration, they can either be located in a shopping center or in a commercial arcade. In this case, the buildings may also possess, generally in upper floors, other uses, of a residential and service nature. If stores are in commercial concentrations but facing the street (the ‘outer’ store of a

commercial arcade for example), they have the dual properties of the above mentioned types, and can be considered under a different category, as being in ‘commercial buildings’. The overlapping of the two different definitions results in 18 types of store ‘integration’, presented in Figure 26. For example, a store that is in a commercial street downtown, in a row (next door to another store) and in a building which also possesses services and homes is characterized as ‘door_to_door_services_residential’, that is ‘d_t_d_serv_res’. If a store is part of a commercial arcade but has a direct street entrance, and is in a building with residences in the upper floors, it can be described as ‘commercial_building_residences’, that is ‘com_res’.

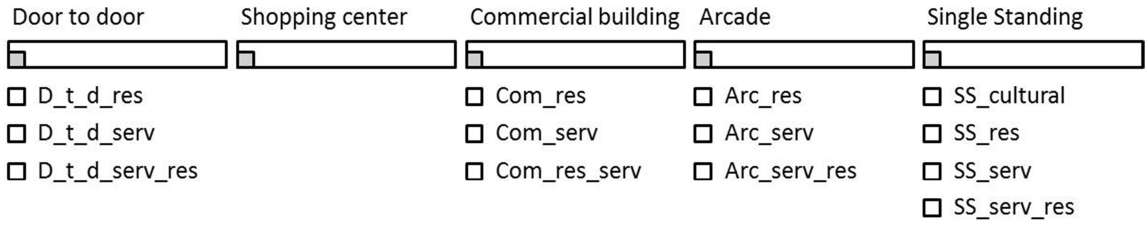


Figure 26 - Types of store 'integration'

The number of floors is a characteristic of the store building rather than the store itself, because practically all stores, with the exception of multi-commercial spaces, possess only one floor. Nevertheless, although the variable ‘floors of the store’ was not inserted into the model, it was taken into account in store characterization. Similarly, with the exception of multi-commercial spaces, practically all stores are in the ground floor of buildings, facing the street. However, because some individual stores may occupy upper floors and do not have direct access from the street (usually traditional or ‘alternative’ store types), a variable was inserted to consider if the store was on the ground floor or on an upper floor.

Lastly, other store characteristics deemed relevant were taken into account, namely the store status and some store perks. Store status was already discussed in Section 3.3. Stores can be ‘open’, ‘closed’ or ‘empty’. Closed stores show signs of an occupied store, but may not be open due to financial, restructuring or even health reasons. Empty stores are not occupied by any activity, and are either abandoned and derelict or waiting to be sold or let, as is the case of store spaces in newly constructed buildings. Stores can also be empty or closed because the activities therein have recently changed their location. This reason should also be taken into account when possible. Concerning store perks, the most important one chosen for this research was the existence of a web-method of sale and delivery. Store can be characterized as having or not having ‘blog’, ‘site’, ‘facebook’, ‘myspace’ or other internet platforms of product promotion and sale. Nevertheless, the ability to actually purchase online was not considered in this research, because that was not coherent with the definition of ‘commercial space’ established above. If that variable were to be considered, pure internet retailers (companies that do not have a physical store, such as amazon.com) should also have to be considered as well. Another perk that was considered as a study variable was the store’s ability to propagate to the street public space, as this has a direct bearing in a street’s morphological characterization. The most common is the existence of an ‘esplanade’ in street cafes and restaurants, but other elements can occur.

The second type of data to be collected and inserted in the model is the morphological data. First a digital model of streets and buildings needs to be made or found, so that the variables can be inserted

and treated in a GIS platform. This should be a standard model with lines representing streets and rectangles representing buildings, both of which able to receive characterizing information. Therefore morphological variables should be twofold: related to streets and related to buildings/blocks, as figure Figure 27 expresses.

Street analysis	Type of street
	Cross section
	Landscape
	Sidewalks
	Accessibility (Space Syntax)
Building/ Block analysis	Block typology
	Overall number of buildings and homes
	Distance between elements/stores
	Land-use mix
	Building occupation
	Building footprints (area)
	Height (floors) and volume
	Building age, style and preservation

Figure 27 - Morphological data collected in the research

Initially a street analysis entails the characterization of the street 'type'. This basically defines if the street is solely pedestrian, pedestrian with restricted car access, or if it has both uses (vehicular and pedestrian). In this case, the quality and the size of sidewalks should also be taken into account. These elements will of course condition much more 'in-street' shopping than that which occurs in big box developments. Space Syntax analysis can help define the measures of integration and betweeness each street possesses in relation to neighboring streets, at a local scale, and to the whole network, at a global scale. The analysis of the street's cross section can also reveal the street size and the characteristics of the building facades. The first element is a quantitative variable but the second possesses some degree of subjectivity and is harder to quantify. It is both related to the relationship between buildings (which can be obtained through the store's integration) and the characteristics of the building itself. Because of time and resource restrictions, the collection of these variables for all buildings did not seem feasible, so only buildings with commercial occupation were considered. These may be deemed representative of certain block sections in terms of size and age, and by simple inference it is known that the other buildings possess either solely residential occupation, administrative or cultural functions, or else services not present in the eighth activity category, 'Services and other activities' (non-commercial services), as is the case, for example, of medical offices.

Building and block characterization should start with the analysis of block typology. Because of Joosten and van Nes's (2005) conclusion, this is a point that should receive an extra care. Block typology can be characterized in four types: 'full', 'semi-hollow' (or 'semi-full'), 'hollow' or 'non

block'. The overall number of buildings and homes within a block, or at least a sub-section[124], are quantitative variables which can supply useful characterizing information. Variables related to distance (between built elements, between stores and between store types) are easily measured and can produce knowledge on pattern dispersion and be compared with mobility and accessibility variables. The land-use mix of average blocks can be at least estimated to a certain degree by what has been explained in the preceding paragraph. But in densely commercial areas, this type of block characterization becomes much more complete because by defining the store's 'integration' the land-use of buildings with commercial activity is unequivocally retrieved. To this element the variable of 'building occupation' should be added. Before, store space was characterized as 'closed' or 'empty', but that does not offer knowledge on the occupation of the *rest* of the building. It was observed that in many pedestrian downtown main streets some buildings with 'traditional' commercial occupation in the ground floors had derelict and apparently abandoned upper floors. Consequently, a variable was added to define if the upper floors of commercial buildings were occupied or not. Buildings can also be characterized by three physical indicators: height, area and volume. The first is a consequence of the number of floors whilst the other two do not need to be collected because they can easily be calculated in the model. Lastly, buildings can be characterized by their age, style and preservation. If the first is a quantitative variable, the others are subjective concepts and have, especially style, a strong architectural connotation, which falls out of the capacity of this investigation. These variables were consequently not inserted into the model, but were instinctively taken into account in the block characterization.

The third type of data to be collected and inserted in the model is of an organic nature, that is, it should relate to the city's intrinsic nature and daily processes, which can be directly and indirectly connected with the morphological and commercial realms. These are synthetized in Figure 28.

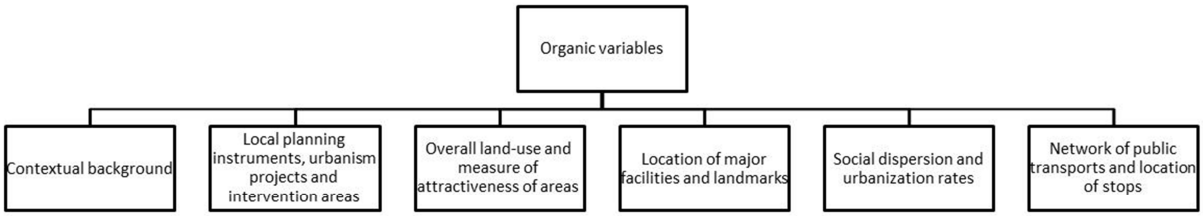


Figure 28 - Organic variables collected in the research

Cities are the outcome of an evolutionary process that comprises historical, geographical, social, economic, morphological and land-use elements. Consequently, a background analysis of these elements needs to be, even if only briefly, performed, in order to supply a context for the subsequent analysis of each city. Furthermore cities occupy a certain position in the urban network, so the role they perform needs to be ascertained. At a local scale, the instruments of local planning should also be interpreted, not only in terms of overall land-use and morphological directives, but also particularly in

[124] A subsection is the smallest territorial unit the Portuguese Statistics Institute (INE) gives information about. It represents the smallest homogenous area, constructed or not, inside a given Parish. In urban areas it usually corresponds to a block.

terms of the directives and articles directly or indirectly concerning commercial activity. The understanding of these instruments, along with the comprehension of already implemented commercial urbanism projects in certain areas, produces knowledge on what has been planned and performed in the city. Some of these analyses have already been done when selecting the case studies. Moreover, cities will have, in parallel with a given commercial and morphological distribution, a network of other land-uses and particularly of major facilities and landmarks, which act as attractive nodes and may certainly influence activity dispersion. The measure of attractiveness of certain areas, with or without commercial use, can also be obtained through the Space Syntax analysis discussed above. This dispersion may be a consequence or a cause of the urbanization rates and of the population patterns. The comparison of these patterns with commercial patterns is also crucial and represents another introduction of the 'Sociological' component and, indirectly, of the 'Economic' component. Lastly, as many works on the subject have already discussed, the system of public transport and the location of stops can also influence store location, so these variables should also be retrieved.

The most important elements that constitute the three major types of data discussed above should have, if possible, a *temporal* connotation, so that evolution patterns can be produced. The temporal analysis should be mostly concerned with the evolution of the activity/sub-activity/category of shopping spaces (changing patterns of distribution), with the physical and geographical evolution of streets/blocks/buildings, and with the organic evolution, namely in terms of statistical social data (inhabitants and their dispersion). This was, unfortunately, very difficult to obtain because, as it will be discussed in the next subchapter, there was an enormous lack of available information. An attempt was made to select other variables that could, to a certain extent, replace the ones that could not be obtained. Consequently, because only the present snapshot of commercial spaces could be gathered (through field research), the age of buildings was used to give some temporal scope to store evolution. Obviously, this produces a poor insight on the changing activities of a given place, but can offer conclusions on which activities look for newer city spaces and if these activities correspond to those that should, theoretically, exist in other places. The physical evolution was easier to obtain, at least in terms of 2D town plans. Yet this also produces little knowledge on the evolution of 3D fabric and land-use mix. Fortunately, all data retrieved from the Census, including number of buildings, inhabitants, families and homes, could be obtained at a subsection scale for 2001 and 2011. INE, upon request, was unable to supply data from 1981 and 1991.

5.2.4. DATA COLLECTION

After establishing a first iteration of the data to collect in order to answer the research questions, a series of steps, synthesized in Figure 29, were taken in order to assure that it could be retrieved.

The first consisted on an initial contact with the four Municipalities. This occurred during the second half of 2010 and it was done first via telephone, to introduce the research and the researcher to the proper departments, and then by e-mail, repeating the same information and addressing the respective Mayors. This e-mail requested three things: first that a meeting could take place so that the research could be presented face-to-face to the concerned parties in the municipality; second the city's present cartographic elements, preferably in shapefile[125] format, as well as other past cartographic elements that could reveal the morphological evolution of the city in the last 30 years (or at least access to

[125] The shapefile format is the one accepted by ArcGIS software.

them); and third any data that the Municipality eventually could have concerning commerce and commercial urbanism projects.

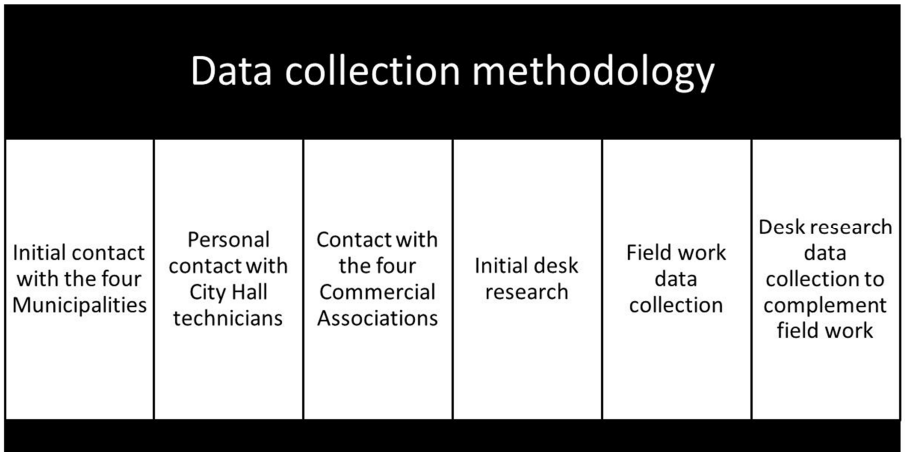


Figure 29 - Data collection methodology

This led to a personal contact with City Hall officials of the respective departments responsible for this information, although the amount and nature of this contact varied from city to city. In Vila Real and Aveiro there were several meetings held in the City Halls where the research was presented and discussed. The contacts in Vila Real were Eng. José Carlos Fernandes (director of the department of Planning and Coordination) and Dr. João Gonçalves (division chief of the Geographical Information division). In Aveiro the contacts were Dr. António Soares (Mayor's Assessor) and Dr. Paulo Mesquita (also division chief of the Geographical Information division). In Évora, the contact, with Dr. Carlos Borrallho (GIS technician), was done exclusively via e-mail. In Leiria, unfortunately, e-mails were never answered and phone calls proved fruitless as the operators suggested the sending of an e-mail. Some of the information requested was eventually sent via letter without warning nor explanation by Dr.ª Susana Neffe (Division of Planning and Territorial Strategy) and no further contact was pursued by the municipality.

These contacts and meetings were only mildly successful. They practically only served to obtain the current digital cartography, which constituted the backdrop of the GIS model. In Vila Real the municipality was also able to supply the digital cartography for 1993. In Aveiro, the present cartographic information is the responsibility of another entity, CIRA[126], so, through Dr. António Soares, contacts were made with Drs. Olga Cravo and Adriana Jacob of CIRA in order to obtain it. The Municipality was able to supply, nonetheless, cartographic information for 1981 and 1984. Both the information of Vila Real and Aveiro arrived in Autocad format, so a conversion to the format supported by ArcGIS was necessary. This was done using the 'Map 3D Export' tool of Autocad. Concerning the rest of the requested information, municipalities proved that they have a lack of treated and available data on commercial spaces (no overall commercial data, no distribution maps, no information about activities, etc). Furthermore the 'organic' data municipalities were able to supply (concerning inhabitants, buildings, etc) proved to be a mere reproduction of the data that can easily be obtained from INE. All municipalities (with the exception of Leiria) expressed, nonetheless, an overt interest in the research.

[126] Intermunicipal Community of the Region of Aveiro.

More unsuccessful was the approach to each city's Commercial Association. Of the four contacted Commercial Associations, only Évora's answered and, almost paradoxically, expressed that it did not have any of the data requested, and dutifully supplied the phone number and e-mail of the City Hall.

Assuming that there was no other way to retrieve the needed information except by researching it from scratch, the last three stages of the data collection methodology were immediately put into action. First, in the last quarter of 2010, an initial desk research was made, in which the exploration of internet databases proved to be paramount. The site of INE was able to supply all the data from the CENSUS concerning inhabitants, buildings, homes and families at a subsection level. The sites of the municipalities supplied background information on the cities and their points of interest and permitted the download of the local planning documents. Sites of public transport companies supplied the routes and the location of stops. Aerial map sites such as *maps.google* and *bing.com/maps* supplied a first contact with the cities and were instrumental in assisting morphological data collection in the field. Unfortunately, the tool 'street view' is unavailable for the four cities, something which would have simplified the work considerably. Sites of multi-commercial spaces supplied information about the store-mix, perks and opening dates. Most importantly, the digital yellow pages, the digital directories of Portuguese companies and other similar sites were able to supply, after careful selection of the cities and of the type of company and activity, information about the name, activity and location of all the commercial companies enrolled in those sites. At first it was assumed that this would dramatically decrease the amount of field work that needed to be done. Consequently, the last few months of 2010 were spent in a vast research and cataloguing process using all available company indexes as sources. The outcome was a series of tables, by street, of all the commercial companies therein. Unfortunately, the first few days on the 'terrain' showed that this work was futile. The tables only rarely matched the reality of the street, because they were incomplete (a consequence of the large variety of shops not enrolled in digital directories), because the companies in the tables had already moved or closed and had been substituted by others, or because they showed the location of the company's legal address, and not of the store address. Other research involved more literature review, particularly concerning existing studies on the four cities. The already mentioned study by Cachinho (2002, *cit i*n GECIC, 2005; Figure 10) presented a hierarchical commercial model of Leiria. But this model only considered location, type and activity of the commercial spaces, it was restricted to the central area of the city, and no morphological variables were collected. Other studies, mainly done in a geographical perspective, had a similar nature. However Domingues' book (2006) on urban transformation in medium-sized cities in Portugal provided background information on the cities and supplied an important addition to the temporal scope of the research. The current cartography supplied by the municipalities is comparable, but the past data is not, first because it was not retrieved for all cities and second because when it was the various elements do not correspond to the same time period. Past cartographic information supplied by Aveiro's municipality dates from the early eighties, Vila Real's is from 1993 and data from the other two cities was not supplied. Consequently, Domingues' book overcomes this gap in the collection of compatible built landscape layouts in distinct time periods because it presents, for the four cities, 2006's and 1975's town plan. Other documents, already perused when analyzing commercial urbanism projects in Portugal and pre-selecting medium-sized cities, such as Moreira *et al*'s (2006), were able to supply additional information. Yet this information was not enough. It practically only covered the 'organic' variables. The 'commercial' and the 'morphological' variables had to be obtained in the field.

During the course of 2011, each of the cities was visited in turn. Permanence periods averaged a month. Vila Real's data was collected during February and March, Leiria's during April, Évora's during May and Aveiro's later in the year, during November. The approach taken was simple. Aided by the map already created in the GIS platform and the bird's eye view maps obtained in *maps.google*, every single street inside the urban perimeter was covered on foot. In each street every single commercial establishment was found, seen, catalogued according to the criteria in Figure 24, and photographed. The photographic library thus created not only serves as a future reference but also facilitated the later desk work of introducing the collected variables into the GIS model. The observation was done, in order to save time, from outside the shop. Only when it was difficult to perceive the elements of store characterization from the outside, was the observation carried inside. Only very rarely were conversations with store clerks engaged, because the elements more difficult to perceive visually, namely of 'store structure' and 'web-connection' were on a later stage researched online. At the same time, and using the same principles, street and building characterization variables, according to the elements in Figure 27, were collected, with the exception of the physical quantitative elements, namely accessibility, distances, areas and volumes, which could later be calculated in the GIS model. This way 7.898 individual stores and hundreds of streets were catalogued, one by one. Figure 30, from a photograph taken in Évora's city center, exemplifies how observation and note-taking techniques in the field combined with extensive photographic work produced an expedite method of retrieving the needed information in the least possible time frame.



Figure 30 - In-situ data collection

After this extraneous field work methodology was completed, further data was found using mostly internet sources. The 'store structure', when not known, was searched first in the official sites of the stores and then, if this proved fruitless, in the several online company directories. If again this did not

reveal the necessary information, and a google internet search provided no solution, the store was considered as 'individual'. Obviously the internet was also used to determine the degree and nature of the web-connection of every single store.

5.2.5. CONSTRUCTION OF THE DATABASE

When all the elements were collected, the database was constructed. Using the GIS platform ArcGIS 9.3, a file was made for each of the four cities. The basis of each file was constituted by the most recent digital cartographic information that could be supplied by the municipalities. On that basis, the collected data was uploaded.

Commercial data was entered in the rectangle that constituted the building the store was in. It was assumed that the store covered the whole footprint of the building. If more than one store existed in the same building, either because they were 'door to door' on the ground floor or because the stores were in different floors, the building was divided in equal parts into smaller rectangles. The exceptions to this rule were the cases of commercial arcades and shopping centers. These were considered as a single entity, and no separation of the inner stores was attempted in the model as this would considerably hinder the visual representation. The type and characteristics of the stores in those concentrations were nonetheless taken into account in the analysis. If the building was of recent construction and the respective rectangle was not in the supplied model, it was drawn with an average area similar to surrounding elements.

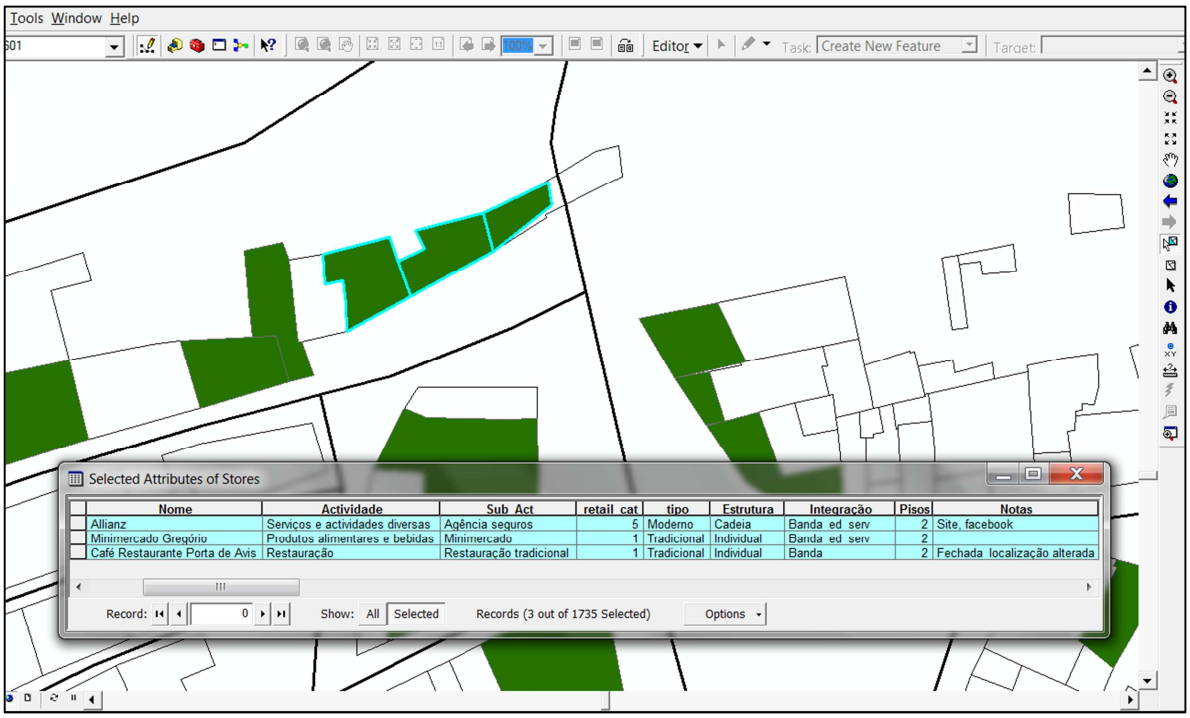


Figure 31 - Print-screen of a section of Évora's model in ArcGIS 9.3., and of the respective attribute table. Stores are represented by the green color. Selected stores have a light blue outline.

An example of how the commercial variables were introduced into the model is presented in Figure 31 which shows the same three stores of Figure 30. The table of attributes was made in the Portuguese

language, as this database is much more useful to Portuguese researchers than any others. It can be seen in that table, for example, that of the three stores only the insurance agency 'Allianz' possesses internet connection. The retail categories ('retail_cat') were numbered from 1 to 5, where M1 is 1; M2 is 2; MC is 3; C is 4 and S is 5. It was known that the Restaurant 'Portas D'Avis', despite being closed, had changed its location, because there was an equally named restaurant on the other side of the street in a relatively newer site.

Because the stores in the model are represented by closed geometrical figures, approximate areas can be calculated and, due to the introduction of the number of floors, so can the building volumes. Building age was defined according to the maps by Domingues (2006) which separate buildings constructed before 1975 and after 1975. Instead of introducing this variable into each building, which would be a time consuming process, the maps by Domingues were scanned in the highest resolution possible and then inserted into the model to exactly match it, through a georeferencing process using the toolbar of that same name of ArcGIS 9.3. By considering Domingues' color code, the pre-1975 buildings could be selected and a new variable in the attribute table was introduced accordingly. The same was made for the post-1975 buildings. The information for other periods (1993 for Vila Real, 1984 for Aveiro) was also inserted into the respective models. Figure 32 shows an example of a neighborhood in Évora where Domingues' map is imposed over the model. Red represents post-1975 buildings and black pre-1975 buildings. It can be seen that since 2006 there has already been new construction in this particular area (represented by the buildings without color). This constitutes yet another temporal variable. The georeferencing toolbar is open.

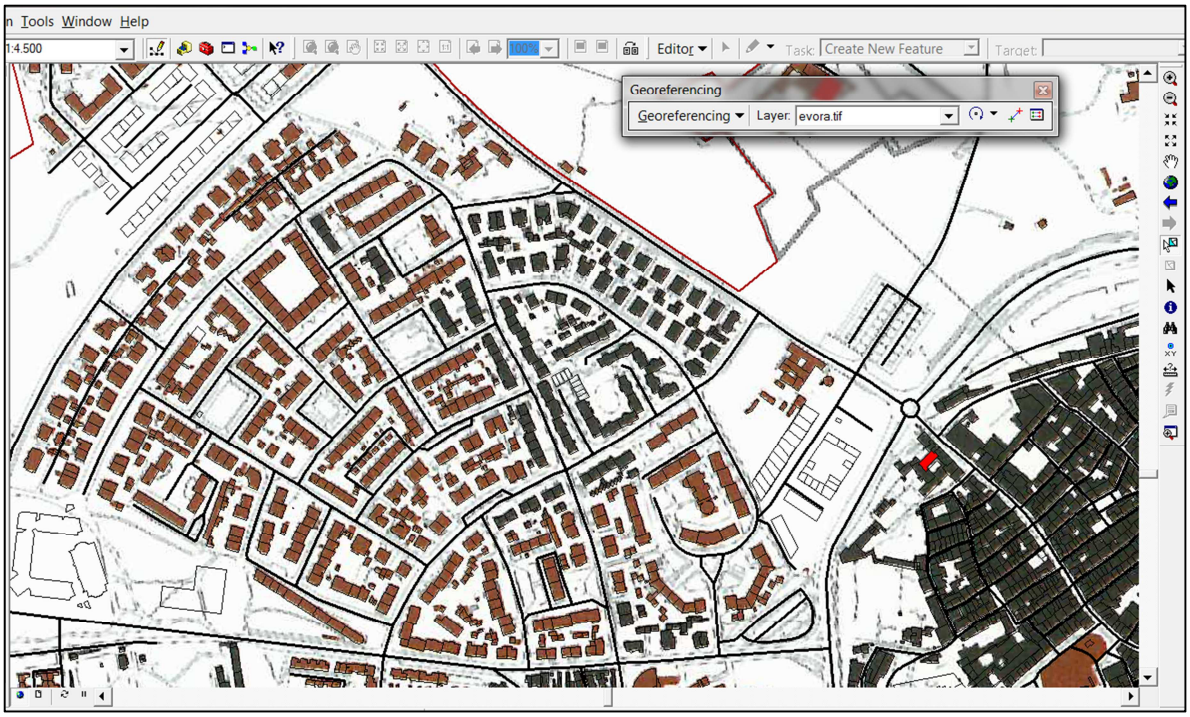


Figure 32 - Detail of one of Évora's new neighborhoods, where Domingues' (2006) map is imposed over the model. Black buildings were constructed before 1975, red buildings after 1975, and white buildings were constructed since 2006.

The perspective shown on Figure 32 also explains how for each block the 'block typology' could be easily characterized. In the lower right corner of the image, which represents part of the inner-walls city center, it can easily be seen that most of the blocks are full. In the new neighborhood on the left most blocks are either hollow or semi-hollow.

Concerning streets, most of the information was not inserted into the model. The type of street was already in the attribute tables of the files supplied by the municipalities. The characteristics of the urban landscape and of the sidewalks do not constitute quantitative variables and so were only considered when analyzing particular areas. Nevertheless, for determining the accessibility of each street a more careful approach was taken. The drawing of axial lines for Space Syntax analysis was not considered because it constitutes a time consuming task and, as this parameter is only one of the various morphological definitions used in this research, that effort was deemed excessive. Therefore, a more expedite method was conceived, that would be easier to implement but still be valid. As mentioned in the literature review, road center lines can, if properly treated, be used in the Space Syntax methodology. In this case, that methodology is used not in axial terms, but in segment terms, because the road lines are constituted by various segments. Also because of this the distance used was a 'metric' distance. As seen in the image above, road-center lines can have circular elements, more than one line depicting, for example, crossings or two-way streets with separate lanes, and reproduce unnecessary roads such as access lanes to garages or parking lanes, that would only influence negatively the performance of the model. Consequently, it was decided that the road-center lines needed to be treated.

First it was necessary to have the complete road-center lines file. In the case of Évora, as seen in the images above, this was easy, because the file for the entire urban perimeter was supplied by the municipality. In the case of Vila Real, only the lines of the central portion of the city were supplied by the municipality, so the rest had to be manually drawn. In both Leiria's and Aveiro's cases, the file containing the road center lines also contained lines depicting the sidewalks and the division of blocks and plots. In both these cases, road-center lines had to be selected one by one and then extracted. Once the four road-center lines files were obtained, the conversion to usable segment maps was initiated. This consisted of two phases. The first was the application of an ArcGIS tool named 'simplify line'. According to the ArcGIS desktop help, this tool '*simplifies a line by removing small fluctuations or extraneous bends from it while preserving its essential shape*'. Figure 33 reproduces the illustration on the ArcGIS desktop help.

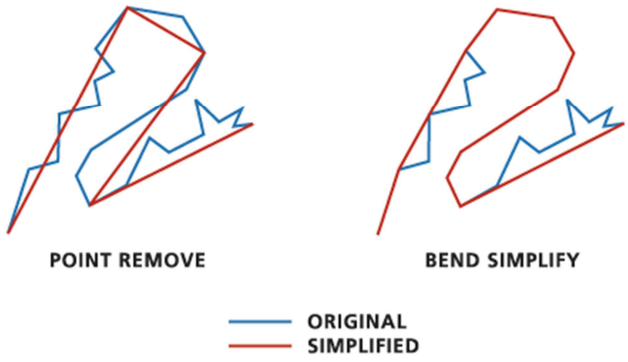


Figure 33 - Concept behind the use of the tool 'simplify line' (source: ARCGIS desktop help)

This tool possesses two simplification algorithms, 'point remove' and 'bend simplify'. 'Point remove' keeps the critical points that depict the essential shape of a line and removes all others, whilst 'bend simplify' keeps the main shape of a line and removes extraneous bends. For each algorithm, a degree of simplification, named 'tolerance', needs to be inserted. For 'point remove' this tolerance is the maximum allowable offset. For 'bend simplify' it is the length of the reference bend baseline. Both are measured in meters. The two algorithms were then tested with different tolerances. It was soon proved that the 'point remove' algorithm produced better results because it better approximated road center lines to segment lines according to Space Syntax parameters. After the decision to use 'point remove' several tolerances were tested. As the tolerance increases, so does the angularity of the line. This angularity was diminished as far as possible, and a tolerance of '5 meters' was reached, as the one that produced the better overall results, that is, the ones that required less subsequent treatment on the second phase. Consequently the second phase consisted on a manual correction, when needed, of the segments. The files supplied by the municipalities sometimes possessed errors like lines that did not connect or two overlapped lines. They also had, as expressed above, unnecessary lines that needed to be deleted. Furthermore, the simplification made by the algorithm was sometimes either too little or too much. Roundabouts were obviously replaced by intersecting lines and main crossing and streets were treated with more care, using the principles of axial line drawing. The result was four segment maps, one for each city, that resembled as much as possible Space Syntax axial lines.

These lines where then exported from ArcGIS to Depthmap[127], where the Space Syntax algorithm, using segment analysis and metric distance, was applied. The values of 'integration' and 'choice' were calculated for the entire network using 16 different radii, from the local street scale to the entire global scale, namely r= 100, 250, 500, 750, 1.000, 1.250, 1.500, 2.000, 2.500, 3.000, 4.000, 5.000, 7.500, 10.000, 15.000 and n. The resulting graph and the attribute table containing the information of 'choice' and 'integration' for all the radii was then exported back to ArcGIS, through another program, MapInfo. Using once again Évora as an example, a section of the model is presented in Figure 34, in which three lines can be seen, the original road-center line (black), the simplified line after the use of the ArcGIS tool (green) and the final line after the manual adjustments (red).

A choice was made to simplify roundabouts by making just one middle intersection (1). The image also shows a case where the simplification was excessive, and the simplified line crossed a series of buildings (2). This line was broken into two segments so that the curve could be accounted for. Large circular edge roads act on the same principle as free-ways and hence can be reduced to fewer segment lines (3). Lines were also broken to account for visibility elements that elude the road lines but are perceived by pedestrians (4).

[127] Depthmap is software developed in the UCL Bartlett School under the supervision of Bill Hillier, that is of free access for academic use and which can, among other uses, calculate 'integration' and 'choice' values for a given axial or segment map.

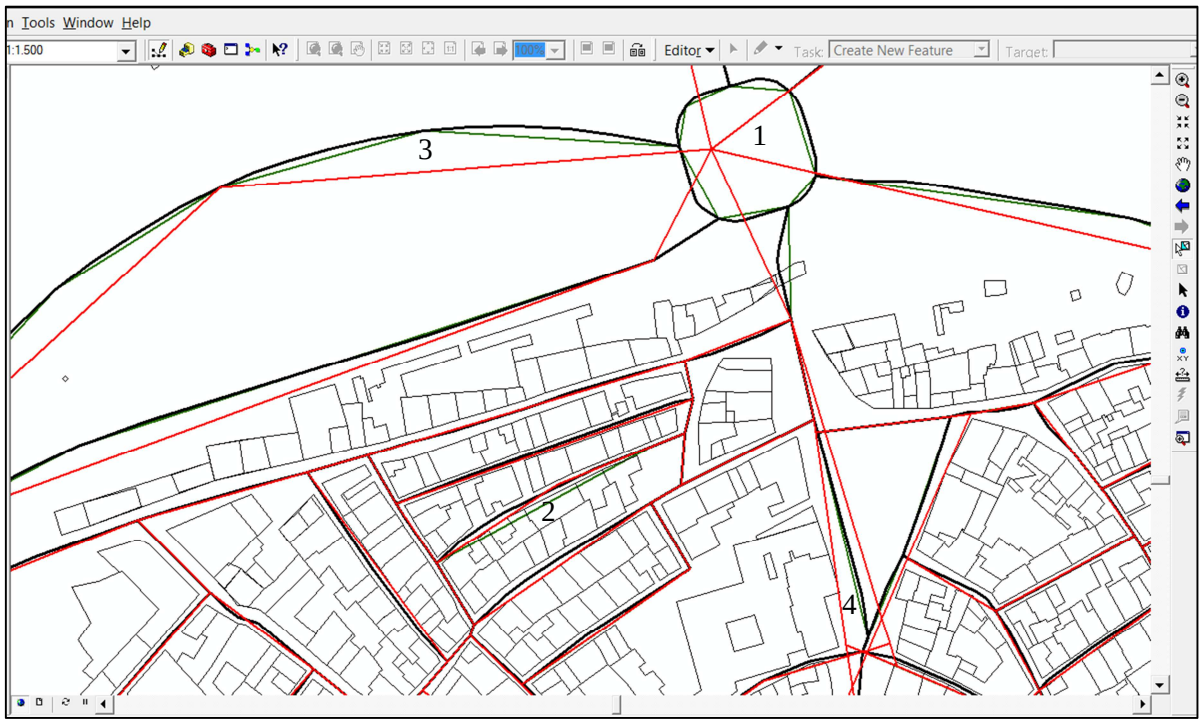


Figure 34 - Example of the conversion of road-center lines to segment lines in Évora. Road center lines are in black, the simplified lines after the use of the ArcGIS tool are in green and the final segment lines, after the manual adjustments, are in red.

Once the Space Syntax model was completed, a last step was devised in order to associate each shop to the segment line that serves it, so that the 'accessibility' of the shop can be calculated. For that, first the 'Spatial Join' tool of ArcGIS was used. This tool, according to ArcGIS desktop help, '*creates a table join in which fields from one layer's attribute table are appended to another layer's attribute table based on the relative locations of the features in the two layers*'. The relative location can be 'intersects', 'contains', 'is within' or 'closest'. Obviously, the 'closest' option was chosen. This way the tool associates each store to the segment line closest to it. The 'shop', that is, the rectangle containing the store variables, is then supplied with all the information of the closest segment line, namely the values of 'integration' and 'choice' for all different radii. But the blind application of this tool would be disastrous, because the line that is closest to a shop may not be the line that *serves* that shop. The same example of Figure 30 and Figure 31 can be given. In this case, portrayed in Figure 35, the store 'Allianz' is connected through the 'Spatial Join' to the line on its right[128], which is the closest line to the shop. But as Figure 30 shows, the entrance of the store is made through the line bellow it. Because the whole area of the building was considered as containing the store, because of the relative distance of the drawn building to the segment line (which will be greater the larger the street is) and because the tool does not know in which side of the building the store entrance is located, the 'Spatial Join' made several mistakes. In most cases of corner stores facing larger avenues, the 'Spatial Join' invariable associated, erroneously, the store to the smaller perpendicular street. It also associated many stores to the back, instead of the front street, just because the back street was narrower and the respective segment line was consequently closer to the building. Therefore, after the application of the tool, a manual correction procedure was carried out in all the stores of the model that needed it.

[128] This line appears to be crossing the building because there is a car and pedestrian passage underneath it.

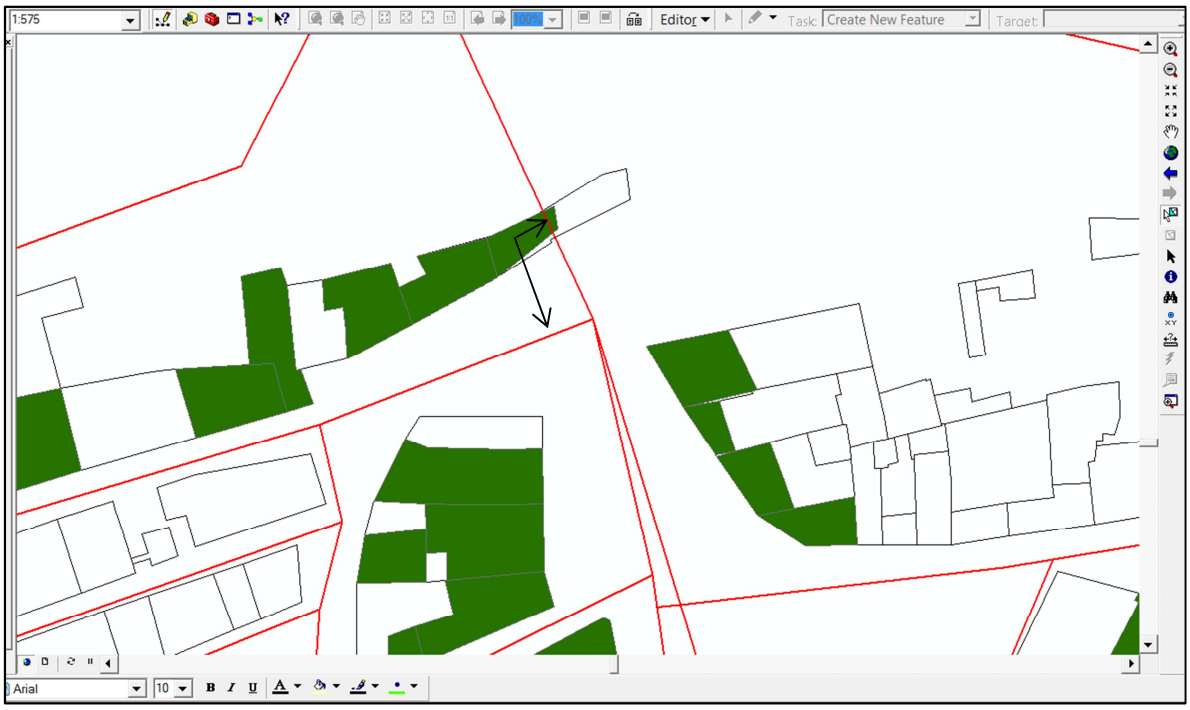


Figure 35 - Application of the Spatial Join tool

Lastly, the 'organic' variables were inserted in the model. Public transport lines were drawn, but not the exact location of stops. This was due to the fact that the sites of the public transport companies had only the route maps and the *names* (not the locations) of the stops. The approximate position of the stops could obviously be inferred by their names, but this imprecision would affect the validity of the calculations. Because the exact location of the stops could not be pinpointed without field data collection, and as there were no time resources for that (for they were spent in the commercial and morphological data collection, far more important to this research), a decision was made not to insert this variable in the model, and just to take it into account in street or block characterization (depending on the degree of precision inferred by the stop name). Major facilities and landmarks were signaled in the respective buildings in the model by a code in their attribute tables. The Census data, concerning quantitative variables of buildings, homes, families and inhabitants, was introduced in the attribute tables of the geometric shapes depicting the subsections (which were also uploaded) for 2011 and 2001. Figure 36 shows, for the same block containing the stores depicted in Figure 30, Figure 31 and Figure 35, the limits of the subsection and the Census information on the attribute table, for 2011.

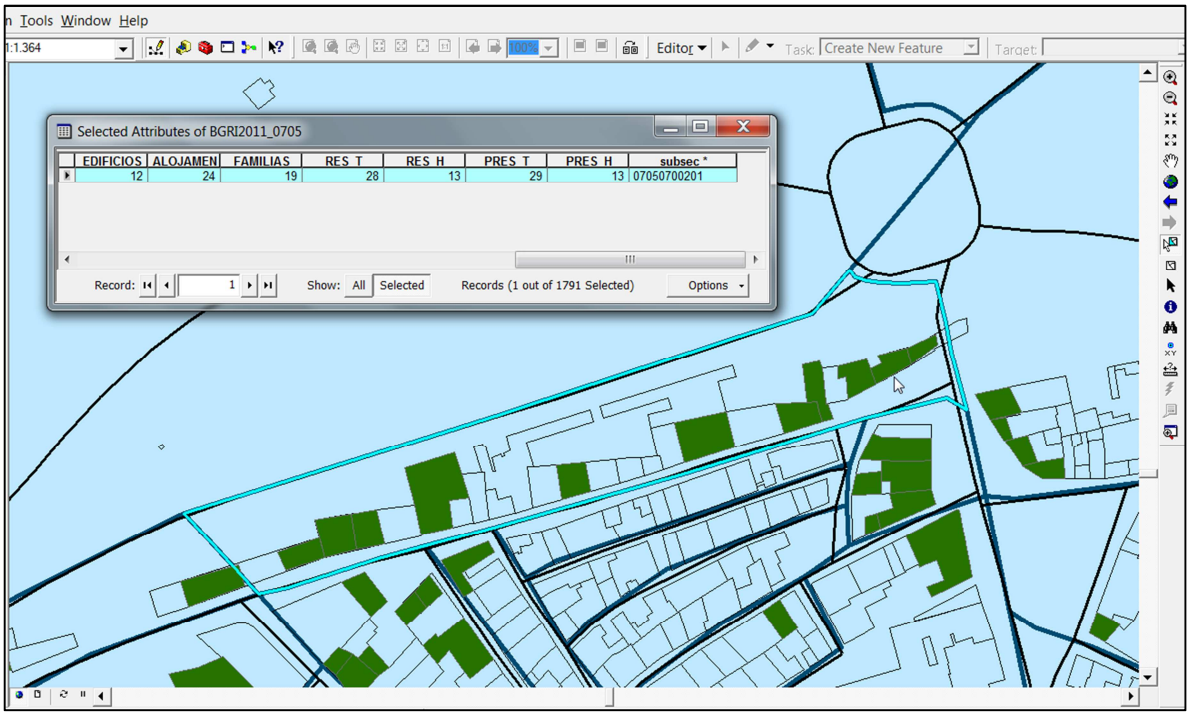


Figure 36 - Example of the division into subsections in the city of Évora. Streets are shown in black and the subsections are limited by a dark blue line. A particular subsection is selected and the Census information for that subsection is showing on the attribute table.

Other elements worked into the database were a consequence of the data treatment and modeling research techniques used in the case study analysis. The next sub-chapter, which concludes Chapter 5, explains how this analysis was devised and organized.

5.2.6. Analysis of the database

The last, and obviously most important element of the working methodology is the analysis of the database. The completed database, using all the procedures discussed above, consists of four GIS-models, one for each city, presenting the same scale and system of coordinates, which contain, in total, 7.898 individual rectangles depicting stores. Each store is characterized directly by 11 different parameters[129] and by the information of the line (street) that serves it, and indirectly by the data of the block it is in and by other morphological and organic variables that are not quantitative.

In order to answer the research questions and prove the validity of the research hypothesis, the database is interpreted using the methodology depicted in Figure 37. This methodology is particularly concerned with the answer to the first research question[130]. This is because the second research

[129] 'Name', 'activity', 'sub-activity', 'retail category', 'type', 'structure', 'integration', 'notes', 'area', 'number of floors of the building' and 'building age'.

[130] *What elements of the form and structure of cities, particularly micro-scale morphological characteristics of the built-environment, contribute to the location, characterization, and performance of commercial spaces? Are these characteristics, in turn, affected by the commercial spaces themselves?*

question[131] is immediately answered if it is proved that the constructed GIS-database is suitable to the requirements of the case study analysis, and because the second part of the third research question[132] can only be answered after the first research question is. Taken this into account, the methodology is composed of five types of analysis, which derive, to a certain extent, from the work that has already been presented in commercial literature. Yet each of these types is, according to the views expressed in this research, inevitably linked to each other. Because of this intrinsic connection, it is difficult to consider each of these parts as an individual step, as has been done before. They are rather cumulative steps, in a sense that they build on each other. Blocks and streets containing commerce, for example, have already been characterized as a whole, but they have never been characterized according to specific types of commerce, that is, the analyses have not taken into account the prior 'phases' of commercial characterization and assessment of the physical distribution of retail. Therefore, the circular graphic representation seems the most coherent. For the same reasons the term 'symbiosis' was chosen, because it defines continuous double way fluxes. In this case, it is assumed that the whole will *indeed* be greater than the sum of the parts, and it is this awareness that constitutes the innovative approach of this research.

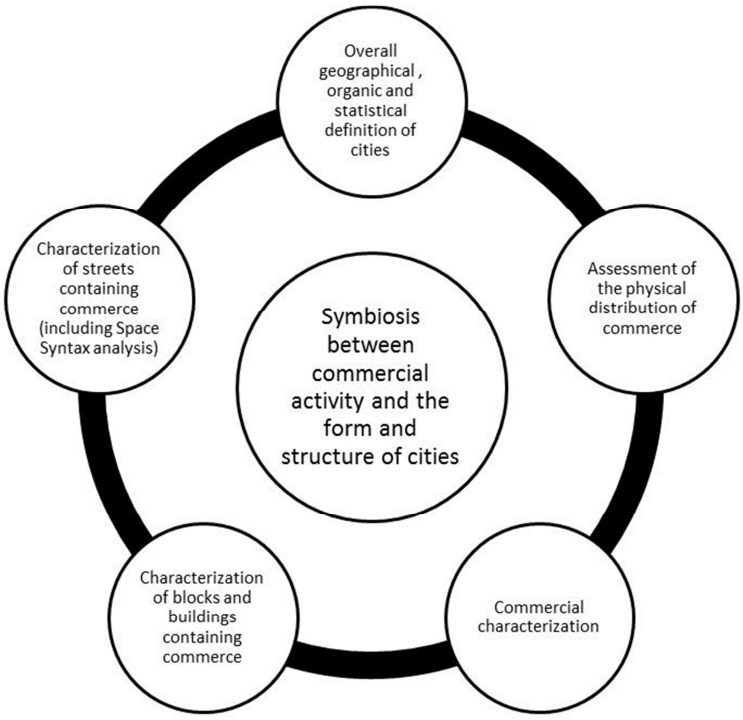


Figure 37 – Case study analysis methodology

Consequently, the analysis mixes these various stages. Nevertheless it will be presented, as much as possible, in a logical sequence to provide a clearer understanding. Therefore, it will start, in Chapter 6, with the basic characterization of the case studies, not only in order to provide a proper backdrop to

[131] *How can a GIS database be designed in order to accommodate the various elements that characterize the form and structure of cities and, at the same time, promote integration between the various fields of research and increase the knowledge on commercial data?*

[132] *How do Portuguese spatial planning instruments deal with the location and control of commercial spaces? Can the morphological understanding of commerce inspire guidelines for future planning regulations so that commercial spaces may be more aptly used as an integral element of the 'regeneration thesis'?*

the subsequent analysis, but also to familiarize the reader with the history, geography, form and structure of these cities (*overall geographical, organic and statistical definition of cities*). Then, set against this urban backdrop, Chapter 7 contains the definition of the 'location, location, location' of stores and of the hierarchies they form (*assessment of the physical distribution of commerce*). The knowledge of each location within a given context is then enriched, in Chapter 8, with its *commercial characterization*. If this has already been done before, although never to such an extent (in terms of number of cities, extension of city area, number of stores considered and number of variables), the novelty is that, mounted on that commercial characterization, and *inseparable* from it, a *morphological characterization*, presented in Chapter 9, is done, of the store, of the building containing the store, of the street serving the store and of the block containing the store. Each element on the chain is perceived as dependent of all others. Therefore, if all the elements are measured for a single commercial space, and if the process is repeated for all spaces within a city, then various patterns can be obtained. If these patterns match, then it can be assumed that an overall variable dependency fluxogram can be drawn. If furthermore these patterns match between cities, broader conclusions can be achieved.

In the case-study analysis stage of the research the cities were interpreted in turn, and only in a later stage were the results crossed and compared. In the following Chapters, to simplify and avoid repetition of analysis' procedures, and also to allow for an immediate pattern comparison, a choice was made to present the outcomes of each research phase simultaneously for all cities. Cities were divided in two major areas; the 'center' and the 'periphery'. The overall interpretation of the results will follow this greater division, whilst a division into smaller areas for a more insightful analysis of particular city spaces will be obtained as a consequence of the definition of urban and commercial hierarchies.

Each of the Chapters 6 to 9 ends with a summary box. These, as the name suggests, summarize the main findings and form the basis for the thesis' conclusions presented in Chapter 10.

6

GENERAL PRESENTATION AND CHARACTERIZATION OF THE CASE STUDIES

6.1. INTRODUCING AND CONTEXTUALIZING THE FOUR SELECTED CITIES

In Section 5.2.2. it was discussed that the variables used in the selection of the case study cities were mainly five: the number of inhabitants, the location within the country, the territorial relevance, the number of (commercial) rehabilitation projects recently carried out and the penetration of new commercial formats. The cities ultimately selected should have, for each of these variables, different values, so that the study could cover the widest range possible. Taking this into account Vila Real, Aveiro, Leiria and Évora were selected.

Because the subsequent analysis will be hard to follow without a proper overall knowledge of these four cities, a choice was made to briefly present them at the beginning of this Chapter. Furthermore, because that analysis will be comprehensive enough, it was deemed more effective to present them in a visual format. Consequently, four 'files', one of each city, were produced. These files, contained in the following pages, have the dual purpose of acquainting the reader with each city's background, overall layout and primary statistics, and function as support for the analysis to come. The 'files' are divided in two parts. The first, on the page on the left, contains three boxes and three images. The boxes briefly characterize the study area (including main statistical data and a more detailed information on the city's location), the city's history and its current role in the urban network. The images present each city's location within the country, its position in the respective Regional Plan and an aerial photograph, as extensive as it was possible to find, regarding the study area. The second part, on the page on the right, contains the model of the city, as produced in ArcGIS 9.3. The limits of the 'urban perimeter', defined according to the criteria mentioned in the previous chapter, are represented in these models, as well as the location of the all stores and major facilities, the age of buildings, and the overall contour of the public transport lines. These images are reproduced in A3 format, for a clearer perception, in Annex 3.

6.1.1. VILA REAL

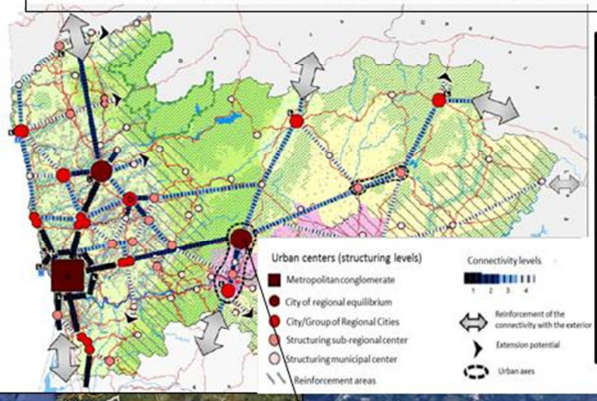


Study area

- Located in the North Region of Portugal and in Douro's sub-region, between the Marão and Alvão mountain ranges and on the left bank of the Corgo river.
- Comprised by 3 urban parishes (S. Dinis, S. Pedro and Nossa Senhora da Conceição) and 7 peri-urban parishes (Lordelo, Arroios and Mateus in full and Borbela, Constantim, Folhadela and Parada de Cunhos partially).
- 23.662.406 m2 / 30.207 inhabitants / 11.314 families / 7.430 buildings / 16.052 homes

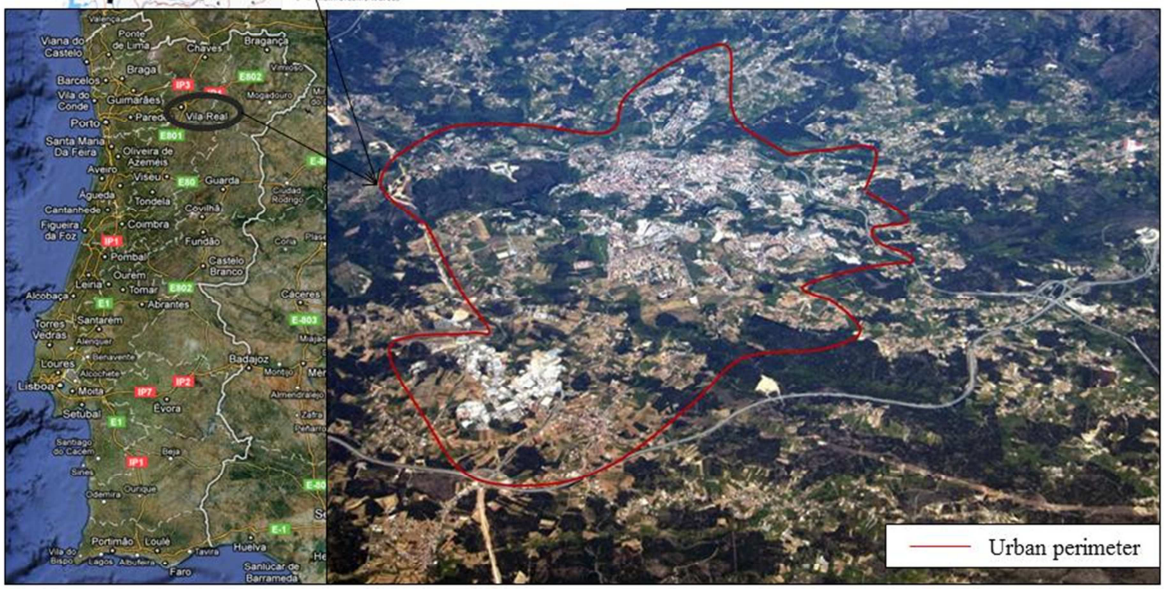
Brief history

The Vila Real region has been inhabited sporadically since the Stone Age and continued so during the roman invasions. Yet after the barbaric and Arabic invasions, the region became practically deserted. In 1289, after several unsuccessful attempts to form settlements in the region, a royal decree by King D. Dinis established the '*Vila Real de Panóias*' in the very same place where Vila Real's city center exists today. The growth of this new settlement was steady. In 1530 it had only 830 inhabitants, but in 1795 it already had 3.600. This was because of its central position between the interior and the coast, and between the North and the Center, but also due to the presence of many members of the Court, a consequence of the influence of the *Marqueses of Vila Real*'s lineage. Because of this it was called the 'Court of the North' and today some of the built landscape still reflects that noble heritage. In the 19th Century it became Province capital, gained the status of most important city in the region because of its economic, demographic and administrative weight, and finally received the denomination of 'city' in 1925. In the 20th Century the major input to the city only appeared in 1973. The Institute that would later (in 1986) become the University of Trás-os-Montes and Alto-Douro was inaugurated. Its presence stimulated the population growth and allowed the settlement of a new generation in the city. Today Vila Real is in a slow but steady growth stage. It has used the structural funds to invest on cultural facilities such as the new Theater Hall, the music conservatory, and the new buildings of the Municipal Public Library and the Municipal Archive. Areas such as the Ferreiros neighborhood and the river banks were also the subject of revitalization projects. These should, theoretically, bring a new dynamism to the city.



Role in the urban network

- District and Municipality capital.
- City of '*regional equilibrium*'.
- Main link in the urban axes Lamego-Régua-Vila Real-Chaves (the Douro Axis) and Vila Real-Mirandela-Bragança.
- It has the development potential and the geographical position needed to perform the intermediate equilibrium role between the Trás-os-Montes and Alto Douro sub-region and the Littoral North.



Sources: Top image by author. Statistical data taken from the 2011 Census. Study area measured in the GIS model. Territorial map taken from July 2009's final proposal of PROT-N. Aerial map taken from www.skyscrapercity.com. Historical references taken from the site of the municipality.

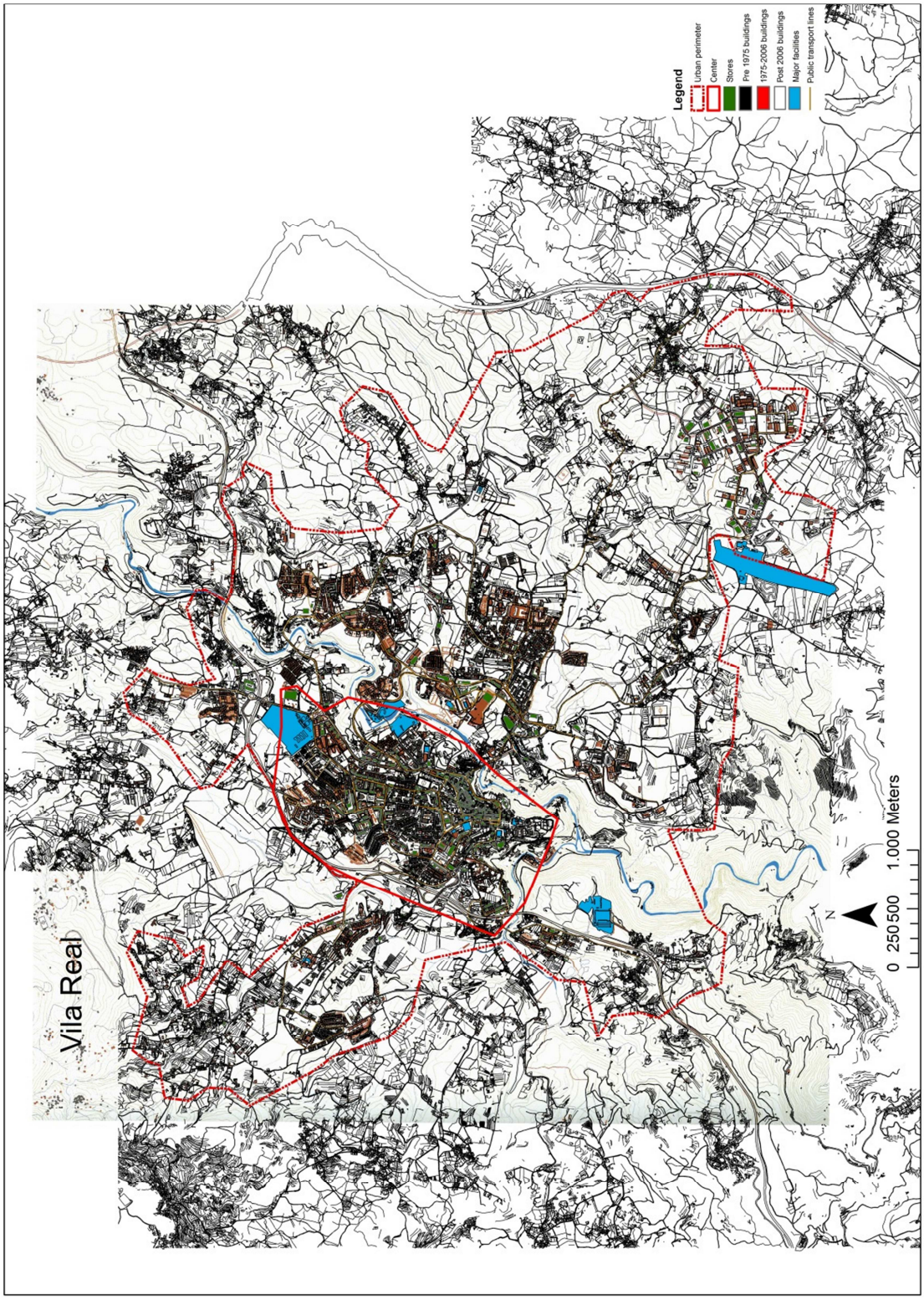


Figure 38 – Vila Real's city model

6.1.2. AVEIRO



Study area

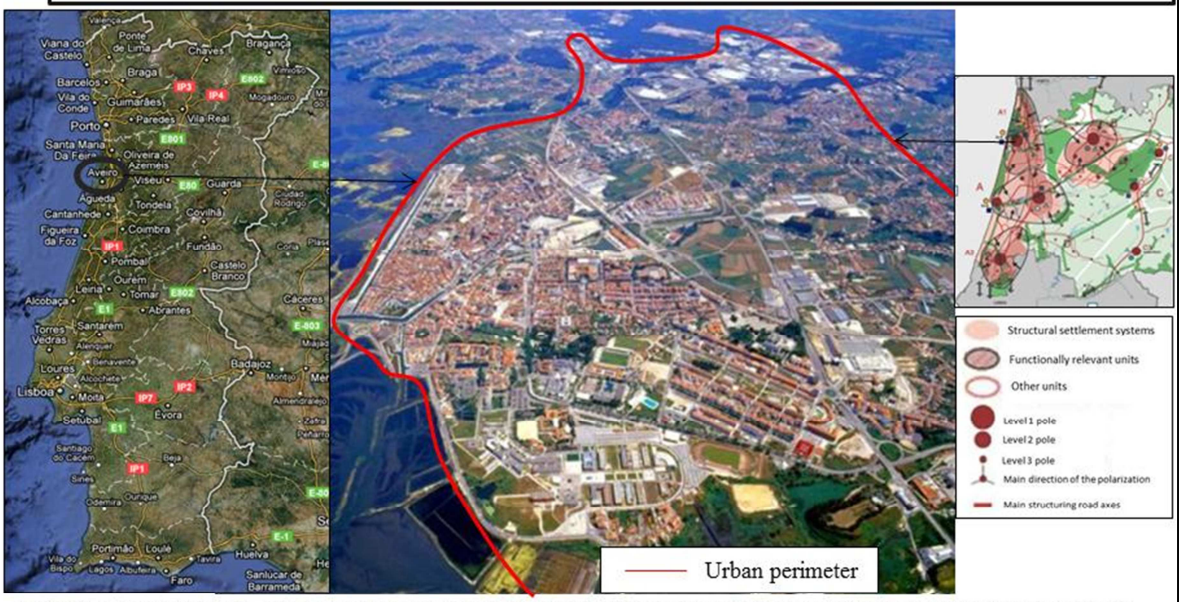
- Located in the Center Region of Portugal, and in the Baixo Vouga sub-region. The city is bathed by the Estuary of the Aveiro river.
- Comprised by 6 parishes (Glória, Vera Cruz, Aradas, Esgueira, São Bernardo and Santa Joana, all partially)
- 17.856.603 m2 / 40.860 inhabitants / 17.568 families / 8.569 buildings / 23.968 homes

Brief history

Aveiro, the '*Portuguese Venice*', was first occupied during the Pre-Historic period. Dolmens and other artifacts still remain in the region as proves of that occupation. Early on, Aveiro's region became associated with the exploration of natural resources, particularly salt, which was also explored by the Romans during their occupation. A 959 will by Contessa Mumadona Dias, donating the entire region to the Guimarães Monastery, calls it '*Suis terras in Alauario et Salin*as', both stressing the importance of the salt exploration and providing the first known prove of a settlement in the place where Aveiro would arise. In the 13th Century, Aveiro gained the status of 'village'. It developed around the main church, where today is the Republic Square, a monument which would be demolished in 1835. In the same period, King D João I ordered the construction of the city walls, which lasted until the 19th Century, when the stones were used to build the new docks. In 1472 the daughter of King Afonso V entered the village's Convent. This favored the village's growth, which continued in the 1500s, promoted by the salt production, the naval trade and the fishing industry. Yet the growing importance of the religious powers hindered the city's further development in the 16th and 17th Century. Furthermore, due to land instability conditions, the all-important channel between the river and the sea had to be closed, causing the demise of the Port, un-healthy conditions due to the stagnation of the lagoon waters and, consequently, a massive population decline and an economic and social crisis. In 1759 King D. José I, after ordering the execution of the last Duque of Aveiro, elevated the village to 'city' status and changed its name to 'New Bragança'. When Queen D. Maria I rose to power in 1777, the city's name was again changed to Aveiro. In 1808 the channel was artificially opened, and this marked the rebirth of the water industry, immediately promoting the city's dynamism and development. In the 19th Century, MP José Estêvão de Magalhães had a crucial role in the city's development, influencing the port's present configuration and the existence of the 'Aveiro' train stop in the Porto-Lisbon railway line. These achievements were transported into the 20th Century. The sea industry is still crucial to the city's economic growth, to which is added the ceramics industry. The natural beauty and resources of the estuary, the various water channels that circle the city center and the architectural richness of the built landscape have made Aveiro a touristic attraction which receives 129.595 tourists a year. In 1973 the University of Aveiro was inaugurated and was heralded as a landmark of modern architecture. It houses today 12.000 students and promotes a cluster of new technologies. Today the city, with all these assets, still presents a perceptible economic and demographic growth.

Role in the urban network

- District and Municipality capital / Level 1 pole / It is the region's main service, commercial, educational, I&D and administrative pole.
- Part of the polycentric polygon Aveiro-Viseu-Coimbra-Leira. Shares with Leiria a great industrial dynamism. Locally, according to the PROT-C, it is the main link in the Aveiro/Baixo Vouga (Águeda/ Ílhavo/ Estarreja/ Albergaria-a-Velha/ Oliveira do Bairro/ Ovar/ Vagos) sub-system. It forms the connection between Viseu and Coimbra, and it articulates strongly with Porto's metropolitan area.
- PROT-C defines as further guidelines for the city the promotion of its biodiversity, of the Port's logistic platform (one of the most important in the country), of tourism and of the industrial sector.



Sources: Top image by author. Statistical data taken from the 2011 Census. Study area measured in the GIS model. Territorial map taken from PROT-Center. Aerial map taken from www.aveiro.eu. Historical references taken from the site of the municipality.

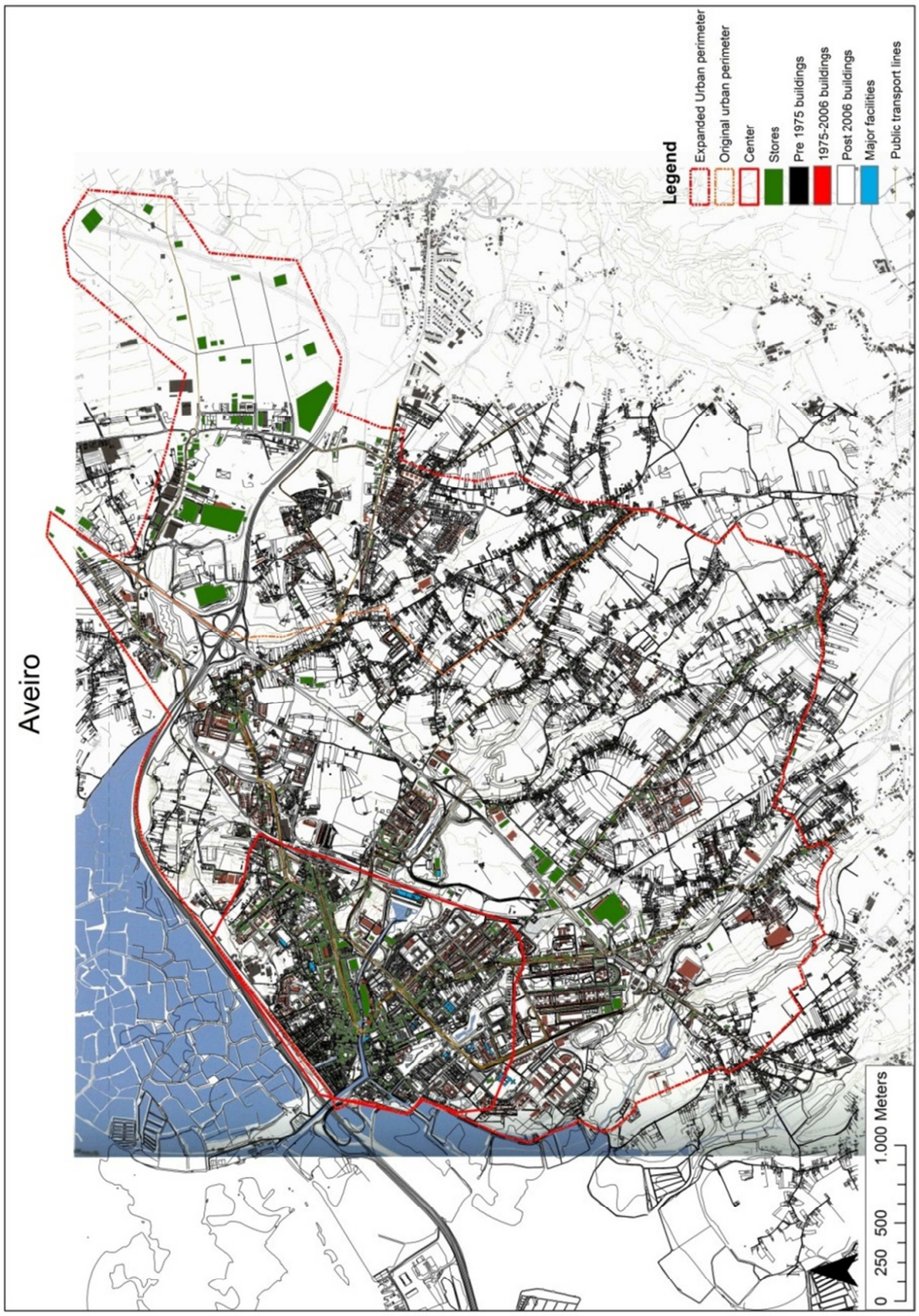


Figure 39 - Aveiro's city model

6.1.3. LEIRIA

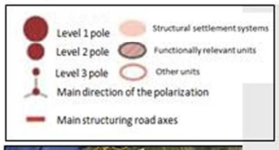


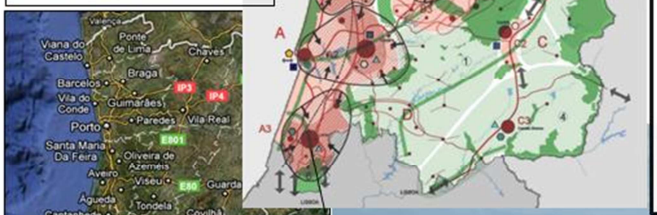
Study area

- Located in the Center Region of Portugal and in the Pinhal Litoral sub-region. It stands on the shores of the Lis River.
- Comprised by 6 parishes (Leiria, Marrazes, Parceiros and Pousos in full, and Barosa and Barreira partially).
- 36.259.245 m2 / 50.455 inhabitants / 20.654 families / 10.017 buildings / 28.031 homes

Brief history

According to archeological research, the Leiria region was initially occupied in the Middle Paleolithic Period (400 thousand to 35 thousand years ago). The first settlement near present Leiria appeared 7 kilometers from where it is today. This settlement was later occupied by the romans, who called it 'Collippo'. During the Moorish occupation, another settlement which consisted of a small village surrounding a central square existed in Leiria's present location, although little information is known about the city until the Middle Ages. It was during this historical period, in the 12th Century, that the first king of Portugal, D. Afonso Henriques, erected Leira's castle in his re-conquest campaign. The small drifting settlements concentrated around the castle and formed a permanent village. D. Afonso Henriques also ordered the construction of the city walls to accommodate this new settlement. In 1142 he gave the city its name, 'Leirena', and promoted its growth. It was between the castle and the River Lis that 'Leirena' flourished. The settlement slowly expanded beyond the city walls and it had an even greater growth during the reign of D. Dinis (1285-1324). This King significantly altered Leiria's landscape. The swamps were transformed into proper soils for agriculture and an enormous quantity of pine trees, today still a trademark of the region, were planted to make the valley fertile. The amount of wood that Leiria's industry could provide made it of crucial importance to the Discoveries. In the 15th Century a large Jewish community settled in Leiria, developing its commercial sector. It was at the end of this Century that King D. João I constructed his palace inside the walls of the Castle, which eventually fell into ruins but was partially recovered in the 20th Century. By order of King D. Manuel I, Leiria became a city in 1545. A few years later the Cathedral was built. After the Discoveries Leiria's importance significantly decayed. It took the industrial revolution, and particularly the glass industry, to revitalize the city. This dependence of industry continued into the 20th Century. Leiria was one of the few district capitals that did not constitute the most populous city in the district. The industry, the agriculture and the cattle-raising were its greatest economic assets. Only later in the 20th Century did commerce, services and tourism become increasingly important. The growth of urban nucleus around Leiria's city center aided by the boost of the civil construction industry, the arrival of many immigrants, the development of the service sector, and the central position of the city in the Littoral of the country, transformed Leiria into one of the most important and developed medium-sized cities in Portugal. Since 1987, the city of Leiria also possesses 3 of the 5 schools of the Polytechnic Institute of Leiria. The city now exerts socio-economic influence over the entire region.





Role in the urban network

- District and Municipality capital.
- Level 1 pole
- Part of the polycentric polygon Aveiro-Viseu-Coimbra-Leira. Shares with Aveiro a great industrial dynamism. Locally, according to the PROT-C, it is part of the Leiria/Marinha Grande/Pinhal Litoral sub-system. The regional development logic is clearly centered in Leiria, which is an employment, tertiary and administrative center.
- Its geographical position favors its growth and development. It is crossed by the main north-south and east-west highways of the country. Its degree of connectivity needs, nonetheless, to be furthered developed.



Partial view of Leira's city center

Sources: Top image by author. Statistical data taken from the 2011 Census. Study area measured in the GIS model. Territorial map taken from PROT-Center. Aerial map taken from http://portugalfotografiaaerea.blogspot.pt. Historical references taken from the site of the municipality.

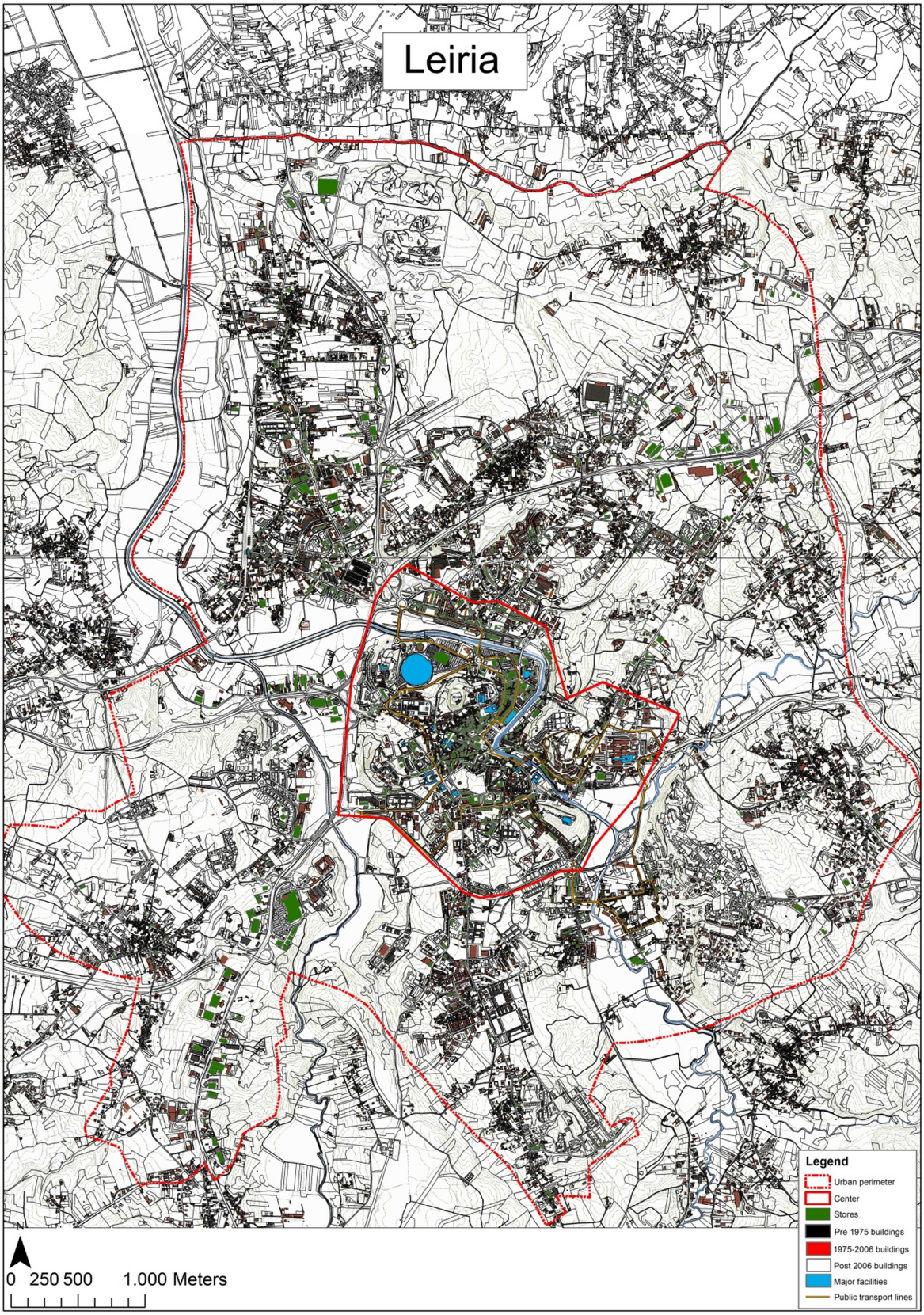


Figure 40 - Leiria's city model

6.1.4. ÉVORA

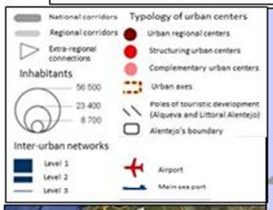


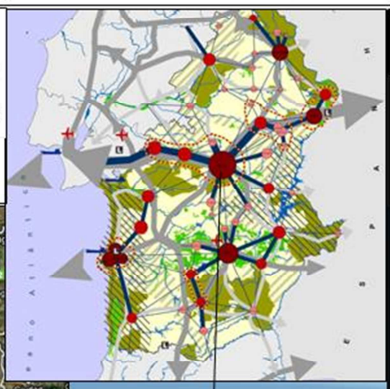
Study area

- Located in the Alentejo Region, at the South of Portugal, and in the sub-region of Center Alentejo. The city stands in the middle of a large plain.
- Comprised by 3 urban parishes inside the city walls (Santo Antão, São Mamede and Sé and São Pedro) and 4 urban parishes outside (Malagueira, Horta das Figueiras, Senhora da Saúde and Bacelo)
- 13.474.660 m2 / 41.846 inhabitants / 17.156 families / 13.708 buildings / 21.397 homes

Brief history

Évora's region was first inhabited in the Stone Age, as many ancestral paintings and stone monuments prove. During the roman occupation, because of its strategic position, the then called '*Liberalitas Júlia*' had a considerable development. The roman built landscape and the roman town plan are today all but lost because the Arabic, the Medieval and the Modern city where erected in turn on top of each other. Yet the location of the former roman wall and of the city gates has clearly influenced the structural form of all these subsequent cities. In the 12th Century, under Arabic domain, Évora was the second largest city of the Badajoz region, and it was known as a great commercial city. It was reconquered in 1165. In the 14th Century the medieval city wall, then called '*New Fence*', was erected. It is that wall that still stands today. Outside the wall Jewish and Moorish communities developed their own neighborhoods. In the 15th Century, King D. João I decreed Évora as the second city of the Kingdom. The presence of the Court for long periods made the city attractive for wealthy families and for artists. During this period of prosperity, the Royal Palace, the University and the Aqueduct were built. The Palace, the main squares (*Giraldo* and *Porta da Moura*) and the aqueduct defined the image of the city, and the aqueduct system influenced the street network. In the 16th Century, the inner-wall city became fully occupied and so sections of the city wall were demolished to unite the interior and the expanding exterior city. In the 17th and 18th Centuries many older constructions were replaced by nobler buildings and many rehabilitation works took place. Unfortunately, in the late 19th and early 20th Century, as a consequence of progress, many heritage elements were destroyed and replaced, and new infrastructures were inserted. But fortunately the events of the 20th Century stopped the replacement of the built heritage. In the dictatorship years Évora's growth slowed, stagnated and even declined. Only in the late 1970s did the city start to grow again. In 1986 all the area inside the city walls was classified as a World Heritage Site by UNESCO. In the early 1990s Évora was the first Portuguese city to write a PDM. This care with the historic center, which is translated into many regeneration projects, has become Évora's trademark and is, justifiably, a source of tourism and wealth. In an isolated region with declining tendencies, Évora has had a slow but certain growth, even if that is a consequence of being the region's main city and therefore concentrating population and amenities that are declining in surrounding, smaller cities.





Role in the urban network

- District and Municipality capital
- Regional urban center
- Most important and dynamic urban pole of the region, in terms of population, services (cultural, educational), economic development, ICT, I&D, and industrial and logistic concentrations, to which is added its built heritage richness and touristic potential.
- Main link in the urban axis Vendas Novas–Montemor-o-Novo–Évora. Mid-term element between Littoral Alentejo and Spain.
- The PROT-Alentejo promotes Évora as a structuring node of the urban network, whose urban functions need to be reinforced in order to stimulate regional integration and development.





Sources: Top image by author. Statistical data taken from the 2011 Census. Study area measured in the GIS model. Territorial map taken from PROT-A. Aerial map taken from http://portugalfotografiaaerea.blogspot.pt. Historical references taken from the site of the municipality.

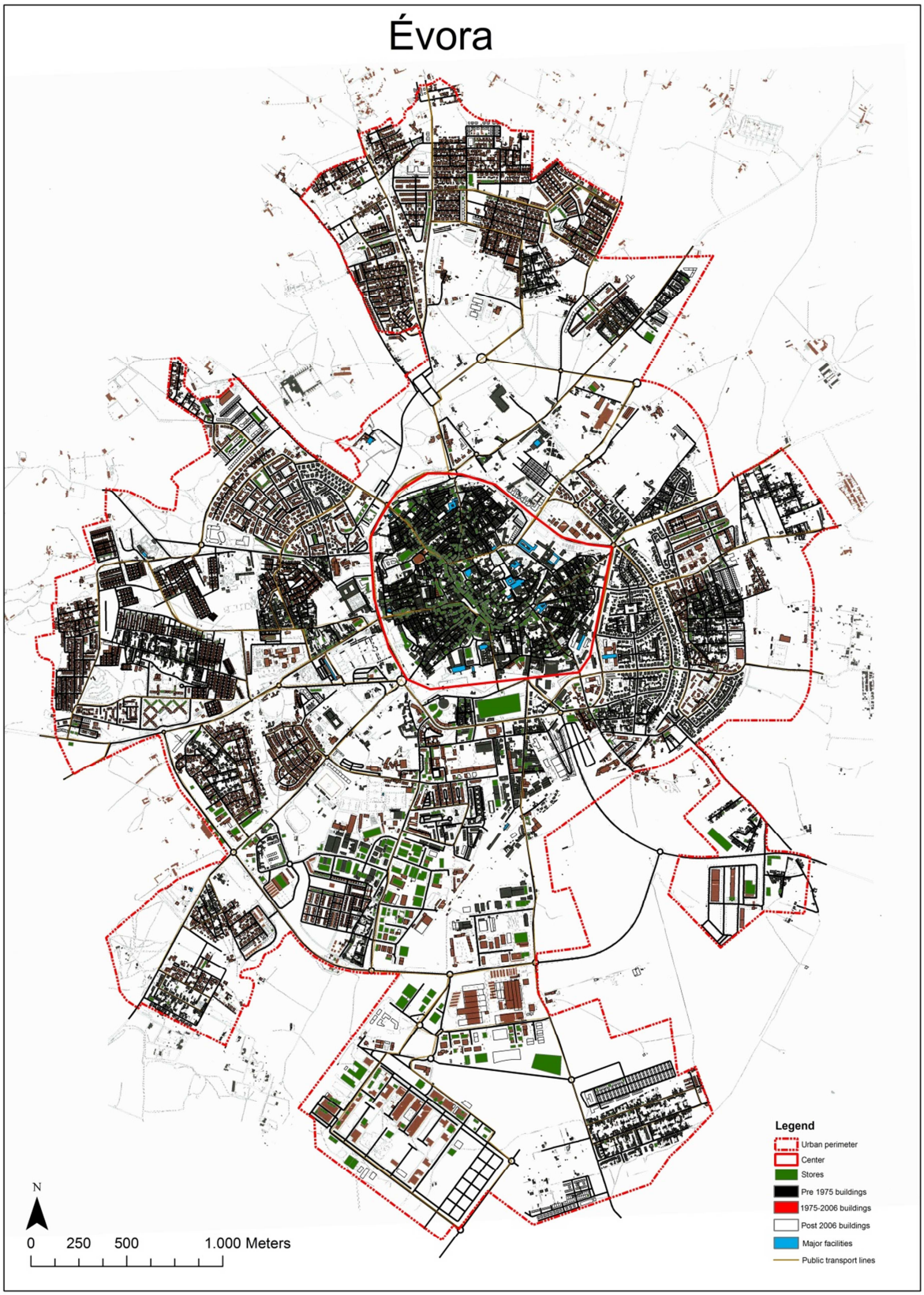


Figure 41 - Évora's city model

6.2. OVERALL GEOGRAPHICAL AND STATISTICAL DEFINITION

6.2.1. DEFINING AND CHARACTERIZING BOUNDARIES

These four cities possess a long lasting historical heritage, as the 'files' above show. This historical legacy is today still very much reflected in the respective city centers, and it has helped to strengthen and consolidate them over the centuries. Consequently, these have presented, until just a few decades ago, clearly defined urban and commercial hierarchies, which constituted the center of the entire region. Actually, today's city centers practically amounted to the entire city. Only in the last 30 or 40 years has the urban perimeter expanded to engulf growing surrounding localities that until then had been less than suburban (and often almost rural). This development of surrounding localities also explains the development of the medium-sized cities. Mimicking, at a smaller scale, the history of larger urban conurbations, the 'periphery' of medium-sized cities had suddenly a significant residential development in order to accommodate the growing working needs of the center. Then, as the communities developed and new city areas bloomed, the peripheries also started to gain an economy and a vitality of their own. Nonetheless, first this momentum only reached particular areas of the 'periphery' and second it never had sufficient scale. Consequently the medium-sized city center never lost its strong and gravitational presence. In the four case studies, the centers are still the greatest areas of integration, centrality, economic strength, commerce and services of their respective cities. These centers have expanded through clearly defined axes to meet surrounding localities and residential areas. These axes are mostly North/South and East/West, with the center generally occupying a literal 'central' position. The exception is the city of Aveiro. Because Aveiro's city center developed by the river, the city had no choice but to expand eastward. The expansion axes are represented in Figure 42, in the next sub-chapter.

This difference between a long established 'center' with morphological influence and commercial, economic and organic importance, and a growing 'periphery' that was always dependent on the center and only recently gained urban status and urban-like growth, should be translated into separate analyses of the commercial and urban phenomena. Consequently, a city center boundary was defined, which is also drawn in the models presented above. The original nucleus was considered as the basis for the definition of 'city center', but could not be considered to be all of it. Because this center also expanded in a continuous fashion, occupying empty urban areas close-by between itself and the existing smaller outer localities, the new axes or poles thus created naturally gained center-like qualities, and even stole some of the historic center's main activities and caused a shift in the center's center. And if they didn't, they at least present a close affinity with the center's organic functioning, so they cannot be considered as separate entities, that is, as part of the periphery. Much for the same reasons, the 'city center' was not bound by the pre-existing limits of the center parishes. Changes in the geographical dispersion of urban forms, urban functions and even commercial spaces, along with the appearance of new structuring elements such as ring-roads or motorways, helped to create new visual, physical and psychological barriers that changed the definition of the center's boundaries.

Consequently, both nature and man-made barriers were taken into account in the definition of each city's center. The River Lis in Leiria, the Estuary of the Aveiro River and the River Corgo in Vila Real (at the bottom of a steep valley right next to the secular center) – water ways crucial to the settlement and the development of the ancient towns – constitute natural boundaries which were obviously maintained. Recent motorways IC2 in Leiria and IP4 in Vila Real, which act as partial ring roads around the center, were also considered as boundaries between the center and the periphery. In Aveiro

this role is somewhat performed by the railway line. In Évora, the mostly intact city walls perfectly limit the historical center which constitutes a world heritage site. Considering all these elements the four centers were then defined. Vila Real's city center (Figure 38) is then comprised by portions of the 3 urban parishes the urban perimeter possesses, and is roughly limited by the valley and the motorway. Aveiro's city center (Figure 39) is composed by portions of Gloria and Vera Cruz's parishes, and is roughly limited by the river, the train line, and, to the South, the University. Leiria's city center (Figure 40) is also composed by portions of two parishes (Leiria and Marrazes) and is limited by the motorway, the ring road and the river. In this case an exception occurs North and East of the center. A new locality situated in the Marrazes parish named 'Nova Leiria'[133] was inserted into the city center area (only around Avenue Dr. Adelino Amaro da Costa – see Figure 56) due to its undeniable affinity to the shopping district of the center and its importance mainly in terms of services. The streets on the East margin of the River Lis were also inserted in the center area. Buildings invariably face the river and pedestrian bridges assure the linkage between both margins. Finally, Évora's city center (Figure 41) is composed by all 3 center parishes (Sé e S. Pedro, S. Antão and S. Mamede) and is unequivocally limited by the city walls.

On the other hand, the 'periphery' or the 'suburbs' of each city consist of the localities situated inside the urban perimeter but outside the boundaries of the city center defined in the previous paragraph. This means that the 'periphery' in this research does not correspond to all the area outside the city centers. Vast empty non-urban areas with no buildings nor shops that still exist inside the urban perimeters (green parks, protected areas, non-built areas, etc) were not considered. This is why the sum of the area percentages in Table 6, in the following page, is not 100%.

6.2.2. INTERPRETING GENERAL DATA

Table 6 presents the overall characterizing data, concerning area, inhabitants, buildings and stores, for the four case-studies. These possess, obviously, different total areas, averaging about 2.000 ha (20 km^2), which is about half of the area of Oporto and one fourth that of Lisbon. The values of Table 6 have a spatial representation in Figure 42, where the cities are presented to scale, and the percentages below relate to the area of the largest, that is, Leiria (36 km^2). Yet although it possesses a much larger area than the other cities, it was perceptible in Figure 40 that Leiria has, at the same time, more empty urban spaces, especially North of the center. At first glance it would seem that the outline of Leiria's urban perimeter is excessive. Further analysis will help to define if that is so. On the other hand, Évora's urban area is much smaller[134] (14 km^2), yet it is one of the densest cities, as Table 6 shows. Évora has, for example, 10 thousand more inhabitants than Vila Real in only half of the area and has the highest number of buildings of all the four cities.

[133] New Leiria

[134] Although it also presents large empty areas such as the one between the center and the northern locality of Bacelo.

Table 6 - Overall characterizing data of the four case studies

Cities		Vila Real	Aveiro	Leiria	Évora
Intervention area (urban perimeter, m^2)	**City**	**23.662.406**	**17.856.603**	**36.259.245**	**13.474.660**
	City center	3.112.403	2.375.412	3.851.337	1.065.516
	% of total area	13,15	13,30	10,62	7,91
	Periphery	17.154.461	14.016.022	25.980.354	12.071.143
	% of total area	72,5	78,49	71,65	89,58
Total number of stores catalogued	**City**	**1.397**	**2.221**	**2.505**	**1.735**
	City center	971	1.255	1.409	840
	% of total	68,24	56,46	55,98	48,41
	Periphery	426	966	1.096	895
	% of total	29,94	43,45	43,54	51,59
Resident population in 2011	**City**	**30.207**	**40.860**	**50.455**	**41.846**
	% in the city center	39,74	20,06	25,18	11,32
	% in the periphery	60,27	70,94	74,82	88,68
Total number of buildings (in 2011)	**City**	**7.430**	**8.569**	**10.017**	**13.708**
	% in the city center	30,21	29,40	18,20	22,89
	% in the periphery	69,78	70,60	81,80	77,11

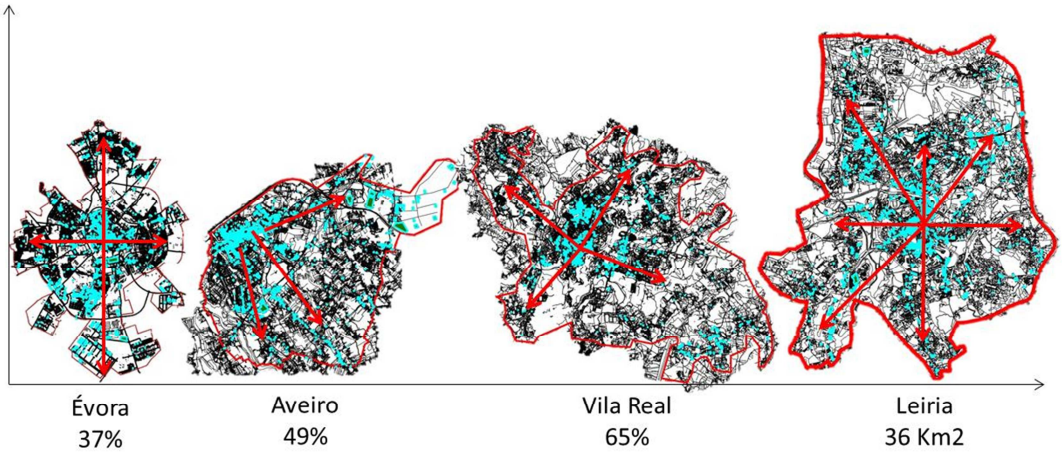


Figure 42 - Scale comparison of the four urban perimeters. Expansion axes are signaled in red and stores are represented by a light blue color.

Although ranging from 1 km^2 (Évora) to 4 km^2 (Leiria) the four city centers present nonetheless one particular characteristic; their relation to the overall study area is the same. Each is about 10% of it. Once again, despite having the largest area, Leiria's city center presents an array of empty urban spaces, and is the least dense city center. On the other hand, the 'peripheries' correspond to about 80% of the study areas. By mere subtraction, it can be seen Leiria and Vila Real have more non-urban areas inside their urban perimeters than the other two cities, amounting to about 20% of the total area. In Leiria, as mentioned above, this is much due to the park North of Marrazes and between the localities of Gândara de Olivais and Pinheiros[135]. In Vila Real, outside the city center, most localities are clearly separated, connected by regional roads without urban ribbons. The terrain topology does not aid a continuous expansion, and the localities are much dependent on the center for jobs and commerce, although they clearly had a separate existence as small villages before being engulfed as part of the urban perimeter.

After periods of decline until the 1970s, these cities have presented steady, even if slow growths. More than a decade ago Carvalho and Sequeira (1999) described Aveiro and Leiria, stronger nodes of commerce and services, as having a 'strong growth', and Évora and Vila Real has having a 'slow or stagnated growth'. But even Évora and Vila Real do not present overall declining statistics. All 4 cities have grown in terms of population, families, buildings and homes from 2001 to 2011, and have only presented a decline in terms of average size of households, a variable which has decreased in the entire country. Yet this overall growth has not been similar inside and outside the centers. Common to the four city centers is that they have had a decline of present population from 2001 to 2011. Taken alone, this could have various meanings, but because there is growth in the same period in the number of homes, buildings (except in Vila Real) and families (except in Évora), it can be deduced that the centers have not lost their growth capacity. The decrease in present population is rather a tribute to the development of peripheral localities, and to a more even distribution of services and jobs throughout the urban perimeter. The resident population has increased, for the same period, in the centers of Vila Real and Leiria, and decreased in the centers of Aveiro and Évora. Considering that the number of families also declined in Évora's center, this may be a sign that the world heritage site is becoming more service and touristic oriented, as residential localities around the city center are still expanding. The periphery's statistic growth, in turn, is more similar to that of the entire city. From 2001 to 2011 buildings, homes, families and resident and present population have increased. But this is not completely straightforward. Overall numbers may increase but peripheral centralities have changed, and some areas have developed whilst others have declined. For example, although there has been an overall increase in the Census statistics for Évora's periphery, the neighborhood West of the center, known as Malagueira (which includes an award winning social housing project by architect Siza Vieira) has had a decrease in resident and present population and in number of buildings, translating the decline of said project.

Table 6 also shows that in average these cities possess about 40.000 inhabitants. These belong, also in average, to 17.000 thousand families[136]. When the case studies were selected the population data considered was related to the municipality and not, as is the present case, only to the urban perimeter.

[135] Northwest and Northeast of the center respectively.

[136] Annex 4 presents an extensive Table which summarizes all the variables collected and calculated, not only for all case studies, but also for all the smaller city areas considered. This and the following Chapters only presents the most important ones for the current research and their averages for the 4 cities, if they derive from values of the same order of magnitude and if they are deemed relevant.

That is why, for example, Aveiro's population seems to be less than that which was initially considered. In this case this is because the city's urban perimeter is much more constrained. Leiria possesses 10 thousand inhabitants over average, but this may be a consequence of the excessive size of its urban perimeter. On the other hand Vila Real has 10 thousand inhabitants below average, and this can, in turn, be a consequence of the absence of urban ribbons between the center and the more isolated peripheral localities. Table 7 shows that Évora is the densest city, with 3.000 inhabitants per square kilometer, and Leiria and Vila Real are the least dense, with 1.300 inhabitants per square kilometer.

Table 7 - Overall indicators of the four case studies

Cities		Vila Real	Aveiro	Leiria	Évora
Population density (inh/km^2)	**City**	**1.277**	**2.288**	**1.392**	**3.106**
	City center	3.857	4.998	3.299	4.447
	Periphery	1.061	2.068	1.452	3.074
Homes per building	**City**	**2**	**3**	**3**	**2**
	City center	3	3	5	1
	Periphery	2	3	2	2
Buildings per shop	**City**	**5**	**4**	**4**	**8**
	City center	2	2	1	4
	Periphery	13	6	8	13
Open stores per area in km^2	**City**	**55**	**102**	**55**	**109**
	City center	278	430	293	688
	Periphery	23	57	33	61
Inhabitants per open shop	**City**	**23**	**23**	**25**	**29**
	City center	14	12	11	6
	Periphery	45	37	43	50
Commercial área (m^2) per inhabitant	**City**	**8,63**	**14,04**	**12,19**	**8,44**
	City center	11,33	15,5	15,96	17,95
	Periphery	6,85	13,44	10,93	7,22

Above it was seen that despite the difference in areas, the centers represented similar percentages of the urban perimeter. That may be the reason why their population is also strikingly similar, with the obvious exception of Évora's city center, which has an impossibility of spatial growth (due to the city-walls) and of growth in height (due to the construction restrictions of the world heritage site). Therefore, whilst Évora's city center only has about 5.500 inhabitants (10% of the city's

population)[137], the city centers of Vila Real, Aveiro and Leiria have all about 12.000 inhabitants[138]. If this difference corroborates the conclusions of the preceding paragraph regarding the decline of the residential value of Évora's city center, it can be seen, on the other hand, that the population density in all the four city centers is somewhat similar (4 to 5.000 inhabitants per km^2). This number may well represent the capacity of the average Portuguese medium-sized city center. The densest areas are not, obviously, in the main traditional commercial centers or squares, but in the more recent commercial axes, associated to mix-use high-rise neighborhoods, mostly erected in the last 20 or 30 years. On the other hand, the growth of Évora's periphery is clearly perceptible when it is discovered that it has the same inhabitants as Leiria's periphery (37.000) against 30.000 in Aveiro and only 18.000 in Vila Real. If in the first three cities there are 14.000 families in the periphery, in Vila Real there are only 7.000. Furthermore, almost 40% of Vila Real's population lives in the center. Vila Real's poor development of the peripheral area is first proven by these statistics.

The four cities have, in average, about 10.000 buildings. Évora has more buildings and the greatest building density per area, whist Leiria and Vila Real have the least building density. 20% (in Leiria and Évora) to 30% (in Vila Real and Aveiro) of these buildings are in the city centers, which means that Évora's and Leira's peripheries have 1,5 more buildings than the peripheries of the other two cities. Once again, Évora's periphery presents a greater building density than the other three cities, which have similar values between themselves. These buildings contain, in average, 2 to 3 homes (Table 7). In the center, Leiria's average increases and Évora's decreases, an obvious consequence of the respective average building heights. These buildings also contain, overall, 2.000 open stores in Leiria and Aveiro (1 in every 4 buildings), and about 1.400 open stores in Vila Real and Évora (1 in every 7 buildings). The city centers contain over 50% of the entire city's stores, with the exception of Vila Real's. Here almost 70% of stores are in the city center.

Considering that any store has the same area as the footprint of the building it is in, it can be assumed that in Leiria and Aveiro there is twice the commercial area (600.000 m2) than there is in Vila Real and Évora. This translates into 13 m^2 of store area per inhabitant in the first two cities and 8,5 m^2 of store area per inhabitant in the last two. Yet, considering the overall number of inhabitants, these differences seem logical, because the four cities present almost exactly one open store for every 25 inhabitants. Also, there are exactly 55 stores per square kilometer in Vila Real and Leiria and twice as much in Évora and Aveiro, numbers that once again seem logical because, for example, Leiria's area is twice that of Aveiro. Therefore, in reality, it can be considered that the overall amount of shops per inhabitant and per area may be the same for these 4 cities. It may be said, perhaps, that this value is the amount of commerce that a city may hold. This can be yet another threshold of equilibrium.

These differences in overall numbers that hide similarities when densities are considered are also reflected in the analysis of the centers and of the peripheries, although Évora's center and Vila Real's periphery constitute, sometimes, exceptions. Leiria's and Aveiro's centers possess more stores (about 1.100) and more floorspace than the other two centers, yet their densities are generally similar to those found in Vila Real's. On the other hand Évora's center may have less stores and overall store area but is much more commercially dense, as it has more stores per inhabitant (1 for every 6, twice as much as the other centers) and per area (700 open stores per km^2). Worthy of note is the fact that Leiria's center has practically, in average, 1 open store per building. Considering just the peripheries, Vila Real's has

[137] Constituting about 2.500 families.
[138] Constituting about 5.500 families.

only half of the stores (400) of the other three, although all the four peripheries present in average 1 open store for every 45 inhabitants. Because of their larger, unoccupied, peripheral areas, Leira's and Vila Real's peripheries have less than half of the stores per area that Évora's and Aveiro's possess (60 open stores per km^2). Even so, Aveiro's and Leiria's peripheries have more concentration of stores (1 store for every 7 buildings), greater total commercial area and greater commercial area per inhabitant (12 m^2 per inhabitant).

Summary Box nº1

All cities have grown in terms of population, families, buildings and homes from 2001 to 2011. When the study area and the number of inhabitants are taken into account it can be said that the differences in data dilute, and the cities present similar densities. These indicators can reveal the threshold of medium-sized cities. Leiria and Aveiro have more stores, Évora and Aveiro have more stores per area (but their areas are smaller) and Évora's densities are conditioned when 'area' and 'building height' are variables.

The city centers are the undisputed poles of commerce and service in the urban perimeter, and have not lost their growth capacity. The single parameter decline of 'present population' may be a sign of suburb development. This is particularly perceptible in Évora, whose center has been losing residential importance. Considering the differences in area, there are similar commercial, population and building densities in all the city centers (except in some cases in Évora's, due to the reduced buildings heights and the physical impossibility of growth);

Peripheries have more or less the same amount of shops as the center (except in Vila Real) and 2 to 4 times more buildings, in 8 times the area, so obviously they are more diffused. They have grown in all indicators except average family size, but this can't be taken at face value, because peripheral centralities have changed. Évora and Leiria have more constructed area outside their city centers;

Évora is the most compact and dense of the studied cities. Leira's urban perimeter seems to have been excessively drawn. Vila Real's periphery seems to have a poor development and be center-dependent. Vila Real and Leiria's centers are the only ones which have increased in population in the last 10 years, but at the same time their urban perimeters contain more non-urban area than the other cities, making them the least dense cities. This may be a consequence of an expected peripheral growth that never materialized.

7

ASSESSING THE PHYSICAL DISTRIBUTION OF COMMERCE

7.1. BUILDING ON THE GEOGRAPHICAL PERSPECTIVE

Once the cities are contextualized, the next stage of the case-study analysis is concerned with the first approach to the interpretation of *where* commerce is located within the city. Obviously, this follows closely the procedures usually performed in Geographical research, although it differs from them in two main aspects. First, in this Chapter the stores are deprived of *all* characterizing information (including activity). Only 'location' is in this case taken into account. The assessment of this 'location' allows for the understanding of the overall spatial behavior of stores, the construction of commercial distribution patterns and the creation of hierarchies. Only in Chapter 8 will these spatial hierarchies be enriched with commercial information, and in Chapter 9 with morphological information. This does not mean, however, that some morphological and commercial considerations are not described, because what is immediately perceived is that they are an intrinsic part of any *location*. Consequently, second, the assessment of location and of commercial hierarchies is not solely based on the visual understanding of *position*. Other variables such as the spatial expansion/evolution of the areas, the age of buildings and the distance to nearest neighbors are also taken into account.

This Chapter is divided in two parts. The first concerns the definition of urban and commercial hierarchies. The second concerns the modeling of the distribution of stores within each of these hierarchical layers. Detailed maps of the areas are supplied so that the reader can be acquainted with each of the localities that constitute these four cities.

7.2. PRE-DEFINING URBAN AND COMMERCIAL HIERARCHIES

The first iteration of the definition of commercial hierarchies was based on the interpretation of two phenomena; first the type of urban and commercial expansion that each city area has had in the past 30 years and second the type of overall commercial distribution each area currently possesses. Initially the center was considered as one single area but the periphery was obviously divided into smaller areas. This division first took into account the natural separation of parishes and neighborhoods, but the boundaries were later re-arranged according to the types of commercial distribution therein.

Table 8 presents the first step of the analysis. For each locality three elements are obtained: the percentage of the city's total number of stores; the percentage of stores, in that locality, that are in buildings constructed after 1975; and a brief characterization of its evolution in the last decades. The limits of each locality are represented in Figure 43, Figure 44, Figure 45 and Figure 46 in the subsequent pages.

Table 8 - Type of expansion of each considered area in the four case study cities

City	Locality	% of total number of shops	% of shops in post 1975 buildings	Type of expansion / area description
Leiria	**City**	**100**	**63,29**	
	Center	**55,98**	**56,21**	**New commercial axes/residential neighborhoods appear North and South of the traditional center. New buildings, especially multi-family, consolidate and define existing axes, mostly to the West, creating new commercial poles.**
	Periphery	**43,54**	**73,08**	
	Sismarias	11,76	73,65	Despite maintaining the 2 pre-existing axes, new constructions with commerce consolidate and define them completely, with the exception of the area closest to the train station. New buildings appear among and around traditional ones.
	Marinheiros	8,86	90,13	Completely new multi-family residential neighborhoods where commerce is appear along pre-existing axes with disperse traditional building occupation.
	Telheiro	5,44	74,45	New multi-family residential neighborhoods where commerce is appear along pre-existing axes with disperse traditional building occupation.
	Marrazes	3,54	64,04	New multi-family buildings appear mostly outside the traditional locality, extending the main axes and creating new poles of commerce. They also complement the existing poles in main traditional streets. Disperse new single family buildings appear among and around pre-existing ones.
	Parceiros	2,03	68,63	New multi-family buildings with commerce which appeared in the center of the traditional locality have enhanced the main axes and created new poles of commerce. Disperse new buildings/neighborhoods with little commerce appear among and around pre-existing ones.
	Pousos	3,73	67,02	
	Gândara de Olivais	2,07	38,46	Disperse new buildings with little commerce appear among and around pre-existing traditional buildings and urban axes, where most commerce still withholds.
	Andrinos	0,52	30,77	
	Pinheiros	0,72	61,11	Few buildings with commerce have offered a small contribution to the poor traditional main street commerce. The proximity of the industrial area allows for some new warehouses in the periphery.
	Parceiros industrial area	3,14	62,03	Practically a new area built around some pre-existing industrial locations in the 2 main industrial axes. In between, the very small traditional neighborhood has been engulfed by a new multi-family neighborhood with a new pole of commerce.
	Vale Sepal Industrial area	1,75	93,18	Completely new area.
Vila Real	**City**	**100**	**50,88**	
	Center	**68,24**	**45,42**	**New center appeared North of the traditional, with new poles of commerce in multi-family neighborhoods. New multi-family buildings (some with shops) also appear West of the traditional center.**
	Periphery	**29,94**	**66,43**	
	Europa and University Avenues	7,38	78,1	Completely new axes with services, residences and commerce, with the exception of the area closest to the train station. It has high-value residences and the city's shopping center.
	Borbela and Urban Mateus	11,24	68,75	Completely new residential neighborhoods fill the gaps between traditional localities, overshadowing them, and creating new commercial poles and some new thoroughfares.

City	Locality	% of total number of shops	% of shops in post 1975 buildings	Type of expansion / area description
	Lordelo	2,74	48,72	New neighborhoods without shops and some new shops near the modern Hospital appear closer to the city center, yet the bulk of the northern locality and of the commercial concentration therein has remained traditional, despite the appearance of new isolated single-family houses around existing construction.
	Constantim	1,19	5,88	Isolated and dispersed new single-family residential buildings appear around the preexisting locality.
	Folhadela	1,19	29,41	New neighborhoods and isolated residential houses mostly without shops appear around pre-existing construction.
	Parada de Cunhos	1,69	66,67	Completely new neighborhood appeared north of the locality (closer to the city center) containing a new pole of commerce. Traditional locality remains mostly unchanged.
	Mateus and Arroios	1,19	29,41	Dispersed single-family new housing appears around existing axes and buildings.
	Constantim Industrial area	3,3	95,74	Completely new area.
Évora	**City**	**100**	**39,37**	
	Center	**48,41**	**1,19**	**Completely traditional.**
	Periphery	**51,59**	**75,20**	
	Bacelo	7,38	91,41	Practically a new locality of multi and single family housing expanded from two small neighborhoods, with specific poles of commerce, especially at the basis of multi-family buildings.
	Malagueira	12,91	81,25	Practically a new locality of multi and single family housing expanded from three small neighborhoods. 2 of them have rows of traditional commerce still standing, but the poles have shifted to specific concentrations especially at the basis of multi-family buildings.
	Sra. da Saúde	8,65	56,00	Completely new multi-family residential neighborhoods with shopping concentrations appear in empty areas inside the traditional, mostly single family, neighborhood, which nevertheless keeps some of its shopping inheritance, principally in the main intersections.
	Almeirim and Horta das Figueiras	22,65	73,79	Practically new industrial area around some pre-existing warehouses. The gaps between and in the dispersed traditional residential neighborhoods have been filled with new multi and single family new neighborhoods with specific commercial concentrations, although there are still many empty urban areas.
Aveiro	**City**	**100**	**46,38**	
	Center	**56,46**	**27,09**	**New commercial axes/residential neighborhoods appeared Northeast and Southeast of the traditional center. New buildings, especially multi-family ones, consolidate and define existing ribbons. Seaside rehabilitation produced a strong commercial pole.**
	Periphery	**43,45**	**71,53**	
	Bairro de Santiago	11,65	90,35	Practically a completely new residential neighborhood, with commerce on specific poles and in the main ribbon, built around a traditional travelling axis which had sporadic occupation. A shopping area has developed in the main travelling intersection.
	Forca	5,71	96,85	A completely new residential/service and commercial neighborhood, built near a sparsely occupied thoroughfare.
	Esgueira (West)	6,52	60,69	New multi-family buildings with commerce West and North of the center of the traditional locality have enhanced the main axis and created new poles of commerce. Disperse new buildings/neighborhoods with some commerce appear among and around pre-existing ones, especially consolidating the link to the city center.
	St. Bernardo, St. Joana, Esgueira (East), Aradas	16,10	55,87	New single and multi-family buildings/neighborhoods with specific poles of commerce have sprung in empty areas in and around existing localities, enhancing the traditional axes and thoroughfares which have practically remained the same. Disperse new buildings/neighborhoods with little commerce appear among and around existing ones.
	Esguiera Industrial area	3,46	59,74	The pre-existing area mostly along 2 axes has been enhanced by a series of new axes and blocks made out of industrial and commercial warehouses.

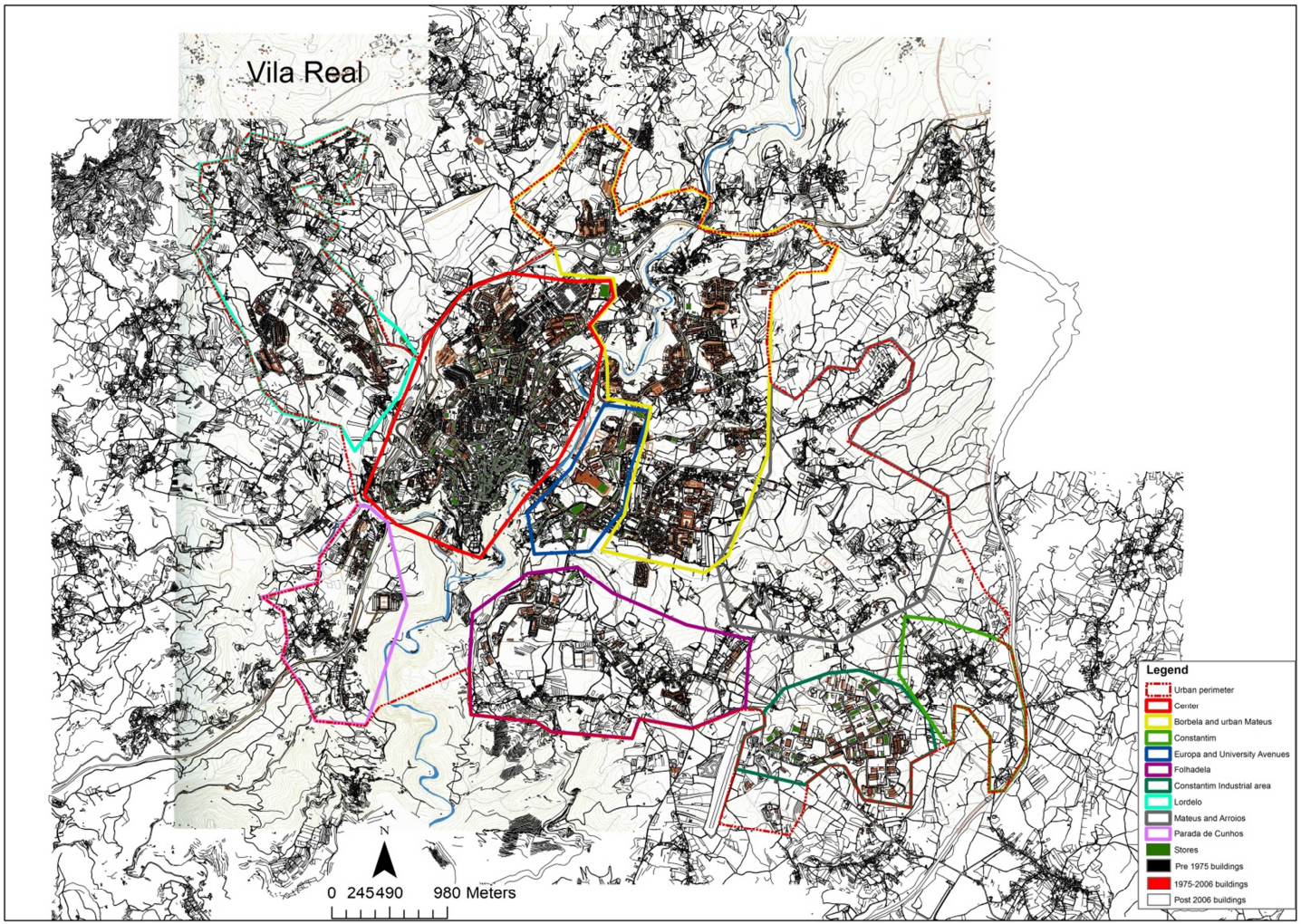


Figure 43 - Division of Vila Real's city model into hierarchical zones

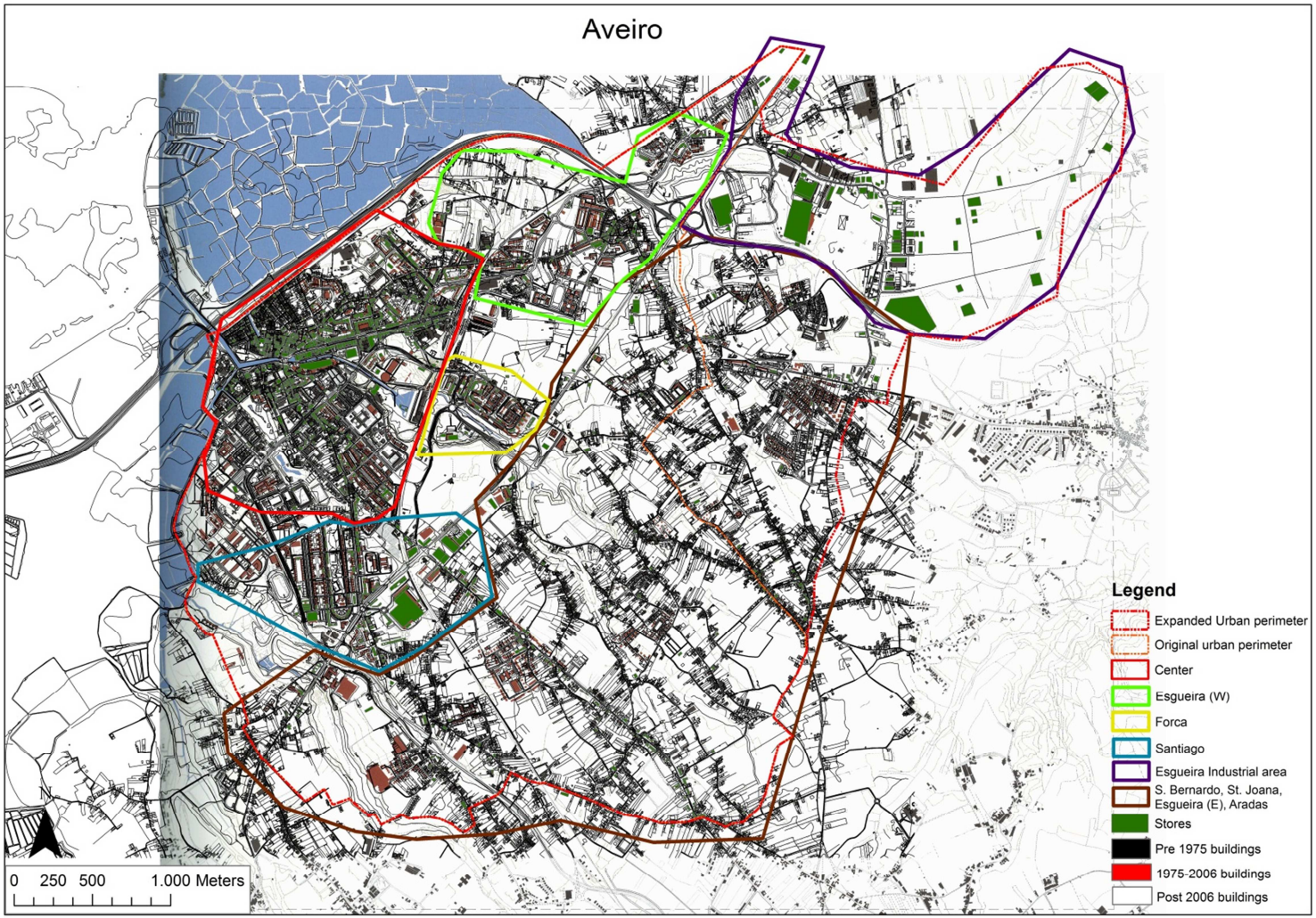


Figure 44 - Division of Aveiro's city model into hierarchical zones

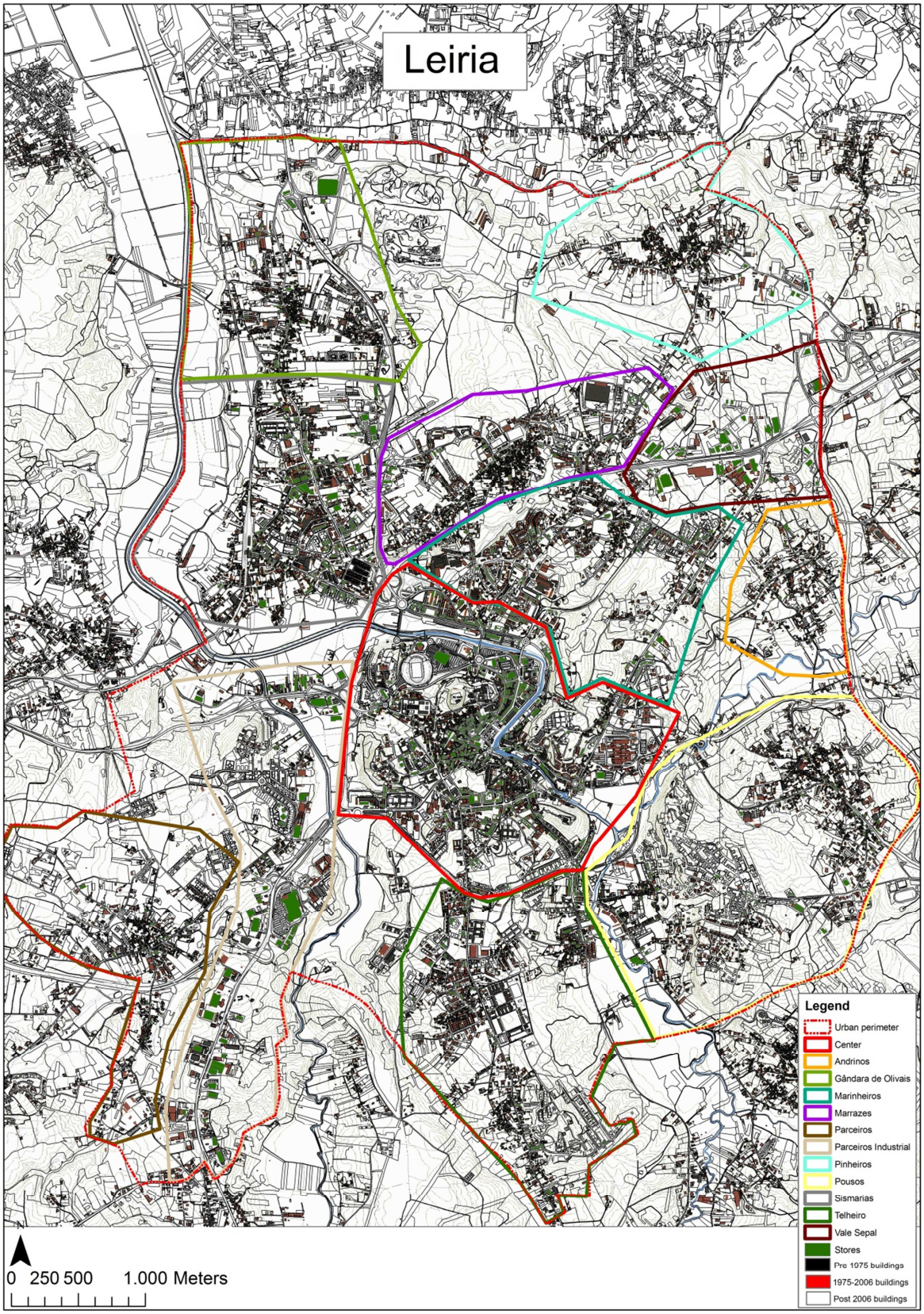


Figure 45 - Division of Leiria's city model into hierarchical zones

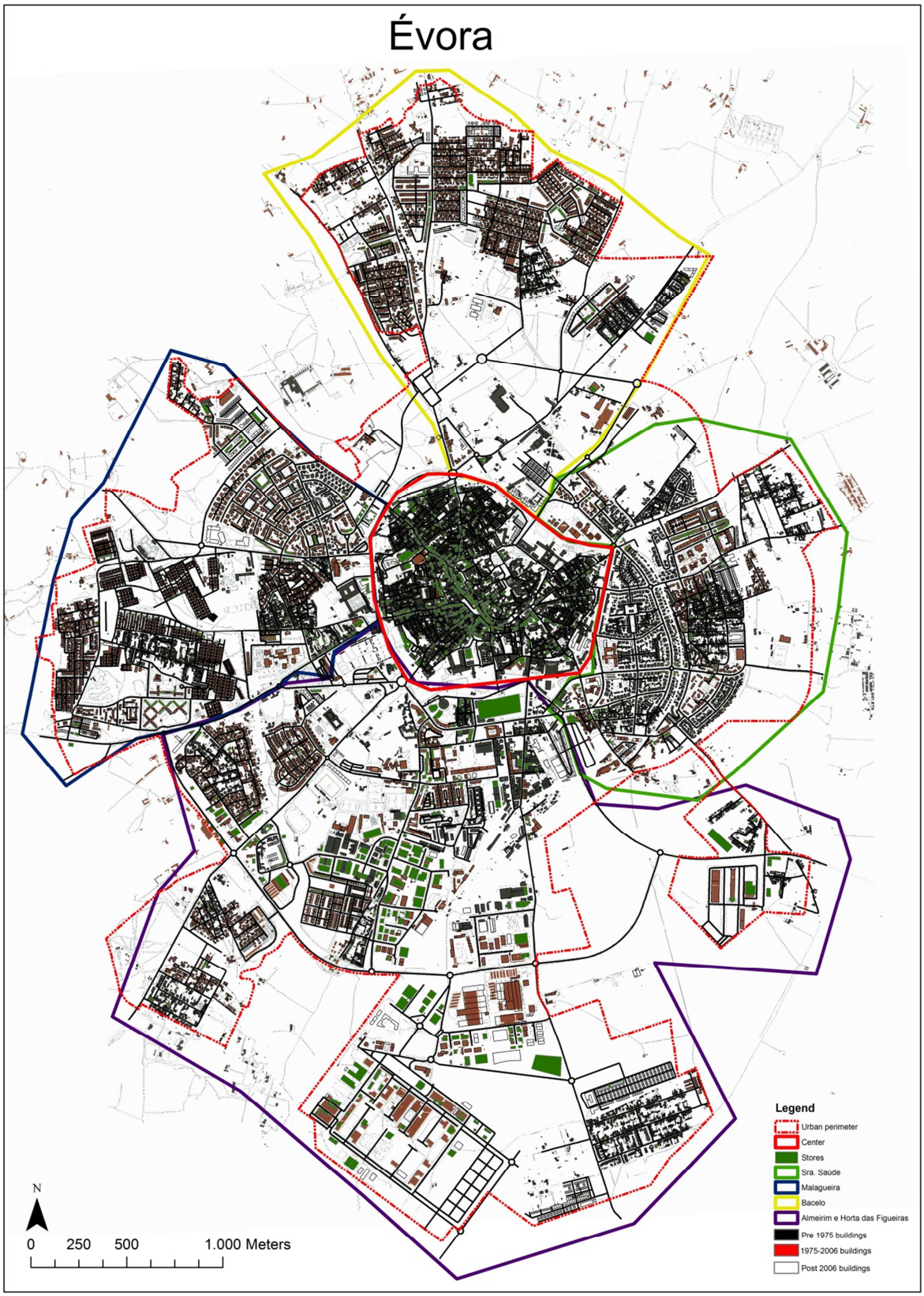


Figure 46 - Division of Evora's city model into hierarchical zones

In the overall city analysis it can be seen that practically half of the stores are in buildings constructed in the last 30 years. Theoretically, it should be hard to know, without data, if it is the commercial offer that has doubled or if there has been a relocation from older to newer buildings. But, although it can be supposed that some relocation has indeed occurred, it is logical to assume that it has not occurred to the entire extent of the offer in new buildings. Consequently, although it is not possible to say how many times, it can be stated that the commercial offer in cities has indeed increased, which is not surprising. If buildings and inhabitants increase in cities, the market logic dictates that commercial offer increases as well. As medium-sized cities developed, two phenomena occurred: first the growth of the importance of their centers as poles of commerce and service for the entire region, and second the growth of residential areas in the center and in the suburbs serving that center. Both these phenomena inevitably produce the necessity of more commercial area, which will more than likely appear in new construction. This is not only a consequence of real-estate development but also of rent values (as new store area is most of the times cheaper than traditional store space) and of local planning, which defines overall commercial area minimums for given zones and allows for commercial spaces to appear practically in all new urbanization areas and in all types of buildings. If before traditional shops usually were situated in low rise buildings in main streets[139], or else in commercial concentrations such as commercial arcades, now the excess of offer has changed the pattern of commercial location, as was discussed in the literature review.

Actually, analyzing the four case studies, it can be argued that *in the centers* the re-location of shopping areas may have closely followed the natural growth of those centers in terms of new construction. New buildings appearing in these city centers are either exclusively residential (generally closer to the peripheries) or else contain shops or services, mostly in a row. And because these new buildings also appear close to each other, then the propagation of shops takes the natural form of continuous ribbons, highly clustered.

As it can be seen in Figure 47, the city centers of Leiria and Aveiro have mostly expanded both to the North and to the South of their traditional centers, whilst Vila Real's center has expanded almost solely to the North. It can be seen that commercial spaces did likewise. Because there are, in these new locations, very few single standing facilities or public spaces that could have held some sort of attraction for commercial spaces, it can be assumed that they located there precisely because they were following land development, particularly residential one, and were able to go there because promoters allocated commercial area to their newly constructed enterprises. The consequence, in these three cities, is that the centers are divided into two sub-centers. One is older, around *Rua Direita*[140], and the other is of recent construction, taking the form either of medium and high-rise residential neighborhoods with stores on the ground floors, or of new business districts, to where services and high hierarchy commerce has shifted.

[139] Often the retailer lived on the upper floor of its shop.

[140] *Rua Direita*, the Straight Street, was the popular term used in Portugal to name the High or Main commercial street of ancient towns. Although this is not the official name of most of these streets, it is still being used today, even if most of them are now associated to traditional commerce. The rehabilitation of the *Rua Direita* is intrinsically entwined with the rehabilitation of downtown retail. Many *Ruas Direitas* are now almost exclusively pedestrian shopping streets.

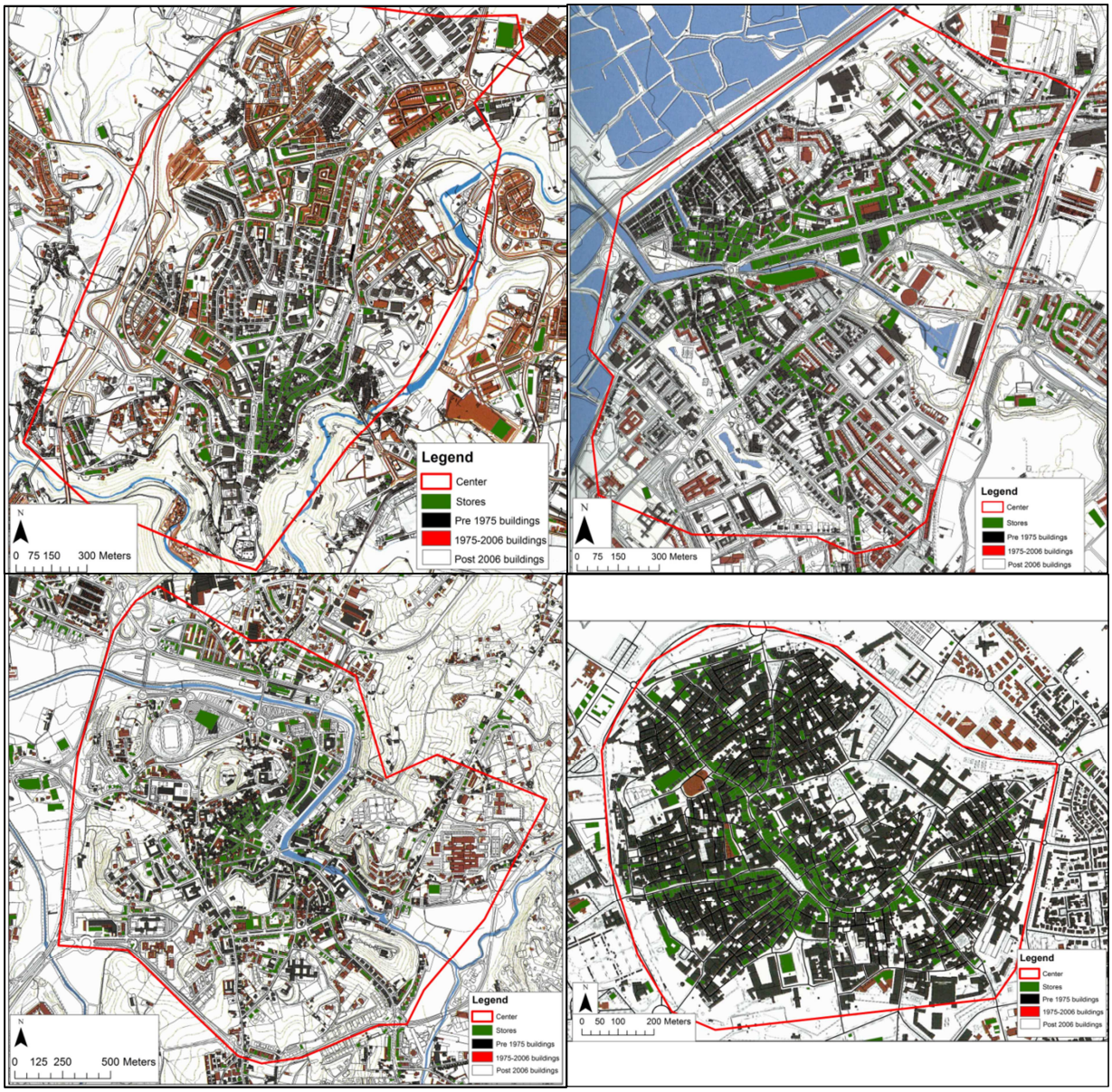


Figure 47 - Close-up of the city centers of Vila Real, Aveiro, Leiria and Évora

Above it was seen that Vila Real and Leiria's centers had increased in terms of resident population. This may be because their centers have been more permeable to newer construction, which can also be a consequence of the available space they possessed, unlike Évora's city center. It is no surprise then that 56% and 45% of the stores in, respectively, Leiria's and Vila Real's city centers are in buildings constructed after 1975. In Aveiro, this number is only 30%, but this is mainly because the principal avenue of the city center, Dr. Lourenço Peixinho Avenue, was first built in the 1920s[141] and most of the construction of the subsequent decades still withholds, and still contains commerce. On the other hand, Évora's city center constitutes the exception. It has had neither room nor willingness (because it is a world heritage site) to change its built landscape, so the commerce still stands in the same streets

[141] Lourenço Peixinho notably fought the public authorities first to have a Lisbon-Oporto train stop in Aveiro, and second to have the station as close as possible to the city center. Because he could not 'push' the station closer to the center, an Avenue, which later, in 1952, was named after him, was constructed to unite the two poles. This Avenue was, over the decades, slowly urbanized until it became the most important artery of the city. It still retains that importance in the present day. This Avenue is depicted in Figure 55.

and buildings as it did decades ago. Inside the city walls there are only three buildings which contain stores[142] that were built after 1975.

If in the center the expansion of the urban landscape has been more or less straightforward, in the peripheries various types of expansion have occurred. Nevertheless, there is, in these four peripheries, a similarity worthy of note in the percentage of shops that are situated in buildings constructed after 1975. As Table 8 shows, the number is between 72-75% in all peripheries but Vila Real's, where it is slightly less (66%). This means that at least 2/3 of the shops situated outside the city centers but inside the urban perimeter of these four medium-sized cities are in newer buildings. Yet these buildings are not necessarily in newer areas. The analysis proves that new buildings, with store space, have filled vacant urban lots or replaced older construction, introducing activities in areas that before either were utterly dependent on the city center or presented only a type of local, first necessity retail.

In the center it is clear that shops followed the natural growth of the city because they made their way first through old, then through new linkages until they reached new urban areas, which became commercial poles in their own right. Outside the center this is more difficult to ascertain. Over 30 years ago, relevant commercial areas outside the city center were very few, were usually associated with local necessity goods and were situated on the center of well-defined villages or residential localities. Here commerce appeared in main intersections or in the main traditional street. In the present analysis, it was discovered that in many traditional suburban localities, even in spite of new construction, commerce still does preferably so. That is, new construction either does not create new commercial area (it is mostly residential), or else it *does*, but that area is not relevant enough to affect the traditional commercial landscape. Consequently these localities have a low percentage of stores in buildings constructed after 1975. Table 8 helps to define a limit of 30% for them. Although Évora and Aveiro have the lowest overall percentages of stores in post 1975 buildings, it is found that this is due to their *centers*, which still have strong traditional commercial inheritances. In their peripheries, only some traditional residential neighborhoods have considerable axes of commerce in pre 1975 buildings, not enough, however, to reduce the percentages considering the overall locality in which those neighborhoods are in. On the other hand, Leiria and Vila Real present an array of traditional localities whose expansion, or at least disperse new construction, has not changed their structure (morphological or commercial). The most critical example occurs in Constantim, in Vila Real, where only 1 of the 17 stores therein is in a building constructed after 1975. These localities are usually the farthest from the city center, bordering the limit of the urban perimeter, and consequently were categorized, in this research, as '*Isolated residential areas*'.

In other peripheral localities, new buildings with considerable store space have appeared around or among the traditional ones. These building mostly correspond to medium-rise multi-family constructions, which possess shopping rows in their ground floors forming new commercial poles. These poles either complement and consolidate the existing axes or else create new ones. It is perceived that the emergence of these new poles of commerce has mostly overshadowed the traditional commercial rows, which nonetheless still exist. Table 8 shows that the localities which possess these dual characteristics have between 55 and 75% of their stores in buildings constructed after 1975. Two different examples can be given to illustrate how older and newer shopping areas can co-exist in the peripheries: Esgueira (West) in Aveiro and Malagueira in Évora. In Esgueira (Figure

[142] Totalizing 10 stores.

48), a locality Northeast of Aveiro's center, the pole of commerce used to be in Vicente de Almeida de Eça Street. Today, that street is still occupied by traditional stores, but it is perceived that the commercial center of the locality has shifted two streets to the West, to Luís de Camões Street, where a square of new, high-rise, multi-family buildings with commercial arcades on the ground floors has been erected. These two centers interact and complement each other nonetheless.

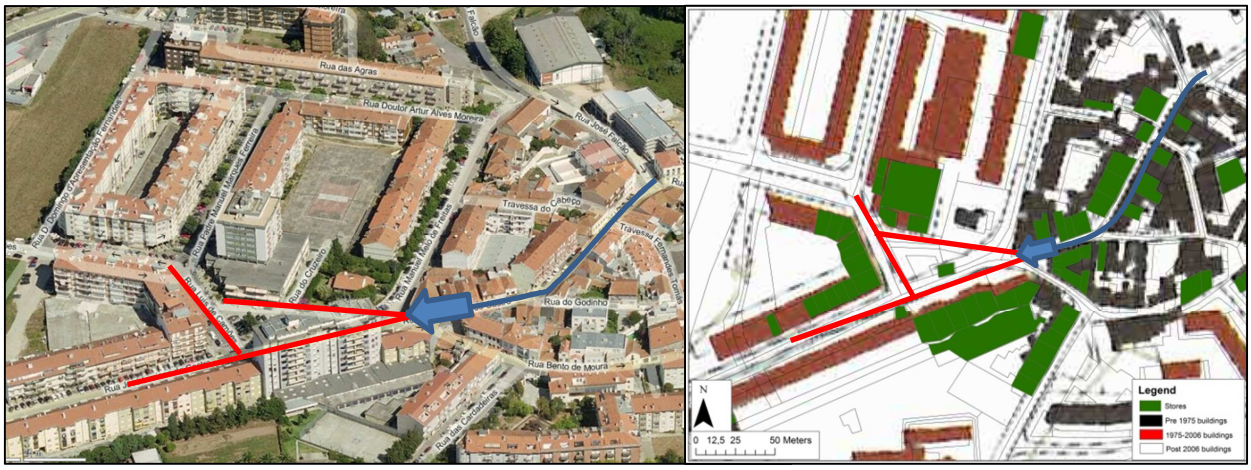


Figure 48 - Aerial photograph and model of central Esgueira in Aveiro, showing the urban and commercial growth from Vicente de Almeida de Eça Street (blue line) to a new square enriched by commercial arcades (red lines). Aerial photograph taken from www.bing.com.

The neighborhood of Malagueira, West of Évora's center (Figure 49), practically consisted of one single street, Santa Maria Main Street, which had a very sporadic and first necessity commerce. With the construction of two new residential neighborhoods, one to the North (Siza's social housing project) and one to the South, each with their own commercial concentrations, the commercial offer of the locality not only has substantially increased, it has also been divided. This has left the pre-existing stores of Santa Maria Street to serve only a small segment of the neighborhood's population.

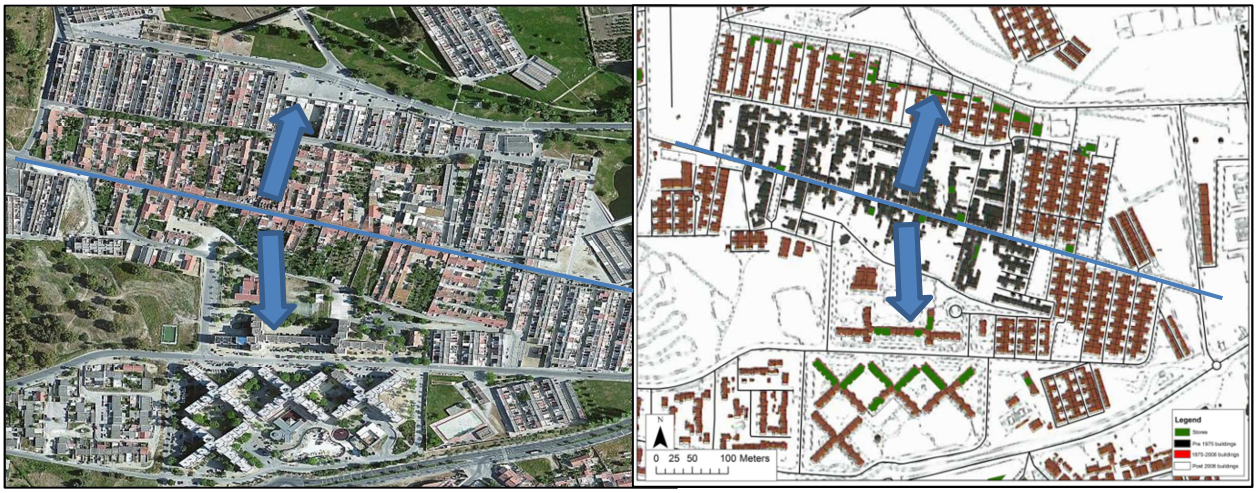


Figure 49 - Aerial photograph and model of central Malagueira, in Évora, showing the urban and commercial evolution from central street Santa Maria (blue line) to surrounding new neighborhoods. Aerial photograph taken from www.bing.com.

In both these cases, and of all other localities in the four cities under the same circumstances, the percentages of shops in newer buildings are always higher. This means that centralities have remained

but the poles of commerce have shifted, if only slightly, to nearby streets. Shops in modern buildings are more, closer together (because they are mostly 'door to door') and more spatially organized, whilst the older poles of retail usually maintain a traditional and specific activity. Practically all these areas have been characterized, in this research, as '*Residential*' or '*Main residential*', although the industrial areas of Parceiros in Leiria and Esgueira in Aveiro also contain the dual occupation of stores in traditional and modern buildings.

Lastly, some peripheral localities have been almost entirely erected in the last thirty years, either growing from small traditional neighborhoods that had little significance, or else along some pre-existing travelling axis with disperse traditional building occupation. These disperse and isolated traditional areas possessed very few stores, so not only has real-estate development created completely new neighborhoods, it has also supplied completely new commercial areas to serve them. Table 8 shows that these peripheral localities possess over 90% of their stores in buildings constructed after 1975. All of them, with the exception of Bacelo in Évora, have a border with the city center. Precisely because of this, these areas have been characterized as either '*Main residential*' areas or '*Extensions of the city center*'. It can be deduced that their outburst of construction has had the goal of first prolonging the center and second bridging or filling the gap between the center and the developing peripheral localities. The commerce these localities possess is intrinsically connected to that of the city center, sometimes producing direct extension ribbons. On the other hand it has also the function of serving the main residential areas of the outer rim of the center, constituted by high-rise buildings and containing the highest values of population density. Two industrial areas; Vale Sepal in Leiria and Constantim in Vila Real are also of almost entirely recent formation.

Yet to have stores in newer buildings does not mean commercial prosperity. Although the analysis of 'closed' and 'empty' stores will be made only in Chapter 8, it can be stressed presently that 55 to 60% of these stores are in buildings constructed after 1975. This can be for various reasons, but the main one may be that the increase of commercial space offer may be unjustified. That may be the reason as well for this tendency to be more perceptible in the peripheries, places with newer, and more out of the way construction. Considering just the centers it can be seen that the values for Aveiro and Évora are similar to those of the entire city. In Leiria and Vila Real, however, there is an increase of 5 to 10 percentage points in the percentage of non-open shops that are located in post 1975 buildings. This is more aggravating if it is remembered that Leiria and Vila Real have more buildings in their city centers than the other two cities. Considering just the peripheries, it can be seen that Vila Real's presents the lowest percentage, with just 54%. This can also be a consequence of the fact that this city has the least number of new buildings in its periphery. The peripheries of the other case studies present significant increases. Leiria's and Aveiro's have 78% of non-open stores in post 1975 buildings, and in Évora, notably, that number is 85%.

Based on the different types of urban and commercial expansion discussed in the previous paragraphs, a first approach to the definition of commercial hierarchies was made. Furthermore, by comprehending this evolution, it was possible to establish general patterns of commercial distribution for each area. These deductions led to the six hierarchical layers presented in Table 9. The geographical relationship between these hierarchies is synthesized in the simple schematic presented in Figure 50. There is, unequivocally, a ring logic associated to the hierarchical commercial expansion of the city. Only the 'commercial/industrial' area appears almost exclusively in one location of the outer rim.

Table 9 - Commercial hierarchies

<table>
<tr><th></th><th>Vila Real</th><th>Aveiro</th><th>Leiria</th><th>Évora</th></tr>
<tr><td>Network of commercial and services' axes + shopping centers and arcades</td><td>City center</td><td>City center</td><td>City center and 'Nova Leiria'</td><td>Inner walls city center (no shopping centers nor arcades)</td></tr>
<tr><td>Extensions of city centers with commercial axes, store clusters and large commercial areas</td><td>Europa and Universidade Avenues</td><td rowspan="2">Santiago, Forca and Esgueira (West) (also with services)</td><td>Sismarias</td><td></td></tr>
<tr><td>Main residential areas with store clusters in residential buildings forming partial commercial axes</td><td>Borbela and urban Mateus</td><td>Marinheiros and Telheiro</td><td rowspan="2">Bacelo, Malagueira and Senhora da Saúde</td></tr>
<tr><td>Residential areas with few isolated stores + clusters in main crossroads</td><td>Lordelo, Constantim, Folhadela and Parada de Cunhos (no shop clusters)</td><td rowspan="2">St. Bernardo, St. Joana, Esgueira (East), Aradas (clusters form perceptible axes)</td><td>Marrazes, Parceiros and Pousos</td></tr>
<tr><td>Isolated residential areas with few stores in main street</td><td>Mateus and Arroios (residual stores)</td><td>Gândara de Olivais, Andrinos and Pinheiros</td><td rowspan="2">Almeirim and Horta das Figueiras</td></tr>
<tr><td>Industrial/commercial areas along a specific axis with individual warehouses and shopping centers</td><td>Constantim industrial area (no shopping center)</td><td>Esgueira industrial area</td><td>Parceiros and Vale Sepal industrial areas</td></tr>
</table>

Whilst the four city centers present similar roles, the peripheral localities in each city are organized differently. Because Leiria's and Vila Real's peripheries consist of smaller localities which had a perceptible existence of mild relevance before becoming part of the urban perimeter (that is, they were not merely residential suburbs), the 5 types of peripheral zones are clearly defined. In Aveiro, the type of expansion is different. It consists of urbanization along travelling axes, rather than localities closed on themselves. In Évora, the expansion localities, North, East and West of the traditional center are clearly residential, built to serve the center, whilst the southern expansion balances residential with industrial/commercial areas. This is why Évora's and Aveiro's peripheries do not exactly fit in the model that suits Leiria's and Vila Real's peripheries. Therefore, in Évora and Aveiro, some zones can be multi-purpose, and hence they comply with more than one hierarchical category. With the analysis of the next subchapter, of the comprehensive interpretation of the spatial distribution of commercial spaces for each individual area, the elements of the hierarchical model will be truly defined.

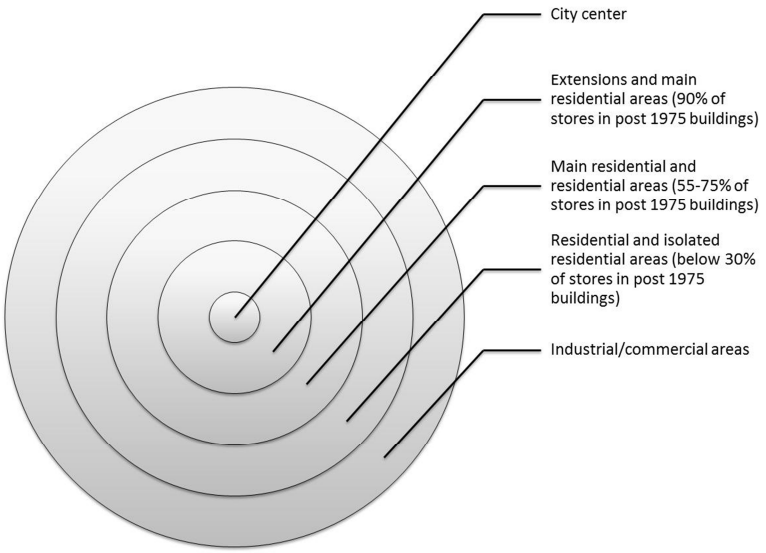


Figure 50 - Spatial representation of the average hierarchical commercial structure of the case-study cities

7.3. DEFINING 'LOCATION, LOCATION, LOCATION'

7.3.1. IN CITIES

The total commercial area amounts, in the average of the four case studies, to only 3% of the total city area (Table 10). The value is lowest in Vila Real, not only because it has the least number of stores, but also because it possesses, like Leiria, a larger urban perimeter. On the other hand, this percentage is not highest in Évora, even though it has the smallest area, because it does not possess as many stores (and multi-commercial spaces) as Aveiro. This percentage is obviously higher in the centers than in the peripheries.

Using the ArcGIS tool 'Calculate Distance Band from Neighbor Count' the way this area is distributed throughout the city, that is, the distances between stores, was calculated. This tool, according to ArcGIS Desktop Help, '*calculates the distance for all features in the input feature class to their nth neighbor (…) then it examines the distances and returns three values: the maximum distance, the minimum distance and the average distance*'. A distance between two stores is considered as the distance between the gravity centers of each. Two distances can be selected: Euclidian and Manhattan[143]. The Manhattan distance was chosen, because it was assumed that it better represented the travel distance in urban spaces.

This way, and using only one neighbor, it could be seen that, on average, every store in each of these four cities distances 27 meters from the next, and that there is not a single store that is more than 700 meters away from another (Table 10). Considering all the stores in the system as neighbors, it can be deduced that from a single store a shopper can reach all the other stores in the city by travelling, on average, 7 km through the network in Vila Real, Aveiro and Leiria, and 4,5 km in Évora.

[143] Euclidean distance (as the crow flies) reflects the straight-line distance between two points. On the other hand, Manhattan distance (city block) reflects the distance between two points measured along axes at right angles. It is calculated by summing the (absolute) differences between point coordinates.

Table 10 - Distance relationships between the stores' physical location

Cities		Vila Real	Aveiro	Leiria	Évora
% of commercial area in total area	**City**	**1,1**	**3,21**	**1,7**	**2,62**
	City center	4,37	7,75	5,27	7,98
	Periphery	0,73	2,78	1,59	2,22
Minimum distance equation	**City**	**$y = 0,8977x - 3,3741$ (first 1.000 stores, $r^2 = 0,9911$)**			
	City center	$y = 0,8384x + 8,6873$ (first 800 stores, $r^2 = 0,9978$)			
	Periphery		$y = 3,5665x - 14,075$ (first 800 stores, $r^2 = 0,9989$)		
Average distance equation	**City**	**$y = 31,468x^{0,5997}$ (first 1.000 stores, $r^2 = 0,9958$)**			
	City center	$y = 15,452x^{0,6097}$ (first 800 stores, $r^2 = 0,9986$)			
	Periphery		$y = 40,376x^{0,6864}$ (first 800 stores, $r^2 = 0,9998$)		
Average distance to nearest store (m)	**City**	**30,72**	**25,65**	**27,73**	**27,37**
	City center	16,44	15,66	15,59	14,95
	Periphery	63,70	38,69	43,33	38,96
Maximum distance to nearest store (m)	**City**	**586,39**	**661,44**	**511,52**	**366,33**
	City center	442,23	171,80	240,79	95,96
	Periphery	586,39	661,41	511,52	366,33
Average distance to all stores (m)	**City**	**6.937**	**6.622**	**6.893**	**4.592**
	City center	2.434	2.025	2.234	1.175
	Periphery	7.134	6.761	7.877	5.108

Using the same procedure, minimum, maximum and average distances can be obtained considering various numbers of 'neighbors', ranging from the closest store (one neighbor) to all the other stores (total number of stores minus one). These values were plotted, and the graphs in Figure 51 were obtained.

As it can be seen, there is an uncommon similarity in the form the physical distribution of stores takes in these four urban areas. The dissimilarities may be first explained by the differences in total number of stores and total study area these case studies possess. For example, in the maximums graph, Évora's curve is obviously lower because, due to the limited urban perimeter of the city, stores in opposite corners of the study area are closest than stores in the same situation in other cities. Yet the dissimilarities in the graphs also arise from the different types of commercial distribution. The analysis of the 'ledges' is one of the elements to retain. Their extension defines the amount of stores that are, in a given place, closer together. In the maximums graph they represent the center concentration and the continuous links to the periphery. The longer the ledge, the longer the continuous links. In the minimums graph they represent the various concentrations of stores. It can be seen that all cities

present relevant concentrations (various 'steps') but Vila Real. This explains Vila Real's lack of strong commercial peripheral poles. Aveiro is the city that appears to have more 'steps'. On the other hand, the 'tip' of all graphs represents the isolation of the farthest stores. This dispersion is less in Aveiro and Leiria, because their 'tips' are smaller and have lesser angles. Vila Real's 'tip' is representative of the commercial isolation of outer localities.

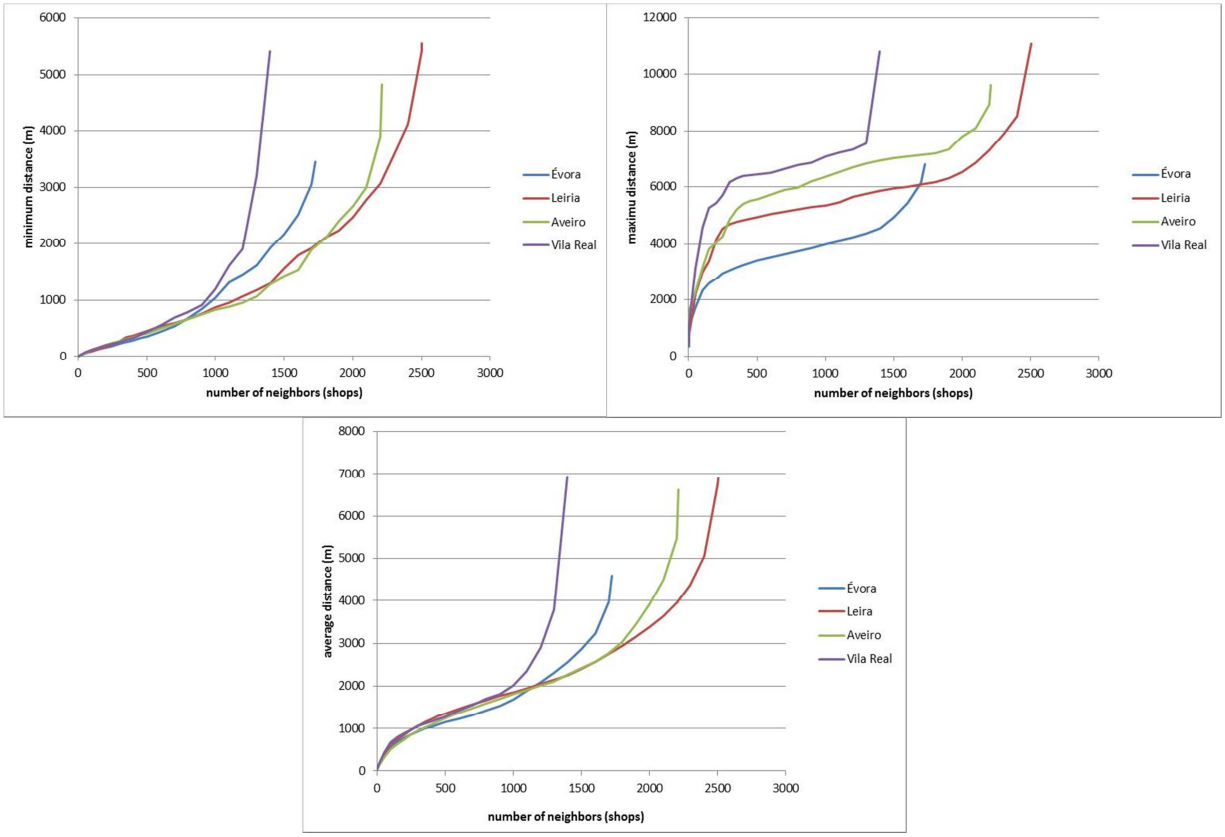


Figure 51 - Minimum, maximum and average distance between each store and n neighbors

The dispersion represented by these graphs can be translated into mathematical equations, which in the case of the average and minimum distances are power functions[144] and in the case of the maximum distances are power functions or polynomial (n=3) distributions. What is striking is that in the first two cases (average and minimums) the curves of the different cities are so similar for the first 1.000 stores that they are practically coincidental. This is no coincidence. It means that about 1.000 stores in each city present similar location concentration patterns. These stores are obviously those in each city center, but can also represent the peripheral commercial clusters. This will be explored in the next sections, relating to the physical distribution of commerce in the centers and in the peripheries, respectively.

Considering only the closest 1.000 stores and the average value of the four curves representing each city, two equations were obtained, where x is the number of neighbors and y the distance in meters (Table 10);

[144] In mathematics, a power function is a function of the form $f(x) = cx^a$, where *c* and *a* are constant real numbers and *x* is a variable.

$$y = 0{,}8977x - 3{,}3741 \text{ (minimum distance)}$$

$$y = 31{,}468x^{0{,}5997} \text{ (average distance)}$$

These equations, with r^2 very close to 1, may well represent the reference equations of the physical distribution of stores in an average Portuguese medium-sized city. For the minimum distance, the correlation between the number of neighbors (shops) and the distance needed to reach them is linear, meaning that these two variables can be proportional. This equation represents the continuous corridors of shopping spaces that spread from the center.

Using the same principles, in this phase of the research four additional graphs, represented in Figure 52, were plotted. These show, for each city, the physical dispersion for the whole city and by hierarchical area[145].

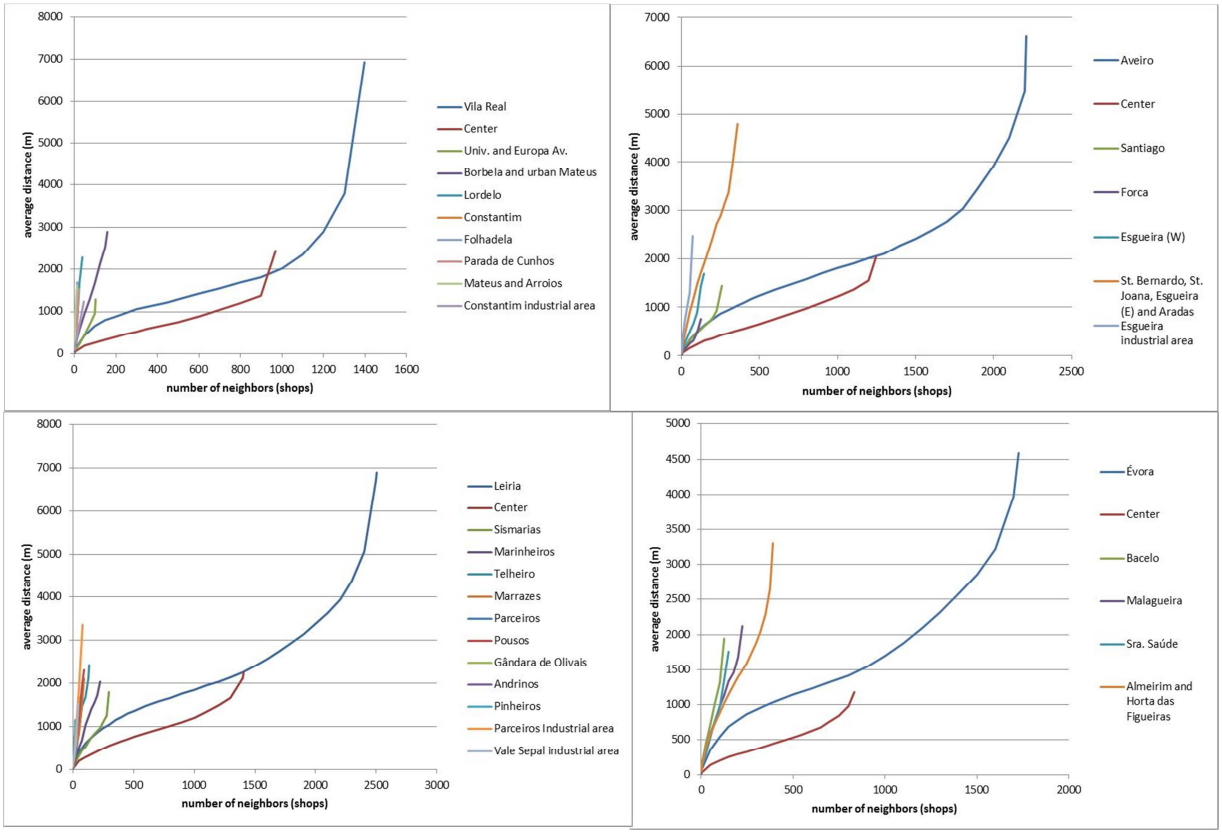


Figure 52 - Average distance between each store and n neighbors, by hierarchical area

There are several things these graphs can reveal. First they can either confirm or put into question the hierarchical separation made above. It is perceptible in all graphs that some localities have different curves whilst others have similar. For example, in Évora's graph the similarities between the three residential localities are made quite clear. This means that the physical location of shops is indeed different by areas and hence it can be proposed that that location can be dependent of the commercial function each area possesses. This being true, areas of the same hierarchical layer but of different cities may present similar curves. Nevertheless, it can be seen that some localities do not group with

[145] Only the graphs for the average distances are represented in Figure 52. The graphs for the minimums and the maximums are displayed in Annex 5.

the others of their hierarchical layer. For example, in Aveiro's graph, it can be seen that Esgueira's (West) physical dispersion seems to have a behavior closer to the other residential localities than with the 'extensions' Santiago and Forca. Likewise in Leiria, Telheiro may belong to the 'residential' and not to the 'main residential' layer. The graphs also reveal that, for all areas, there is always a similarity for a reduced number of neighbors. Stores always concentrate in similar geographical fashion. Lastly, the minimums graphs (displayed in Annex 5) shows that the center is indeed the area with the greatest concentration of stores. In all cities, practically up to 1.000 neighbors, the minimums curve for the center and for the entire city is the same.

In the next two sections, a closer look is given to the center and to the different areas that constitute the periphery.

7.3.2. IN CITY CENTERS

Briefly, the commercial distribution in the four studied city centers follows mostly the logic of streets. Commerce appears in rows, usually in only one side of a block, following the main street lines and forming, consequently, commercial axes. Only near traditional centers do these axes tend towards the formation of a closed network (the logic of blocks), as stores occupy closely parallel and perpendicular streets in all sides of the block.

Spatially, this commercial area amounts to 8% of the city center area in Évora and Aveiro, and to 5% of the city center area in Vila Real and Leiria, a difference which, once again, may be explained by the differences in overall areas and in the number of stores (Table 6). Using the nearest neighbor methodology explained above, the distance patterns for the center stores can be obtained. These are portrayed in the graphs of Figure 53. Once again, it is the power function that best explains the behavior of store location. And once again, there is an uncanny similarity in the average and the minimum patterns for a reduced number of neighbors. In this case, the limit considered was 800 stores, which practically constitutes the commercial universe of Vila Real's and Évora's centers, and the inner cores of the other two centers. Table 10, previously presented, shows the regressions obtained by considering the average of these very similar values. Again, the minimum equation is linear. This means that in the traditional centers and in the associated shopping linkages (and many times also in the new centers) the travel distance needed to reach a given number of stores is precisely proportional to that number. The curves also clearly show that Vila Real's center has more outliers[146] (the highly perceptible 'tip' of the curve) and that Évora's and Aveiro's centers have a more fluid and continuous distribution of stores (less 'steps' in the graphs). The existence of two 'steps' in Vila Real's maximums graph and the larger distance between them shows the existence of two distinct commercial centers, practically without linkages between them, as it will be discussed ahead (Figure 54).

[146] Although one of these is the hypermarket Continente, at the edge of the center limit (Figure 54). As it is discussed in the next paragraph, if this store is not considered, the distance to the farthest store in the center substantially decreases.

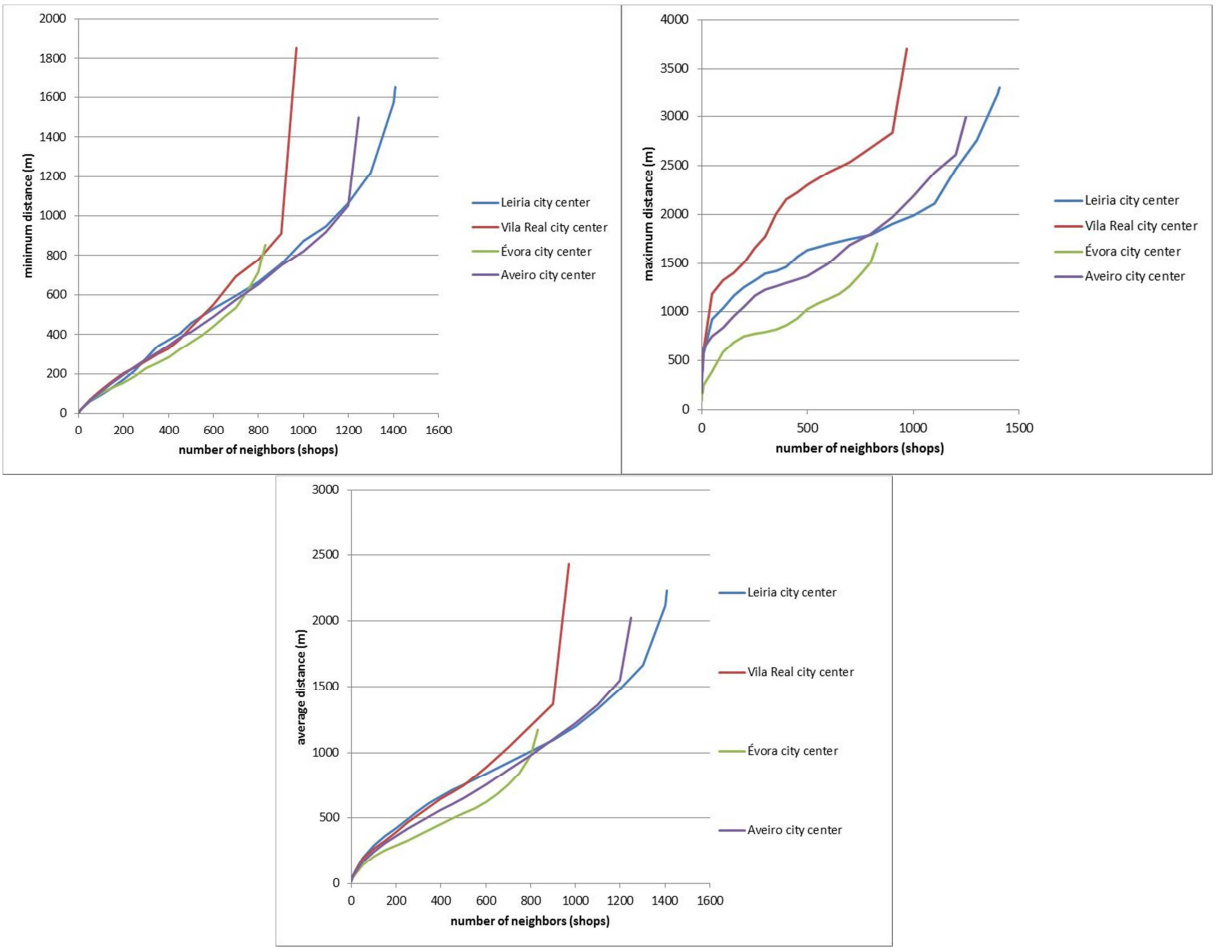


Figure 53 - Minimum, maximum and average distance between each store and n neighbors in the city centers

As is summarized in Table 10, in these centers each store is in average 16 meters away from the next. It can then be assumed that most stores are practically 'door-to-door', because this distance is measured between the centers of the squares that depict the stores. No two stores are farther apart than 100 meters in Évora (proving the compactness of its center), 170 and 240 meters in Leiria and Aveiro respectively, and 450 meters in Vila Real. This larger value in Vila Real can be in part explained by the location of the hypermarket Continente, in the northwest corner of the intervention area (Figure 54)[147]. If Continente is removed, the maximum distance between any given two stores in Vila Real's center becomes closer to 200 meters, the same as in Leiria and Aveiro. All the stores in the city center can be reached from a given store by travelling 2,5 km through the network. In Évora this distance is only a predictable 1 km.

Figure 54, Figure 55, Figure 56 and Figure 57, in the following pages, depict the city center models for each city, including the precise location of stores, the location of major facilities, the main street axes and their names, and some illustrative photographs.

[147] This hypermarket was considered as part of the center for various reasons. First because of its proximity to one of the exits of the ring-road. Second because it can be clearly seen from Square 25 de Abril and from the surrounding residential neighborhood. Third because this neighborhood has had recent residential/store development, still in progress, and the influence of Continente is certainly noticeable. And fourth because this is one of two large scale stores that serve the center.

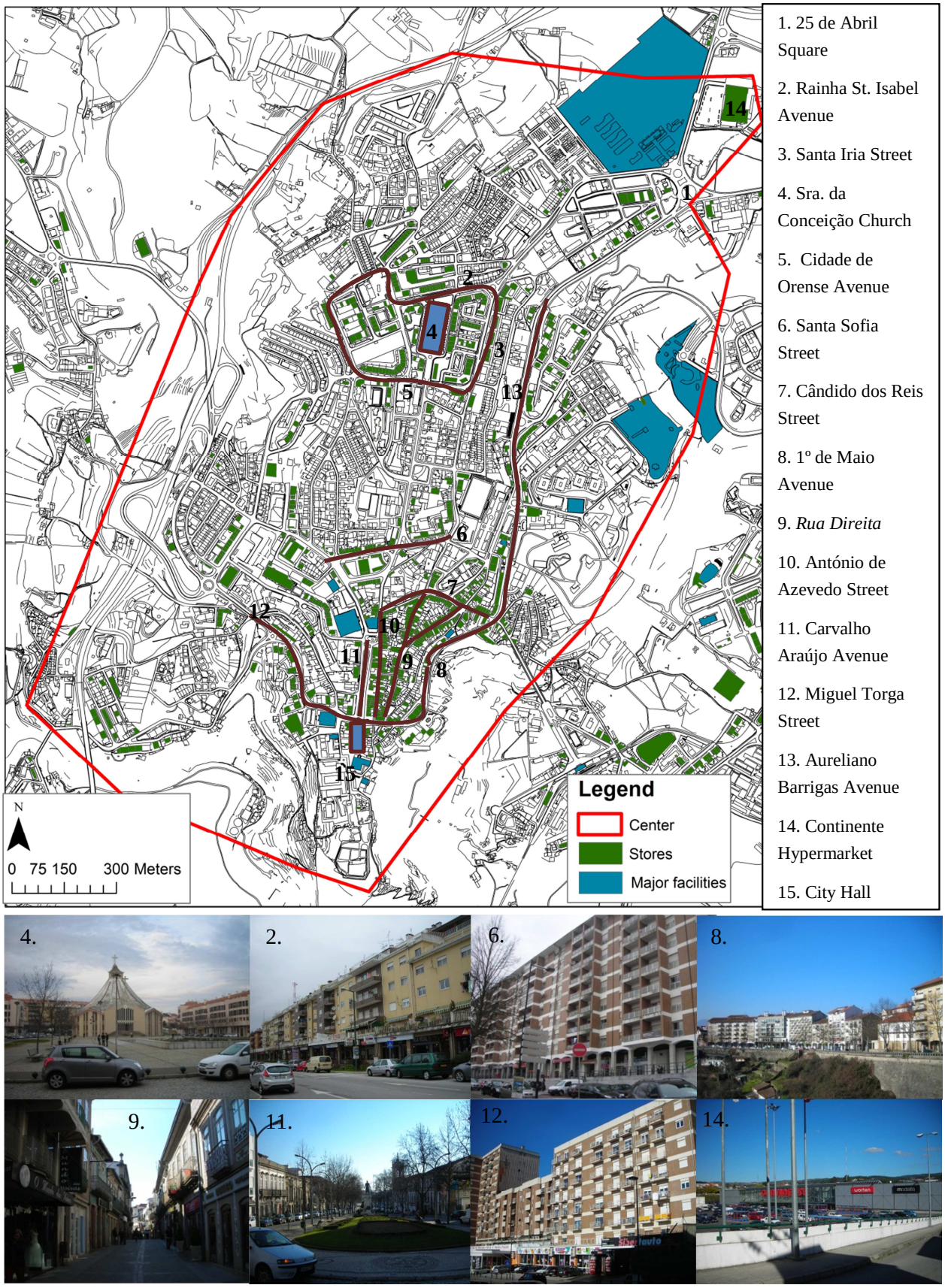


Figure 54 - Vila Real's center commercial distribution (photographs by author)

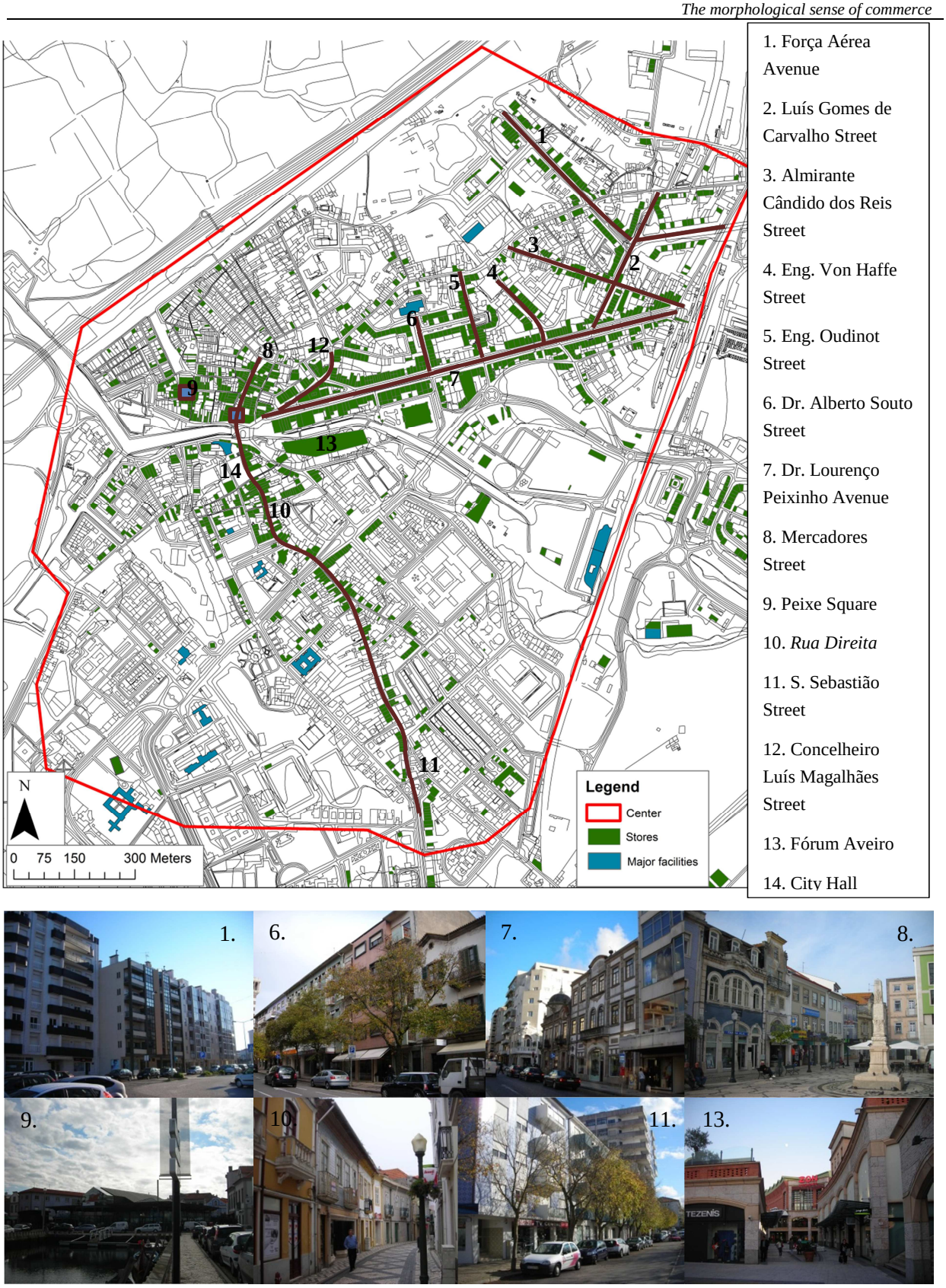
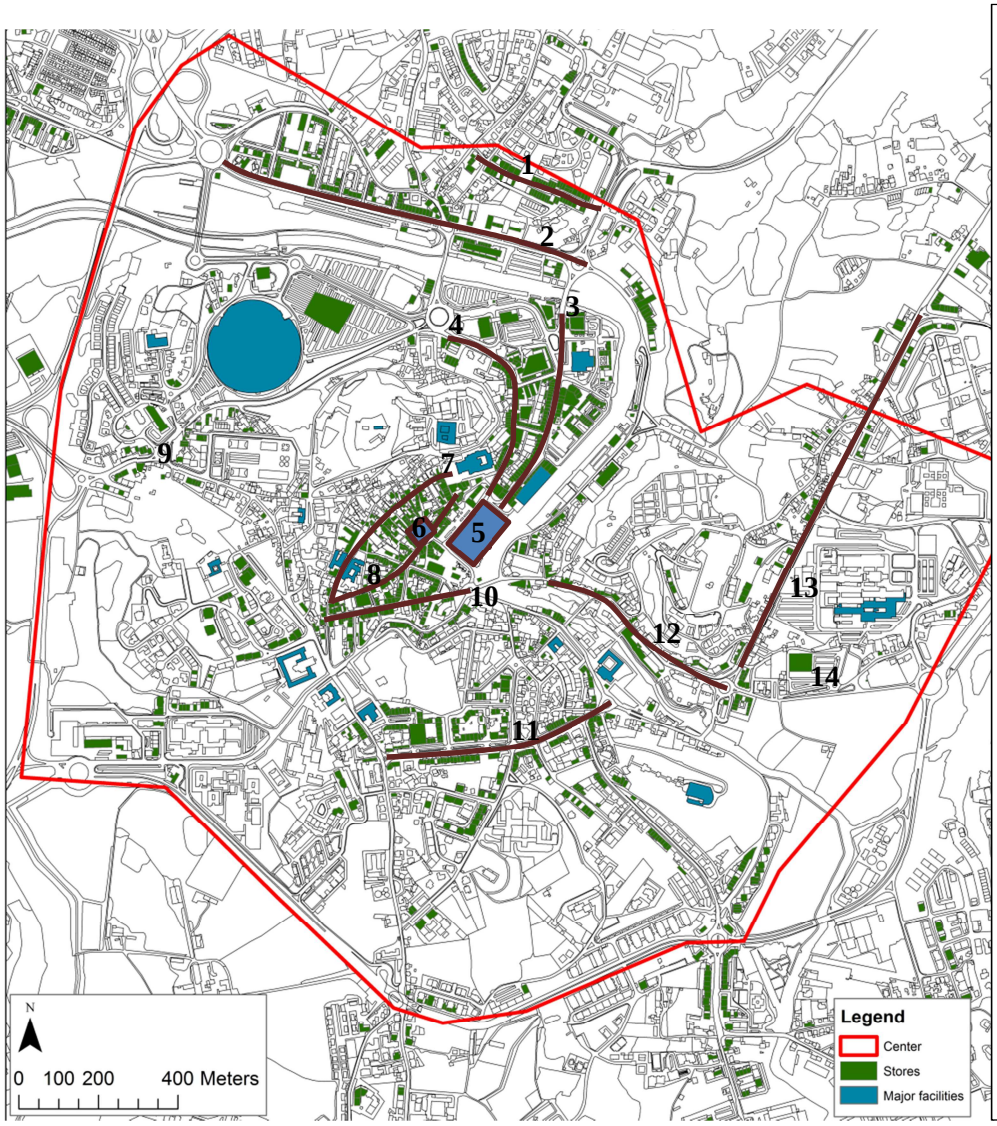


Figure 55 - Aveiro's center commercial distribution (photographs by author)



1. Dona Glória Barata Rodrigues Street
2. Dr. Adelino Amaro da Costa Avenue
3. Heróis de Angola Avenue
4. Capitão Mouzinho de Albuquerque Street
5. 5 de Outubro Square
6. Rodrigues Lobo Square
7. *Rua Direita*
8. Comandante João Belo Street
9. Intersection between Mártires Street and 25 de Abril Avenue
10. Combatentes da Grande Guerra Avenue
11. Marquês de Pombal Avenue
12. Tomar Street
13. Paulo VI Street
14. Park Olhalva Shopping Center



Figure 56 - Leira's center commercial distribution (photographs by author)

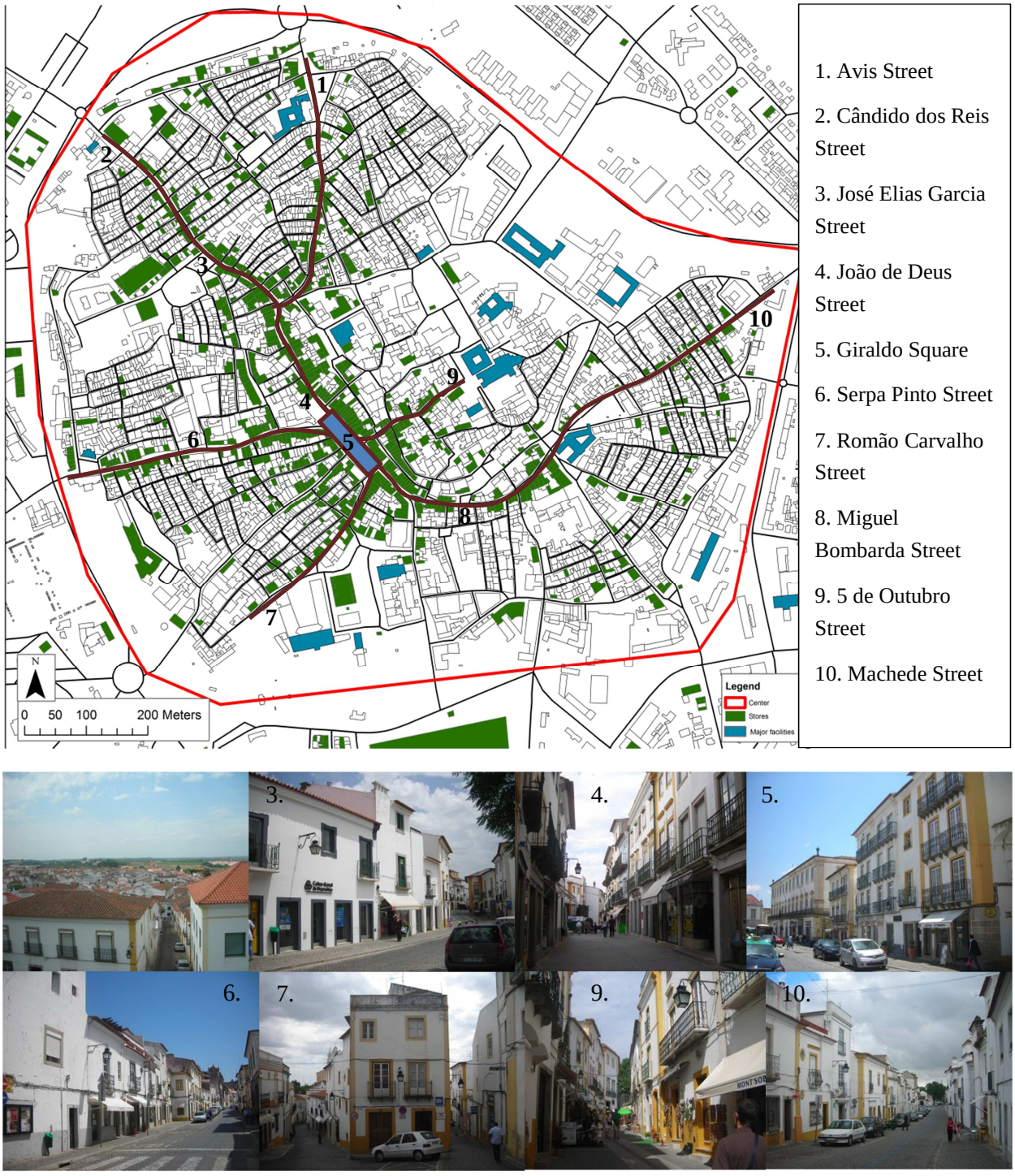


Figure 57 - Évora's center commercial distribution (photographs by author)

The first stores in these city centers appeared in what is now called the 'traditional center'. This center usually occupies, geographically, a central position. It is from this center that perceptible axes flow, making a continuous shopping bridge to more recent commercial concentrations, which have, more than often, constituted a new center. Consequently, it can be said that there are, roughly, three main types of commercial occupation in these four medium-sized city centers: the traditional center, the new center and shopping linkages. The commerce that does not fall into any of these three categories appears only sporadically near new residential neighborhoods, mostly in the intersection of main residential axes. One exception to this model occurs in Vila Real's city center, whose traditional center and new center are clearly separated, and there are no continuous shopping linkages between them (Figure 54). In Évora (Figure 57) there is hardly what can be called a 'new center', at least inside the city walls. The commerce flows continuously through linkages from the central Giraldo Square until it reaches the main axes of residential areas outside the city walls.

The traditional commercial center is more compact, with a series of closely connected commercial blocks, short and full, low-rise, and of residential/commercial occupation. The stores usually appear occupying the whole extent of the traditional, pedestrian, *Rua Direita* (or in the case of Évora, João de Deus and 5 de Outubro Streets), and all around a major square. In Leiria this is the Rodrigues Lobo Square; in Évora the Giraldo Square; in Aveiro both the Peixe Square and the one in Mercadores Street; and both in Vila Real and Aveiro this is also the square in front of the City Hall. Here the streets are narrow, one way, pedestrian or with reduced traffic, and contain narrow sidewalks or none at all.

On the other hand, it is more difficult to discern the new centers from the shopping linkages. This is because the new centers are organized as a series of axes (or just a long axis, as Dr. Lourenço Peixinho Avenue in Aveiro), than actually a series of blocks. Commerce expands from the traditional center through various shopping linkages (in these cases mostly North-South), which can be linked to a series of smaller perpendicular shopping streets, until it reaches, at the edges of the center, clearly perceptible East-West residential axes. In the main commercial axes commerce usually locates in the larger edge of semi-hollow (and sometimes hollow) blocks (facing the main street) in buildings between 3 and 6/7 floors, mostly with services. It is in these main axes that most chain stores are located and through these that the public transport lines pass. Streets throughout the center and in residential commercial areas are usually one way, but structured so as to complement themselves, with average width and with average sidewalks. At the edges or in main thoroughfares building heights are higher and the avenues possess two-way traffic[148].

Therefore, at the edges of the center area, there are service/commercial/residential streets such as Força Aérea Avenue in Aveiro, Dr. Adelino Amáro da Costa and Marquês de Pombal Avenues in Leiria or Rainha Santa Isabel Avenue in Vila Real. These are connected to the traditional center through linkages such as the all-important Dr. Lourenço Peixinho Avenue in Aveiro or the Heróis de Angola Avenue in Leiria. These, in turn, constitute less residential, and more service axes. Some linkages also establish the connection to residential and commercial areas outside the center. This is much more perceptible in Évora, where Streets such as Cândido dos Reis or Serpa Pinto connect directly with residential areas, but outside the city walls. But there are similar examples in other cities, such as São Sebastião Street in Aveiro, Paulo VI Street in Leiria, and Aureliano Barrigas Avenue in

[148] The thorough morphological characterization is presented in Chapter 9.

Vila Real. These streets have mostly a residential occupation. There is yet a third type of linkage, which constitutes a middle term between the older and the newer center (or the periphery). These are usually East-West commercial axes between shopping areas, but they are parallel to them, that is, they do not make, literally, the 'linkage'. Examples are the Santa Sofia Street in Vila Real and the Combatentes da Grande Guerra Avenue in Leiria.

As mentioned, the only city which has a clearly perceptible 'new center', not in the form of an axis, is Vila Real. Here, the residential/services/commercial axes of Rainha Santa Isabel Avenue, Santa Iria Street and Cidade de Ourense Avenue close upon themselves, forming a compact urban structure around Sra. da Conceição Church. This center is nevertheless commercially isolated. Even the linkage to the northern part of the city, Aureliano Barrigas Avenue, does not pass through this center.

Occasionally there are commercial concentrations around important residential or access roundabouts, such as the case of the intersection between Mártires Street and 25 de Abril Avenue in Leiria; and the 25 de Abril Square or the central roundabout in Miguel Torga Street in Vila Real. The rest of the commercial spaces in these city centers are, as mentioned, associated to residential areas, both traditional and high-rise. Although they work, locally, as isolated elements, they are never more than two turns away from an important commercial axis.

Therefore, it can be said that the average commercial distribution logic in the centers can be synthesized by the diagram on Figure 58. Because Vila Real and Aveiro have off-center traditional centers, the expansion did not occur in all directions. Obviously, as discussed in the above paragraphs, not all centers contain all of these commercial elements.

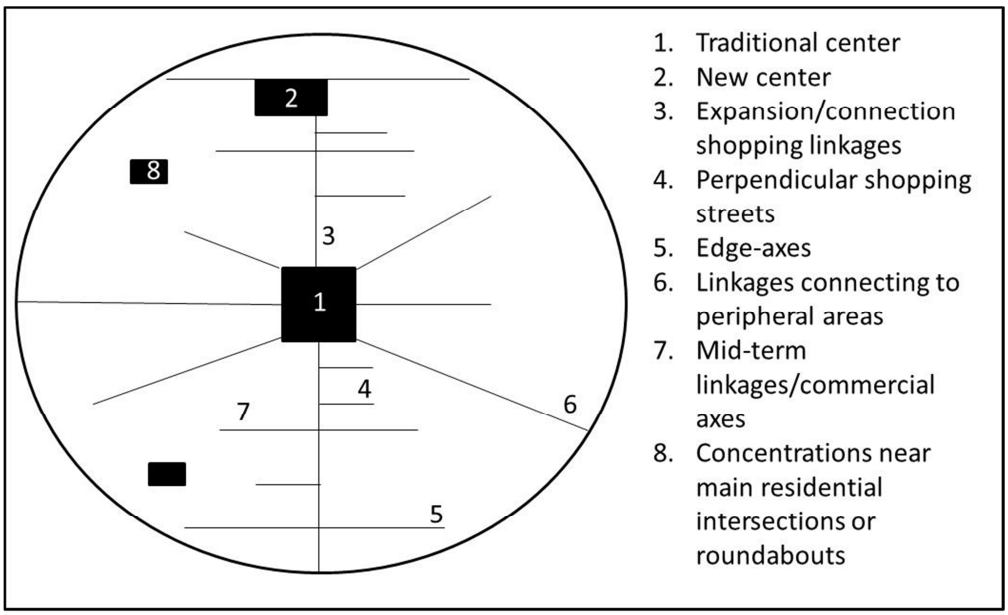


Figure 58 - Commercial distribution model of the city centers

7.3.3. IN THE PERIPHERIES

Briefly, the commercial distribution in the four studied peripheries follows clearly a logic of streets and axis. Commerce has a road-side occupation in hollow or semi-hollow blocks, also appearing in

main crossroads and dispersedly in isolated areas. In industrial areas, it clusters in all sides of large blocks.

Of the four peripheries, Vila Real's is clearly the one that cannot be inserted in the same overall category as the rest. It possesses less than 500 stores (unlike the other peripheries which have close to a thousand) and these constitute less than 30% of all the city's stores. Furthermore, practically one fourth of these commercial spaces are in two single avenues, the Europa and Universidade Avenues (Figure 43, Figure 60), close to the city center. This means that Vila Real's periphery not only is the least dense in terms of urbanization, it is also the least dense in terms of commercial spaces. Consequently, whilst the commercial area occupies 2% of Aveiro's, Leiria's and Évora's overall peripheral areas, it occupies less than 1% of Vila Real's peripheral area.

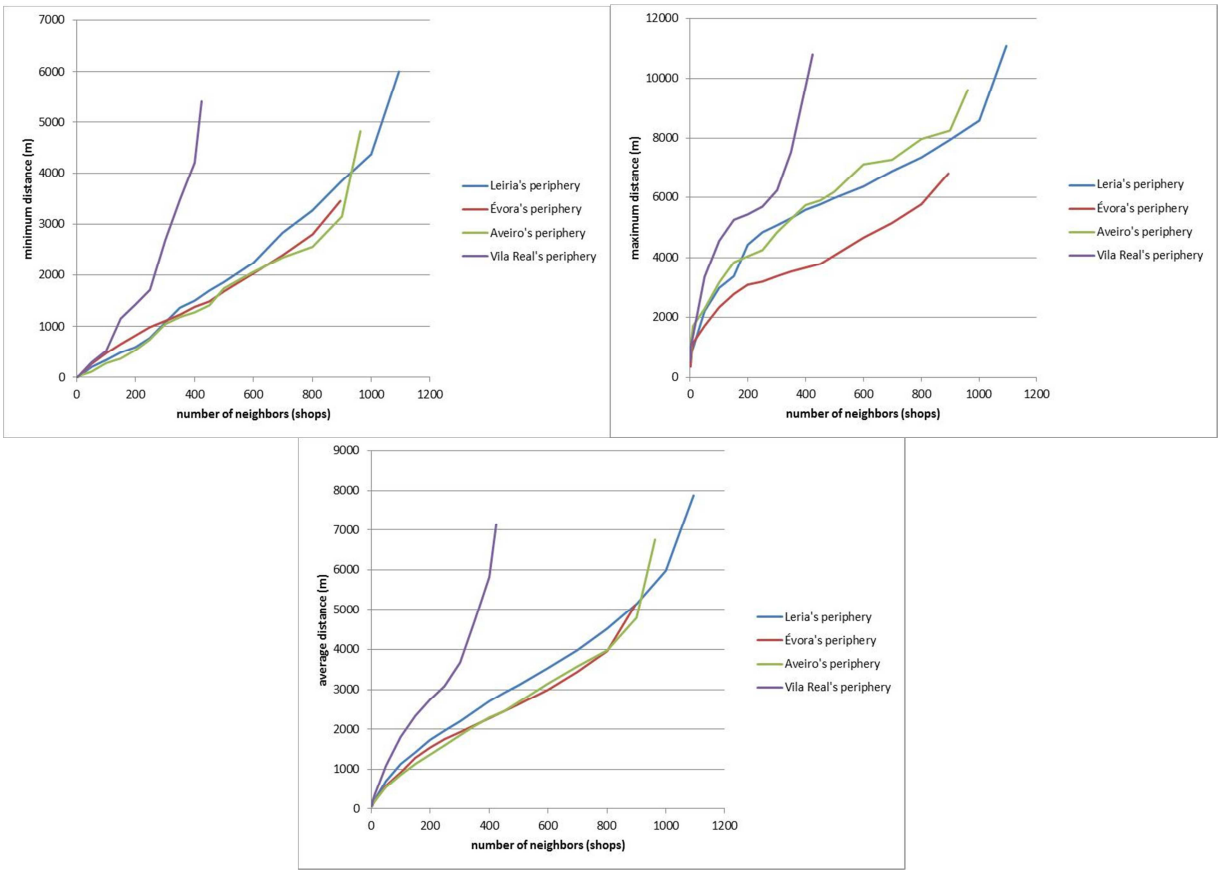


Figure 59 - Minimum, maximum and average distance between each store and n neighbors in the peripheries

Similar distance graphs as before can be calculated just for the stores located in the peripheries (Figure 59). It can be seen that, although the location patterns of stores still follow power functions, they fail to be similar between the four peripheries, precisely because Vila Real's store distribution pattern is different. In this case, the concentrations of commerce are constituted by a smaller amount of stores (less length of the 'steps'), these concentrations are always farther apart (larger height between 'steps'), and there are more outliers (larger 'tip' with a greater angle). Consequently the distance needed to reach the same number of stores is always greater in Vila Real. Furthermore, there is only one clear commercial concentration (represented by the only 'ledge'), which is the axis constituted by the Europa and Universidade Avenues.

Excluding Vila Real however, the patterns are still similar in the minimum and average distributions. The differences in the maximums graph may occur just because Évora's periphery has a smaller area. It can be perceived that Évora's curve follows a similar path as Aveiro's and Leira's, only at lower distance values. In Aveiro's periphery, both the minimums and maximums graphs show various small 'steps'. This is a reflection of a type of commercial distribution based on various small concentrations, which are more than often not linked to each other by commercial corridors. On the other hand, Évora's and Leira's curves are smoother, meaning a more continuous commercial propagation from the center to the residential peripheral areas.

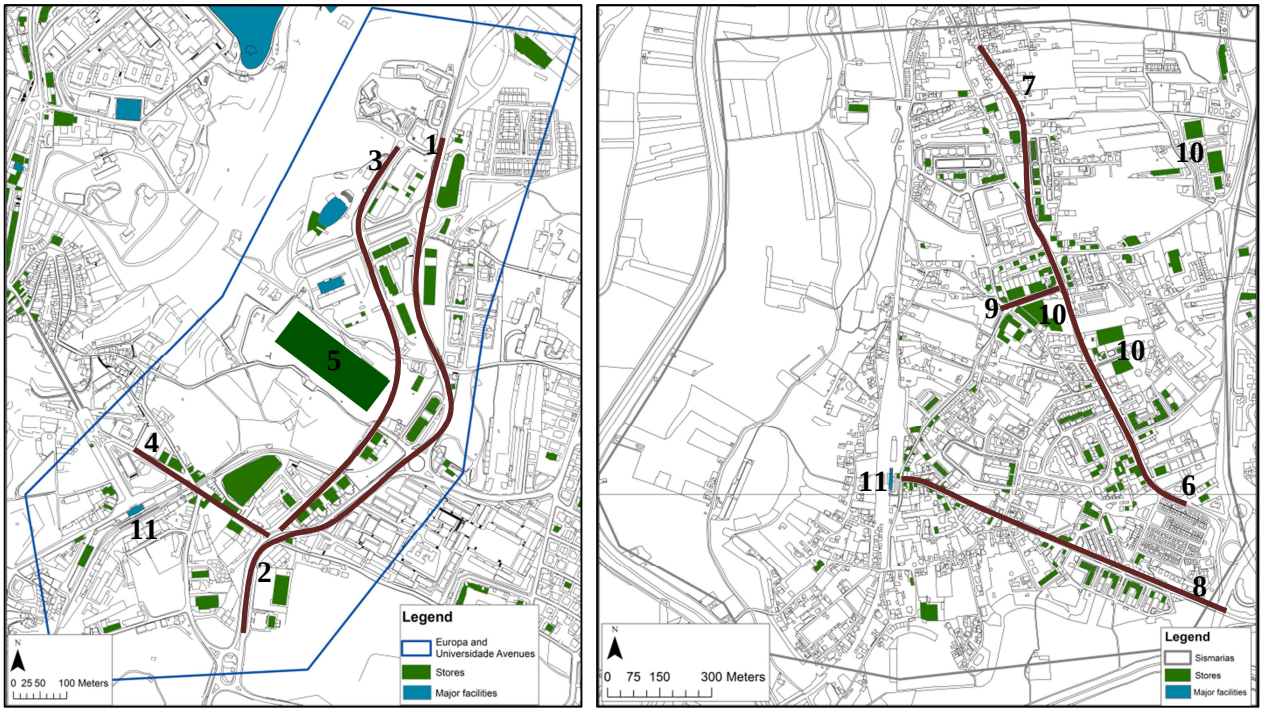
Worthy of note is also the fact that Évora's and Aveiro's curves are practically coincidental in some stages of the average graph. In the minimums graph, Aveiro's curve is closer to Leiria's below 300 neighbors, but then it also becomes closer to Évora's curve. This can mean that Aveiro's and Leiria's peripheries have similar small clusters of stores, but the overall dispersion pattern of Aveiro's peripheral shops is closer to that of Évora's. In reality this can be translated into the fact that although Aveiro's and Leiria's peripheries have witnessed the growth of similar multi-family housing neighborhoods with shopping clusters, the overall expansion of their commercial axes is not similar. Aveiro's and Évora's peripheral commercial and urban patterns have grown linearly from the center around perceptible axes (former travelling axes), whilst Leira's and Vila Real's peripheral urban and commercial structure is more associated to the growth of pre-existing peripheral villages, which already had, even if small, commercial poles.

The curves of Évora, Aveiro and Leiria follow, more or less until the 800th neighbor, similar tendencies. This number also corresponds, in average, to the open stores in each of these peripheries. Table 10 contains the minimum and average distance equations calculated considering the average of the values of these three peripheries. Once again, for the minimum distance, there is a strong correlation with a linear equation. In these three peripheries each store distances from the next, in average, 40 meters. This number is 64 meters in Vila Real's periphery, showing that there are more isolated stores there. Nonetheless, it is Aveiro's periphery that possesses the farthest store. It is 660 meters away from the closest. In Leiria's and Vila Real's peripheries this number is about 550 meters and in Évora, the most compact of cities, is 360 meters. All the stores in the periphery can be reached from a given store by travelling 5 km (in Évora), 7 km (in Vila Real and Aveiro) and 8 km (in Leiria) through the network. The differences are an obvious consequence of the size of each urban perimeter.

Similarly to the focused analysis made for the city centers, a more precise approach to the physical commercial distribution of the peripheries is presented in the next pages. The division of the sections was made not by cities, but by the layers of the commercial hierarchy. This way, not only can the validity of this division (contained in Table 9) be tested, but also a direct comparison can immediately be achieved between the areas of different cities. The images depict the models of the areas that constitute each hierarchical layer, including the location of stores, the location of major facilities, the main street axes and their names, and some illustrative photographs. Furthermore, nearest neighbor distance graphs were also produced for each layer, to strengthen the deductions made through the observation of the models. These are also displayed in Annex 5.

7.3.3.1. Extensions of the city center

With the exception of Évora, all cities present localities bordering the center that, due to their commercial intensity (and amount of residential development), unlike any other area in the periphery, can be considered as 'extensions' of the shopping hierarchies of the city center. As proposed by Table 9, these are Sismarias in Leiria, the area surrounding the Europa and Universidade Avenues in Vila Real, and the neighborhoods of Santiago, Forca and Esgueira in Aveiro. The models for these areas are displayed in Figure 60 and Figure 61.



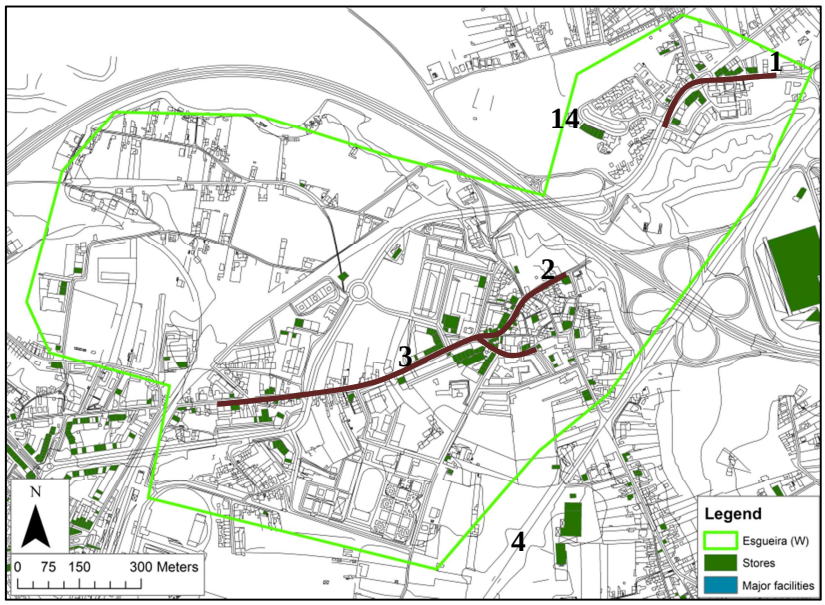
1. Europa Avenue / 2. Universidade Avenue / 3. Actor Ruy de Carvalho Street / 4. Dr. Augusto Rua Street

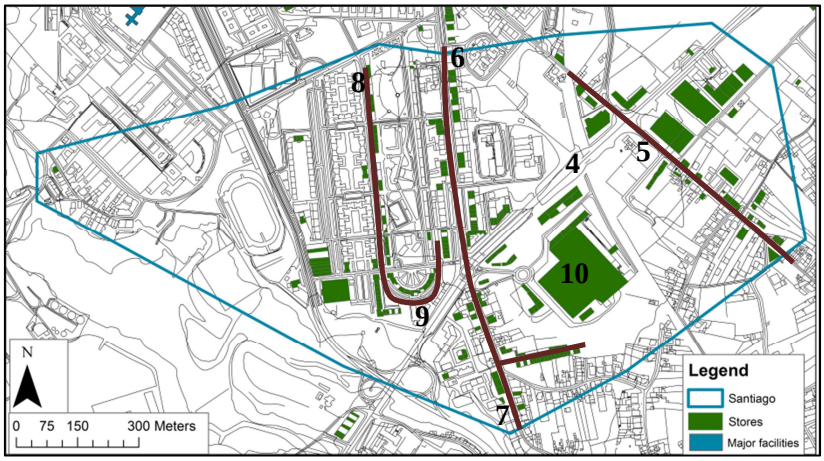
5. Dolce Vita Douro / 6. Figueira da Foz Road / 7. Liberdade Avenue / 8. Station Road / 9. D: Carlos I Street

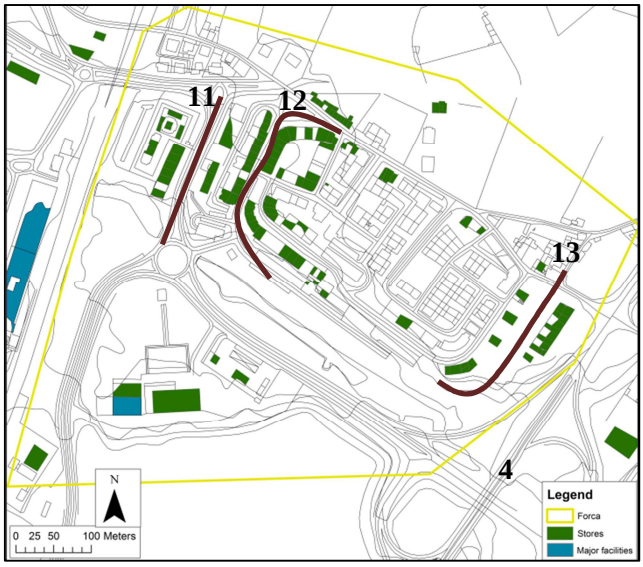
10. Commercial warehouse cluster / 11. Train station



Figure 60 - Sismarias' and Europa and Universidade Avenues' commercial distribution (photographs by author)







1. Esgueira Circular
2. Vicente Almeida Eça Street
3. José Luciano de Castro Street
4. N109
5. S. Bernardo Road
6. Dr. Mário Sacramento Street
7. *Rua Direita* of Aradas
8. Espinho Street
9. Anadia Street
10. Glicínias Plaza
11. Eng. Adelino Amaro da Costa Street
12. Dr. Orlando Oliveira Street
13. St. Tomé e Príncipe Street
14. Commercial island





Figure 61 - Esgueira's (W), Santiago's and Forca's commercial distribution (photographs by author)

In these areas commerce appears mostly road-side, in hollow or semi-hollow blocks. Near traditional or residential areas, the blocks are regular, smaller and sometimes fuller, yet they get larger, hollower and irregular in outer areas. These are either less occupied or are crossed by a series of main traveling thoroughfares. It is mainly the logic of these 1 or 2 main axes/thoroughfares that commerce follows, because it was also here (due to the travel-through relevance of the axis) that major (residential) constructions arose as the localities expanded. These thoroughfares are usually large, possess sidewalks, accommodate 2-way traffic, and are connected to some important axis leading directly to the city center. Examples are the Estação Road[149] in Sismarias, the Europa Avenue in Vila Real, the José Luciano de Castro Street in Esgueira and the Dr. Mário Sacramento Street in Santiago. It is perceived that most stores and the entrance to most residential neighborhoods face these thoroughfares. The neighborhoods are usually 4 to 6 story high, but can contain higher buildings occasionally.

These thoroughfares are complemented by a residential network. Commerce can also appear here, usually clustered around important residential streets with large multi-family buildings, some of which possess services. The street network in this case is constituted by complementing one way streets. These streets decrease in size and reduce (or eliminate) their sidewalks the further they are from the thoroughfare, that is, the further they are into the traditional/residential areas. Although the residential areas developed around these second level thoroughfares, commerce keeps to the main residential roads, at the edges of the blocks, usually in groups (in a row), on the ground floors of multi-family buildings. This occurs, for example, in Espinho Street in Esgueira, or in the Eng. Adelino Amaro da Costa Street in Forca. The remaining commerce, that is, the one that is not in the first and second levels of the road network, follows a model closer to that of the 'main residential' and 'residential' areas, that will be presented below. If commerce is on newer areas it means that it is either around main intersections or in purpose built clusters in residential neighborhoods, usually in multi-family buildings. This is the case of the Esgueira Circular or of the many residential neighborhoods along the Figueira da Foz Road. If commerce is in traditional low-rise areas in once important suburban zones, then it appears around a landmark or an old center. Both in Sismarias and in the Europa Avenue traditional commerce locates around the train station. In Esgueira there is clearly an older center in Vicente Almeida Eça Street, as was already shown in Figure 48. In these cases the blocks are characterized by narrow roads with narrow or non-existent sidewalks. A couple of streets in Esgueira are even pedestrian, but commerce seldom is here.

Forca constitutes a very strong service pole, but it is the concentration of large-scale commercial areas that better characterizes these 'extensions'. Actually, these concentrations appear to be located in these areas precisely in order to overcome the deficiency of larger modern formats in city centers. Here there was enough space to build a nearby and easily accessible cluster that allows city center dwellers to make vast and quick purchases without the hindrance of having to travel to the industrial area. The momentum of these areas is also maximized by the enormous amount of residential area surrounding them. Therefore there are large scale shopping centers in the Universidade Avenue (Dolce Vita Douro) and in the Rua Direita of Aradas in Santiago (Glicínias Plaza) and large scale commercial warehouses, of food, home and fashion items, both at the beginning of S. Bernardo Road in Santiago and in and around the Figueira da Foz Road in Sismarias.

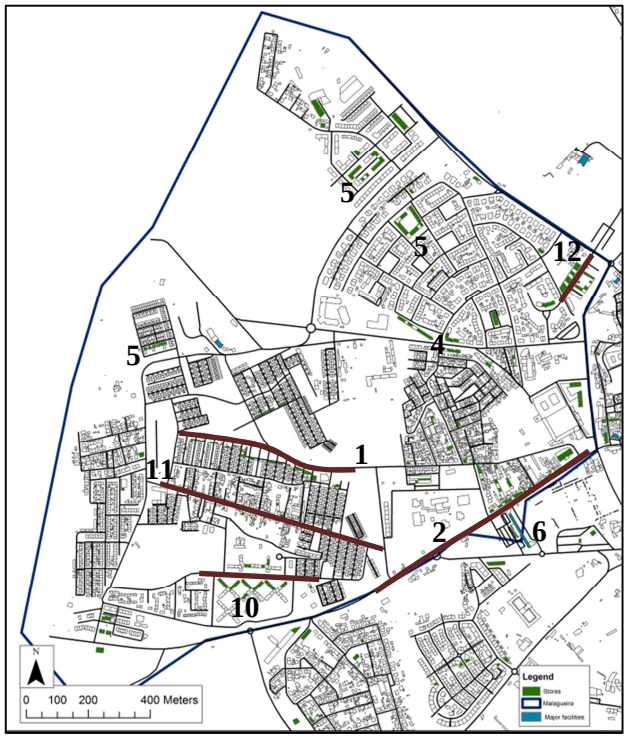
[149] Station Road. It leads directly to the train station.

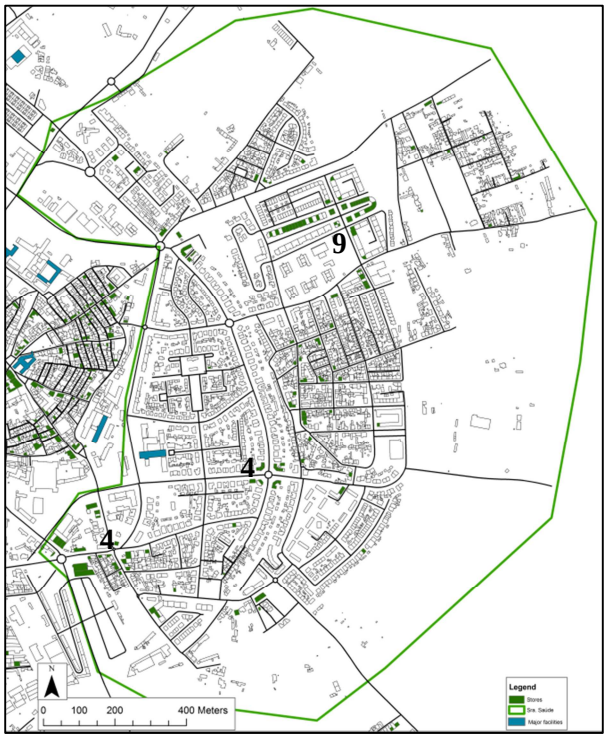
Although these areas have the same hierarchical function in the respective cities they are in, because they have different sizes and different number of stores, it could be expected that their store location curves would inevitably be different. Yet analyzing the graphs displayed in Annex 5, it is perceived that there are revealing similarities. For example, the average curves of Esgueira (W) and Europa and Universidade Avenues are entirely compatible. Even so the minimums and the maximum curves show that Esgueira (W) has a great central concentration of stores (initial and middle 'ledge' in the respective graphs – undoubtedly the José Luciano de Castro Street) that the extension in Vila Real does not, because it works as an axis. Santiago's and Sismarias's curves are also very similar. Both 'extensions' possess an important commercial axis and both possess concentrations around large scale commercial facilities. The graphs prove that the way the stores are located in these concentrations is practically coincidental. The curves overlap in the average graph below 70 neighbors, and in the maximums graph between 100 and 180 neighbors. Commercially and urbanistically, Sismarias and Santiago perform similar roles serving, respectively, Leiria's and Aveiro's city centers.

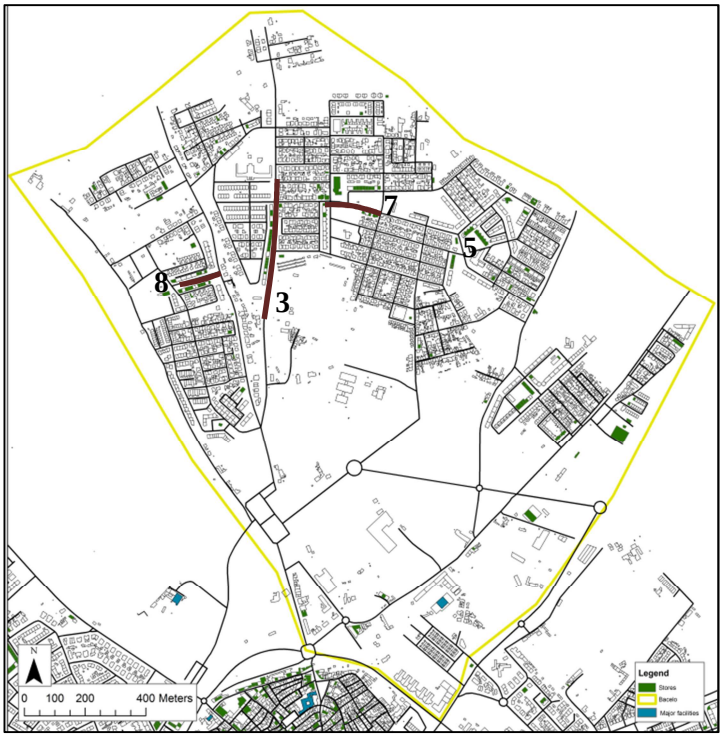
7.3.3.2. Main residential areas

Santiago, Forca and Esgueira, not only complement themselves by possessing each a distinct attribute of centrality (respectively, a shopping center, a dense service area and commercial arcades), they also complement the center in two ways: by being a commercial extension of it, and by containing the city's main residential areas, as they are formed by a series of multi-family housing neighborhoods. This role is also performed, as proposed in Table 9, by Marinheiros and Telheiro in Leiria; Borbela and urban Mateus in Vila Real; and Bacelo, Malagueira and Senhora da Saúde in Évora.

As discussed before, most of these areas (whose models are displayed in Figure 61, Figure 62 and Figure 63) are of recent construction. Large residential neighborhoods with multi-family buildings have developed around disperse and little dense agglomerations which possessed just occasional, mostly first-necessity, commerce. Consequently, commerce is generally in small clusters on the ground-floor of these multi-family buildings, 4/5 stories high. In these areas commerce has two main logics. First, it is more than often road-side, in the larger edge of hollow or semi-hollow blocks, following the logic of the main travel or residential axes. These axes are local 2-way streets usually with sidewalks, and have the dual role of being thoroughfares to the suburbs and of serving main residential neighborhoods. This dual role promotes the growth of residential enterprises along their axes and the natural clustering of commercial spaces. In the case studies, these roads include, among others, the already mentioned José Luciano de Castro and the Dr. Mário Sacramento Streets in Aveiro; the Marinheiros Road and the D. José Alves da Silva Pereira Street in Leiria; the Jaime Campos and the Gaspar Sameiro Streets in Vila Real; and the S. Sebastião and the Malagueira Avenues in Évora. Most of these are directly linked to the city centers.



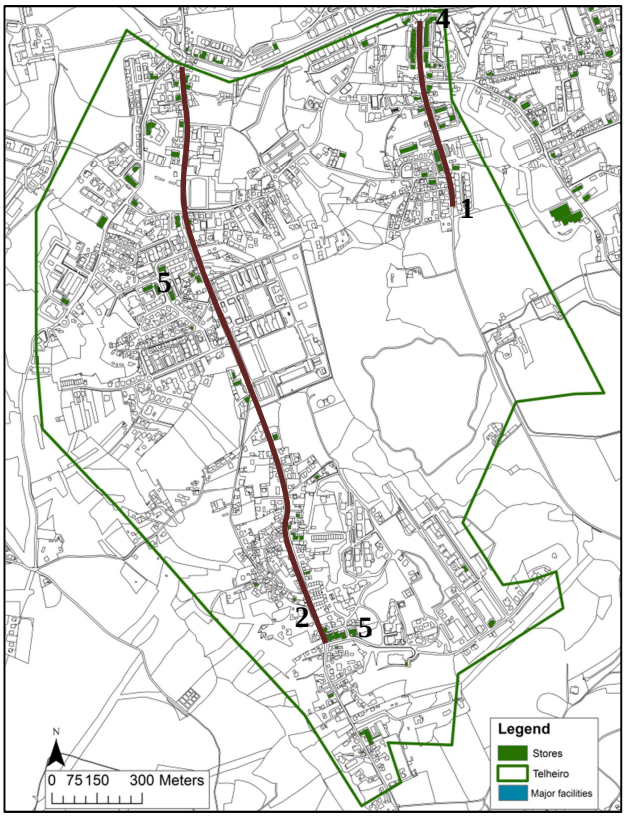


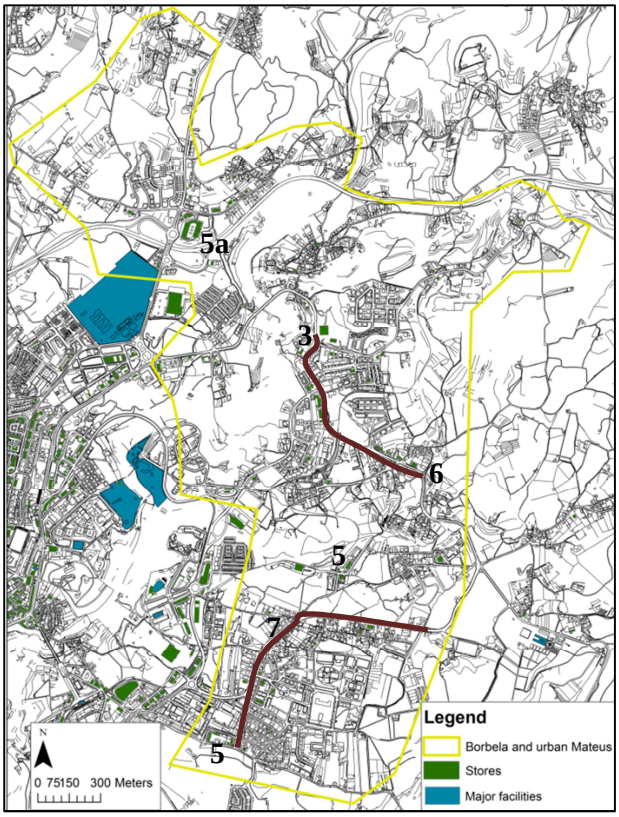


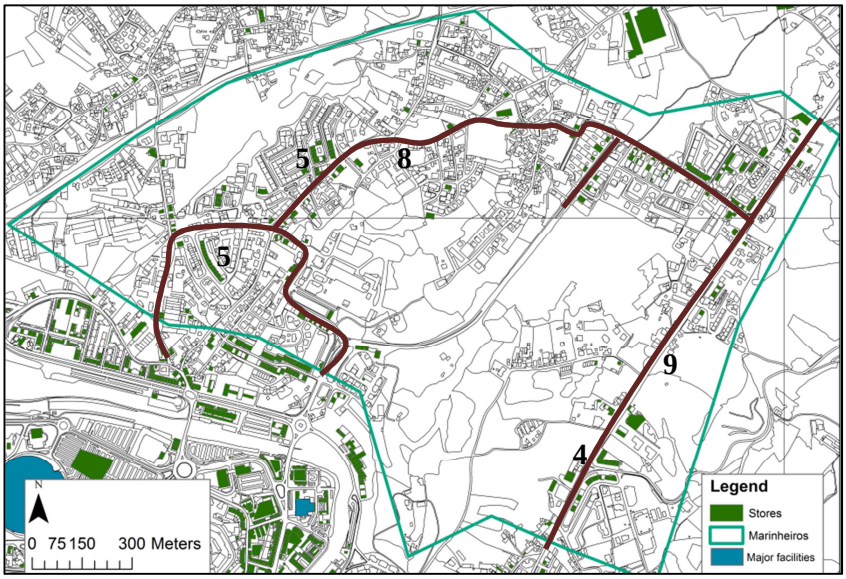
1. Malagueira Avenue
2. S. Sebastião Avenue
3. Albino Passaporte Street
4. Commercial islands in main crossroads
5. Commercial islands in residential buildings
6. Main bus terminal
7. Fernando Pessoa Avenue (also 4)
8. Dr. César Baptista Street (also 5)
9. Nossa Senhora da Saúde Urbanization (also 5)
10. Escurinho Avenue (also 5)
11. Central Street Santa Maria
12. Chartres Street (also 5)



Figure 62 - Malagueira's. Senhora da Saude's and Bacelo's commercial distribution (photographs by author)







1. Vale dos Lobos Stret
2. D. José Alves da Silva Pereira Street
3. Jaime Campos Street
4. Commercial islands in main crossroads
5. Commercial islands in residential buildings
6. Gaspar Sameiro Street
7. Nossa Senhora dos Prazeres Street
8. Marinheiros Road / 9. EN 1



Figure 63 - Telheiro's, Borbela's, urban Mateus' and Marinheiros' commercial distribution (photographs by author)

The second logic is one of concentrations rather than of axes. A large portion of the commercial spaces in these areas is concentrated in poles on the ground floor of large residential multi-family free-standing buildings (forming blocks by themselves) or in main crossroads. These poles either complement existing axes, or appear in the middle of solely residential neighborhoods, constituting isolated commercial 'islands'. Services, when they appear, are usually in these 'islands'. Here, roads are usually parallel and one-way, with reduced sidewalks (or without them in more traditional residential areas), and building heights are usually similar to the rest of the main residential areas (4-6 story). Occasionally, especially if the buildings with the commercial poles are more recent, building heights can increase. Examples of commercial 'islands' in main crossroads are the one in Fernando Pessoa Avenue in the center of Bacelo, the one in the national road EN 1 in Telheiro, and the one in the center of Senhora da Saúde in Évora. Examples of commercial 'islands' in the middle of residential neighborhoods are more frequent and include the one in Dr. César Baptista Street in Bacelo; the one in Chartres Street in Malagueira; the one near Esgueira Circular in Aveiro; as well as those along Marinheiros Road and Dr. José Alves da Silva Pereira Street in Leiria. The rest of the main residential areas are constituted by low-rise traditional residential neighborhoods, but only seldom commerce is here.

When the distances to the nearest neighbors are plotted (see Annex 5) it can be seen that there are four distinct groups. The first is constituted by Telheiro and Borbela/urban Mateus. Both areas have a large central street with occasional commercial occupation, that is complemented by unconnected small yet dense clusters elsewhere (like Vale dos Lobos Street and the concentration north of Continente in Borbela – 5a of Figure 63). Bacelo's curve stays close to this group, yet always at lower distances. The second group is composed of Senhora da Saúde and Esgueira (W). They have clear 'ledges' that signify one larger concentration (Senhora da Saúde Urbanization and José Luciano de Castro Street respectively) and another smaller concentration. Elsewhere the commercial occupation is more disperse, as the angle of the curve shows. These areas have a very similar commercial pattern to Malagueira and Marinheiros until a little over 100 neighbors. The only difference between these two sets of groups seems to be in the overall number of stores. Because Malagueira and Marinheiros have more stores, their curves extend further than those of Senhora da Saúde and Esgueira (W). The maximums graph shows clearly that Malagueira has more 'steps', an obvious consequence of the amount of small clusters it possesses. Because Esgueira (W) was previously found to have great similarities with the Europa and Universidade Avenues, it can then be assumed that these avenues' commercial location can also be similar to those in Malagueira, Marinheiros and Senhora da Saúde. The similarities between Forca and Santiago are also more evinced here than before, especially for a small number of neighbors. Yet Forca's area is much smaller and the number of shops in Santiago much greater for the areas to present similar location patterns. If for the maximums and average graphs these differences fade for small number of neighbors, it is perceptible in the minimums graph that the closer concentrations have a very different distance nature.

7.3.3.3. Residential areas

The three 'main residential' localities of Évora also perform, farther from the center, the role of 'residential' areas. As it is proposed in Table 9 this role is also performed in Leiria by Marrazes, Parceiros and Pousos. In Vila Real it is performed by a series of low density localities, which hardly possess store clusters. These localities are in different locations of the urban perimeter, and are

connected by long non-urbanized extensions. This is not the case in Aveiro. The four peripheral residential localities, East of N109, are continuous and connected to each other. The erratic urbanization pattern, constituted by an intricate web of small roads, leads to the formation of store clusters[150]. These can occasionally form perceptible commercial axes, a characteristic not common to residential areas that is mainly found on the upper layers of the commercial hierarchy.

In these residential areas (Figure 62, Figure 65, Figure 66) commerce is practically no longer properly inside residential neighborhoods and stays road-side, facing the main local travelling axes. These are 2-way regional roads with narrow sidewalks. Commerce is either located in the larger edge of hollow or semi-hollow blocks or road-side in non-blocks. This depends of whether the locality has been developed solely at the 'shore' of the main axis or if there is a certain amount of urban depth away from it. São Tiago Road in Marrazes; N230 in Esgueira (E), Coronel José Pereira Pascoal Street in Pousos and the main streets of Parceiros and São Bernardo, are examples of this type of thoroughfares that cross the center of the localities and that contain mostly all existing commerce. The commercial location follows the lines of these main travel and residential axes, but it is far from continuous, so it does not constitute (except in some cases in Aveiro) perceptible commercial axes. The clustering, when it occurs, is practically all in main crossroads and, with a few exceptions, in newly constructed multi-family buildings. This occurs at the center of both Parceiros and Pousos, near the Hospital in Lordelo and also in other crossroads in São Bernardo, Parada de Cunhos, Constantim, Marrazes and Esgueira (E). These multi-family residential buildings usually are 3 to 5 stories in height. Even so, commercial 'islands' in residential neighborhoods can also sporadically appear, but they are constituted only by a residual amount of stores. The rest of the stores appear isolated, dispersed in both traditional and modern residential areas, usually in 1-2 story buildings, in narrower one-way streets often without sidewalks. Although this type of occupation is perceptible outside the main road in most of the residential localities, it is stronger in Vila Real's localities of Folhadela and in the Northern traditional part of Lordelo. These are still villages, practically rural, that just happen to be inside the urban perimeter.



Figure 64 - Images related to Figure 65 (photographs by author)

[150] Formerly, the urbanization in this area was road-side along two or three more or less parallel main roads like the S. Bernardo Road or the N230 (Figure 65). It was characterized mainly by Manor houses of extensive farmland lots, which occupied the inside of the blocks. These lands were eventually filled by other roads and road-side urbanization, but this was done in an erratic fashion, resulting in the present pattern. Localities are not concentrated around a close set of perpendicular and parallel streets or main squares, like in city centers or in the peripheral localities of other cities. Localities are centered around main axes.

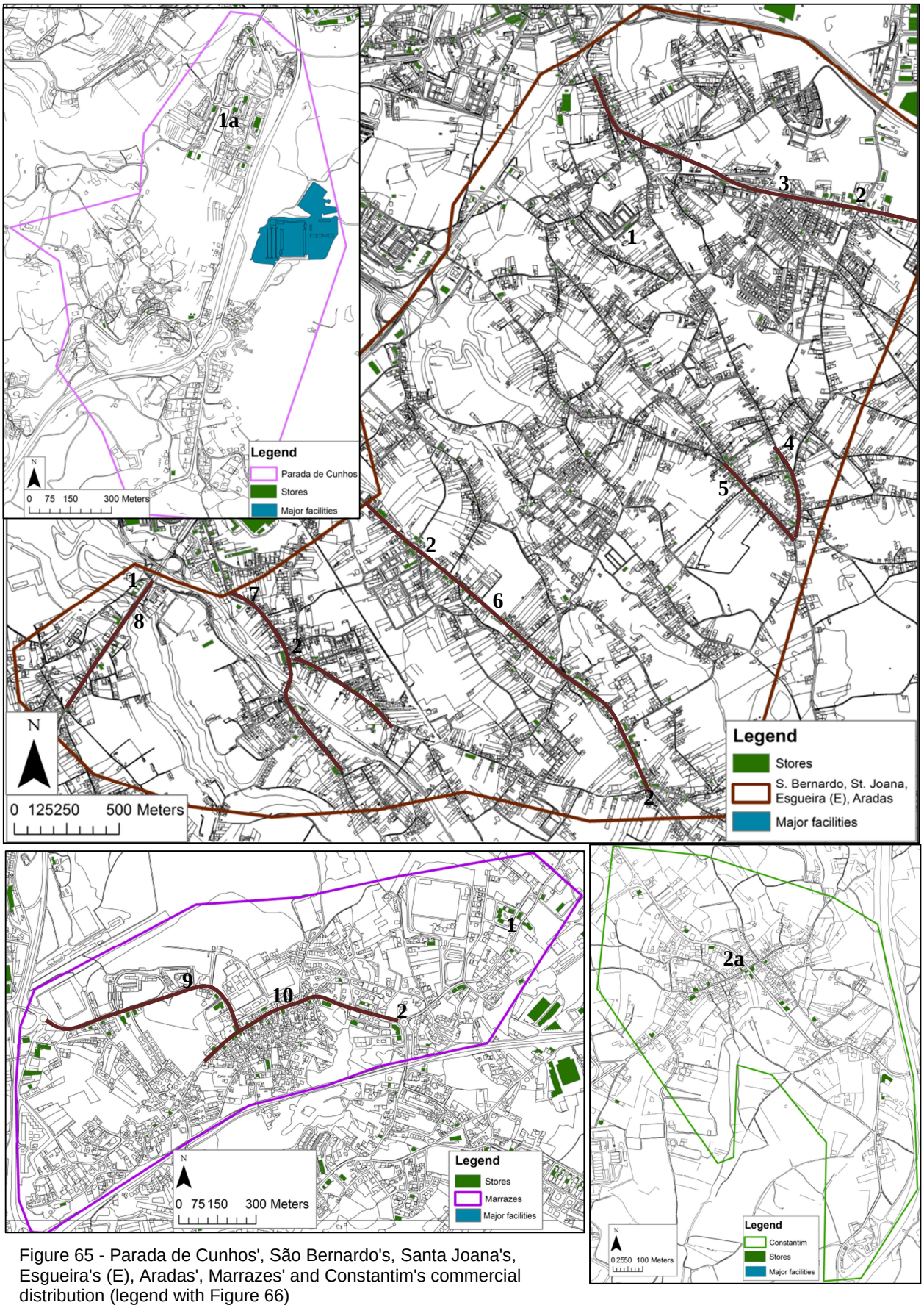
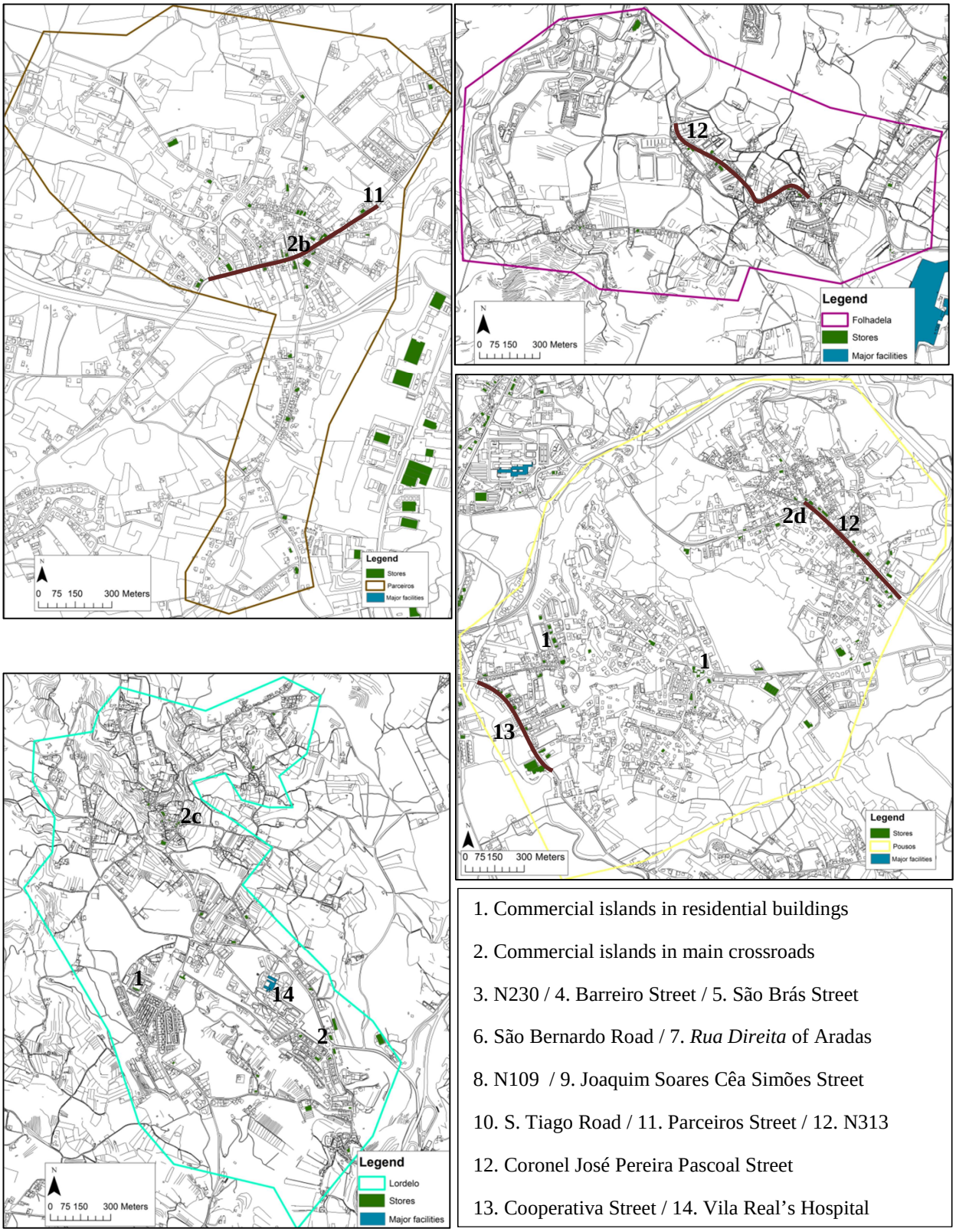


Figure 65 - Parada de Cunhos', São Bernardo's, Santa Joana's, Esgueira's (E), Aradas', Marrazes' and Constantim's commercial distribution (legend with Figure 66)



1. Commercial islands in residential buildings

2. Commercial islands in main crossroads

3. N230 / 4. Barreiro Street / 5. São Brás Street

6. São Bernardo Road / 7. *Rua Direita* of Aradas

8. N109 / 9. Joaquim Soares Cêa Simões Street

10. S. Tiago Road / 11. Parceiros Street / 12. N313

12. Coronel José Pereira Pascoal Street

13. Cooperativa Street / 14. Vila Real's Hospital

Figure 66 - Parceiros', Folhadela's, Lordelo's and Pousos' commercial distribution

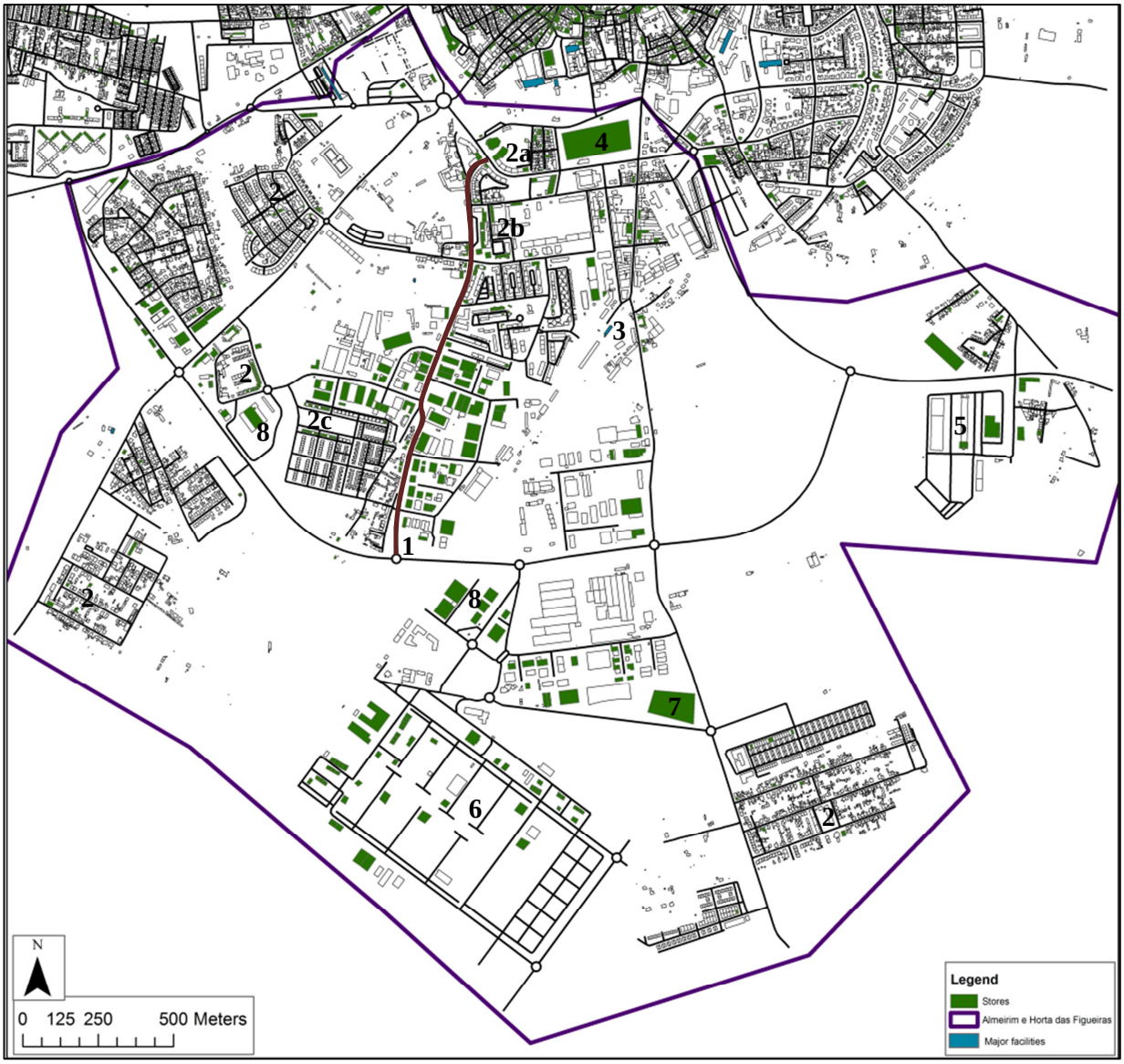


Figure 67 - Images related to Figure 66 (photographs by author)

Considering, once again, the distance nearest neighbor graphs (Annex 5), it can be perceived, unlike in the other hierarchical layers, that there is more similarity between the localities of the same cities than between the localities of different cities. This is fairly simple to understand why. These residential areas have very few commercial clusters, and even those are constituted by a small amount of stores. That is why the curves are only similar when a very small number of neighbors is considered. As the number increases, the curves become much more dependent of the distance between clusters and of the overall form of the locality. Obviously, these two variables will be more similar inside the same city. Vila Real's localities, for example, are more diffuse, and hence a larger distance is needed to reach the same number of stores. They also have much less stores compared with the other localities. The opposite happens in the more compact Évora's peripheral localities. Nevertheless, there are still some similarities. The most noticeable is in the minimums graph between the residential areas of Évora and those of Aveiro, for less than 80 neighbors. The observation of this similarity helps to validate the choice of giving a dual hierarchical role to the residential localities of both these cities, as displayed in Table 9. Although Évora's also behave as 'main residential areas', and many parts of Aveiro's have patterns similar to 'isolated residential areas', these localities of both cities have common commercial clusters, therefore these must inevitably fall into the mid-category of 'residential areas'.

7.3.3.4. Isolated residential areas

The isolated residential localities are small villages or residential neighborhoods, mostly with a traditional inheritance and a prior existence before becoming part of the urban perimeter. Consequently, they possess older stores in older buildings. Localities like Mateus, Arroios, Andrinos and Pinheiros possess less than 20 stores, all of first necessity, and their roles in the commercial hierarchy are practically insignificant, that is, they only possess a small local importance. In Évora, for example, these neighborhoods are now traditional residential pockets inside the posterior Almeirim and Horta das Figueiras industrial area that developed around them, and possess no attraction for anyone but the own residents. The models for these localities are presented in Figure 65, Figure 68, and Figure 69.



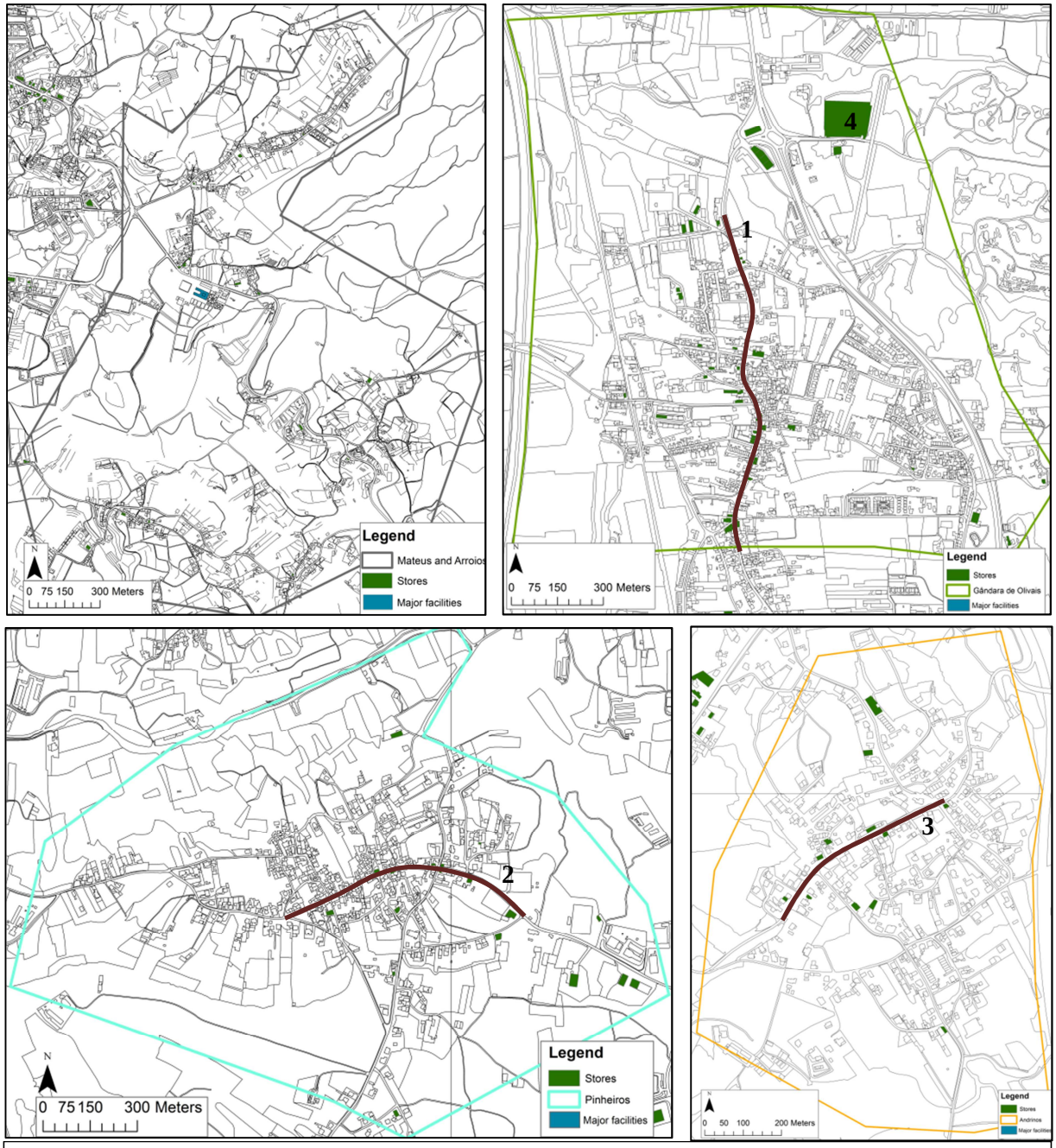
1. Horta das Figueiras Street / 2. Residential pockets with commerce not belonging to the industrial area

3. Train Station / 4. Fair ground / 5. Supplier's Market / 6. Industrial and Technological Park

7. Future Évorashopping / 8. Hypermarkets



Figure 68 - Almeirim's and Horta de Oliveiras' commercial distribution (photographs by author)



1. 25 de Abril Street / 2. Principal Street of Pinheiros / 3. Principal Street of Andrinos / 4. Flee Market



Figure 69 - Mateuss', Arroios', Gândara de Olivais', Pinheiros', Andrinos' commercial distribution (photographs by author)

In these localities commerce is practically all road-side, in large irregular hollow or non-blocks, following the logic of the main travel-through axes, which also act as the central local streets. These streets are usually small, with 2-way traffic and reduced sidewalks. The 25 de Abril Street in Gândara de Olivais, the *Rua Direita* of Aradas, the Barreiro and São Brás Streets of Santa Joana and the Principal Streets of both Pinheiros and Andrinos perform this role. In these localities only a small amount of stores locates in less important streets (narrow, often 1-way and without sidewalks) in out-of-the-way neighborhoods. Stores are practically only in low-rise free-standing buildings or else in the ground-floor of medium-rise residential buildings that may eventually appear in main crossroads. Mateus/Arroios and Andrinos constitute the most rural of localities, with a residual amount of traditional stores (17 and 13 respectively). But whilst in Andrinos the stores are clearly located in the Principal Street, in Mateus and Arroios there fails to be a perceptible guideline and the stores are clearly dispersed. These are all traditional stores selling first necessity goods. On the other hand, the Almeirim and Horta das Figueiras area possesses a larger mix of commercial types. The pre-existing traditional neighborhoods possess a residual amount of commercial activity similar to that above mentioned, whilst some commercial clusters appear either in main crossroads/buildings, near important thoroughfares and closer to the center, or in newly constructed residential neighborhoods, with similar patterns as in the 'residential areas' (2c of Figure 68). Even so, the greatest occupation of Almeirim and Horta das Figueiras is performed by commercial and industrial warehouses. These can also be found, in a much smaller extent, in Pinheiros (a consequence of the close-by Vale Sepal industrial area) and in Northern Gândara de Olivais.

Plotting the average, minimum and maximum distances to the nearest neighbors, it can be seen in Annex 5 that the same phenomena, justifiably, happens as in the 'residential areas', that is, areas of the same cities have similar curves. Obviously, a direct comparison is more difficult because Almeirim and Horta das Figueiras, and Aveiro's periphery relate to a much larger number of stores. And even these are different because one (Évora's) is mainly industrial, and hence more concentrated, and the other (Aveiro's) is mainly residential and hence more dispersed. Andrinos and Pinheiros have very similar behaviors, because both practically just possess one main street with a dozen stores. It can also be seen that for the maximums curve, for a small number of neighbors, Aveiro's localities have a similar distance distribution as Gândara de Olivais. 25 de Abril Street in Gândara de Olivias is a long commercial axis which has a constant but not dense occupation similar to N230, São Bernardo Road and *Rua Direita* of Aradas in Aveiro.

7.3.3.5. Industrial/commercial areas

Lastly, to complete this Chapter, a look is given at the physical distribution of commerce in industrial/commercial areas. Sections of both Almeirim and Horta das Figueiras (Figure 68) and Parceiros (Figure 70) industrial areas contain residential areas among and around industrial/commercial axes. These are either commercially unimportant (pre-existing traditional localities) or else follow the pattern already drawn for 'isolated residential' or 'residential' areas. The other areas of these two localities, and the entire extent of the rest of the industrial/commercial areas (Vale Sepal, Constantim and Esgueira) are characterized by an irregular concentration of shops (mostly in isolated 1 story high buildings/warehouses) on all sides of large and geometrical semi-hollow blocks. The commercial distribution is irregular although the blocks are geometric because the intercalation of industrial and commercial land-use follows an erratic pattern.



1. Marinha Grande Road / 2. Parceiro's residential pocket / 3. IC2 / 4. João Francisco do Casal Street

5. Shopping centers / 6. Paulo VI Street / 7. M1249

Figure 70 - Parceiros', Esgueira's, Constantim's and Vale Sepal's Industrial areas commercial distribution (photographs by author)

The streets serving these blocks are usually large, have 2-ways and possess narrow or no sidewalks. These are the cases of the Horta das Figueiras Street, the João Francisco do Casal Street in Esgueira and the Marinha Grande Road in the northern section of Parceiros. In Leiria, namely in Vale Sepal and in the southern section of Parceiro's industrial area, the main street is a large, 2 way thoroughfare; the IC2 ring road. In this case commerce is road-side as there are no blocks. In Vale Sepal the IC2 connects with the Paulo VI Street, which leads directly to the city center. In Constantim, and in specific zones in Évora (the Supplier's market, the Industrial and Technological Park) the industrial/commercial area is practically closed upon itself. Furthermore, these areas can also possess large scale hypermarkets or shopping centers. Leiriashopping is situated in Parceiros; Aveiro Retail Park, Pingo Doce Shopping Center and Aveiro Center are located in Esgueira; and the site of the future Évorashopping and the Continente and Intermarché hypermarkets are located in Almeirim and Horta das Figueiras. There are none in Vila Real's industrial area.

The nearest neighbor graphs that conclude Annex 5 show that the commercial spatial distribution in industrial areas is practically similar in all cities. The obvious exception is the curve depicting Almeirim and Horta das Figueiras, because it takes into account various residential pockets that the other industrial areas do not possess. Esgueira Industrial area's curve, on the other hand, presents a 'ledge' in the maximums graph that is more distinguishable than those in the other purely industrial/commercial zones. This can be a consequence of the degree of attraction and concentration inspired by the three large scale commercial establishments it possesses, and also of the fact that the distribution logic does not follow a single long axis, but rather two perpendicular axes.

Like for the center analysis, a diagram was produced in order to summarize the commercial distribution logic of the peripheries. The result is contained in Figure 71. There is inevitably a linear logic in this distribution, but the elements become increasingly isolated from each other (that is, not linked) as the distance from the center increases. Once again, not all the case study peripheries contain all the elements portrayed in the diagram.

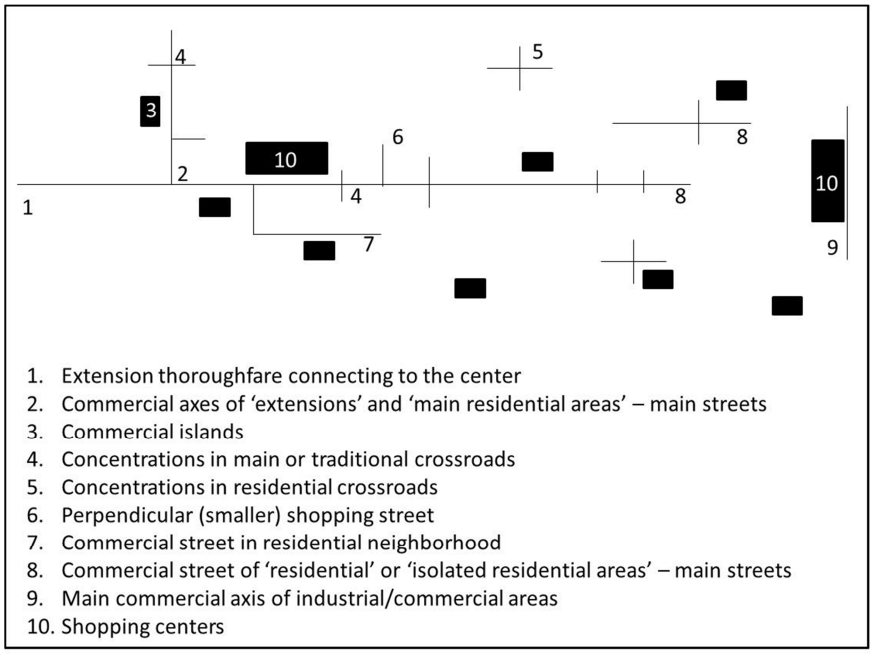


Figure 71 - Commercial distribution model of the peripheries

Summary Box nº2

The physical location of shops in cities follows a power function that can be quantified. For the largest concentrations of stores (in the center, in the peripheral commercial clusters), these functions are so similar between the four case studies that an average equation can be produced. Furthermore, considering the minimum distance, the curves assume linear distributions, meaning that in the closest concentrations, distance and number of stores reachable can be proportional. The exception is Vila Real's curve for the peripheries, which clearly follows a different pattern, due to the evident isolation, dispersion and less clustering of its commerce and urban structure in general.

Half of all the stores are in buildings constructed after 1975. In the centers commercial evolution has followed land development, namely that of residential multi-family buildings with stores on the ground floors, which have produced new commercial concentrations and/or ribbons. Therefore there are three kinds of commercial areas in the centers: the traditional center, shopping linkages, and the new center. This has caused a shift in the commercial distribution logic from a closed network (blocks) formed around main traditional landmarks (traditional center of older and lower buildings), to an array of commercial axes/linkages where avenues are larger, building heights are higher, and those with triple occupation (residence, home and services) appear, mainly at the edges. Aveiro and Évora have more center stores located in traditional areas. This is more critical in Évora, where only 1% of shops are in new buildings, and there is no 'new center' inside the city-walls. In Vila Real there is a deficiency of shopping linkages between the traditional and the new center.

Outside the centers new buildings (housing more than 2/3 of shops) have been fundamental to the creation of new peripheral commercial poles, changing centralities, and, theoretically, increasing the peripheral accessibility, because they have helped to shape new axes/thoroughfares. Yet the expansion/penetration of these new buildings has not been similar, and varies inversely to the distance to the center. Isolated residential areas hardly changed their morphological and commercial structure, whilst some main residential areas, extensions of the city center and industrial areas are almost completely new. In intermediate areas, even though the traditional rows still exist, commercial centralities have shifted. Shops in newer buildings are more, closer together and more spatially organized.

Consequently, not counting the centers, there are 5 types of hierarchical commercial localities, where commerce follows, with declining intensity, a logic of main streets and axis (road-side), yet also concentrating in crossroads or activity clusters in multi-functional buildings (4-6 story), until it becomes dispersed and traditional in low-rise, low density areas. These axes (ring roads, expansion thoroughfares, local or regional roads passing through the center of localities) assume paramount importance; they are the distributors of development throughout the peripheries (linking it with the center), and most localities (and stores) develop around/facing them. Activity clusters in multi-family buildings contradict this logic and impose centers of commerce in out-of-the-way streets. It was found that the same hierarchical zones but of different cities present similar location patterns, with the exception of the 'residential areas', whose patterns are more similar within the same city.

Vila Real and Leiria have commercially stronger centers and their outer localities have had a clear commercial existence, even if small, before becoming part of the urban perimeter. The peripheries of these two cities are structured in a logic of localities, whilst Aveiro's and Évora's are structured in a logic of axes. Therefore, even if Aveiro's and Leiria's location patterns are similar for lower number

of neighbors (meaning similar small cluster concentrations), the overall patterns are much more similar between Évora and Aveiro. These two cities have expanded through ring roads and rays-of-the-sun thoroughfares, with commerce concentrating on important residential/service buildings facing them. Yet Aveiro presents more ‘steps’ in the distance graph, meaning various small concentrations, often not commercially linked, whilst Évora (and Leiria) present much smoother curves, meaning a more continuous commercial distribution from the center.

8
COMMERCIAL CHARACTERIZATION

8.1. OVERVIEW

The purpose of this Chapter is to give a characterizing depth to the patterns of commercial location defined in Chapter 7. As seen in Figure 24 in Chapter 5, the collected data specifically concerning the 'store' itself, later inserted into the model, goes much beyond the considerations of 'location' or 'activity'. Therefore, this Chapter will try to present that data, and create spatial and numerical associations between variables. It is divided in four parts. The first deals with the characterization of the location and amount of the different types of stores. This analysis is performed considering the 'activity', the 'sub-activity' and the 'category' of each establishment. All other variables will also be, through the use of extensive double-entry tables, correlated with the 'activities' and the 'categories'. The second part concerns the store's 'integration' in the city's built landscape, that is, the assessment of the relative location of each store to others, and the type of land-mix use of the buildings stores are in. The case of multi-commercial spaces is also addressed. The third part presents the 'store management' variables, namely store 'type' and store 'structure'. Lastly, the fourth part briefly presents the location, amount and type of other store characteristics that were collected, namely the 'web-connection', the 'store status' and the nature of the building and street occupation (location in upper floors, use of esplanades, and so on).

Because the databases are extensive and the amount of correlations possible is also very wide it is difficult to present the information in a succinct yet understandable fashion. As much as possible, the information is condensed in tables or in visual representations. Even so, some more detailed textual descriptions are presented either as footnotes or in Annex. Also in Annex are displayed all the A3 maps relevant to the understanding of the spatial patterns of these variables.

8.2. ACTIVITIES, SUB-ACTIVITIES AND CATEGORIES

8.2.1. IN CITIES

Considering the division into 8 activities presented in Figure 25 (plus one[151]), each city's stores were catalogued and the results are presented in Table 11. The first thing that can immediately be perceived

[151] 'Others', to account for multi-commercial spaces (considered as one unit) and those whose activity could not be ascertained (because they were either closed or empty).

when analyzing this Table is that there is great similarity in the overall percentages that each city presents. This uncanny similarity may be surprising, but it can reveal a consistency in the commercial sector (even if it is just instinctive) about the way location, activity and integration choices are made, and about the thresholds of activities that sustain the normal functioning of an average medium-sized city.

Table 11 - Percentage of Activities in the case studies, presented by cities, by centers (cen.) and by peripheries (per.)

	Vila Real			Aveiro			Leiria			Évora		
	City	Cen.	Per.	**City**	Cen.	Per.	**City**	Cen.	Per.	**City**	Cen.	Per.
Home appliances and electronics	**5,1**	5,5	4,2	**4,2**	3,7	5,0	**3,9**	3,5	4,2	**4,3**	3,8	4,7
Hygienne and personal care	**1,4**	1,5	1,2	**1,6**	1,8	1,3	**1,7**	2,3	0,9	**1,6**	1,8	1,5
Home	**13,8**	13,7	14,8	**10,2**	8,0	13,3	**10,9**	9,2	13,0	**11,0**	11,8	10,4
Leisure and culture	**6,3**	7,0	4,9	**6,0**	6,9	4,9	**5,3**	5,7	4,7	**6,8**	8,2	5,6
Fashion	**10,7**	14,3	2,6	**11,2**	16,0	4,9	**9,7**	15,0	2,9	**11,8**	19,4	4,7
Food & Beverages	**7,0**	6,8	7,7	**6,2**	5,9	6,6	**5,4**	4,2	7,0	**6,2**	6,0	6,4
Restaurants & Cafés	**22,9**	20,4	28,9	**17,6**	19,4	15,1	**18,1**	16,7	20,2	**24,6**	24,4	25,0
Services and other activities	**27,1**	24,8	33,6	**27,8**	23,0	34,4	**30,1**	29,2	31,6	**24,1**	18,1	29,5
Others*	**5,7**	6,0	2,1	**15,2**	15,3	14,6	**15,0**	14,1	15,4	**9,6**	6,5	12,3
Total	**100**	100	100	**100**	100	100	**100**	100	100	**100**	100	100

* Multi-commercial or of Activity unknown (closed or empty)

More than one in every four establishments sells goods and commodities corresponding to 'Services and other activities'. This is also the activity which occupies the greatest commercial area[152]. It can be argued that 'Services and other activities' houses, besides the directly related service sub-activities, all the others that had no match in the previous seven activities, and therefore, because it has a wider definition, it will naturally contain more stores. But this is not entirely true because, analyzing the sub-activities, it can be seen that some of the most popular ('banks', 'real estate agencies', 'insurance agencies' and, particularly, 'hairdressers'[153]) are precisely of the ones that correspond to 'commercial services'. Immediately it is seen that these types of services are much more common in Leiria and Aveiro than in Vila Real and Évora.

[152] About 30% of the commercial area in each city.
[153] Hairdressers amount to 5% of all stores in each city and Banks to 2,5%.

The second most common activity overall is 'Restaurants & Cafés', and it is here that the greatest dissimilarities between case studies (or more precisely case study pairs) are seen. By understanding the nature of these pairs (something which has already been introduced in previous chapters) these dissimilarities can be easily explained. Leiria and Aveiro may have, relatively, less 'Restaurants & Cafés' for two reasons. First because the degree of development of the respective regions these cities are in, and the roles they perform in the respective urban networks, call for stronger service-prone centers. Second because, as it can be inferred by the 'Others' activity, they possess more multi-commercial spaces throughout the city, places where cafés and food-courts are common. Analyzing the sub-activities it can be seen that the trade-off between these two pairs occurs precisely between restaurants and service establishments. The 'street café' is undoubtedly the most common of all sub-activities, with even percentages in almost all cities[154], but the amount of 'Restaurants', on the other hand, is, relatively, twice as much in Vila Real and Évora, than in Leiria and Aveiro[155]. The fact that Évora has the highest percentage of 'Restaurants & Cafés' and the lowest of 'Services and other activities' helps to define the character of a city more focused on other goals, such as tourism.

'Fashion' (much due to the weight of 'Clothing' stores[156]) is the third most represented activity, (especially in the centers), possessing more or less the same amount of stores as 'Home'. In Vila Real there is evidence that there can be a particular 'Home' cluster (14%). The number of stores selling 'Food and Beverages' and 'Leisure and culture' products are more or less similar, whilst 'Home appliances and electronics' and 'Hygiene and personal care' stores are the least found in these cities. While the larger number of 'Other' stores in Leiria and Aveiro can be considered a consequence of both a greater number of non-open stores (which in turn can be a consequence of these two cities having an overall greater number of store spaces), and a greater number of multi-commercial spaces, in Vila Real the lower percentage is justified by the small number of 'closed' and 'empty' stores, and in Évora by the small number of multi-commercial spaces.

Considering the entire city, and applying the 'Average Nearest Neighbor' tool of ArcGIS[157], it can be seen that most of these activities present a clustered pattern. The only activity which presents clear random patterns in all cities is 'Hygiene and personal care'. 'Home appliances and electronics' may present random patterns in Évora and Leiria, as well as 'Food & Beverages' in Évora.

Although a more focused analysis of the center and the periphery will be made in the following sections, it can be said, from this brief overview, that whilst Leiria and Aveiro present high-order commercial establishments and services as their main sub-activities, Vila Real and mainly Évora have a larger number of small local stores possessing neighborhood-oriented activities. These deductions are strengthened by the overall analysis of the retail categories, which are presented in Table 12. There are, relatively, 8% more M1 stores, that is, of first necessity, in Évora and Vila Real than in the other two cities. Furthermore, Aveiro and Leiria also possess slightly higher percentages of S stores, which relate mainly to services and entertainment. The rest of the percentages are more or less similar between cities, mimicking the Activity distribution. C, followed by MC, are the most relevant

[154] It represents 11% of all stores in Vila Real, Aveiro and Leiria, and 15% in Évora.
[155] They correspond to 10% of all stores in Vila Real and Évora, but only to 5% in Leiria and Aveiro.
[156] Over half of the 'Fashion' stores (6% of the 11%) belong to the 'Clothing' sub-activity.
[157] This tool is part of 'Spatial Statistics Tools' and the 'Analyzing Patterns' subdivision. It calculates a nearest neighbor index based on the average distance from each feature to its nearest neighboring feature, and displays a clustered/dispersed scale.

categories after M1. The higher percentage of C stores in Vila Real is a proof of the primacy of the household and construction market. All of these categories present a clearly clustered pattern, at a city-scale.

Table 12 - Percentage of Categories in the case studies, presented by cities, by centers (cen.) and by peripheries (per.)

	Vila Real			Aveiro			Leiria			Évora		
	City	Cen.	Per.	**City**	Cen.	Per.	**City**	Cen.	Per.	**City**	Cen.	Per.
M1	**37,2**	36,6	39,7	**30,4**	31,7	29,1	**30,7**	29,0	33,2	**37,6**	36,5	38,8
M2	**7,8**	8,3	6,8	**8,0**	8,3	7,7	**8,5**	9,6	7,3	**8,0**	8,9	7,2
MC	**14,2**	18,5	4,7	**15,2**	20,7	8,2	**13,3**	19,4	5,5	**15,4**	23,8	7,6
C	**29,3**	24,6	41,1	**23,2**	15,5	33,2	**24,8**	20,1	30,9	**22,6**	16,3	28,5
S	**5,8**	6,0	5,6	**8,1**	8,7	7,2	**7,7**	7,8	7,7	**6,8**	7,9	5,7
Others*	**5,7**	6,0	2,1	**15,2**	15,1	14,6	**15,0**	14,1	15,4	**9,6**	6,5	12,3
Total	**100**	100	100	**100**	100	100	**100**	100	100	**100**	100	100

* Multi-commercial or of Category unknown (closed or empty)

If for each Activity or each Category a separation is made between the stores in buildings constructed before and after 1975, it is perceived that the percentages are not very different from those considering all the stores, which were presented in Table 8. This means that the new commercial offer is balanced in terms of activities, as the same proportions are maintained. Only 'Fashion' and, to a lesser extent 'Restaurants & Cafés' present a decline from the overall reference value (that is, considering all the stores), which can only mean that these activities have a greater tendency to be in older buildings and historical areas. As it will be seen in the next sub-chapters, this is precisely so[158]. On the other hand 'Services and other activities' have an expected increase, that is, they prefer, in general, newer buildings. In terms of retail categories, MC stores display a clear tendency to be located in pre-1975 buildings (a consequence of the 'Fashion' stores) and C stores prefer, on the whole, newer buildings.

The following two sections present a more focused analysis on this theme for the center and for the peripheries, respectively. The city A3 maps showing the division of stores by Activities are presented in Annex 6, whilst similar maps for the Categories are displayed in Annex 7.

8.2.2. IN CITY CENTERS

Mimicking the city-scale analysis, the four city centers also possess similar proportions of activities, as it can be seen in Table 11. These may once again be proposed to represent the natural amount that sustains the commercial equilibrium in average medium-sized centers. The differences in percentages that specific case studies present may reveal particular functions performed by those centers. Figure 72

[158] 90% of all the city's 'Fashion' stores can be found in the city centers and 'Restaurants & Cafés' not only are there as well, they are also the first stores (especially 'cafés') to be found in the center of peripheral localities.

shows the activity distribution in each of the centers, whilst Table 13, in the following pages, summarizes the most important commercial variables calculated in the perspective of each Activity[159].

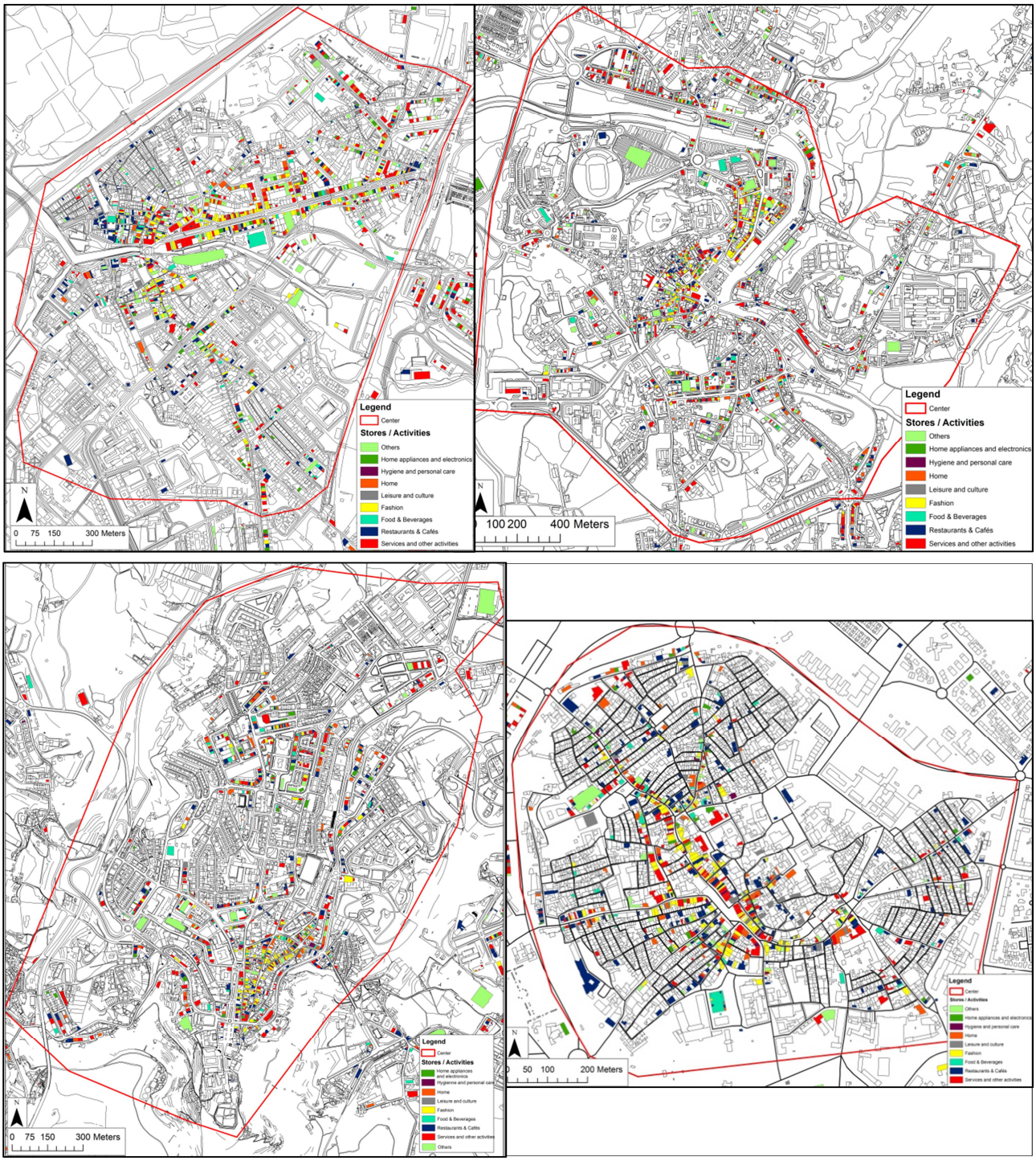


Figure 72 - Activity distribution in Aveiro's, Leiria's, Vila Real's and Évora's city centers

[159] When nothing is mentioned in parenthesis the percentages are similar in all the four centers. When they are not similar the cities are signaled by the first letter of their name (VR, A, L, E). Only the elements 'Percentage', 'Location', 'Pattern', 'Building age' and 'Main sub-activities' are analyzed in this section. The others will be discussed ahead.

Table 13 - Activity characterization in the city centers

Activity	Services and other activities	Restaurants & Cafés	Fashion	Home	Leisure and culture	Food & Beverages	Home appliances and electronics	Hygiene and personal care
%	29% (L); 24% (VR,A), 18% (E)	27% (E) , 20% (VR,A), 17% (L)	15% (19% E)	14% (VR, E); 9% (L, A)	7%	6%	4%	2%
Location	Main squares and larger, two-way, commercial axes, preferably modern ones. Favor intersections, squares and roundabouts, but they also appear in residential areas and in near-edge-of-center locations.	Narrower blocks of the traditional center. Older existing axes. They also favor main squares and axes, sometimes not so much in the main facade, but always one turn away.	Presence almost solely in one or two very strong axes (a newer thoroughfare and *Rua Direita*) and surrounding streets. Stays clear of residential areas, preferring traditional axes. Newer areas also have perceptible fashion stores, but these are more spaced from one another.	They appear, not so much in main axes, but in perpendicular roads to these. They appear in intersections that mark the transition between the main axes and residential areas, and also have some significance in the traditional center.	Have a tendency to concentrate in particular areas not far from main axes. Otherwise they are mostly represented by one or two establishments in residential areas.	Outside main center areas, near residential/traditional areas, and near intersections. There are particular squares which are often food-related. Often appear in pairs and if they are in main axes, they are farther from its central portion and near residential spaces. These shops are also near landmarks. Chain supermarkets have the tendency to drift towards newer residential areas.	Main axes away from the center's center, closer to residential areas	Despite the few stores, there is a sort of linearity in their distribution, covering strategic point along or around the main commercial axes. There are sporadic concentrations of 3 or 4 stores
Pattern	Clustered (to a lesser extent in E)	Clustered	Very clustered (even higher in VR)	Less strong clustered patterns, that may be random in E and A	Random that can be clustered in certain areas. Clearly clustered only in Aveiro	Clustered (L), clustered/random (VR, A), random/dispersed (E)	Clustered/random (random/dispersed in É)	Dispersed/random
Buildings heights	60% in 3-6 story; 30% over 6 story. (In E, 80% in 2-3 story)	50% (L, VR); 67% (A), 97% (E) in 1-3 story	80% (VR,E), 50% (L,A) in 1-3 story	45% in 1-3 story (95% E); 45% in 4-7 story	50% in 1-3 story (90% E); 40% in 4-7 story	100% (E), 55% (A, VR) and 42% (L) in 1-3 story	20% (L), 40% (VR), 55% (A); 100% (E) in 1-3 story 60% (L), 50% (VR), 40% (A); 0% (E) in 4-7 story	80% in 2-4 story (56% L)
Building age	60% (L), 50% (VR), 40% (A), 3% (E) post 1975	50% (VR, L), 20% (A), and 1 store in E in post 1975	28% (L), 16% (VR, A) and 1% (E) post 1975	55% (VR,L); 30% (A), 0% (E) post 1975	50% (L), 30% (VR, A); 0% (E) post 1975	60% (L), 40% (VR), 30% (A); 0% (E) post 1975	70% (L), 50% (VR), 40% (A); 0% (E) post 1975	50% (L), 10% (A), 0% (VR, E) post 1975
Building type	40% with services (half with com, res, serv). 12% VR	66% (E, VR), 50% (L, A) solely residential	80% residential (mostly solely in E,VR; with services in L, A)	70% solely residential (50% L)	70% residential (mostly solely in E,VR; with services in L, A)	60% solely residential (40% L)	80% (VR,E), 60% (A, L) solely residential	60% solely residential (35% L)

Activity	Services and other activities	Restaurants & Cafés	Fashion	Home	Leisure and culture	Food & Beverages	Home appliances and electronics	Hygiene and personal care
Relative location	70% door to door	70% door to door (48% E)	85% door to door	70% door to door (90% A)	70% (E, L) and 80% (A, VR) door to door	70% door to door (56% E)	90% (L), 80% (VR,A), 50% (E) door to door	80% door to door (95% A)
Store structure	60% individual	95% individual	70% individual	80% individual	90% individual	94% (E), 86% (VR) and 76% (L,A) individual	62% (VR,A), 70% (E,L) individual	66% (VR,A), 85% (E,L) individual
Store type	90% Modern (80% VR)	70% (VR, E), 80% (L,A) modern	75% (VR,A); 90% (E, L) modern	75% modern (50% VR)	80-90% modern (65% VR)	75% (L,A), 45% (VR,E) modern	70% modern (slightly less in VR, E)	Pratically 100% modern
Closed and empty	5%	9%	5% (2,5% E)	13% (E), 9% (L), 5% (VR,A)	6% (13% VR)	9%	7% (L,E); 4% (A, VR)	20% (VR), 10% (L) (both 3 stores), 0% (A,E)
Main sub-activities	'Hairdressers', 'Banks', 'Insurance Agents', 'Real estate agencies', 'Beauty Parlors' and 'Travel agencies'	'Cafés', 'Restaurants', 'Bars', 'International cuisine', 'Fast Food' and 'Ice Cream Parlor'	'Clothing', 'Shoe stores', 'Eyewear' and 'Jewels', 'Fashion accessories'	'Home decoration', 'Have-everything', 'Furniture' and 'Construction Materials'	'Stationary-news stand', 'Sports goods', 'Flowers and Plants', 'Photo shops', 'Art Gallery', 'Toys' and 'Libraries'	Supermarket', 'Minimarket', 'Grocery store', 'Butcher', 'Dietetic products', 'Sweets', 'Drinks' and 'Fruits and Vegetables	'Home appliances' and 'Computers', 'Telecommunications', 'Electronic articles and materials'	'Pharmacies', 'Perfumes', 'Cosmetics', 'Articles for Hairdressers', 'Others'

'Services and other activities' is still the main activity (and the one occupying the greatest area[160]) in all centers, with the exception of Évora's. Not only that but, with the same exception, the centers contain more than half of the entire urban perimeter's 'Services and other activities', clearly defining their role[161]. In Évora, on the other hand, the main activity is 'Restaurants & Cafés', which is the second most representative activity in the other three city centers. It can be seen that Leiria's center has the highest percentage of services and the lowest of restaurants, and in Évora exactly the opposite happens. This constitutes a revealing difference in the roles of these two centers. Actually, Évora's center percentages can be a consequence not only of its role but also of its structure. This center has only a residual amount of buildings constructed after 1975, so no new shopping areas were created. The importance of the touristic activity added to the construction restrictions of the world heritage site helped to keep the narrow and traditional street network that theoretically favors small enterprises. New residential buildings with shops and services, or exclusively of shops and services, may be in the ring road just outside the city wall, but they are, effectively, outside the center. Furthermore, Évora's center resident population is only one third of the resident population of the other three centers[162], so it seems natural that services have chosen to be both closer to residential areas and in newer areas. As it can be seen in Table 13, only 3% of 'Services and other activities' in this center are in buildings constructed after 1975, whilst in the other centers this number not only is over 40%, it is also higher than the reference values (considering all stores) which proves that services prefer more modern buildings. It can then be assumed that other sub-activities such as 'street cafés' or 'fashion' stores (traditional or not) have occupied the space that service activities did not find suitable. That may be the reason why 'Fashion' is, in Évora's city center, even more significant than 'Services and other activities'. It completely agrees with the finding made above that 'Fashion' and 'Restaurants & Cafés' increase and 'Services and other activities' decrease in pre-1975 buildings. Therefore, the amount of 'Fashion' stores not only is much higher in the center than in the peripheries (80 to 90% of these stores are in the centers), it is also higher the more relevant the *traditional commercial center* of the center is. That is why this activity is clustered in all centers, but even more so in Vila Real's, whose traditional center still detains the greatest importance inside the urban perimeter. 'Fashion' is therefore the activity that has most survived (along with 'Restaurants & Cafés') in the traditional centers. It may be proposed, furthermore, that it has indeed helped these centers to survive.

Furthermore, it can be speculated that the survival of 'Fashion' in the centers is also dependent on the amount of multi-commercial formats. Coincidently or not, the cities that have had a slower permeability to these formats, Évora and Leiria, are the ones with a relative higher percentage of 'Fashion'. It could be said that both centers have gained modern chain fashion stores in their traditional shopping streets, precisely because these had no other suitable place to go. In Leiria, this phenomenon is highly perceptible. The larger potential of the city, and the fact that Leiriashopping has only opened in 2010 has catapulted the presence of the most famous 'Fashion' stores around 5 de Outubro Square. Zara's store is a notable example (Figure 73). The rehabilitation of a derelict traditional building is one of the landmarks of this square.

[160] It occupies one fourth (25%) of the commercial area in all city centers but Évora's, where over one fourth (27%) is occupied by 'Restaurants & Cafés' establishments.
[161] Whilst Évora's city center contains 35% of all the 'Services and other activities' that can be found in the urban perimeter, Leiria's and Aveiro's contain 50% and Vila Real's an astonishing 60%. This is yet another variable that helps to prove the major dependency the periphery (and probably the entire region) of Vila Real have of this city's center.
[162] 4.700 inhabitants against about 12.000.



Figure 73 - Zara store in a rehabilitated building in 5 de Outubro square in Leiria / Pull & Bear store in Évora's João de Deus Street

On the other hand, the percentages of 'Home' stores are again not similar between pairs. If services trade-off percentages with restaurants, then, because all other activities have almost similar percentages in all the four centers[163], differences in 'Home' stores can only be balanced with 'Others', that is, with the multi-commercial spaces and non-open stores. That is why, for 'Others', almost the inverse percentages occur. In Aveiro and Leiria, 'Home' stores are much more common in the suburbs, in industrial areas and inside shopping centers. These are more modern and usually require larger store areas. It is true that this type of 'Home' store also exists in Évora and Vila Real but there is a much more common type in these two traditional centers, namely small decoration and home article stores[164], which appear to be much less in Leiria and Aveiro. It is this type of traditional 'Home' store that boosts the percentages of this activity in the more 'traditional' centers. The justification of multi-commercial spaces may also explain the lower percentages 'in the street' of 'Food & Beverages' and 'Home appliances and electronics', and why in Évora and Vila Real there is a greater amount of traditional family stores that still retain these activities.

Despite the differences in the statistics, the truth is that the geographical distribution of these Activities is mostly similar, with few exceptions, in all centers. Whilst Annex 8 contains a more detailed description of each activities' pattern (through the presentation of individual activity 'files'), complementing the summaries presented in Table 13, the diagram on Figure 74, built over the one presented in the previous Chapter, tries to organize the spatial information presented in Figure 72, so that an average distribution model can be proposed.

As it can be seen, and as mentioned above, the traditional centers house preferably 'Fashion' and 'Restaurants & Cafés' establishments. The 'traditional' 'Food & Beverage' establishments are also located here, as well as some 'Home' stores. 'Services and other activities' can also appear in main squares, intersections and around major landmarks, but they are majorly in the greater and larger commercial axes, both linkages and edge-axes. Undisputedly this activity has the widest, although central, spatial representation, not only because it can afford the best locations, but also because it has, according to its sub-activities, different needs. Service agencies ('banks', 'insurance agencies', 'real estate agencies' and 'travel agencies') need the center's main axes, personal stores such as the all-

[163] 7% 'Leisure and Culture'; 6% 'Food and Beverages'; 4% 'Home appliances and electronics' and 2% 'Hygiene and personal care'. Curiously, both Évora's and Vila Real's centers have exactly 68 'Leisure and culture' establishments each.

[164] In Évora, the touristic shop selling hand-made products is also an asset to the city's commercial landscape.

important 'hairdresser'[165], 'laundries' and 'beauty parlors' require proximity to residential neighborhoods, and car-related sub-activities, for example, ('garages', 'gas stations', 'car stands') require the space and accessibility that the axes leading from the center to the peripheries can provide. Location and amount of activities are conditioned by spatial possibilities (for example, in closely defined centers such as Évora's these last sub-activities hardly exist because there is, literally, no space), as well as by the city's overall role (Leiria's center, for example has almost twice as much 'banks' and 'real estate agencies' than any of the other centers).

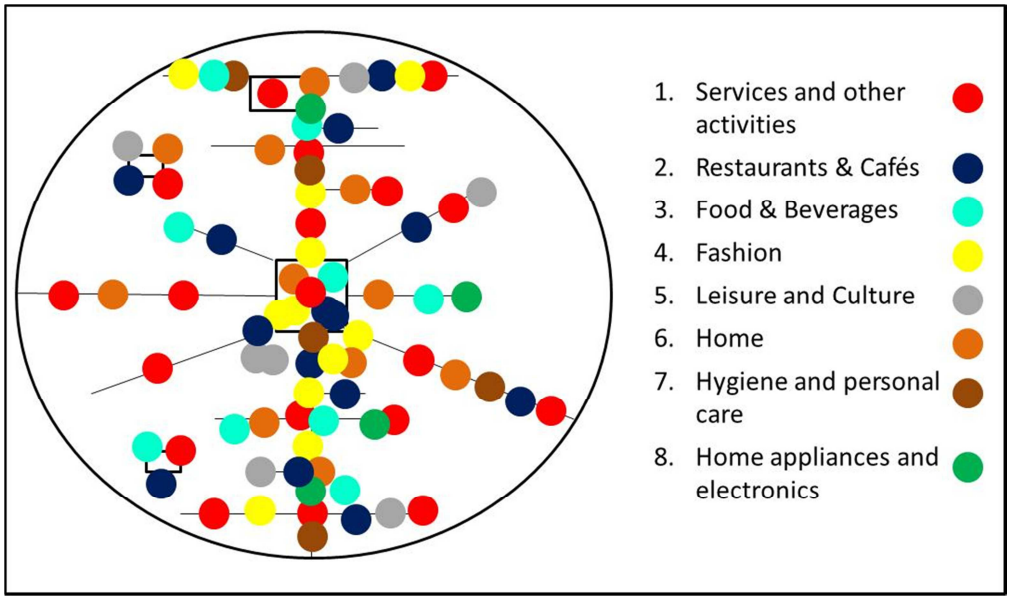


Figure 74 - Spatial representation of the average activity distribution in the centers

Two other activities have an equal wider spatial representation but with much less density: 'Restaurants & Cafés' and 'Hygiene and personal care'. This explains why 'Restaurants & Cafés', even though they favor traditional areas, don't have a clear presence in pre-1975 buildings. They also locate in linkages, in new centers and in residential areas, although preferably not in the main facade of commercial axes (they are generally one turn away). These stores also seldom appear alone. The ratio between resident and present population may also justify why Leiria's and Aveiro's centers have much more 'Cafés' than 'Restaurants', besides the other more generic reasons. Aveiro's center also has an overt presence of 'Bars' which is clearly a consequence of the strong influence of the University in the city. On the other hand, 'Hygiene and personal care' stores are very few but there is a linearity in their distribution, covering strategic points around main axes. 'Pharmacies' are in this case the most relevant sub-activity.

'Home appliances and electronics', 'Home' and 'Food & Beverage' stores are located in main axes but way from their core, that is, closer to the transitions to residential areas. The number of these stores is also fewer so their patterns are very poorly, or not, clustered. 'Home' stores follow the city's commerce generally in perpendicular streets to the main axes. If in the traditional centers the main activity is the 'have-everything' family-owned store, closer to newer residential areas it is the 'Home decoration' store. Other, more spacious types of 'Home' stores can locate in axes leading to the peripheries (along mainly with services). If these necessities cause, as mentioned above, an absence of

[165] One in every five 'Services and other activities' stores in each of these city centers is a 'hairdresser'.

specific 'Home' sub-activities in Évora's center, Vila Real's, on the other hand, has a higher representation of traditional and technical stores, selling, for example, tools and construction materials[166]. Both these centers also favor 'have-everything' 'Home appliances and electronics' stores. This activity appears less and farther apart but is more receptive to newer areas, especially in the form of the sub-activities 'Home appliances' and 'Computers'. 'Food & Beverage' stores, although not generally in main axes, hardly ever lose their centrality. They stay close to landmarks, main intersections, and traditional and newer residential areas. If in the former they are mostly represented by family-owned stores, in the latter the overt presence of chain supermarkets is more than evident. Évora and Leiria, with stronger residential poles outside the center, have a poorer representation of these establishments in their inner commercial cores[167]. This variable, along with the regularity of the pattern inside the center, seems to be entirely connected to the amount and distribution of residential neighborhoods. Hence the pattern is only clustered in Leiria's center. Aveiro has been more permeable to new formats, whilst Vila Real's center, once again, sustains over 50% of the entire city's 'Food & Beverage' facilities. It should be noted that traditional single product activities such as 'Fishmongers' or 'Bakers', have very little significance (1 or 2 shops each per city center). This means that today most centers practically depend solely on multi-product food establishments.

'Fashion' stores only appear outside the traditional center and surrounding main axes sporadically in newer areas, in a more spaced pattern and with other type (high-end) of sub-activities. 'Leisure and Culture' establishments are in particular areas not far from main axis (a small art district for example) or else they are represented by 1 or 2 establishments in all residential areas ('news-stands', 'library', 'sporting goods'). Once again Leiria and Aveiro have more specific types of 'Leisure and Culture' stores. These residential commercial intersections also contain, aside from this activity and sporadically 'Food & Beverages', mostly 'Services and other activities' and 'Restaurants & Cafés'. These concentrations are fewer in Évora's center because it lacks great commercial intersections (except Giraldo Square), a consequence of the absence of well-defined residential 'islands' or edge-axis composed of residential/service/commercial rows.

Detailed information on this subject is, as mentioned, further found in the activity 'files' of Annex 8.

By what has been seen above it is no surprise to learn, looking specifically at the sub-activities, that of every 10 stores, almost always one is a street café, one is a restaurant and one sells clothes[168]. Hairdressers' (5%), 'Banks' (3%) and 'Insurance agencies' (2%) are the following most relevant sub-activities but all others have a less than 2% overall representation, so their patterns are harder to follow. A division in categories makes more sense, but before that some brief considerations on sub-activities are made.

While Leiria has the most balanced distribution of sub-activities between the center and the periphery, Vila Real is completely center-oriented. Only 3 of the 85 sub-activities present in Vila Real's urban perimeter are not represented by at least one store in the city center[169]. Furthermore, there is a large

[166] But this city has a much less representation of more refined, neighborhood oriented, home stores.
[167] A thorough description of the number, type and brand of the existing supermarkets is displayed in the respective file of Annex 8.
[168] The exception occurs in Leiria's and Aveiro's centers where 'Restaurants' correspond only 5% (not 10%) of all stores.
[169] 'Nightclub', 'Home/garden equipment' and 'Home appliances repairs'. While 'Nightclubs' are easily substituted by the nightlife cafés in the center (concentrated in the neighborhood known as 'Pioledo' in Santa

amount of sub-activities that, when outside the center of Vila Real, are mostly or entirely located in the Europa and Universidade Avenues' area[170]. On the other hand, Évora's city center has lost a variety of functions to the outer ring, where new residential/service/commercial buildings are located. Notwithstanding these nuances, there is a significant number of mainly fashion, services, touristic, entertainment and food related sub-activities, common to all case studies, that exist solely or mostly (over 50-60%) in the city centers. These are displayed in Table 14.

Table 14 - Sub-activities that exist mostly or solely in the centers

Activity group	Sub-activities
Fashion and Health Care	'Perfumes & Cosmetics', 'Jeweler', 'Fashion accessories', 'Hairdressers' (*except in Évora*), 'Clothing', 'Shoe store', 'Eyewear', 'Hairdresser products'
Service	'Bank' (*except in Évora*), 'Travel Agency', 'Insurance Agency', 'Real estate agency' (*except in Évora and Aveiro*), 'Funeral home' (*except in Aveiro*), 'Buy gold', 'Rent-a-car' (*except in Évora*)
Touristic	'Handicraft', 'Religious products'
Entertainment and culture	'TV/hi-fi', 'Toys, fun & games' (*except in Leiria*), 'Art gallery', 'Library', 'Photography', 'Telecommunications' (*except in Évora*), 'Musical instruments', 'Theaters' and small art-house theaters
Night entertainment	'Bar', 'Nightclub' (*except in Vila Real*)
Food-related	'International cuisine', 'Restaurants' (*except in Leiria*), 'Cafes' (*except in Évora*), 'Sweets', 'Frozen products', 'Ice Cream parlor', 'Fast Food', 'Dietetic products'
Traditional and Home	'Shoe Repair', 'Textiles for Home', 'Tapestry', 'needle and thread', 'Stationary & Press Center', 'Lighting' (*except in Évora*), 'Articles for home', 'China' (*except Aveiro*) and 'Decoration'

This list proves that Évora's center has a clear deficiency of sub-activities, especially those related to services or residential clusters (such as 'Hairdressers'), when compared with the other centers. On the other hand it possesses more 'traditional stores'[171]. Vila Real's and Aveiro's centers have more exclusively residential areas than the other two city centers, and that may be the reason why some services seem to lack here as well, and why other activities such as 'Laundries' or 'Supermarkets' have higher percentages in the center[172]. The overt presence of sub-activities such as 'Fishmongers' in Aveiro strengthens the notion that this is a strong 'Food & Beverages' center. In Vila Real it is clear the presence of food-related activities[173], traditional stores[174] and specialized stores[175]. Leiria appears

Sofia Street), the other two types of products and services may be found near the center in more expansive stores or in Dolce Vita Douro.

[170] As mentioned before, the center and this axis account for 76% of all the urban perimeter's commercial spaces, in only 20% of the area.

[171] 'Hardware', 'Bricolage', 'Repairs', 'Baker' and 'Grocery store'.

[172] Other sub-activities in this condition include 'Coffee boutiques' and 'Hunting & Fishing'.

[173] 'Butcher' or 'Fruits and Vegetables'

[174] Such as 'Hardware'

to present services and necessity goods for home and health, but has fewer food related, touristic and traditional stores[176]. Succinctly it can be said that Leiria and Aveiro's city centers are more service-prone, Évora's presents more 'traditional' activities and Vila Real's presents more 'specific' ones, mostly home-related, that in the other three centers are generally present in traditional/peripheral areas.

Although these differences occur between cities, the core of the major sub-activities is the same. That is why when they are grouped into the different retail categories, the overall percentages still retain a high degree of similarity between case studies. Figure 75 shows the four city center maps taking this division into account, and Table 15, similar to Table 13 in every aspect, summarizes the most important commercial variables calculated in the perspective of each Category. Once again, detailed files concerning the description of each Category can be found in the second part of Annex 8.

M1, the establishments related to first necessity goods of local accessibility are, obviously, the most common in the four city centers. And logically the division between Aveiro and Leiria, and Vila Real and Évora is maintained. This difference is once again a remainder of the distinct roles performed not only be the cities, but also by the littoral and interior regions. Considering the entire city, C stores were seen to be the second most important category, followed by MC stores. Whilst C stores gain weight with home and car-related activities, MC stores have most of their weight due to fashion. Therefore, and considering what has already been concluded in these city centers, it is no surprise that MC stores are more relevant in Aveiro's and Évora's city center, C stores are more relevant in Vila Real's city center, and both categories have about the same weight in Leiria's city center. M2 stores present similar percentages in all cities, and in Vila Real there is a slightly lesser percentage of S stores, which is also perfectly justifiable by what has been comprehended above.

[175] 'Copy Centers', 'Acclimatization', 'Home appliances', 'Safety equipment'.

[176] Aside from the sub-activities common to all the other centers, Leiria has in its city center more 'Copy centers', 'Beauty Parlors', and 'Home Appliances' (like in Vila Real), 'Bakers' (like in Aveiro) and also, unlike other cities, 'Pharmacies' and 'Radical sports' stores.

Table 15 - Retail category characterization in the city centers

Activity	M1	M2	MC	C	S
%	37% (E, VR), 30% (A, L)	9%	20% (24% E)	16% (E,A), 20% (L), 25%(VR)	8% (6% VR)
Location	Main axes, intersections and squares, both of first and second importance. Both in centers and thoroughfares, and in the commercial axes or single concentrations of residential areas. Appear less in the central portion of the main, newer, thoroughfares, where 'Fashion' and 'Services' are. Concentration also in traditional city center.	More concentrated than M1, and are located around main squares or specific axes of the traditional center. They lack, nonetheless, in the rest of the traditional center. Yet in the commercial concentrations of residential areas they are still represented, even if by just one or two stores.	Concentrated more in main central axes (including *Rua Direita*). They lack in main thoroughfares (a place which is occupied by C stores). In residential areas they clearly take one step down to less important areas, in favor of services and restaurants. In commercial concentrations of residential areas, they sometimes fail to be.	More common in residential areas than the central places. They occupy the residential main streets and squares, notably in the principal connections to the suburbs or 'last axes' of the center. In the center, they are usually perpendicular or parallel to the main streets. Although they also appear in main axes, the particular concentrations are one turn away.	Dot the main commercial areas, more spaced than other activities. There are few in main axes, intersections or roundabouts. Instead, they appear more in perpendicular or parallel streets to the main axes, or in the residential thoroughfares, namely those who also have miscellaneous services. Nevertheless, there are concentrations, in the traditional center, concerning the arts, entertainment or night district. In outer residential localities, the number is little and they appear sporadically, mostly isolated, although they practically don't miss a neighborhood, at least in the center.
Pattern	Clustered	Clearly clustered (L), to a slightly less extent in E, VR; and may tend to a random one in A	Clustered (to a lesser extent in VR)	Clustered (may tend to random in É)	Clustered, in a lesser extent (A), and tending to random (L). In E the random pattern may be dispersed, and in VR the pattern is probably random.
Building heights	90% in 1-7, equally divided 1-3 (a little more in A) and 4-7 (100% in 1-4 E)	40-45% are in 1-3 story (86% in E), and likewise in 4-7	90% (E),70% (VR), 50% (A), 45% (L) in 1-3 story. 45% are in 4-7 story for L, A	97% (E), 53% (A), 42% (VR, L) 1-3 story A and VR, L invert for 4-7 story	58% (A), 35% (VR, L), 95% (E) 1-3 story. VR, L; and A invert for 4-7
Building age	60% (L), 50% (VR), 26% (A) and less than 1% (E) post 1975	50% (L), 40% (VR), 26% (A) and 1% (É) post 1975	34% (L), 20% (VR, A) and 2% (E) post 1975	60% (L), 50% (VR), 34% (A) and only 1% (E) post 1975	60% (L), 53% (VR), 32% (A) and 4% (E) post 1975.
Building type	75% residential (mostly solely in E, VR; with services in A, L)	65% (85% VR) are in residential buildings (mostly residential in VR, E, but in A (16%) and L (23%) they also have services). 15% (L, E), 5% (VR, A) free-standing	80% (90% VR) in residential buildings (almost solely residential in VR - 85% - but the degree of services increases: 8% E, 15% A, 26% L)	70% (VR, E), 60% (A), 50% (L) solely residential buildings. 22% (L, A), 5% (VR, E) serv, com, res. 13% free standing stores (A 3%)	75% (VR), 51% (A), 47% (E), 42% (L) solely residential. A has 16% S stores serv, com, res and L has twice that. In E 21% free standing stores (less than 10% in others).
Relative location	75% door to door (55% E)	70% door to door (80% in A)	85% door to door	65%-70% door to door (A 86%)	79% (A, VR), 73% (L), 53% (E) door to door
Store structure	95% individual	52% (VR, A), 46% (L) and 65% (E) individual	68% individual	75% (85% E) individual	47% (L), 55% (A, VR) and 62% (E) individual
Store type	68% (VR, E), 83% (A, L) modern	88% (E, L), 95% (A), 75% (VR) modern	76% (A, VR), 86% (E, L) modern	60% (VR), 75% (E,A), 80% (L) modern	90% - 95% modern
Closed and empty	5% (A), 8% (VR, E), 11% (L)	6% (3% E)	4%	5% (VR, A), 9% (L) and 13% (E)	6%

Activity	M1	M2	MC	C	S
Activities they represent	54% Restaurants & Cafés' (64% E); 24% 'Services and other activities' (13% E); 9% 'Food & Beverages' (14% VR); 7% 'Leisure and Culture' (5% L); 4% 'Hygiene and Personal care' (8% L).	'Services and other activities' (48% L, 40% VR,E, and 32% A); 'Leisure and culture' (36% E, VR, and 28% L,A); 'Food & Beverages' (37% A, 25% E, and 20% L, VR); 'Restaurants & Cafes' 3%.	77% 'Fashion' (81% E); 10% (E, VR) and 14% (L, A) 'Services and other activities'; 5% 'Leisure and Culture' (4%); 3% 'Home appliances and electronics' (7% VR), and few 'Home' stores (except in A).	70% (E), 55% (VR, A), 45% (L) Home'; 40% (L), 26% (A, VR), 11% (E) 'Services and other activities'; 20% (E, A), 15% (VR, L) 'Home appliances and electronics', few 'Hygiene and personal care stores' (VR, A)	'Services and other activities' (80% VR, L; 73% E; 63% A), 'Leisure and Culture' (11%, but 17% E), 'Restaurants & cafes' (10%, but 24% A)
Main sub-activities	'Cafes', 'Restaurants', 'Hairdressers', Stationary', 'Beauty center', 'Laundry' (more in A,L), 'Minimarket' (more in E, A), 'Butcher' (more in VR), 'Pharmacy', 'International cuisine' (more in L)	Banks' (more in L), 'Flowers and plants', 'Photography', 'Toys' (all to a lesser extent in A), 'Library' (few in VR), 'Supermarkets' (particularly in A and to a way lesser extent in E), 'Drinks' (in E), 'Sweets' (VR, A), 'Dietetic food products' (A), 'Shoe repair'	'Clothing', 'Shoe Stores', 'Eyewear', 'Fashion accessories', 'Jewelry', 'Travel agency', 'Sports goods', 'Telecommunications'	Hand-made' (E), 'have-everything' (particularly in VR, E), 'Home decoration' (except VR), 'Furniture' (except E) 'Construction Materials' (particularly VR), 'Real estate agencies' (more relevant in L,A), 'Car Stands', 'Automobile accessories' (particularly VR, L), 'Home appliances', 'Computers	Insurance Agency' (less in A); 'Other services'; 'Rent-a-car' (particularly in L,A) 'Health Club' (particularly in L), 'Copy centers', 'Funeral Homes', 'Art galleries' (less important in L), 'Cinemas', 'Theaters', 'Games' and 'Night clubs' (all of few %), 'Bars' (more relevant in A)

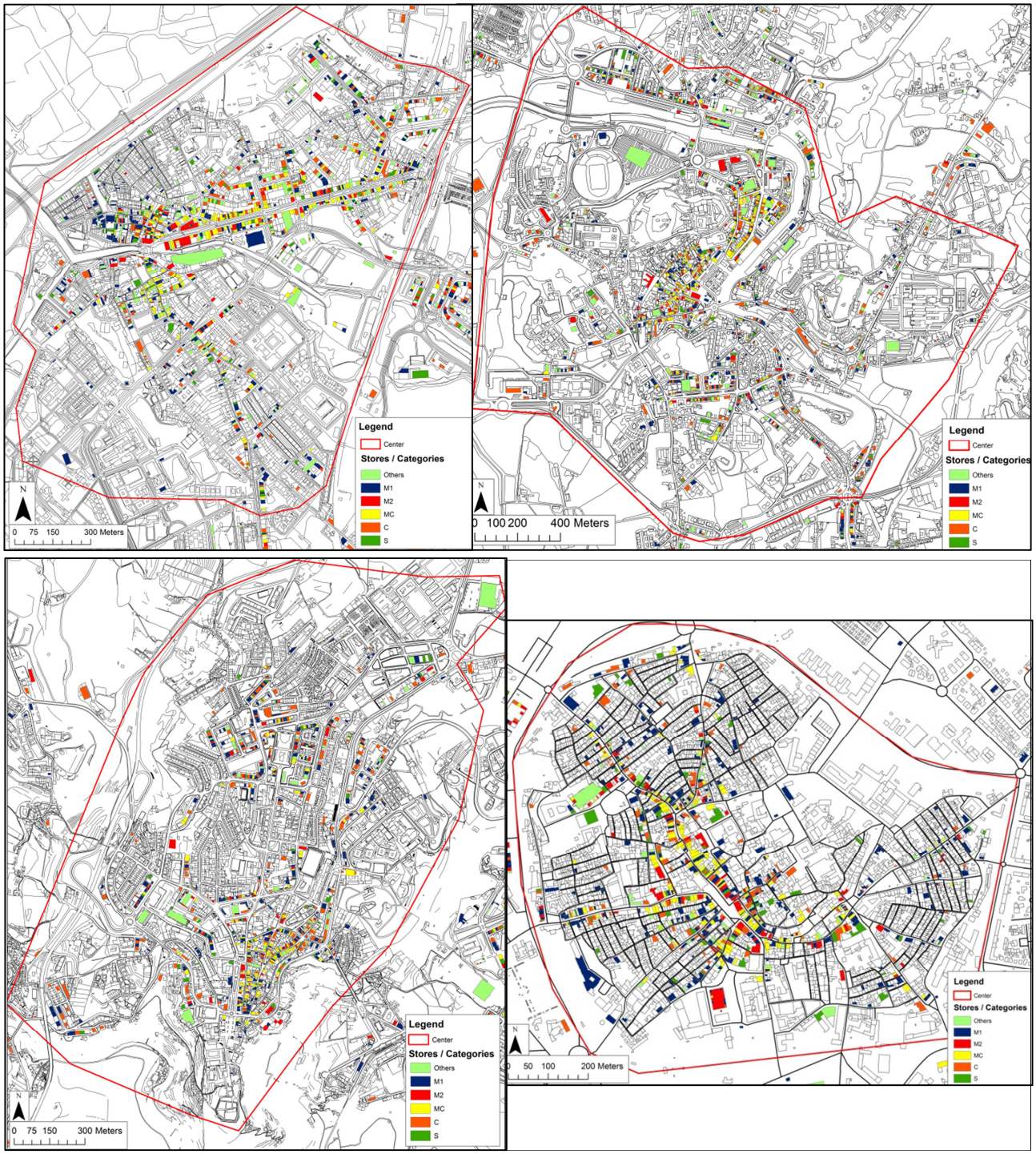


Figure 75 - Retail category distributions in Aveiro's, Leiria's, Vila Real's and Évora's city centers

The location patterns are also very similar in all cities. Using the same principles as before, the models on Figure 75 were converted into a schematic diagram, presented in Figure 76. M1 stores, because they are of first necessity and therefore include some of the major sub-activities[177], have an all-around occupation. The exception occurs clearly in the central portions of main new edge- or linkage-thoroughfares, as long as these portions do not include a major intersection.

[177] Such as 'Cafés', 'Restaurants', 'Hairdressers' and 'Stationary/news-stand'.

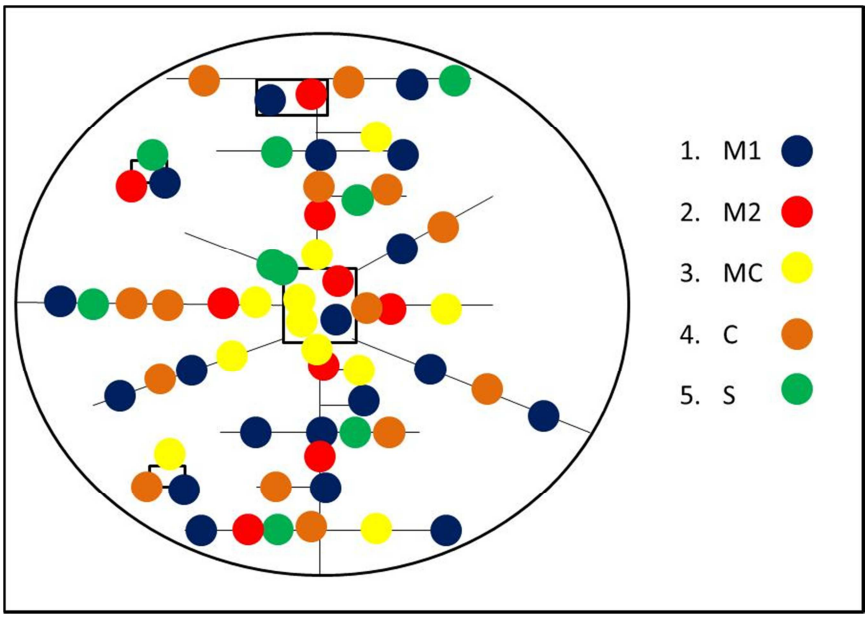


Figure 76 - Spatial representation of the average category distribution in the centers

This place, in the newer axis, is occupied mostly by MC and M2 stores, and more sporadically by C stores. M2 stores are both in old and new centers but their occupation is much more concentrated. They are in main squares and thoroughfares when representing higher services, such as 'banks', closer to the traditional centers when representing 'Food & Beverages' or 'Leisure and culture', and also appear in residential areas (as 'video rental' for example or other 'Leisure and culture' establishments). Over 80% of MC stores belong to 'Fashion' so this category follows closely that pattern, particularly near traditional centers. When in newer or residential areas MC stores correspond preferably to 'travel agencies', 'sporting goods' or 'telecommunications'. This diversity leads to a clustered pattern which is less strong in Vila Real because of the divided centers. On the other hand, C stores prefer new (post 1975) residential areas, locating in residential main streets and squares, and in the principal residential connections to the suburbs or 'last axes'. In the first case they represent items for the home, in the second technical stores such as 'construction materials'. In this particular case Vila Real's supremacy, as seen above, is clearly noticeable. Closer to the center's center, C stores are usually in perpendicular and parallel streets to the main axes, one turn away. 'Real estate agencies' for example, appear here, more so in Leiria than in any other city. Lastly, S stores are also preferably in newer areas, and, like C stores, locate one turn away from main axes, or else in residential thoroughfares, namely those which also possess miscellaneous services. 'Insurance agencies' or 'Health clubs' appear in these locations. Because of this, despite their fewer numbers, they hardly miss a neighborhood. They are also in the traditional center, concerning the arts, entertainment or night district. Annex 8 supplies additional information about category distribution and characterization.

8.2.3. IN THE PERIPHERIES

If the percentages of activities are mostly similar considering the entire city and just the centers, then logic dictates that they should also be similar in the peripheries. The small noticeable differences may help justify the different roles each of these case-study peripheries performs. Looking at the values presented in Table 11 it can be seen that the differences are mainly two. The first is the very slim

percentage of 'Others' in Vila Real's periphery in comparison with the other three[178]. Vila Real has both a very small amount of multi-commercial spaces outside the center (and none outside the 'extension' and the 'main residential area'), and practically no 'closed' and 'empty' stores[179]. The second is once again the fact that Évora's and Vila Real's peripheries have more 'Restaurants & Cafés' than Aveiro's and Leiria's. The other activities present more or less similar percentages between case-studies and even the same order of magnitude as in the center, with one expected exception. The weight of 'Fashion' decreases by more than 10 percentual points. Consequently, the most common activities are 'Service and other activities', 'Restaurants & Cafes' and 'Home'. This happens both in the peripheries as a whole and in the various hierarchical urban/commercial areas of the suburbs. 'Services and other activities' in particular, not only have once again the greatest overall significance (over 1/3 of all peripheral stores) and occupy the greatest commercial area[180], they also have an increase in weight, especially in the more 'traditional' cities. This is a consequence not only of the amount of car-related sub-activities and of industrial/commercial warehouses, both of which require space, but also of the personal services inherent to dense residential areas, such as 'hairdressers', 'banks' or 'real estate agencies'[181]. Because of the lack of these services in Évora's city center, and of the large amount of residential population in this city's periphery[182], the percentage increase of 'Service and other activities' is greater in this city than in any of the others.

At first glance, the more traditional/residential the locality is, the more seems to be the presence of 'Restaurants & Cafés'. Consequently, it seems logical that this activity has more weight than services in Évora's and Vila Real's peripheries. This occurs for the 'main residential areas' of these cities but also for the 'residential areas' of all case studies except Aveiro's. Yet in 'isolated residential areas' this does not hold true, so it could be assumed that the variable 'inhabitants' is also fundamental. In these areas, there is insufficient population momentum to produce more than one or two central street 'cafés' and 'restaurants'. This also helps to explain why 'restaurants' are, in terms of relative percentage, favorably outside (rather than inside) the center only in Leiria, where the residential communities are larger and more consolidated. Worthy of note is also the very poor percentage of 'Hygiene and personal care' stores. There are hardly more than 10 stores per periphery offering these products.

Because it would not be feasible, due to size restrictions, to represent the ArcGIS models containing the activity distribution for the peripheries, as it was done for the centers, it is suggested that the A3 city maps presented in Annex 6 be consulted. Summarizing this distribution, the diagram containing the average model for the peripheries is presented in Figure 77 below. This diagram is complemented, in the following pages, with the visual description of a few representative neighborhoods. Table 16, on the other hand, summarizes the most important commercial variables calculated in the perspective of each Activity. Further detailed information can be obtained in the specific activity 'files' of Annex 9.

[178] 2% against about 14%
[179] This can be a consequence of the fact that the total number of stores is also much more constrained.
[180] Namely 38% of all peripheral commercial area in Leiria and Vila Real and 30% in Évora and Aveiro.
[181] It is precisely these three types of sub-activities; car-related (accessories, stands and garages), hairdressers and service agencies (banks, insurance and real-estate) that constitute the most important sub-activities of 'Service and other activities' in the peripheries.
[182] Évora's periphery has practically the same inhabitant as Leiria's periphery (37.000), in half of the area.

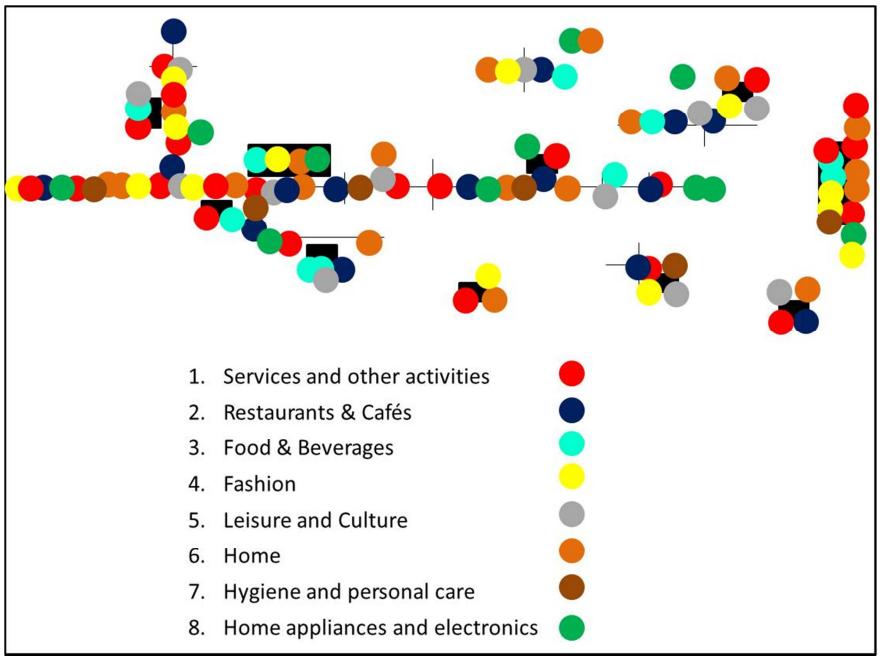


Figure 77 - Spatial representation of the average activity distribution in the peripheries

The 'extensions' and the 'main residential areas' not only contain the greatest population density, they also mimic the center in terms of distribution and amount of activities. Therefore, the number and variety of activities in the main commercial axes of these locations is greater than in any other part of the periphery. For the same reason, these areas can contain up to 60% of all the peripheral stores of a given activity[183]. These main peripheral thoroughfares, leading away from the city center, contain mainly 'Services and other activities', 'Home' and 'Fashion'. Curiously, these are also the three activities that mainly shape the 'industrial/commercial' areas on the far end of the urban perimeter, both appearing in individual large warehouses and inside the multi-commercial spaces. Yet between these two locations, their distribution is different. As it can be seen in the example presented in Figure 78, in the main intersections or squares of residential neighborhoods or main distributional roads 'Services and other activities' appear dominantly (due to 'hairdressers' or miscellaneous services), whilst 'Home' and 'Fashion' are farther apart, because they are more akin to residential areas. In these cases most of the other activities are represented by at least one store. Obviously, the sub-type of these activities shifts according to the location. 'Services and other activities' in 'industrial/commercial' areas are essentially car-related. 'Fashion' is high-end closer to the centers and main residential areas, and then can present itself in the form of outlets in industrial warehouses and in the form of all kinds of chain stores inside shopping centers. It can also be 'traditional' and family owned when it appears sporadically in small clusters in less developed residential localities. This is the reason why the pattern of this activity is less clustered (particularly in Vila Real), whilst the other two are mostly clustered.

[183] Sismarias, for example, has 60% of the 'Fashion' stores outside the city center, and over ¼ of all other activities, with the exception of 'Hygiene and personal care' stores. In another example, the Europa and Universidade Avenues contain 60% of the 'Fashion' and 'Hygiene and personal care' stores outside the center and 45% of all 'Leisure and culture'.

Table 16 - Activity characterization in the peripheries

Activity	Services and other activities	Restaurants & Cafes	Home	Food & Beverages	Leisure and Culture	Home appliances and electronics	Fashion	Hygiene and personal care
%	32%	27% (E, VR), 20% (L), 15% (A)	14% (10% E)	7%	5%	5%	5% (E, A), 3% (L, VR)	1%
Location	Main peripheral thoroughfares leading away from the city center and in industrial areas. In peripheral localities, they concentrate in main intersections, squares and roads. In residential clusters, they have considerable significance. Practically only absent in out of the way residential localities.	Exist in most commercial axes and concentrations, but more spaced and in a lesser number than Services, although they seldom appears alone. They are close to, but not exactly on, intersections but face all the most important thoroughfares and landmarks. They appear in the center of all out-of the way residential localities even if with small representation. Poor significance in industrial areas.	Main concentrations in Industrial areas and main peripheral thoroughfares. In areas closer to the center and in main residential localities they are either farther from the main portion of the main axes, or in perpendicular roads to these or to intersections, closer to residential spaces. Consequently, they also appear in residential clusters, sometimes in pairs. They appear in more isolated traditional localities, farther from main axis roads.	Seek residential localities, but only the largest and newest, where they are in pairs in main axes or else strongly clustered near high-rise multi-family buildings, even if these are not facing the main street. Large food establishments are also here. They are either practically inexistent in more traditional localities, or exist in single numbers, mostly on the main street.	Occupy main axes and intersections. Even though there can be one of these stores in the core of those concentrations, the bulk is as close as possible to residential areas. In residential commercial clusters there is at least one of these stores.	Locate in small numbers in main peripheral thoroughfares, especially those leading to the industrial areas where they are also located. They are also in residential clusters. Almost absent in traditional localities. When there, they are in their open periphery.	Very poor representation outside the city center. Concentrate in the extensions of the centers and the thoroughfares that lead from it, in specific axes or around intersections/roundabouts. The rest appear dispersed and alone, either in new residential clusters or, to a lesser extent, in traditional shopping streets in outer localities, most of the times facing main travel axis or intersections. They also have some representation in industrial areas, in the form of outlets or large scale establishments.	Very few stores. No more than 2 in each locality, located near the commercial center, facing the main thoroughfare, or on residential clusters. Largest concentration (no more than 3 stores) in extensions of the center, and practically absent in traditional residential areas.
Pattern	Clustered	Clustered	Clustered (can be random in VR)	Clustered (L), to a lesser extent (VR, A), can be random in E)	Clustered (L), may be random (E, A), random/dispersed in VR	Clustered/random (VR, L); random (A); random/dispersed (E)	Clustered (A, L), to a lesser extent (E), disperse in VR	Dispersed
Building heights	60% (A, L), 80% (VR), 90% (E) in 1-3 story. Only A and L with significance over 5 story (20%)	60% (A, L), 75% (VR), 90% (E) in 1-3 story. Only A with significance over 5 story (15%)	64% (L, A), 73% (VR), 94% (E) in 1-3 story. A 10% above 7 story, the other all below	53% (A), 62% (L), 73% (VR), 84% (E) in 1-3 story 40% 4-7 (A, L); 20% 4-5 (VR)	58% (VR, A), 65% (L), 88% (E) in 1-3 story. VR 14% 11 in story (rest bellow 6); E max 4 story; A, E max 7 story	44% (VR, L), 56% (A), 95% (E) in 1-3 story 40% 4-5 (VR); 42% 4-7 (A); 52% 4-7 (L)	27% (VR), 58% (A, L), 90% (E) in 1-3 story 40% (A, L), 73% (VR) in 4-7 story	40% (VR, A), 30% (L), 69% (E) in 1-3 story 60% (VR), 31% (E) in 4-5 story 54% (A), 70% (L) in 4-7 story
Building age	75% (69% VR) post 1975	51% (VR), 63% (E, A), 67% (L) post 75	64% (A), 69% (L), 77% (E, VR) post 1975	63% (75% E) post 1975	67% (L), 72% (E, VR), 77% (A) post 1975	77% (A, E); 84% (L, VR) post 1975	74% (90% VR) post 1975	78% (L, A), 85% (E), 100% (VR) post 1975

Activity	Services and other activities	Restaurants & Cafes	Home	Food & Beverages	Leisure and Culture	Home appliances and electronics	Fashion	Hygiene and personal care
Building type	60% (A, L), 40% (E, VR) residential (almost solely in VR, 70% solely in L and 58% solely in A, E)	54% (VR, E), 73% (A, L) residential (solely in VR, almost 80% in E, L, but only half in A - more buildings with services)	60% (A), 50% (VR, L), 33% (E) residential (VR all solely, 70% in L solely res and 58% in E and A)	50% (E), 60% (VR), 70% (A, L) residential (2/3 solely res in A, 80% in E, L; 95% in VR)	56% (E, VR), 65% (L), 75% (A) residential (solely in VR; about 2/3 in solely residential in A, less in E, more in L) 1/4 in serv, com res in A, E; 1/5 in L	48% (E), 71% (A, L), 95% (VR) residential (all solely res in VR, 2/3 in others)	65% (E), 75% (A), 80% (VR, L) residential (3/4 solely residential in VR, L; little over half solely residential in E, A)	60% (VR), 77% (E), 90% (L), 100% (A) res (in VR all solely res, in others about 60% solely).
Relative location	30% (VR), 50% (E, L), 65% (A) door to door	22% (VR), 52% (E), 58% (A, L) door to door	69% (A), 55% (L), 48% (E), 33% (VR) door to door	56% door to door (27% VR)	76% door to door (57% VR)	50% (E, VR), 74% (A, L) door to door	75% (VR, E), 87% (A, L) door to door	60% (VR), 69% (A), 84% (E), 90% (L) door to door
Store structure	63% (E, A), 71% (VR, L) individual	97% individual	74% individual	83% (71% L) individual	90% individual (81% A)	77% individual (83% VR)	87% (A), 77% (E, L), 45% (VR) individual	60% (VR), 83% (L, A), 92% (E) individual
Store type	67% (VR), 80% (L), 90% (E, A) modern	47% (VR), 71% (L), 76% (E, A) modern	65% (VR), 77% (A), 87% (E, L) modern	40% (VR), 60% (E), 72% (L, A) modern	52% (VR), 83% (L, A), 90% (E) modern	67% (VR), 87% (A, L), 95% (E) modern	75% (A), 92% (E, L), 100% (VR) modern	100% modern
Closed and empty	1% (VR), 3% (E, A), 6% (L)	6% (A, VR); 8% (E, L)	4% (VR, E), 6% (L, A)	5% (A), 10% (E, L), 15% (VR)	0% (VR), 9% (A), 13% (E, L)	0% (VR), 2% (A), 4% (L), 7% €	9% (6% L)	9% (A, L); 0% (VR, E)
Main Sub-activities	Car accessories', 'Hairdresser', 'Car stand', 'Garage', service agencies (banks, insurance, real estate)	Cafes', 'Restaurants', 'International cuisine', 'Bar'	Construction materials', 'Furniture', 'have-everything', 'Decoration', 'Bricolage' (VR and E particularly), 'Textiles' (not VR), equipments and tools	Minimarket', 'Supermarket' (more in L, less in VR), 'Butcher', 'Drinks', 'Grocery Store' and 'Baker' (VR), 'Fruits & vegetables' (more A, L), Hypermarket	Stationary-news stand', 'sports goods', 'flowers and plants' (especially VR), 'Video club', 'Pet shop', 'Toys & games' (A, L), 'Library' and 'Photo shop' (A, E),	Computers' (more VR, A), 'Telecommunications (more E), 'Other', 'Electronic articles and materials', 'Home appliances', 'Repairs'	Clothing', 'Shoe Store', 'Optics', 'Fashion accessories' (except VR)	Pharmacy', 'Perfumes and Cosmetics', 'Others'
Category	C (over 50%), M1, S (both close to 20%), M2, MC	M1 (98%), S, M2	C (practically 100%), residual MC in A, L	M1 (65-70%), M2 (30-35%), except in L (50/50)	M2 (56% A, VR; 36% E, L); M1 (40% E, rest around 25%), MC, S (1 store in C in A)	C (over 80%), MC	MC (100%)	M1 (100%)



Figure 78 - Activity distribution in one of the main crossings of the S. Bernardo Road, in Aveiro, which acts as a micro-commercial cluster. 'Services and other activities' face the roundabout, whilst 'Home' and 'Fashion' stores are farther from it. Most of the other activities are represented by at least one store. There is also a considerable number of closed and empty stores. Aerial photograph taken from www.bing.com

'Home' stores, on the other hand, are the ones that present the most clearly defined changes from the center to the limits of the urban perimeter. Closer to the center they are usually in main commercial concentrations[184], as seen above. In residential areas they leave the main axes and locate in perpendicular roads to them, to offer 'decoration' or 'articles for home' goods to near-by neighborhoods. Gradually they gain in area again and in the outskirts of farther localities and in 'industrial/commercial' areas they consume large space and present 'bricolage', 'tools' or 'construction materials' sub-activities. Occasionally, going against this model, some specific concentrations can occur in peripheral main roads, such as the one found in Gaspar Sameiro Street in Vila Real (Figure 79). Yet even this concentration is not enough to strengthen the 'Home' pattern in this periphery, simply because the peripheral localities of this city are very disperse and unconnected.

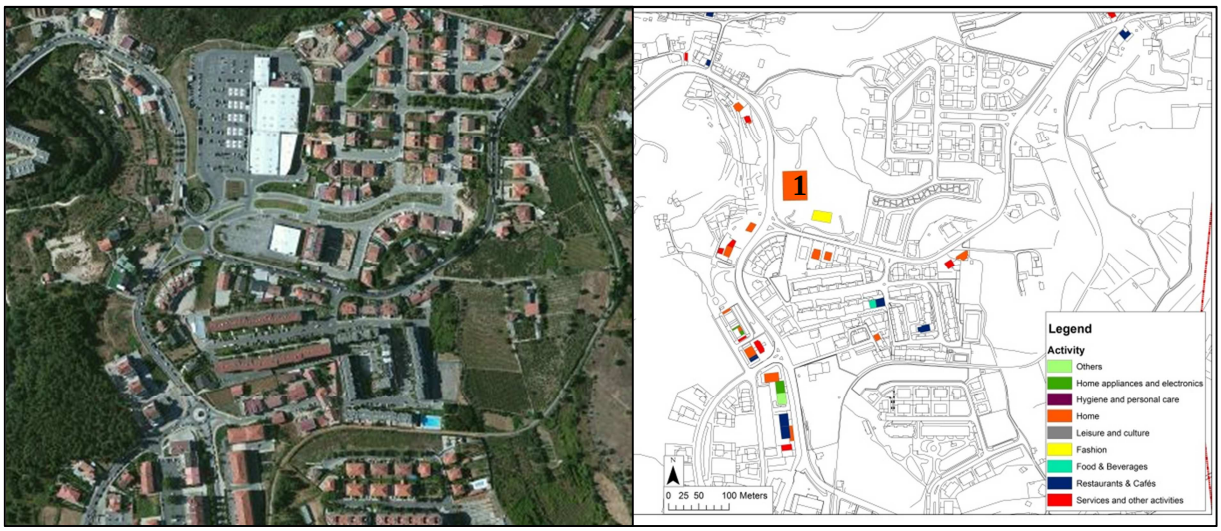


Figure 79 - Home cluster in the Gaspar Sameiro Street in Vila Real, boosted by the presence of Bricomarché (1), a 'Home' hypermarket. Aereal photograph taken from www.bing.com

[184] Presenting complementing sub-activities to those found in the center, which require some space.

'Home' stores also appear, in more traditional localities, alongside 'Restaurants & Cafés', but not in the same place. 'Home' ('have-everything' traditional stores) are once again not in main axes, whilst 'Restaurants & Cafés' appear always near traditional centers and landmarks (obviously favoring pre-1975 buildings). Here, along with everywhere else, these stores seem to seek the travel-through traffic. They appear in most important roads and connecting thoroughfares, always in pairs, although with larger intervals between concentrations. They are also represented by at least one store in commercial 'islands'. Actually, most of these 'islands' have a wide variety of activities. With the exception of 'Home appliances and electronics' and 'Food & Beverages', all other activities are usually represented by at least one store[185]. Both 'Home appliances and electronics' and 'Food & Beverages' are only near residential neighborhoods in the areas closer to the center, where the greater population density attracts, for example, 'computers', 'telecommunications' and 'supermarket' stores. The cluster of large food-establishments in Sismarias (Figure 80) is a perfect example of this. Elsewhere they are also closer to the industrial/commercial areas. In the case of 'Home appliances and electronics' they are almost only found in warehouses in outer thoroughfares or 'lost' in the outskirts of peripheral localities, where they complement the stores inside shopping centers. As for 'Food & Beverages' they locate more 'inside' than 'outside' the shopping centers, although they obviously also locate in traditional residential areas ('minimarket', 'grocery store'). These are more evident in the two cities which had pre-established localities (Vila Real and Leiria). Nevertheless they have clearly been overcome by large-scale modern formats in the above mentioned accessible places. The pattern appears to be as clustered as the continuity between localities and residential areas.

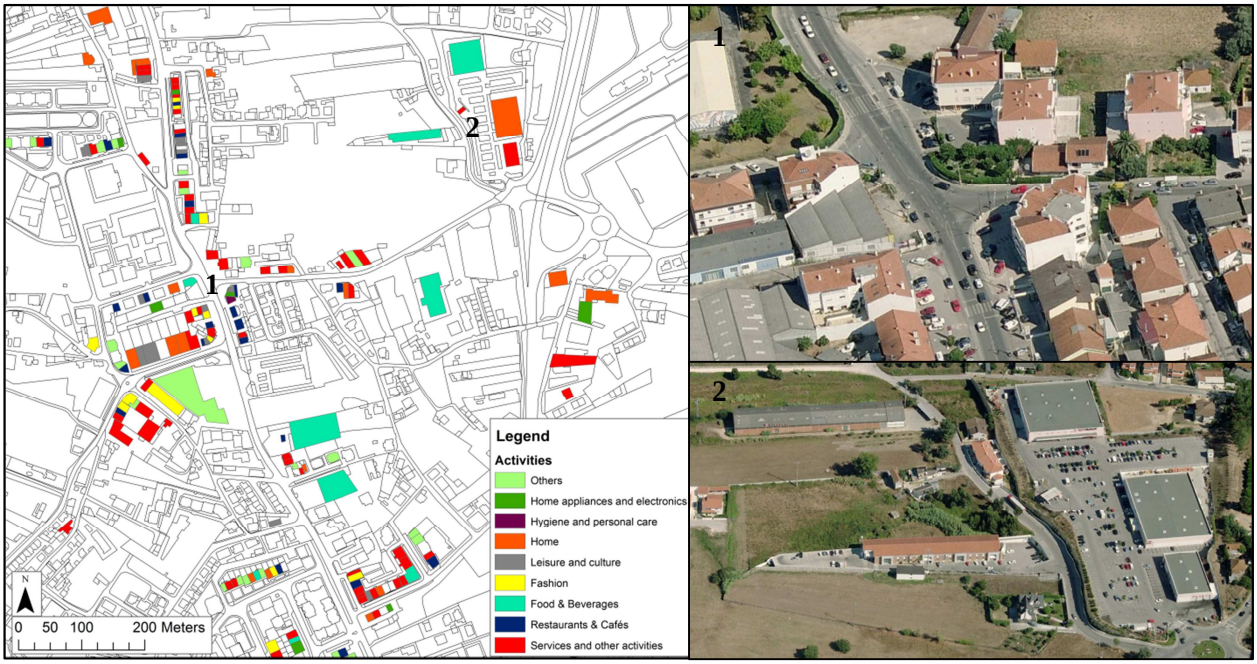


Figure 80 - Close-up of northern Sismarias, where the concentration of large scale Food & Beverage establishments is perfectly visible. Detailed aerial photographs (taken from www.bing.com) show the area's main crossing (1) and the Intermarché concentration (2). Various commercial concentrations in residential buildings are visible.

Lastly, 'Leisure and Culture' and 'Hygiene and personal care', both with little representation, seem to depend on pedestrian traffic, as they are usually in the most important commercial axes and residential

[185] That is why neighborhoods like Malagueira, Lordelo, Parada de Cunhos and Gândara de Olivais have a wider range of sub-activities than their hierarchical counterparts, because they possess more 'islands'.

'islands'. The 'stationary/news-stand' and the 'pharmacy' store are in most important axes whilst other such as 'flowers and plants', 'video club', 'perfumes and cosmetics' are near residential neighborhoods. Both favor post 1975 buildings and multi-commercial spaces, although they don't appear in all commercial 'islands'. More detailed information on the activities' behaviors may be found in the 'files' of Annex 9.

Once again, it is harder to analyze the sub-activities because these are more than 80. A grouping into retail categories was made for a simpler assessment, following the same principles already shown for the centers. Before that however, brief considerations are made on the micro distribution of sub-activities. In the peripheries, of every 10 stores almost two can be 'cafés' (less in Aveiro and Leiria[186]), one is a 'Restaurant'[187] and one is either a 'garage', a 'stand' or a 'car accessories' store'[188]. 'Hairdressers' and 'Construction materials' still have some significance (3-5%) but all others have a less than 3% representation. Car, home and industry-related stores are obviously primarily in the suburbs. Yet food stores and those sub-activities related to residential areas also have a larger representation in terms of percentage in the periphery than in the center. The following sub-activities exist solely or mostly (comparative higher percentage) outside the center:

Table 17 - Sub-activities that exist mostly or solely in the peripheries

Activity group	Sub-activities
Car-related	'Car accessories', 'Garage', 'Gas station', 'Car stand'
Home/industry related	'Construction materials', 'Electrical hardware and materials', 'Industrial materials', 'Safety equipment' (*except in Vila Real*), 'Home/garden equipment', 'Home hygiene' (*except in Vila Real and Aveiro*), 'Repairs', 'Hardware and tools' (*except in Évora and Vila Real*)
Food & Beverage	'Drinks' (*except in Évora and Aveiro*), 'Minimarket', 'Butcher' (*except in Vila Real),* 'Hypermarket' (*except in Vila Real*), 'Supermarket', 'Cafes' and 'Coffee House' (*both except in Vila Real and Aveiro*)
Residence-related	'Video Store', 'Laundry' (*except in Vila Real and Aveiro*), 'Furniture'
Miscellaneous services	'Post office', 'Pet shop'
	Hunting and Fishing (*except in Vila Real and Aveiro*)

As discussed above in Leiria and Vila Real very few sub-activities exist solely outside the center. In Leiria this is because there is an even distribution of sub-activities[189] (to some extent the same happens

[186] 'Cafés' represent 18% of all the stores in Évora's and Vila Real's peripheries and 11% in Aveiro's and Leiria's.

[187] Restaurants' represent 11% of all the stores in Vila Real's periphery and 6% in Évora's and Leiria's, but only 4% in Aveiro's. This difference, especially for Aveiro, will be understood below.

[188] Each has about 4% representation in all peripheries but Vila Real's. In this city 'stands' and 'car accessories' stores' correspond each to 7%.

[189] This is mostly due to the weight of Sismarias, Marinheiros and Pousos (around Leiriashopping) which present a variety of activities, although not much choice, and compensate outer localities which possess a locally oriented commercial distribution. Besides the ones mentioned in the Table, only Restaurants' and 'Cinemas' also have a greater percentage outside the city center.

in Aveiro). In Vila Real, however, this is because the city is very much center-oriented, and there is a clear deficiency of sub-activities outside[190]. Furthermore, most sub-activities (whether they exist in majority in the periphery or not) are mainly or exclusively in the Europa and Universidade Avenues, causing a huge disequilibrium in the access to stores in the urban perimeter[191]. To a much lesser extent, this dependency happens, as mentioned above, in the other 'extensions'[192]. Whilst Évora also has preferably outside the center other 'traditional' sub-activities[193], Aveiro, on the other hand, presents a more diversified amount of stores.[194] The existence of three different neighborhoods that act as main residential areas/extensions of the city center is probably the cause. As mentioned, although the 'main residential' areas favor preferably home and service stores, they have a wider range of options. As the distance from the center increases the diversity decreases. Some localities are able to compensate with a series of second necessity sub-activities (like Borbela and Mateus), yet most 'residential' and 'isolated residential' localities have both a limited range of stores and clear sub-activity deficiencies, such as a lack of commercial services[195].

This being said, and keeping with the pattern observed in the center, it can be stated that whilst Leiria and Aveiro are more service-prone peripheries, Évora has more 'traditional' activities and Vila Real has more 'specific' ones, related to home and the automobile industry. But once again, despite these differences, there is a regularity in the distribution of the sub-activities. Consequently, when they are grouped into the five retail categories there are distinct patterns that can be perceived. The A3 maps depicting this division in the four city models can be observed in Annex 7. Due to their size, they are not replicated here. Instead, Figure 81 presents a representative diagram of their distribution. Table 18, in the following pages, summarizes the most important commercial variables calculated in the perspective of each Category. Although a brief comment is made regarding this distribution, further insight can be obtained consulting the 'files' on the second part of Annex 9.

M1 and C are the highest represented categories, amounting together to almost 2/3 of all peripheral stores. They even possess almost exactly the same percentage in the four case studies with the exception of Évora[196]. The higher percentage of M1 stores in both Évora and Vila Real reflects the amount of 'traditional' or 'dormitory' residential neighborhoods, the lack of some other category types in these localities and, consequently, their lesser development, or at least their more limited commercial offer. In Vila Real the higher number of C stores reflects the 'Home' and 'car-related service' cluster.

[190] Beside the ones mentioned in the Table common to the other cities, these are 'Home appliances repair', 'Flowers and Plants', 'Health club' and 'Grocery store'.
[191] The sub-activities 'Video club', 'Herbal store', Fast food', 'Fishmongers', 'Pet shop', 'Travel agency', 'Press center' and 'Optics' exist solely in these two axes when outside the center, and 'Hairdresser', 'Post Office', 'Bakery', 'Bank', 'Butcher' and 'Pharmacy', have over a 50% representation here when outside the center.
[192] Sismarias, for example, has 100% of the city's peripheral 'Travel agency', 'Rent-a-car', 'Photography' and 'Buy Gold' stores and over 80% of all the peripheries' 'shoe stores'.
[193] Such as 'Sewing and needle', 'Fruits and Vegetables', 'Painting materials' and 'Watch shop'.
[194] Besides the ones mentioned in the Table, 'Antiques', 'Bricolage', 'Tea shop', 'China', 'Woods', 'Multimedia', 'Perfumes and natural cosmetics', 'Porcelain', 'Computers' and 'Photography' also have higher percentage outside the city center.
[195] In terms of 'residential' areas, for example, Marrazes and all of Vila Real's outer localities seldom have a service.
[196] Aveiro's and Leiria's peripheries contain around 30% of both M1 and C stores and Vila Real's periphery around 40% of each. Évora, on the other hand, has 40% of M1 stores but only 30% of C stores.

Table 18- Retail category characterization in the peripheries

Activity	M1	M2	MC	C	S
%	31% (A, L); 39% (E, VR)	7%	8% (E, A); 5% (VR, L)	30% (41% VR)	7%
Location	Although present in most main peripheral commercial axes, both of first and second importance, they concentrate particularly in intersections and roundabouts near landmarks, and in the commercial centers of localities or of residential neighborhoods.	They locate in main intersections or commercial concentrations in residential buildings in main suburban localities, or else in main commercial axes of the city center extensions. In other peripheral localities they are much less, and appear isolated almost only in newer residential clusters. Rarely appear in isolated traditional localities.	Poor representation outside the city center, mostly on the 'extensions' close (not necessarily on) the main travelling axes, in close-by residential clusters. In the main axes or main residential roads they are usually near intersections (not necessarily facing them). They appear sporadically and isolated in main axes or intersections of traditional localities or in newer residential neighborhoods away from the main axes. Appear in industrial areas, in the form of outlets or large scale establishments.	Mainly in Industrial areas or in the principal connections/thoroughfares leading from the center to the suburbs. They also appear both in thoroughfares connecting the several peripheral localities, and in main local central roads. In this case, they are close to the main intersections, but are not necessarily facing them. Can appear dispersed in other, out of the way streets and traditional isolated localities. Appear alone in residential clusters. Cluster in industrial and service areas in the form of warehouses.	Dot the main commercial areas, more spaced than other activities. In main thoroughfares leading from the center they appear at regular intervals, which get larger farther away from the center. In outer areas they appear in or close to main streets, generally not facing the main intersection. Lack in most traditional residential neighborhoods but in newer residential commercial clusters, one or two stores appear, sporadically and mostly isolated.
Pattern	Clustered	Clustered, except in VR, where it can be random	Clustered, except in VR where it can be random/dispersed	Clustered	Clustered (A, L), clustered that can be random (E, VR)
Building heights	52% (A, L); 71% (VR); 85% (E) in 1-3 story 43% (A, L) in 4-7 story 15% (E), 24% (VR) in 4-5 story	46% (A), 65% (VR, L), 86% (E) in 1-3 story 31% (VR), 14% (E) in 4-5 story 35% (L), 50% (A) in 4-7 story	35% (VR), 55% (A, L), 90% (E) in 1-3 story 55% (VR), 10% (E) in 4-5 story 44% (A, L) in 4-7 story	70% (A, L), 78% (VR), 96% (E) in 1-3 story 18% (VR), 4% (E) in 4-5 story 29% (A, L) in 4-7 story	56% (A, L), 63% (VR), 92% (E) in 1-3 story 33% (VR) in 4-5 story; 8% (E) in 4 story; 39% (A) in 4-7 story; 43% (L) in 4-6 story
Building age	68% (54% VR) post 1975	73% (L), 79% (VR), 88% (E, A) post 1975	70% (A, L); 80% (VR, E) post 1975	72% post 1975	67% (A, VR); 73% (L, E) post 1975
Building type	59% (VR, E); 79% (L, A) residential (solely res in VR, 3/4 solely in E, L; 58% solely in A)	56% (VR, E), 77% (A, L) residential (80% of these in L, VR solely res; 63% in A; 51% in E)	60% (E), 70% (A), 77% (L), 85% (VR) residential (90, 70, 60 and 50% of these solely residential respectively VR, L, A, E)	52% free standing alone (32% A) 24% (E), 40% (L, VR), 50% (A) residential (solely in VR, 2/3 in others)	41% (E), 58% (VR), 65% (L), 75% (A) residential (all solely in VR, 2/3 in A, L; only 29% of these solely res in E)
Relative location	66% (A, L), 60% (E), 29% (VR) door to door	31% (VR), 66% (E, L), 85% (A) door to door	65% (VR), 75% (E), 81% (A, L) door to door	28% (VR), 41% (E, L), 61% (A) door to door	48% (VR, E), 64% (A, L) door to door
Store structure	96% individual	43% (E, A), 51% (L), 66% (VR) individual	62% (E, VR), 78% (A, L) individual	73% individual	53% (E, A), 64% (VR, L) individual
Store type	49% (VR), 75% (E, L), 80% (A) modern	55% (VR), 86% (L), 95% (A, E) modern	76% (A), 87% (VR, L), 93% (E) modern	65% (VR), 81% (A, L), 88% (E) modern	75% (VR), 85% (L), 94% (E, A) modern
Closed and empty	7% (VR, A), 9% (L, E)	3% (8% L)	5% (E, VR), 9% (A, L)	5% (2% VR)	0% (VR), 1% (A), 5% (E, L)

Activities	71% (VR), 62% (E, L); 50% (A) 'Restaurants & Cafes' 25% (A, L), 16% (E), 10% (VR) 'Services and other activities' 12% 'Food & Beverages' (16% A) 4% 'Higienne and personal care' 3% 'Leisure and culture' (6% E)	38% (E, A), 26% (L), 21% (VR) 'Service and other activities' 26% (A), 33% (VR, E), 49% (L) 'Food & Beverages' 26% (E, L), 35% (A), 41% (VR) 'Leisure and culture' 2% 'Restaurants & Cafes'	54% (VR, L), 61% (E, A) 'Fashion' 21% (7% E) 'Services and other activities' 15% (9% A) 'Leisure and culture' 15% (E), 9% (L, VR), 5% (A) 'Home appliances and electronics' 5% (A), 2% (L) 'Home'	50% 'Service and other activities' 38% 'Home' 12% 'Home appliances and electronics'	2% (E), 4% (VR, A), 12% (L) 'Leisure and culture' 0% (E), 4% (L), 8% (A, VR) 'Restaurants & Cafes' 87% (98% E) 'Services and other activities'
Main subactivities	Cafes', 'Restaurants', 'Hairdressers', 'Minimarket', 'Beauty Parlor (more in A, L), 'Grocery Store' (in VR), 'Stationary-press center' (less in VR), 'Pharmacy', 'Butcher', 'Laundry' (except VR), 'Bakers' (more in VR)	Banks' (less in VR), 'Supermarket' (less in VR), 'Flowers and plants' (more in VR), 'Drinks', 'Dietetic food products' (except VR, less in A), 'Pet shop' (more in A,E), 'Video store', 'Toys' (except VR), 'Sweets' (mainly A)	Clothing', 'Sports Goods' (less in A), 'Telecommunications' (less in A), 'Shoe stores', 'Sew and needle' (less in E), 'Travel agency', 'Eyewear' (more in A, VR), 'Jewelry' (more in A)	Car accessories' (more in L, VR), 'Garage' (more in E), 'Car stand' (more in E, VR), 'Construction materials' (more in VR), 'Real estate agency' (more in L), 'Furniture', 'Have-everything', 'Gas station' (less in L), 'Computers', 'Home decoration', 'Home and electrical appliances'	Other services'; 'Insurance Agency', 'Health club' (more in L, VR), 'Copy Center' (more in E, A), 'Post office' , 'Bar' (except E), 'Fun & Games' (L), 'Rent-a-car' and 'Funeral Home' (except VR)

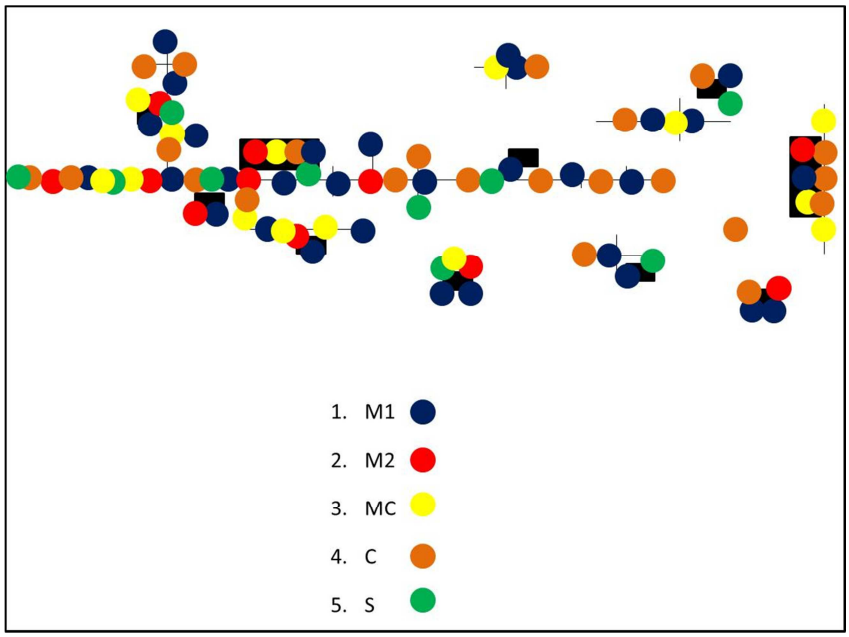


Figure 81 - Spatial representation of the average category distribution in the peripheries

These two categories, M1 and C, will then obviously be more relevant in most locations, and are the only ones with a clearly clustered pattern in the four peripheries. They are, notably, the only two categories that have any significant appearance in outer residential areas, either in main central streets or main thoroughfares. M1 stores (mostly 'cafés', 'restaurants', 'hairdressers' and 'minimarkets') also appear relevantly in all commercial 'islands' (Figure 82), something that cannot be said of C stores. Both also appear in main thoroughfares connecting to the center[197] or between localities, and in main residential roads. Yet M1 stores prefer intersections, roundabouts and locations near landmarks, whilst C stores do not necessarily face these main concentrations. Obviously, they are also found in, and close to, 'industrial/commercial' areas.

MC stores[198] do not find in the suburbs the busy and central locations they require. That is why they stay closer to the center around the principal axes of the main residential areas, where the commercial concentrations (and, literally, the *multi-comparison*) is stronger. This justifies the increased percentage in Évora's and Aveiro's peripheries, where there are residential localities more strongly linked to the center's shopping[199]. Only occasionally these stores are in residential 'islands'. They also appear in the form of outlets in the industrial areas and inside the shopping centers.

M2 and S stores are the ones with least representation in the peripheries (7%). M2 need a large customer base and quick accessibility ('supermarkets', 'banks'), so they are only located in dense residential areas ('extensions', 'main residential areas' or 'islands'), always in important axes, intersections and visible locations[200]. S stores follow more or less this pattern, although they are much more spaced and do not need to be in central positions.

[197] Here C stores are mostly 'real estate agencies', 'furniture', 'home decoration' or 'computers' stores.
[198] Most notably fashion sub-activities, 'sports goods', 'telecommunications' and 'travel agencies'.
[199] Neighborhoods that were devised as 'suburbs' and not 'localities' as in Vila Real and Leiria.
[200] And more than often in new buildings.

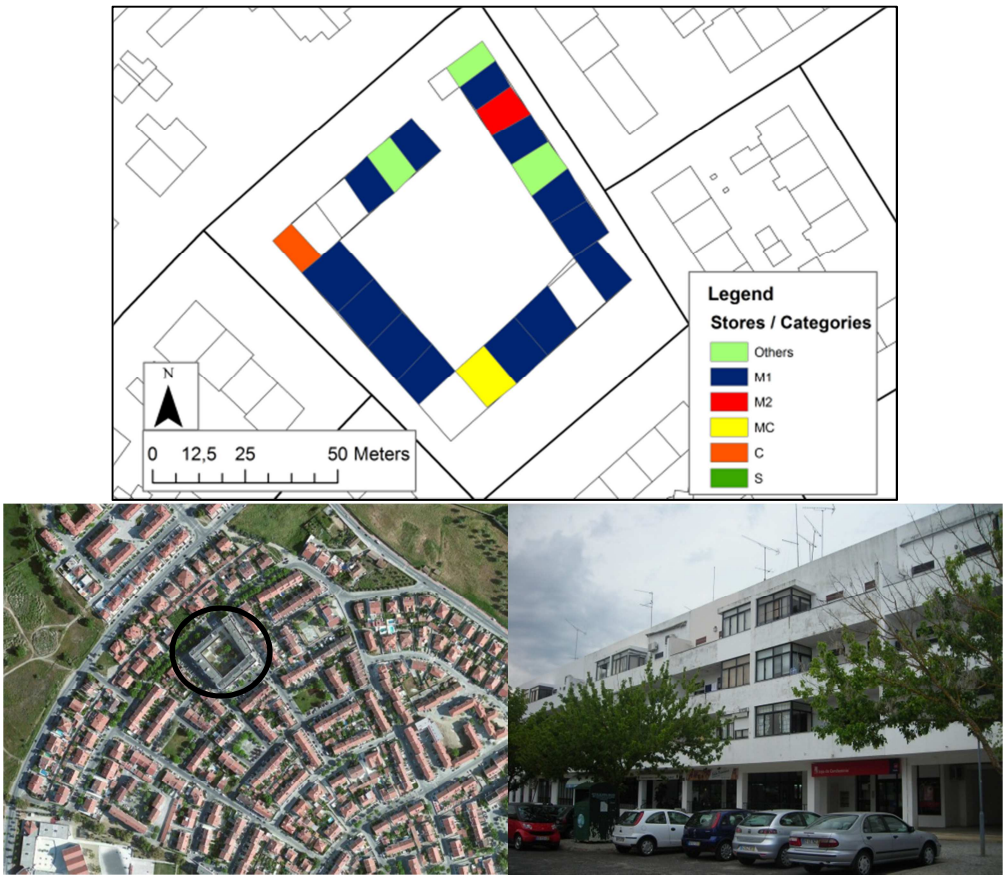


Figure 82 - Example of a commercial 'island' in an exclusively residential neighborhood (northern Malagueira in Évora). M1 stores are in an evident majority. This concentration also possesses three closed or empty stores ('others') and five spaces occupied by non-commercial services (therefore not signaled – white spaces). Aerial photograph taken from www.bing.com. Photograph by author.

By understanding that in most categories and in most localities the percentage of stores in post 1975 buildings is usually above the reference values, then the importance of more recent buildings in the construction of the commercial landscapes of the suburbs can be explained. Further information about the categories can be retrieved in Annex 9.

8.3. INTEGRATION

8.3.1. BUILDING OCCUPATION AND RELATIVE LOCATION TO OTHER STORES

As Table 19 shows, the majority of stores in each of the four case studies are located 'door to door'[201]. This is not just a prove that commerce performs much better in proximity, but also that buildings that contain store space in their ground floors are usually erected close to each other, or, to be more precise, 'in a row'. Yet these 'door to door' stores do not always correspond to stores in different buildings. This is indeed the case in traditional shopping streets, but in large service districts, and in main residential neighborhoods, buildings can be erected containing sometimes a dozen (or more) store spaces. This close proximity of stores, if escalated by a succession of similarly constructed buildings close-by, forms the commercial concentrations described in the previous sub-chapters.

[201] 70% of the stores in Leiria and Évora and 60% in Vila Real and Évora share a wall with at least another store.

Table 19 - Percentages of store integration by cities, by city centers (cen.) and by peripheries (per.)

	Vila Real			Aveiro			Leiria			Évora		
	City	Cen.	Per.	**City**	Cen.	Per.	**City**	Cen.	Per.	**City**	Cen.	Per.
Door to door	**3,7**	4,8	0,9	**6,6**	3,6	10,6	**4,5**	3,4	6,0	**9,0**	3,4	14,2
D_t_d_residential	**52,4**	62,5	28,6	**40,6**	48,4	30,0	**39,1**	38,8	39,4	**35,3**	48,0	23,5
D_t_d_services	**1,8**	2,4	0,5	**7,2**	12,0	0,9	**4,1**	7,1	0,4	**6,1**	8,9	3,8
D_t_d_serv_res	**5,1**	6,3	2,3	**21,8**	17,1	28,5	**22,8**	27,3	17,1	**11,4**	5,9	16,5
Shopping center	**0,1**	0,1	0,2	**0,2**	0,1	0,4	**0,3**	0,4	0,3	**0,2**	0,1	0,2
Commercial building	**1,3**	1,3	1,4	**0,5**	0,7	0,2	**0,7**	1,2	0,1	**1,3**	1,2	1,3
Com_res	**0**	0	0	**0,4**	0,2	0,7	**0,4**	0,7	0	**0**	0	0
Com_serv	**0**	0	0	**0,7**	1,0	0,3	**2,1**	3,7	0	**0,6**	1,3	0
Com_res_serv	**0**	0	0	**0,4**	0,3	0,4	**0**	0	0	**0**	0	0
Arcade	**0,3**	0,4	0	**0**	0,1	0	**0**	0	0	**0**	0	0
Arcade_res	**0,6**	0,4	1,2	**0**	0	0,1	**0,1**	0,1	0,1	**0**	0	0
Arcade_serv	**0**	0	0	**0,4**	0,6	0,1	**0,1**	0,1	0	**0**	0	0
Arcade_serv_res	**0**	0	0	**0,3**	0,4	0,1	**0,1**	0,2	0	**0**	0	0
Single standing	**19,6**	9,4	43,0	**9,4**	3,9	16,8	**15,7**	7,7	25,9	**19,8**	10,1	28,8
SS_cultural	**0,1**	0	0,2	**0**	0	0	**0**	0,1	0	**0**	0	0
SS_res	**13,8**	11,1	20,7	**9,5**	9,2	10,0	**8,0**	6,7	9,7	**14,4**	18,9	10,1
SS_serv	**1,1**	1,1	0,9	**1,1**	1,7	0,3	**0,8**	1,3	0,3	**1,6**	2,2	1,0
SS_serv_res	**0,1**	0,1	0	**0,6**	0,6	0,5	**1,1**	1,3	0,8	**0,3**	0,1	0,6
TOTAL	**100**	100	100	**100**	100	100	**100**	100	100	**100**	100	100

Consequently, the most common building containing stores is precisely the one which also possesses, to some extent, residential occupation. This is more than evident in Vila Real, where over half of the stores are in buildings with *only* residential occupation[202]. In the other cities, this number is lower (around 40%) because of the influence of service and residential/service buildings. By what has been assessed above, it is no surprise that these stores (either 'door to door' or 'single standing') in buildings containing a triple occupation (services, commerce and residences) are more prominent in Leiria and Aveiro, where they represent almost ¼ of all stores[203]. On the other hand, Évora and Vila Real have much more single standing stores in buildings with any land-use mix (36%), and much

[202] Described hereafter as 'solely residential' although, obviously, they also contain commerce.
[203] The number is 23%, against only 12% in Évora and just 5% in Vila Real.

more purposely built commercial buildings (20%)[204] than Leiria and Aveiro[205]. These two cities are much denser, and have a market need for greater building heights and for the variety and amount of stores that commercial clusters can provide.

When just buildings constructed after 1975 are considered, it can be seen that there is a shift of 10 percentage points from 'single standing' to 'door to door'. Obviously, stores in newer buildings are closer together (due to the 'cluster mentality' mentioned above) than stores in older buildings.

In the next pages a more detailed analysis of 'integration' for the centers and for the peripheries is performed. The A3 maps contained in Annex 10 provide a visual aid to these deductions.

In the centers, in all case studies but Évora's, an astonishing 80% of stores are located 'door to door'. This proves that the concentration of stores in the centers is indeed highly clustered and follows clearly defined commercial axes. In the traditional *Ruas Direitas*, stores are in different buildings, but in succession, and in the newer thoroughfares most modern buildings possess more than one store space[206]. In Évora's center, the number of 'door to door' stores is smaller (66%) mostly because of the amount of single standing stores in residential buildings, outside the main commercial axes[207].

Not only are the center stores mostly 'door to door', they are also mostly in solely residential buildings. Those containing services appear almost exclusively in two locations: in the main thoroughfares (where 'chain' stores are also located) or else in the edge/residential axes. In the first case, there is a slightly greater tendency for commercial/service buildings, although the stores therein are hardly one in every ten[208]. In the second case, buildings with the triple occupation of services/commerce/residence are much more common, especially in Leiria's center[209]. All in all, buildings containing (not exclusively) both commerce and services will obviously be much more common in Leiria's and Aveiro's centers[210]. Because only one store in ten is in a building with services in Vila Real's center this can mean only one of two things. Either Vila Real's center has a deficiency of services when compared with the other centers, or else these are located in buildings containing exclusively services, or just services and homes[211]. Although it is more than likely that these do exist, it does not seem feasible that they exist to such an extent as to balance the percentages. It can then be assumed that here is evidence that there is a lack of services in Vila Real's center.

Looking at Table 13 it can be seen that, obviously, services seek other services. With the exception of Vila Real[212], over 40% of 'Services and other activities' in the centers are in buildings containing other types of non-commercial services, and half of these also contain homes, that is, have the triple land-

[204] Just 'Single standing', without any other type of occupation other than the commercial.
[205] 25% and 20% respectively in the first case, and 16% and 9% in the second.
[206] This complements the discovery made in Chapter 7 that the average distance between the center of gravity of stores in the center is only 16 meters.
[207] Outside the main commercial axes centered on Giraldo Square (where most commerce is located), the city center's occupation is mostly composed by one or two story traditional residential neighborhoods, which possess isolated stores, mostly in intersections. Even if there is one store in each side of some intersection they are not, for the purpose of this research, 'door to door'.
[208] Only in Aveiro's center are the stores in these buildings over 10%.
[209] Here the stores in these buildings amount to 30%. The commercial importance of Dr. Adelino Amaro da Costa, Heróis de Angola and Marques de Pombal Avenues, for example, contribute to this value.
[210] 40% in Leiria's and Aveiro's centers, 20% in Évora's and only 10% in Vila Real's.
[211] As mentioned, in this research only buildings containing at least one store were catalogued.
[212] Only 12%, once again proving the service deficiency of this center.

use. Those activities which prefer the main central axes, such as 'Fashion' and 'Leisure and culture', are also inevitably in buildings with services, and obviously, this is more prominent in Leiria's and Aveiro's centers[213]. The other activities prefer residential buildings (and many solely residential), particularly 'Home' and 'Home appliances and electronics' stores, proving their affinity to residential neighborhoods. Obviously, this is reflected in the distribution of the retail categories (Table 15), even though there is no clear category with a preference for buildings with services. Whist C and S stores are clearly in solely residential buildings, except in Évora[214], the other activities are also always over 70% in buildings with (at least) homes, being that these percentages are highest in Évora and lowest in Leiria. In Aveiro's center, there is a very small number of single standing C stores (3% against 13% in the other cities), which should be explained by the existence of semi-industrial/commercial thoroughfares in the close-by 'extensions', which unburden the center.

Table 13 and Table 15 also show that all the activities and categories in the center locate preferably 'door to door' (over 70%). This is more prominent in 'Fashion' (and MC stores), where not only 85% of stores are 'door to door', but also many of these have, as a next door neighbor, another 'Fashion' store, thus constituting the previously discovered 'Fashion' clusters. If on one hand Évora's center activities and categories are usually those with less 'door to door' stores, Aveiro's are the ones with a larger percentage. In Évora less than 50% of stores belonging to 'Restaurants & Cafés', 'Food & Beverages' and 'Home appliances and electronics' (all closer to residential areas) are 'door to door'[215] and there are twice as much M1 stores in free standing residential buildings than in any other center. In Aveiro the continuity of the commercial rows is made perfectly clear by the fact that some activities contain over 90% of 'door to door' stores[216], and by the fact that the M2 and C categories also have a much higher percentage of 'door to door' stores than in any of the other centers.

Considering now the peripheries, it can be seen that once again Vila Real is the exception. Obviously, there are less 'door to door' stores in all peripheries, both because, despite the existence of commercial 'islands' in residential buildings, there are a lot less commercial ribbons and a lot less new buildings containing more than one store space, something which confirms the slow permeability of new construction in many of the outer localities. But because of the weight of the commercial 'islands' in residential multi-family buildings, the commercial ribbons of the 'extensions', and the micro-clusters in main intersections, the percentages of 'door to door' stores only drop, in all cities but Vila Real, about 10 to 20 percentage points from the values of the center (to 60-70%[217]). Yet in Vila Real only 1/3 of stores are 'door to door', and most of these are actually in the 'extension' Europa and Universidade Avenues[218]. This is accounted for the lack of commercial 'islands' and of peripheral commercial ribbons in this city.

Obviously, as the percentage of 'door to door' stores decreases, the percentage of 'single standing' stores increases. In Vila Real's periphery the percentages of each type of single standing store is twice

[213] As it is noted, the percentage of stores in solely residential buildings in Leiria's center is always less.
[214] Noteworthy is that in Évora's center one in every five S stores is single-standing (only one in ten in the other centers), reflecting the number of purpose built commercial services' buildings inside the city walls.
[215] That is why only 55% of M1 stores are 'door to door' in this center.
[216] 90% of the 'Home' stores and 95% of the 'Hygiene and personal care' stores are 'door to door'.
[217] In absolute terms, there are around 60% 'door to door' stores in Leiria and Évora's peripheries, and 70% in Aveiro's.
[218] This area contains 45% of all 'door to door' stores located in solely residential buildings and 73% of all 'door to door' stores located in residential/service/commercial buildings in Vila Real's entire periphery.

as much as in the other peripheries, and those in purposely built structures are more than those in residential buildings, for all cities[219]. These 'single standing' stores are a prerogative of most residential areas, and the more traditional an area is, and the fewer stores it possesses, the greater is the increase of their percentage. Closer to the center ('extensions' and 'main residential areas') 'single standing' stores appear only in small, traditional, residential areas, outside main commercial axes, yet in 'isolated residential localities' and 'industrial areas' the majority of stores are of this nature. In this regard, the localities of Vila Real and Leiria (that were small but consolidated before being engulfed in the urban perimeter) show a greater tendency for 'single standing' stores. Only in Aveiro's periphery is this tendency more uncertain, because the concentrations are along axes, and near landmarks and intersections.

It is both in the 'extensions' (in the main peripheral thoroughfares) and in the residential commercial pockets[220] that most services outside the center are located, even though they can also appear near other services (such as the Hospital in Lordelo). And even though there are about 20-30% of stores in buildings containing services in Leiria, Évora and Aveiro's peripheries[221], this number is only 4% in Vila Real's. The service deficiency of Vila Real is not only a reality inside, but also outside the center, and most buildings here contain either just residential or commercial/residential occupation. Obviously, most stores in these peripheries are located in residential buildings, a number which increases with the distance from the center. Yet the increase in importance of single standing stores in solely residential buildings is only felt in Vila Real (twice as much percentage weight than in the center). Exactly the opposite happens in Évora's periphery. If Aveiro's periphery is characterized by a series of small clusters of stores along the thoroughfares, Évora's has a series of clusters in new residential buildings ('islands'). That is precisely why here 'door to door' is more relevant. Furthermore, although Évora's periphery has as many overall 'single standing' stores as Vila Real's, many are in purpose built structures[222]. It is this variable (stores in purposely built buildings), as discussed above, that has a significant increase in the periphery. Although the warehouses of the industrial/commercial area are an obvious contributor to this percentage, there are also a series of stores, especially in traditional localities[223] that fall into this category. And even in more developed residential areas, these stores of one single floor can be 'door to door', as is the case, for example, of the commercial island in Esgueira (W) depicted with the number 14 in Figure 61. As it can be seen on Table 19, the percentage of single standing 'door to door' stores increases in all peripheries but Vila Real's.

Table 16 and Table 18 show that, in the peripheries, most activity and category types prefer residential buildings. This is truer for 'Hygiene and personal care', 'Home appliances and electronics' (except in Évora) and 'Fashion'. Because in Évora's periphery (unlike in Vila Real's) the lack of services in the center is compensated, this city, along with Aveiro, presents the highest percentages per activity and per category of location in buildings also containing services. Therefore, in these two cities, and because services seek other services, only half of the residential buildings where 'Services and other

[219] Single standing stores in residential buildings amount to 20% in Vila Real's periphery and only 10% in the other three. Single standing stores in purpose built buildings are 43% in Vila Real's periphery, close to 25% in Leiria's and Évora's and only 17% in Aveiro's.
[220] Nossa Senhora da Saúde Urbanization in Évora, for exemple.
[221] Aveiro's has the highest number due to the service cluster of Forca.
[222] Mostly due to the type of expansion occurring in Almeirim and Horta das Figueiras.
[223] Like Mateus, Arroios, Gândara de Olivais and Aradas.

activities' stores are located are exclusively residential. This also happens for M2, MC and 'Home' stores, and, for Évora, even more so for C and S stores[224]. On the other hand, in Vila Real's periphery practically all buildings are solely residential. It could be a paradox to note that precisely Évora's and Vila Real's peripheries also have the smallest percentages of stores located in buildings with residential occupation, but this is because these peripheries possess more purposely built stores, particularly of the C category[225]. Only in Aveiro are the percentages of C stores in single standing buildings lower (32%). With the exception of Esgueira's industrial area, Aveiro's store clusters are always akin to residential neighborhoods, something which also justifies this peripheries' affinity (along with Leiria's) to 'door to door' distributions. The number of 'door to door' stores seems to be perfectly connected with the number of (new) residential buildings, as the store types that favor both these elements are the same[226], having little existence elsewhere in the suburbs (in the older areas). For example, 90% of all the peripheries' 'Fashion' stores in Aveiro and Leiria are 'door to door'[227]. Obviously the lower percentages of 'door to door' (bellow 30%) appear mostly in Vila Real (and to a lesser extent in Évora), and, for all peripheries, mainly for the M1 and the C categories. Not only are these stores more common (therefore they exist more dispersedly outside the nano-clusters), they are practically the only stores, as seen above, which appear in residential and non-commercial areas, being also significant in 'industrial/commercial' areas. Noteworthy is the fact that, although in other peripheries over half of 'Food & Beverage' stores are 'door to door' in Vila Real's this number is 27%. Because this city has a very small number of super and hypermarkets in its periphery (that are usually 'single standing'), it can be deduced that the minimarkets and other 'Food & Beverage' traditional first necessity stores appear dispersed throughout the peripheral localities, even if in commercially poor places. Likewise less than 30% of M1 stores in this city are 'door to door'[228], so here first necessity stores find a way to locate in isolated localities even if they are not part of a commercial cluster.

The particular case of integration in multi-commercial spaces (shopping centers and arcades) is discussed in the next section.

8.3.2. THE CASE OF MULTI-COMMERCIAL SPACES

Table 20 presents the amount of multi-commercial spaces present in each of the case studies. Two distinct groups are perceptible in the overall analysis. The first consists of Aveiro and Leiria, the two more developed cities, which possess both a great amount of shopping centers and commercial arcades. In this regard, Aveiro has practically the same amount of arcades as the other three cities combined, proving that it has been strongly penetrated by newer commercial formats. The second group consists of Évora and Vila Real, both with a small amount of shopping centers. But whilst

[224] Only ¼ of the C and S stores located in Évora's peripheral residential buildings are in solely residential buildings.

[225] Mostly 'Services and other activities' and 'Home', associated to isolated residential and industrial/commercial areas. That is why C stores (composed mainly of these two activities) also favor more 'single standing' locations. Close to 52% of C stores in Évora's and Vila Real's peripheries (and also in Leiria's) are in this type of building.

[226] 'Hygiene and personal care', 'Home appliances and electronics', 'Fashion' and also 'Leisure and culture'.

[227] The same percentage is found in Leiria's periphery for 'Hygiene and personal care' stores. MC stores for Leiria and Aveiro and M2 stores in Aveiro are also above 80% 'door to door'.

[228] The other cities contain about 60%.

Évora appears to have a very small penetration of modern formats, Vila Real has had, especially in the center, arcade development.

Table 20- Number of multi-commercial spaces

Cities		Vila Real	Aveiro	Leiria	Évora
Shopping centers	**City**	**2**	**5**	**6**	**1 (+2)***
	City center	1	1	3	0 (+1)
	Periphery	1	4	3	1 (+1)
Commercial arcades	**City**	**10**	**17**	**8**	**1**
	City center	8	14	7	1
	Periphery	2	3	1	0

* (+2) relates do Eborim (closed and abandoned) and Évorashopping (in construction)

Consequently, in Évora, multi-commercial spaces amount to only 5% of the total shopping area. In Leiria and Vila Real this number is twice as much. What is striking is not this, but that the percentages of Vila Real and Leiria are the same. Only one of the six shopping centers in Leiria is of large-scale dimensions, and the overall commercial area of Vila Real is smaller, so it could be said that, despite the differences in overall numbers, coincidently the percentages turned out similar. Yet at the same time, as it will be seen ahead (Figure 83) the geographical dispersion curves of the multi-commercial spaces are very similar between these two cities, so eventually, more than coincidence can be at work. Aveiro's multi-commercial spaces, on the other hand, account for ¼ of all the city's commercial area, clearly defining its landscape.

Using the same nearest neighbor technique as before, maximum, minimum and average graphs can be produced (Figure 83). Considering the average graph, it can be perceived that the geographical location of the multi-commercial spaces follows a polynomial (n=2)[229] trend, except in Évora. In this city it follows a perfectly linear trend (r^2 =1), but this is an obvious consequence of the small amount of points used (just four). The above mentioned similarities between Leiria and Vila Real are striking, and so are the perceptible 'ledges' in the maximums graph of Aveiro and Leiria, probably representing the succession of arcades in the center. The graphs show that on average, in all cities but Évora, each multi-commercial space distances from the next 400 meters. This is actually not a long distance, because the average obviously is conditioned by the proximities found in the center[230]. In Évora, on the other hand, the average is almost 2 km. Both in Aveiro and Vila Real, two multi-commercial spaces are never farther apart than 1,5 km. Yet this number can be deceiving because in Vila Real all commercial spaces are concentrated around the centers, whilst in Aveiro they are spread across the urban perimeter. In Leiria and Évora, this number is around 2,3 km, something which is caused, in the first city, by the clear presence of outliers (as the maximums graph reveals). In Aveiro and Leiria one can reach all muti-commercial spaces travelling 4 kilometers in the system, and in Vila Real and Évora 3 kilometers (more center-prone and center-dependent localities).

[229] In statistics, polynomial regression is a form of linear regression in which the relationship between the independent variable x and the dependent variable y is modeled as an nth order polynomial. In this case, it follows the form $y=a_o + a_1x + a_2x^2$, in which *y* is the distance, x the number of neighbors and *a* constants.
[230] Elsewhere, as the graphs shows, 1km distances between establishments can be found.

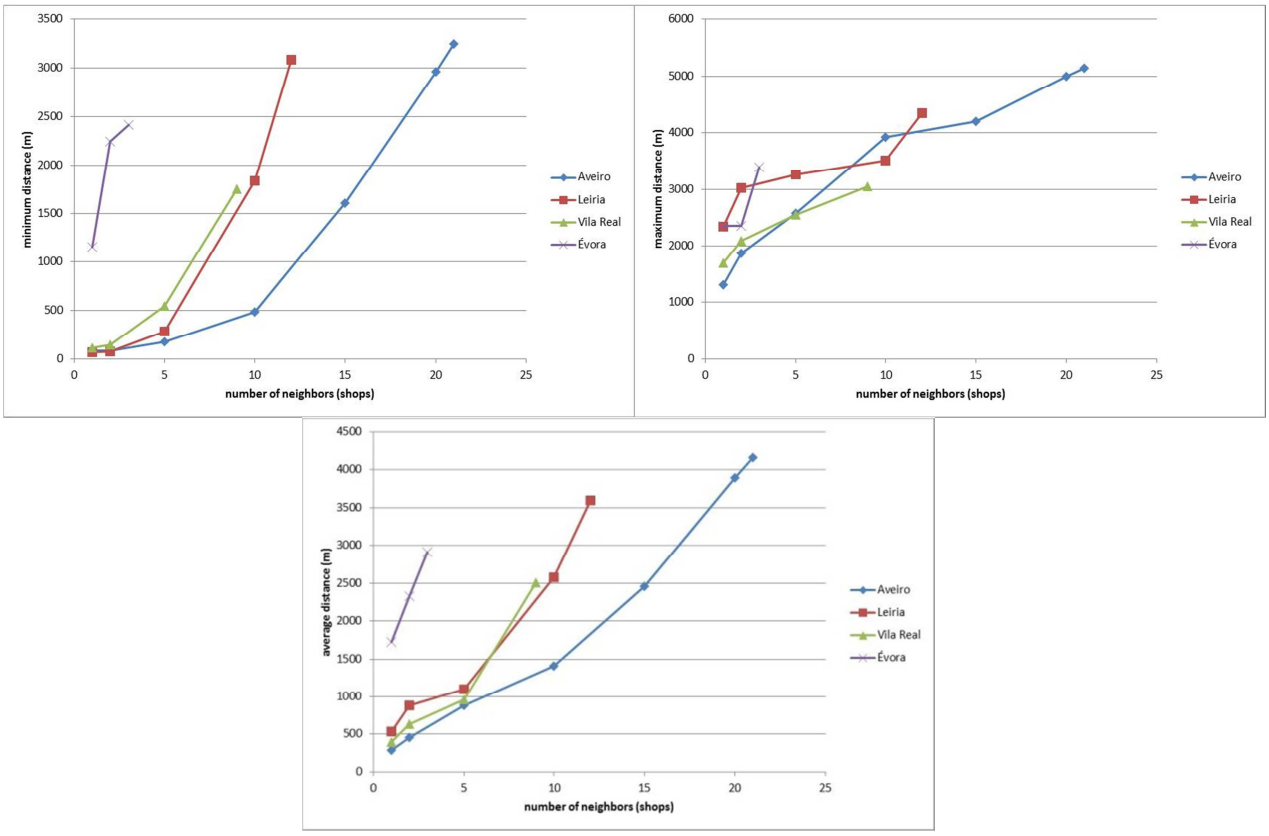
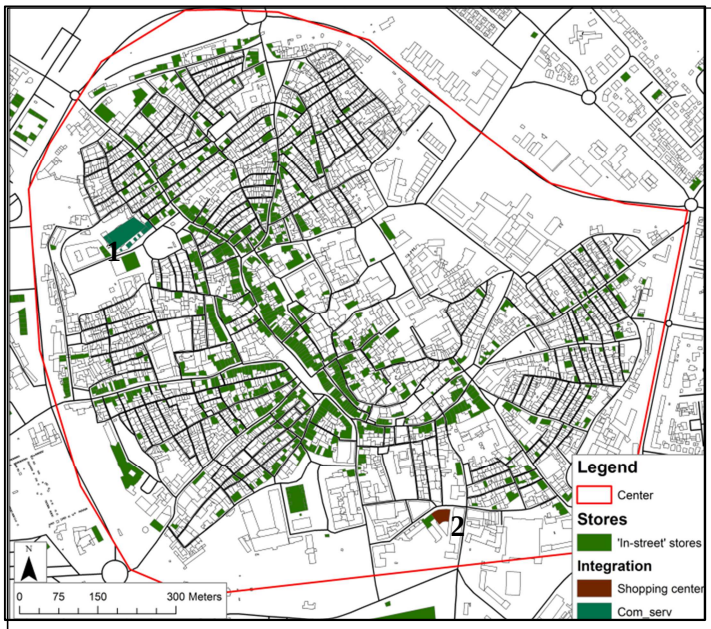


Figure 83 - Minimum, maximum and average distance between each store and n neighbors in terms of multi-commercial spaces

In order to explain these differences, a closer look is taken at the center and the periphery. Évora is clearly, in both cases, the exception. This is the only case study city which still does not possess a large scale shopping center[231], and it also fails to have a typical network of first generation shopping centers which appeared in the late 1970s and in the 1980s (commercial arcades in the ground floors of high-rise residential buildings). If in the center this can be a consequence of the construction restrictions, overall, this could be caused simply by the lack of commercial momentum that could justify such enterprises. The existence of commercial 'islands' in the suburbs of this city can also exert some degree of influence.

The models for the city centers containing the location and some representative photographs of the multi-commercial spaces are depicted in the following pages in Figure 84 and Figure 85. Detailed descriptions of these facilities are presented in the footnotes. Considering their nature, type, amount of stores (occupied and unoccupied) and location, some considerations can be made.

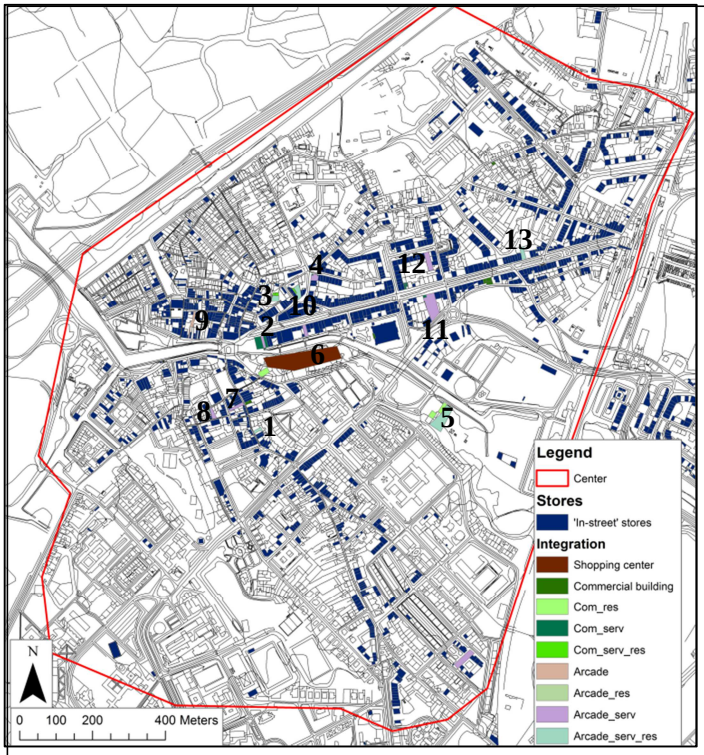
[231] Although, and with some delays, Évorashopping appears to be on early construction in the outskirts.







1. ÉvoraCom / 2. Éborim







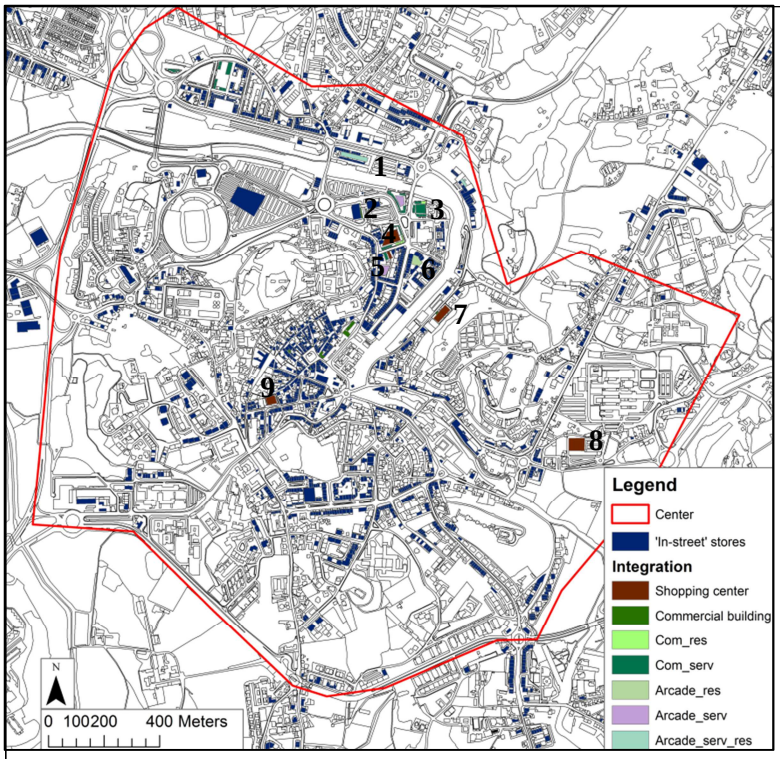


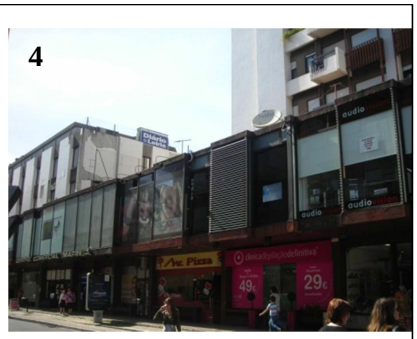
1. *Rua Direita* Arcade / 2. Avenida Center / 3. Vera Cruz Shopping Center / 4. Corticeiro Building

5. Aveiro Centrum / 6. Forum Aveiro / 7. José Estevão Arcade / 8. St. Catarina Arcade / 9. Rossio Arcade

10. Veneza Shopping Center / 11. Oita Shopping Center / 12. Ria Plano Arcade / 13. Avenida Multicenter

Figure 84 - Location of Évora and Aveiro's center multi-commercial spaces (photographs by author)



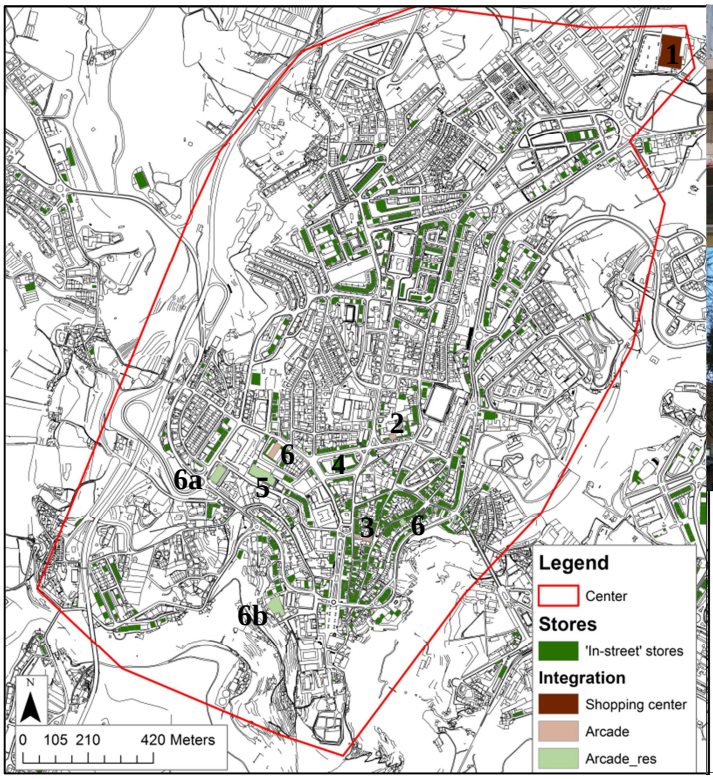




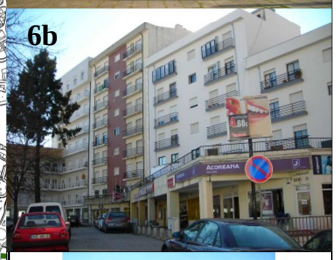
1. Jardins do Lis Arcade / 2. City's Market / 3. Edíficio 2000 Shopping center / 4. Maringá Shopping center

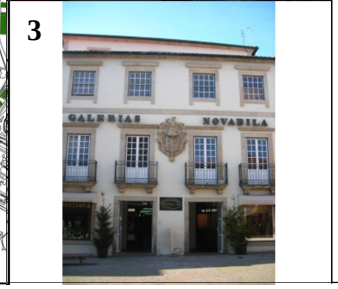
5. São Francisco Shopping center / 6. Lis Shopping Center / 7. Sol Leiria Shopping Center

8. Park Olhalvas Shopping Center / 9. Dom Dinis Shopping Center









1. Continente Shopping center

2. D. Dínis Arcade

3. Novabila Arcade

4. City's Market

5. Seixo Arcade

6. Other comercial arcades

Figure 85 - Location of Leiria's and Vila Real's center multi-commercial spaces (photographs by author)

First, there is a connection between the absence of large scale establishments and the degree of commercial development 'in the street'. Évora's center, of course, shows this point almost perfectly[232]. The city had only one small purpose built shopping center, Éborim[233], which closed in 2009, and since then it only possesses one commercial arcade, ÉvoraCom[234]. If this is much contested by the inhabitants of the city[235], it has had, nonetheless, the clear advantage of pushing the typical shopping center chain stores to the main traditional commercial streets and squares, promoting their rehabilitation. This has also happened, due to the lack of a large scale multi-commercial space, in Leiria's center. Yet here, like in Vila Real's and Aveiro's, there is a solid network of first and second generation in-city shopping centers and commercial arcades, which complement the street shopping and offer an added vitality to it. Actually, this is the model to which most European city centers are tending to. Many important European cities like Eindhoven, Brussels or Dublin have strong commercial centers constituted by closely parallel and perpendicular pedestrian (or of hindered traffic) shopping streets, with the difference that the buildings forming these blocks are occupied by in-city shopping centers and arcades. Obviously, Leira's, Vila Real's and Aveiro's centers are still far from achieving this commercial dynamic (also because their regional influence areas are much more reduced), but nevertheless these three cities present interesting mixes of multi-commercial spaces and street commerce. This inevitably leads to a second question, of whether the success of arcades cannot also be dependent of the main shopping axes[236]. The example of Éborim seems to prove that there is something in this statement. The un-success of this establishment had the consequence of not being able to generate, through attraction, a commercial corridor uniting the center and the Southern periphery. But it could be proposed that this is precisely the reason for Eborim's un-success, that is, the fact that it is not facing any main commercial axes, as Évoracom is.

In average, Leiria, Vila Real and Aveiro have each about 10 commercial arcades and first or second generation shopping centers in their city centers. The most notable and most successful of the first generation shopping centers[237] are all located in highly developed commercial axes and act as extensions of the street commerce, especially because they contain a very similar type of establishments as the streets they are in. Obviously, they do not possess 100% occupation, especially in upper floors, and their attraction can be hindered due to the fact that generally they do not possess a food court or a movie theater[238]. Most of the arcades and second generation shopping centers in Leiria and Aveiro also possess a strong connection to street shopping. In Leiria, these are mostly in the 'new

[232] In this center multi-commercial spaces account for just 3,5% of all the commercial area, against about 9% in the other cities.
[233] Éborim, at the South end of the center, consisted on a 3 story-high single standing building, which had room for about 25 establishments and contained a cinema complex with 2 screens, the only ones in the city. Since 2009 it has been closed, and part of the building has been occupied as a police station.
[234] ÉvoraCom is of recent construction (a consequence of the commercial urbanism project of the same name) and it is located in Joaquim António Aguiar Square in front of the city's Theater. It is on the ground floor of a 3-story service building and it contains varied stores such as a hairdresser, a pizza parlor, a toy store as well as other home and service stores. It has also about 1/3 of empty store spaces. Nevertheless it coordinates well with the main square it faces and with the José Elias Garcia shopping street.
[235] As many forums and blogs on the internet prove.
[236] Instead of the first always influencing negatively the second, as it is always assumed.
[237] Arcades Novabila in Vila Real's Rua Direita, Oita Shopping Center in Aveiro's Dr. Lourenço Peixinho Avenue, and Dão Dinis Shopping Center in Leiria's Combatentes da Grande Guerra Avenue. Each possesses 3-4 floors of commercial area and one floor of services, occupying roughly a block and containing several entrances.
[238] Actually Oita Shopping Center had a movie theater with one single screen in the last floor, but it closed in 2005.

center'[239], and although but a few boast the name 'Shopping Center' correctly (they are more 1-2 story arcades), most are successful ventures, precisely because they seem to be intrinsically connected to the street[240]. One of the few unsuccessful places in this center is Sol Leiria Shopping Center, which is now closed. As it can be seen, it stands in the other side of the river, and is unconnected to the main commercial axes. In Aveiro, these multi-commercial spaces are either in *Rua Direita*[241] or located in the West side of Dr. Lourenço Peixinho Avenue, orbiting the intersection of the city's two main commercial axes.

On the other hand, and mimicking the example of Sol Leiria, most least successful enterprises are not facing main axes, which just appears to confirm the theory proposed. In Aveiro, the case of Aveiro Centrum[242] proves that to be modern, to be open to the street, is not always a formula for success if other considerations are not taken into account. Of two entire floors of commercial floor-space available, only 3 spaces are occupied. It may be argued that the area is still being developed and that the amount of commercial offer available at this site is excessive presently, but it will be able, in the near future, to accommodate the impending growth. On the other hand, analyzing the geography of the center's commercial spaces, it is clear that this location, even though it is close to the center and to the Forum shopping center, even though it has the potential clientele of the residential areas close-by, is an outlier, that is, it is not, as Figure 84 clearly shows, on a commercial axis and not close to the rest of the center's arcades. In Vila Real's center something similar happens, but to a much larger scale. Most of the commercial arcades, located on the southern part of the center, do not seem to have been developed as part of a pre-conceived integrated plan of complementing the street shopping axes. Instead, with few exceptions[243], they appear in excessively large high-rise residential buildings (which contrast heavily with the surrounding traditional streets) close, but not connected, to the main shopping districts. These 'forced' shopping clusters possess a high number of empty store space. This means that even though their location is excellent (close to one of the free-way/ring-road exits), the success of these establishments, at least in the center, may not be entirely linked to accessibility of the resident population. These 'islands' therefore, work in the periphery but not in the center. Here these need to complement existing commercial axes.

[239] The service and commercial axes of Heróis de Angola Avenue and Capitão Mouzinho de Albuquerque Street (which link the traditional center to Nova Leiria).

[240] Maringá, Lis, Edifício 2000 and São Francisco are all four large 1-2 story commercial arcades (or in-city shopping centers) located in high-rise buildings, mostly devoted to services in the upper floors. These have a considerable number of stores (around 50 each) and have varying degrees of success, although very few appear to be doing poor business. Maringá and São Francisco stand on opposite sides of the same street, but whilst Maringá is a success in terms of store occupation and affluence, São Francisco has very few stores occupied. This can be related to the excess of offer in the area. In the commercial axis of Nova Leiria, Jardins do Lis is another successful commercial arcade with most store spaces occupied. With the exception of Sol Leiria, the rest of the multi-commercial spaces in Leiria's city center consist of smaller arcades, around 10 store spaces each.

[241] *Rua Direita* and José Estevão Arcades for exemple.

[242] Aveiro Centrum is, in terms of the city's commercial spaces, its white elephant. Obviously, it tried to imitate Forum's successful approach of an open shopping center with high-value residences and services on the upper floors. Just two street away from Forum (but at the 'back' of Dr. Lourenço Peixinho Avenue), Aveiro Centrum is located in Carlos Aleluia Street, in a former industrial area of the city, which has slowly been rehabilitated. Most of the City Hall services are now in an old factory in the same area, and new residential buildings are starting to appear in the many empty urban spaces. Aveiro Centrum has 2 entire floors of open store space, and 4 more floors of residences.

[243] The D. Dinis Arcade in Pioledo is near the city's market and has received a new burst of vitality as the city's nightlife spot and location of alternative stores.

Another statement that can be proposed is that 'number of stores 'can also be a crucial element in these arcades' success. In Aveiro, for example, with the exception of Oita, all arcades have a limited number of commercial spaces (around 10). This model also occurs in many arcades in Leiria, and it seems to be favorable for two reasons: these arcades can easily occupy all their store spaces, and all stores therein can always be in close contact with the street commerce. Most larger arcades and in-city shopping centers above cited only have close to 100% store occupation in the areas nearer the street entrance. The number of empty stores increases drastically with the distance to the door, and the top floors or cellars of these arcades and smaller shopping centers sometimes appear to be completely abandoned, whilst at street level, near the entrance, the stores spaces are prospering (or at least they are occupied and show shopper movement). Some of these spaces, such as Oita, Don Dinis or Novabila, because they occupy a block, minimize this phenomenon by having several entrances, which at least gives an increased dynamic to the ground floor[244]. Unfortunately, most of these spaces have more than one floor, and, more unfortunately still, most are not designed to face the street. These 1980s, early 1990s constructions tried to mimic early shopping centers which were closed unto themselves. But as they declined, and maintenance issues arose, the environments became unappealing with dim lights, narrow corridors and tricky stairways. Shoppers became accustomed to more modern, more open to the street, multi-commercial constructions, with comfortable climates that imitate the hustle and bustle of the street without creating a decrepit sense of insecurity. If open air shopping centers like Forum provide this experience, small arcades are at least able to avoid the environment decline, because 'the street' has always a perceptible presence. This can be the reason why, for example, Aveiro's center still presents 14 of these smaller commercial arcade establishments.

All centers but Évora's also possess one large scale modern shopping center. Yet only Forum[245], in Aveiro, located in the intersection of the two main commercial axes, has a physical connection with the center's street shopping, something which may also have arisen from the dynamic explained in the preceding paragraph. Continente and Park Olhalvas in Vila Real and Leiria, respectively, are expansions of a pre-existing hypermarket (hence the edge-of-center location) with other stores[246] belonging to the same company/promoter. Their influence near the main residential areas has, nonetheless, been able to shift the center of gravity of the center in their direction, and that is one of the main reasons why they were not considered as part of the periphery. Yet it could be assumed that this weight shift is balanced in these two cities by their network of smaller scale shopping centers and commercial arcades, as seen above[247].

Nearest neighbor graphs, presented in Annex 11, mathematically corroborate these findings. Évora's curve is just a single point, because there are only two establishments with a 1 km distance between them. In the other three city centers the curve is polynomial (n=2). The curves of Leiria and Aveiro are more similar, especially when they depict the central areas where shopping centers articulate with smaller arcades. Yet the average distance between multi-commercial establishments in Aveiro is half

[244] In Novabila Arcade, in Vila Real, for example, the store spaces on the ground floor which makes the connection between the city's two main traditional shopping streets, *Rua Direita* and António de Azevedo Street, are all filled. In the other three floors the occupation decays as the floors increase.
[245] This much mentioned open air shopping center has 86 individual store spaces and a 9 screen cinema complex.
[246] Such as 'dry cleaner', 'pharmacy', 'café' and 'home decoration'.
[247] Continente, particularly, seems to compensate and obvious deficiency in Vila Real's 'new center' – the lack of multi-commercial spaces.

of that in Leiria[248], showing that there is a greater density in this city, precious to the dynamic of its commercial and economic activity. The maximum distance between two establishments orbits 1 km, that is, it is smaller than the diameters of the centers. Only in Vila Real is this distance twice as much, because Continente is taken into account. Without it, and because there are no multi-commercial establishments in the 'new center', the maximum distance is less than 500 meters, showing the great concentration near the traditional center[249]. If the outliers of the other cities are also removed, that is, edge-of-center shopping centers, surprisingly the geographical distribution of multi-commercial spaces becomes all too similar. This means that the location of arcades follows similar distance patterns.

In the peripheries, as it was seen in the diagram of Figure 71, multi-commercial spaces appear practically in just two hierarchical layers. They are either close to the city center, in the outer rims formed by 'extensions' or 'main residential areas', or else they are farthest from it, at the edges of the urban perimeter in 'industrial/commercial areas'. As seen it is also in these two locations that large scale 'Food & Beverage' hypermarkets are located. Many times these establishments and the multi-commercial spaces are associated, or the latter are formed as an extension of the previous.

Each city possesses (not counting Évora), at least one large scale establishment in the 'extensions'. Glicínias Plaza[250] in Santiago (Figure 61), Dolce Vita Douro[251] in Europa Avenue (Figure 60) and City Park Leiria[252] in Sismarias (Figure 60) not only appear to compensate a deficiency of larger establishments in the center (hence avoiding the need for shoppers to go to farther outer areas), they are also extremely articulated with the dense residential and commercial areas that surround them. What is apparent in the history of these three locations, described in the footnotes, is that their influence is all too evident in the new commercial and residential dynamics the areas they are in have

[248] In Leiria's center (and Vila Real's) the average distance between multi-commercial spaces is about 350 meters, whilst in Aveiro's center it is only 180 meters.

[249] Likewise, in Leiria's and Aveiro's centers all the multi-commercial spaces can be reached by travelling 1,4 km in the network. In Vila Real that number is 2,6 km with Continente but just 1 km without.

[250] Glicínias Plaza possesses 94 store spaces, a 6 screen movie complex, and a large-scale hypermarket (Jumbo). Constructed ten years ago, it can be said that it articulates in more than one way with Forum. It is located at an opposite edge of a continuous commercial axis composed of *Rua Direita*, S. Sebastião Street and Dr. Mário Sacramento Street. It possesses many similar chain stores. And even its cinema complex belongs to the same chain and both the movies and the sessions are articulated with those of Forum. Yet, whilst it can be a complement of Forum when the city center population is considered, its location facing both the N109 and the S. Bernardo Road gives it a better accessibility in serving the peripheral and the out-of-urban-perimeter population. Not only that, but the proximity to the dense residential areas of Santiago and Forca (and respective amenities such as the Santiago Market and the Miradouro Business Center) has created an extended dynamic in this area.

[251] Dolce Vita Douro was constructed in 2004. With a massive 130 store spaces, a 7 screen cinema complex and, once again, a Jumbo hypermarket, it actually did not articulate with any pre-existing commercial axis. It created its own dynamics. More or less at the same time, the city's new Theater was inaugurated on the other side of the street. Later new high-rise and high-value multi-family residential developments (with commerce on the ground floors) created the axis of Universidade and Europa Avenues. The new student residences are also located in Actor Ruy de Carvalho Street. The area which had just a few stores near the train station, has now the large majority of the stores outside the city center, including the only supermarkets and 1 of 2 peripheral shopping arcades (in Dr. Augusto Street).

[252] City Park Leiria is not a large scale 'box', but a commercial complex, located in the intersection of D. Carlos I Street with Figueira da Foz Road. It is comprised of four major stores, namely Moviflor (furniture), Aldi (supermarket), Kibabo (home decoration) and Vodafone (telecommunication). This shopping center is clearly articulated with the commercial axis of the Figueira da Foz Road, and the 'Food & Beverage' cluster, which includes an Intermarché (divided in separate isolated blocks for 'supermarket', 'clothing', 'car-assistance' and 'bricolage') and other multi-national supermarkets (see Figure 80).

gained. Most new multi-family construction surrounding these shopping centers (which have appeared *after*) also contain shopping spaces, strengthening the clusters.

As mentioned, the remaining large-scale multi-commercial spaces[253] are located in the 'industrial/commercial areas'. Only two, Constantim and Vale Sepal, do not possess large-scale establishments. Therefore, Leiriashopping[254] is located in Parceiros; Almerim and Horta das Figueiras contain an Intermarché[255], a Continente[256] and the future Evorashopping[257]; and Esgueira industrial area possesses three large scale shopping centers close to each other: Pingo Doce Shopping center, Aveiro Center and Aveiro Retail Park[258]. Whilst in the 'extensions' these establishments were closely connected to the center's commercial ribbons, here they are connected to another type of commercial occupation, namely commercial warehouses. There are no large scale shopping centers in isolated areas or surrounded solely by residential neighborhoods. This could mean that they prefer to be surrounded by a pre-existing commercial/industrial structure, but the most obvious conclusion is that, like in the 'extensions', even though they may arrive at a certain location *first*, they do not stay 'commercially alone' for long. Furthermore, these areas usually contain high accessibility (close to ring-roads or freeways), which attests to their degree of attraction and target customer base, which entails a regional, rather than a city-scale. All of these areas also appear to be having increases in the residential construction market, something which is not perceived, precisely, in the two 'industrial/commercial' areas without shopping centers.

On the other hand, not only do the peripheries possess less than 3 commercial arcades each, these are all located in the 'extensions'. The suburban model consists of commercial 'islands' in the ground floor of residential buildings, with stores 'in a row', yes, but facing the street. The 'traditional' model of the 'arcade' only remains in the areas which could have received the influence, in the 1980s/1990s,

[253] With the notable exception of an isolated large flee market in Gândara de Olivais.

[254] Leiriashopping (Figure 70) is, as mentioned, a new construction (2010), and has appeared in an advantageous area because (i) it is close to the commercial warehouses of the industrial area (such as MediaMarkt, Aki, Cinemacity); (ii) it has a direct accessibility to the city center through the ring-road and (iii) it faces the city's Polytechnic institute, and so it has always a constant flow of student population close-by. It has 124 store spaces, a Continente hypermarket and a 7 screen cinema complex.

[255] Facing the Industrial and Technological Park, it is divided into individual large scale blocks selling 'supermarket', 'clothing', 'car-assistance' and 'bricolage' goods.

[256] Continente, closer to the residential areas in the West, follows a similar structure as Vila Real's Continente or Leiria's Park Olhalvas; it is an expansion of a hypermarket with other first necessity smaller stores belonging to the same company.

[257] Évorashopping will also be closer to the Industrial and Technological Park. What is immediately perceptible in this area, and because there is a large array of empty urban lots, is that residential construction is booming. A new geometric single family housing neighborhood is in the last stages of construction just East of the construction site of this shopping center, as it can be seen in Figure 68. When the economic crisis is overcome and this enterprise is complete, it should be estimated that the residential construction in this area will increase.

[258] This area (Figure 70) is separated from the rest of the city by ring roads and free-ways in all sides, so it has developed as a closed and dense industrial area, where commercial warehouses have mostly concentrated in two axes. Facing the free-way, these three large-scale multi-commercial establishments have appeared one after the other. This location is not only meant to serve the city but the various other towns of the Aveiro region. Pingo Doce Shopping center is an extension of a pre-existing Pingo Doce hypermarket (former Feira Nova hypermarket) complete with a set of small stores and a Moviflor furniture store. Aveiro Center, managed by Cushman & Wakefield, also developed from a pre-existing hypermarket (Carrefour, later Continente) to contain 50 more other store spaces. Aveiro Retail Park, which opened in 2002, has 15 large store spaces, housing establishments (like Toys & Us or Seaside) that in other industrial areas usually have their own individual warehouse. The arc made by these large-scale shopping centers constitutes the greatest commercial concentration of the four case-studies, and one which attests to the commercial development of Aveiro.

of the center, when they were expanding. That is why they appear in the new square in Esgueira (W)[259], in Sismarias[260] and in the Europa and Universidade Avenues[261], always in multi-family service buildings. The formula for their success however, is exactly the same as the one found when analyzing the center. The ones which complement pre-existing street shopping and are smaller, are more successful than those with a large amount of store spaces, more than one floor, and located farther (even if only a couple of streets) from the main commercial axes. Therefore, in the periphery, the commercial 'island' model is much more successful than the 'arcade' model.

Because the amount, weight and relative distance of multi-commercial spaces are so different between case studies[262], even though they appear in the same locations, none of the distance patterns, presented in Annex 11, are similar[263]. The two multi-commercial establishments in Évora's periphery distance from each other 2,5 km. This is indeed a large distance, but the area in between is comprised of commercial warehouse axes, which have a strong possibility of growth if there is a successful commercial dynamic in the area. In the other cities, because multi-commercial establishments are usually close to each other in specific areas, the average distances between two of them are less than half of Évora's value[264]. Obviously this distance increases with the distance of the industrial area to the main 'extension'. Because Vila Real only has these establishments in the 'extension', the maximum distance is 700 meters, whilst in Aveiro's and Leiria's peripheries it is 3,5 km[265]. Aveiro's graph, however, shows the only clearly perceptible 'ledge'. This is because of the concentration of the three large scale establishments in Esgueira industrial area.

8.4. STORE MANAGEMENT

8.4.1. TYPE

As discussed in Chapter 5, the definition of the 'type' of each commercial establishment is subjective. In this research, a store was considered 'traditional' or 'modern' according to a criteria which dwelled on the overall presentation of the store, the product display type, the relationship with the street and the methods of sale, and not on any considerations on products sold, age of the store or type of

[259] As depicted in Figure 48. They all appear to have, at least occupation-wise, relative success.
[260] The arcade is close to the Station Road. It is very small (about 10 stores) and only half are occupied.
[261] The most important arcade is in Dr. Augusto Street, which could house between 20 and 30 establishments in two floors. It is in a large scale multi-family building and most of the attraction comes from the fact that it houses a Public Finances counter. Yet much of the same phenomenon as in the center happens. Only the stores either close to the street or to this public counter are occupied. Away from this area most store spaces are empty and in the lower level (the basement), in a dim environment, practically all stores spaces are unoccupied. The remaining arcade of Vila Real's periphery has also a very small number of spaces (about 10), and is located in a residential neighborhood of Mateus, not very far from the Universidade Avenue. Practically all of these spaces are unoccupied.
[262] In Évora only 6% of the total commercial area in the peripheries is comprised of multi-commercial spaces, whilst in Vila Real and Leiria's peripheries this number is 10%, and in Aveiro a massive 32%.
[263] Another reason is that there are less than 5 points to measure to and from in each city, which causes the distance correlations to be very poor.
[264] Namely 500 m (in Vila Real), 900 m (Aveiro) and 1,6 km (in Leiria).
[265] Likewise, the distance from one given multi-commercial establishment to all others is the same 700 meters in Vila Real's periphery, but 4,4 km in Aveiro's and Leiria's.

structure[266]. With this in mind, the percentages of the store 'type', for each city, are displayed in Table 21, and the A3 location maps are displayed in Annex 12.

Table 21 - Percentages of store type by cities, by city centers (cen.) and by peripheries (per.)

	Vila Real			Aveiro			Leiria			Évora		
	City	Cen.	Per.	**City**	Cen.	Per.	**City**	Cen.	Per.	**City**	Cen.	Per.
Modern	**62,3**	65,0	58,0	**70,5**	70,2	71,1	**70,0**	72,7	67,2	**73,0**	72,8	73,4
Traditional	**32,1**	29,0	39,9	**14,3**	14,5	14,3	**15,0**	13,3	17,4	**17,4**	20,7	14,3
Others*	**5,6**	6,0	2,1	**15,2**	15,3	14,6	**15,0**	14,0	15,4	**9,6**	6,5	12,3
TOTAL	**100**	100	100	**100**	100	100	**100**	100	100	**100**	100	100

* Multi-commercial or of Type unknown (closed or empty)

In all cities but Vila Real, 70% of all shops are 'modern', that is, they have a modern store format and a modern type of sales transaction, even though they may be family owned (individual) or facing *Rua Direita*. This percentage increases to 75% in buildings constructed after 1975, which makes perfect sense. In the same cities, 'traditional' formats are only 15% of the universe of stores, and when just post 1975 buildings are considered their number reduces to half. This decrease is compensated by an increase in 'Others', particularly due to the various empty stores in new buildings (yet to occupy), and the multi-commercial establishments. On the other hand, in Vila Real, one in every three stores is still 'traditional', a number which increases to an amazing 40% in the peripheries. This number complements various conclusions above drawn of Vila Real's commercial delay in relation to other Portuguese medium-sized cities, and of the clustering of new formats almost exclusively in its center. With this exception, most percentages change little when just the centers or just the peripheries are considered. There is a slightly greater tendency for more modern shops to be located in post 1975 buildings, but that is expectable.

Therefore, not counting Vila Real, less than one in every five stores in the centers are 'traditional'. The truth is that these stores have been disappearing from the secular commercial streets, and have been replaced by modern formats. This has occurred not only due to a natural process of evolution, but also because multi-national chains wishing to enter these cities' markets had a very restrictive RLT choice, as most shopping centers have only recently been built and both the commercial and residential cores of these cities are in, or close to, the center. Therefore, pedestrian streets, including *Rua Direita*, present a considerable number of multi-national stores (obviously 'modern'). But these are not the only type of modern stores to appear in traditional streets. Due to this new established competition, many traditional 'individual' retailers also felt the need to innovate in order to survive. The absence of multi-commercial spaces can be the reason why, when looking at the traditional central shopping streets in each city (Figure 86), Évora's is the one where most 'traditional' stores have disappeared[267]. For different reasons this also happens in Leiria and Aveiro. Both cities had shopping centers built in the last few years but they also possessed, before that, an array of commercial arcades and smaller shopping centers in many new areas around the traditional shopping streets. In this case the de-'*traditionalization*' of *Rua Direita* may well have been a consequence of the strong development of

[266] The other characteristic of store management to be discussed in Section 8.4.
[267] Even though this center has the second highest percentage of traditional stores.

the rest of the center's (and even the city's) commerce. The only city where this does not happen is Vila Real, even though, as seen above, the city also presents a considerable number of commercial arcades. Yet, as shown, these have poor connections both to the traditional shopping streets and to the 'new center'. This, along with the poor development of the peripheral localities (and probably of the region) has helped to maintain an above average traditional landscape in the city, and stores appear to have more difficulties in updating themselves.



Figure 86 - Store type comparison of the *Rua Direita* of Évora, Vila Real, Aveiro and Leiria

The 'traditional' stores that are left in these centers not only orbit the former shopping axes (*Rua Direita*), sometimes in less important perpendicular streets, but also other ancient landmarks, such as a

square or a Church. They also locate close to the city's market (complementing it) and, in the case of Vila Real's and Aveiro's centers, near the train station[268].

Consequently, these 'traditional' stores are inevitably associated to lower building heights and to specific commercial activities. As Table 13 and Table 15 show, M1 and C goods have the tendency to be sold by 'traditional' stores, whilst over 90% of stores selling S and M2 products (excluding in Vila Real) are 'modern'. This is because 'Services and other Activities', 'Leisure and Culture', 'Hygiene and Personal Care' and 'Fashion' products all have a tendency to be in 'modern' stores[269]. The case of 'Fashion' stores is particularly interesting, because there appears to be a paradox, as before it was said that they represented, almost literally, the 'traditional' center itself. Because they are associated to the main traditional commercial axes, and have prevailed 'in the street' almost exclusively in these, traditional 'Fashion' stores have suffered an intense competition from modern counterparts. As the example depicted in Figure 73 shows, the multi-national 'Fashion' stores are usually the first to enter the market of traditional shopping streets. This causes either a relocation of the 'Fashion' cluster (as is the case of Leiria's center) or a massive update of pre-existing 'Fashion' stores (as is the case of Évora's center). In Aveiro and Vila Real, the traditional 'Fashion' store axes have been, to a certain extent, maintained. If in Vila Real this is due to the present commercial state of the center, in Aveiro it is probably due to the fact that modern 'Fashion' stores had many multi-commercial locations, and newer axes, to choose from, so their pressure towards existing 'in street' stores was less intense.

If Aveiro's and Leiria's centers[270] always possess more 'modern' stores per activity and per category, on the other hand in Vila Real's center, less than half of the 'Home' and 'Food & Beverage' products, for example, are sold in 'modern' stores, proving this city's remaining loyalty to these traditional types, and the particular affinity to C (Home) stores that no other city possesses. Évora's center also has less than 50% 'Food & Beverage' 'modern' stores, which shows that both cities are dependent of a network of 'grocery' stores and 'minimarkets', and rely less on larger chain super and hypermarkets.

In the peripheries the major difference found is, as mentioned above, the percentage of 'traditional' stores in Vila Real. Actually, each peripheral hierarchical locality of Vila Real has a higher percentage of 'traditional' stores than any of its counterparts in the other three city's peripheries. Furthermore, the area surrounding the Europa and Universidade Avenues contains one third of all 'modern' stores outside Vila Real's city center. Not only are the peripheral localities of Vila Real farther apart from the center and from each other (and with less connecting urban and commercial ribbons), they also lack many of the commercial 'islands' in the ground floors of new residential neighborhoods that characterize the landscape of the other peripheries. It is precisely in these commercial poles that

[268] In Évora and Leiria the train station is outside the center, but both are also surrounded to a certain extent by a few remaining 'traditional' stores. More specifically, the location of 'traditional' stores in these case studies is as follows: in Vila Real they are mainly around *Rua Direita* and Cândido dos Reis Street, and the traditional axis stretches to the train station on other side of the valley (in the Europa and Universidade Avenues area). In Évora, they are hardly in the Giraldo Square or in the main commercial axes, appearing instead in less important perpendicular streets, such as Machede Street, Romão Ramalho Street and Avis Street. In Leiria's center they practically remain only near the city's Cathedral at the top of *Rua Direita*, or on the east bank of the river, in Tomar Street. In Aveiro's center, the main poles of 'traditional' commerce occur on the East side of Dr. Lourenço Peixinho Avenue (closer to the train station) and around Mercadores Street (leading to Vera Cruz Church).

[269] Associated, as before mentioned, to shopping linkages and the edge axes composed of buildings with greater heights and the triple land-use.

[270] And in the case of 'Fashion' and MC stores, also Évora's center.

'modern' stores cluster in the outer localities. Aside from these, 'modern' stores appear mostly on two obvious locations: the 'expansions'[271] and in the 'industrial/commercial areas'.

On the other hand, most of the stores that are dispersed, without a clear pattern, throughout the peripheral, low-density areas, away from the centers of the smaller localities, are usually 'traditional', standing in residential single family buildings and selling first necessity goods. In the central areas of older localities, 'traditional' stores can also define the main local axes or the areas close to landmarks (train station, main square). Even so, 'traditional' stores can also appear in newer residential areas. In 'main residential' areas they usually appear if the neighborhoods have a lower social status. This is the case, for example, of the social neighborhood locally called 'Comboios Amarelos' located in Santiago in Aveiro[272].

On the other hand, most 'residential' and 'isolated residential' localities present more 'traditional' than 'modern' stores[273]. Or if not, as a whole, they at least present clear particular clusters of 'traditional' stores. Actually, it can be seen that these residential localities which have a balanced distribution of 'modern' and 'traditional' stores do not follow the same patterns. For example, Pousos has the cluster of 'modern' stores closer to its main square, whilst in Marrazes the opposite happens. Unlike in the center, where modern stores have occupied 'traditional' buildings, particularly in the older shopping axes, in the peripheries this does not seem to have occurred. 'Traditional' stores have either closed or been maintained in the same locations, whilst newer stores have occupied almost exclusively newer buildings. The excess of offer which appeared as a consequence of the construction of the commercial 'islands' in newer multi-family residential neighborhoods has given new and modern stores more preferable choices than those found on the peripheral traditional commercial axes. Therefore, the patterns of modern and traditional stores in the periphery follow closely the expansion of the localities, depicted on Table 8. This being the case, it is harder for older shopkeepers to update their store formats, both because they are not in contact with the new commercial clusters, and because they are linked to the structure of these localities, many of which have maintained their 'traditional' outlook.

Consequently, the activities which appear in the three main suburban locations: the 'extensions', the 'industrial/commercial' areas, and the commercial clusters in residential buildings, are those which are preferably modern. As Table 16 and Table 18 show, 'Hygiene and personal care', 'Fashion', 'Home appliances and electronics', 'Services and other activities' and 'Leisure and culture' products are mostly sold by 'modern' stores. Those activities which exist in the residential traditional areas, outside the new commercial 'islands', especially 'Food & Beverages' and 'Restaurants & Cafés' (and to some extent 'Home') will always be sold by more 'traditional' store types. Obviously, these correspond mainly to the M1 store category, but also to the C category, except when industrial areas are concerned. Vila Real presents, for each category and activity, always the lowest percentage of 'modern' stores, with the exception of MC and 'Fashion' stores. Actually, 100% of all 'Fashion' stores

[271] Forca, Sismarias, Europa and Universidade Avenues.

[272] In this neighborhood, most stores in Santa Maria da Feira Street are 'traditional'. This street is located between Espinho Street and Dr. Mário Sacramento Street (Figure 61).

[273] In Leiria, these are the three 'isolated residential' localities: Pinheiros, Andrinos and Gândara de Olivais. In Vila Real, these are all the 'residential' and 'isolated residential' localities with the exception of Parada de Cunhos, where the weight of the newer residential neighborhood closer to the center influences the percentage. In Aveiro, these are St. Joana, the southern area of São Bernardo and the traditional neighborhoods of Esgueira (E). Lastly, in Évora, 'traditional' stores are in majority in the traditional neighborhoods of Malagueira, Sra. da Saúde and in the central square of Bacelo.

in Vila Real's periphery are 'modern'. But this is because they are all in the Europa and University Avenues. In Évora, because of the restrictions of development inside the center, new construction has proliferated in the outer rim, something which leads to higher percentages of 'modern' stores in the activities and categories associated to recent residential clusters. On the other hand, the lack of definition of the localities of Aveiro's periphery, lost in a confuse network of former rural lands, helps to increase the number of 'traditional' stores therein.

8.4.2. STRUCTURE

Table 22 shows that, as far as it could be ascertained, over 2/3 of shops present in these cities are 'individual'. This means that they are owned by promoters which solely retain that store, or rather, the image and market characteristics related to each of these stores (name, logo, aesthetics) are unique.

Table 22 - Percentages of store structure by cities, by city centers (cen.) and by peripheries (per.)

	Vila Real			Aveiro			Leiria			Évora		
	City	Cen.	Per.	**City**	Cen.	Per.	**City**	Cen.	Per.	**City**	Cen.	Per.
Chain	**19,9**	20,9	17,8	**19,0**	18,7	19,5	**19,0**	20,9	16,6	**16,4**	15,6	17,1
Discount	**0,2**	0,3	0	**0**	0	0	**0**	0	0	**0**	0	0
Franchising	**0,8**	0,7	0,9	**0,9**	0,9	0,8	**1,0**	1,6	0,4	**0,8**	0,7	0,9
Individual	**73,4**	71,6	78,6	**64,7**	64,9	65,0	**65,0**	63,3	67,5	**73,1**	77,1	69,7
Outlet	**0,4**	0,5	0,2	**0,1**	0,2	0,1	**0,1**	0,1	0,1	**0,1**	0,1	0
Other*	**5,3**	6,0	2,3	**15,3**	15,3	14,6	**17,9**	14,1	15,4	**9,6**	6,5	12,3
TOTAL	**100**	100	100	**100**	100	100	**100**	100	100	**100**	100	100

* Multi-commercial or of Structure unknown (closed or empty)

This definition, intrinsic to the so-called 'family-owned' stores, is much more akin to that which usually describes 'traditional' retail. Yet although practically all (if not entirely all) 'traditional' stores are 'individual', many 'individual' stores are not 'traditional', especially in the present times. For example, small, alternative store types, presenting new experiences, new store layouts and 'new' products (even though they may be 'vintage'!), promoted by 'individual' entrepreneurs, have flooded many European downtowns, especially in art or former derelict districts. None of these stores is 'traditional' even though they do not belong to a chain or a franchise. But there are other examples which, along with the conclusions taken from the previous section related to store type, help to show one thing: that the myth that 'street' commerce and individual promoters are being wiped out of cities in favor of multi-national chains and big-box development is, at least in these four cities, untrue. The myth is demystified. The 'traditional' store is indeed disappearing (it is less than 20% of all stores), but it has been substituted, mostly, not by the multi- or inter-national brands, not by the 'franchises', 'outlets' or 'chain' stores, but by individual promoters who have either entered the market with a store conceptualization closer to that of the shopping center format, or were already in the market but managed to update their store formats. It can be argued that, because in Table 22 shopping centers and commercial arcades were considered as single entities (and so their weight is exactly the same as a

small traditional store), the numbers might be erroneous. But these establishments are all categorized as 'Others', so if they are not considered, 'in the street' there is still the same proportional difference between the 'chain' and the 'individual' stores. 'In the street' there are more than three 'individual' stores for each 'chain'. Obviously, this does not mean that the 'individual' stores are economically successful (an assessment of market shares and store profitability eludes this research) but it would be hard to believe that a 3,5 to 1 ratio could be kept if they were not (at least to a certain extent).

Practically one store in every five belongs to a 'chain' except in Évora (16%). But because 'chain' stores are found to have a greater tendency to be located in post 1975 buildings, these differences can be, to some extent, explained. On the other hand, 'franchises' (located mainly in the centers) and 'outlets' (located mainly on the edge-of-center or in industrial areas) have a very poor representation. In the following paragraphs a closer look is taken at the centers and the peripheries. The supporting A3 maps containing the store structure distribution are shown in Annex 13.

In the centers, practically the same ratios between 'chain' and 'individual' stores are maintained. 'Chain' stores, although they are still one in every five, have the tendency to cluster. Because they are associated to the main new commercial axes (linkages and edge residential/commercial/service streets) they are usually correlated to higher buildings, most containing services and central activities. It is then no surprise that, looking at Table 13 and Table 15, 'Services and other activities', 'Fashion', 'Hygiene and personal care' and 'Home appliances and electronics' (M2, S and some MC categories) have the lowest representation of 'individual' stores. It is also no surprise then, knowing that Évora's center lacks in new commercial axes with the triple land-use, that this center has the lowest percentage of 'chain' stores. In the four centers, 'chain' stores usually appear around a main ('new') square and an associated main thoroughfare[274]. The example of Aveiro's center is depicted in Figure 87. In all these cases, 'chain' stores also appear in intersections, associated to the same type of buildings and activities as above mentioned.

On the other hand, the difference in the percentages of 'individual' stores between the pairs Leiria and Aveiro (65%), and Évora and Vila Real (around 75%), is maintained for the center. Because this 10 percentage point difference is not compensated by the 'chain' stores, it is obviously due to the larger amount of 'Other' stores, 'franchises' and 'outlets' in the first two cities. As it would be expected the weight of 'individual' stores decreases if just buildings constructed after 1975 are considered. They are associated mostly to M1 types (95%), namely 'Restaurants & Cafés' (95%), 'Leisure and Culture' (90%) and 'Food & Beverages'. Évora's and Vila Real's centers have the greatest amount of 'Food & Beverage' stores associated to 'individual' stores[275], reinforcing the conclusions made in the previous sub-chapter. On the other hand both Évora and Leiria's centers have a greater share of 'Home appliances and electronics' and 'Hygiene and personal care' stores in 'individual' establishments than the other two centers.

[274] In Évora's center they are located in the corridor made by João de Deus Street, leading up to the Giraldo Square. In Leiria's center the same happens in Heróis de Angola Avenue and 5 de Outubro Square. In this case, the two edge, post 1975, thoroughfares, Dr. Adelino Amaro da Costa and Marquês de Pombal Avenues, also possess a large quantity of 'chain' stores. In Vila Real's center, 'chain' stores obviously locate in the 'new center', particularly where St. Iria Street articulates with the Sra da Conceição Church Square. In Aveiro's center, most 'chain' stores are on the West end of Dr. Lourenço Peixinho Avenue.
[275] 95 and 86% respectively.

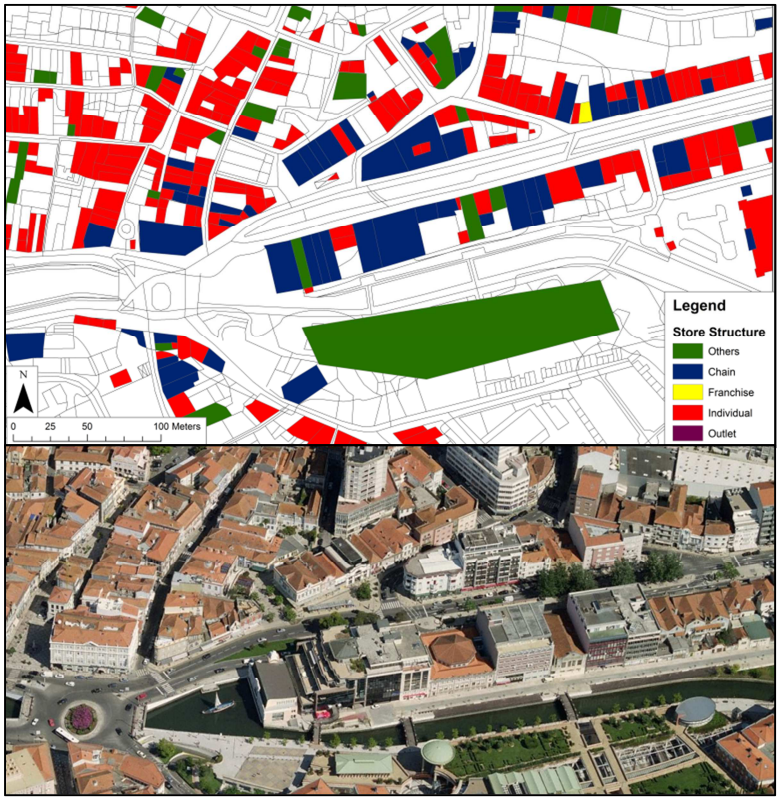


Figure 87 - Model and aerial photograph of the West end of Dr. Lourenço Peixinho Avenue, depicting the chain store concentration (aereal photograph taken from www.bing.com)

In the peripheries it would be expected that the percentage of 'individual' stores should increase and that of 'chain' stores decrease, but this does not happen in all case-studies. This happens clearly in Vila Real and, to a lesser extent in Leiria. In Évora the opposite happens and in Aveiro the percentages are more or less maintained. The way the peripheral localities are structured clearly influences the percentages. If most 'residential' and 'isolated residential' localities are practically composed of 'individual' stores, 'chain' stores appear, like modern stores do, in the 'extensions', in the commercial 'islands' and in the 'industrial/commercial' areas. Preferably, they are in the 'extensions', close to the city center either in specific locations[276] or else along the main axes of those 'extensions'[277]. The increase in the weight of 'chain' stores both in Évora's and Aveiro's peripheries can then be justified by the greater commercial strength of their 'extensions' and 'main residential' localities, which complement (Aveiro) and compensate (Évora) their respective city centers. Consequently, looking at Table 16 and Table 18, it can be seen that it is the M2 and S categories, as well as 'Services and other activities' that correspond to most of the 'chain' stores.

Likewise, as mentioned, 'chain' stores can also appear in main intersections, commercial concentrations or in the main axes of residential localities[278]. In the case of Aveiro's locality of São Bernardo 'chain' stores can also be associated to warehouses of semi-industrial and commercial areas, but in the other cases they are almost exclusively associated to new multi-family buildings ('banks' for example). It is in the 'industrial/commercial' areas, however, that most peripheral 'chain' stores are

[276] Like the 'Food & Beverage' cluster of Sismarias, the service area of Forca or the residential-commercial-service rows of Malagueira, close to the city wall.
[277] Like Vale dos Lobos Street in Telheiro or the Europa Avenue.
[278] Like in Marrazes or São Bernardo.

located. Here they can account for 30 to 50% of all stores, an obvious consequence of the presence of multi-national warehouses and large-scale retail establishments. The fact that in the peripheries over 25% of 'Home' and MC stores, as well as over 30% of 'Services and other activities' correspond to 'chains' is justified by the weight of these 'industrial' areas. On the other hand, the observation that Leiria's periphery presents more 'Food & Beverage' 'chain' stores than any other periphery, corroborates the deductions made above about the greater presence of super- and hyper-markets in the outer residential areas of this city (especially in Sismarias). In Aveiro, 'Fashion' stores are clearly 'individual', more so than in any other periphery. 'Chain' stores of this nature have many multi-commercial spaces to choose from in this city, so, 'in the street', practically just 'individual' stores (87%) remain.

The number of 'franchises', 'outlets' and 'discount' stores in the peripheries hardly reaches 1%. Therefore, over 2/3 of stores are 'individual', and in Vila Real's periphery these amount almost to 80%. This number once again stresses the existing gap between the center and the periphery in this city, and between this city's periphery and all others. It also reinforces the role of the 'extension'. The axis composed by the Europa and Universidade Avenues contains 1/3 of all the 'chain' stores found in the periphery as well as 3 of the 4 franchises. This also helps to justify why, against the logic of the other activities, the percentages of 'individual' stores selling both 'Fashion' and 'Hygiene and personal care' products are the lowest in Vila Real. It is because both these types of establishment practically only locate in the 'extension', close to, or in Dolce Vita Douro. Furthermore, because Constantim Industrial area does not possess a shopping center, the appeal (found in the other cities) to quickly develop a series of large single standing commercial warehouses around it is non-existent. Practically all M1 stores found in the peripheries (96%) are 'individual', the same number as in the center (95%). This is yet another proof of the survival of the first necessity neighborhood store, unlike popular belief.

8.5. OTHER STORE CHARACTERISTICS

Before proceeding to the morphological characterization of commercial buildings, blocks and streets (which is the object of the next Chapter), this Chapter is concluded with the brief analysis of three additional elements related to the characterization of 'the store' that were collected in the field research. These consist of elements both of the 'store perks' and the 'store status' as presented in Figure 21. In terms of 'store perks', the presence of the most important external channel of promotion and sale, the internet, is analyzed. Also it was seen if the store possessed an 'esplanade', that is, if its presence extended from the building to the street public space. As an added though, it is also discussed both the presence of stores with an indirect connection to the street, that is, those that are not on the ground floors (or do not possess a private ground floor entrance), as well as those which stand alone in buildings, simply because the upper floors are unoccupied. Lastly, in terms of 'store status', the presence of non-open stores in these case studies is interpreted, bearing in mind that later this phenomenon will also be compared with the morphological characterization of the spaces they are in.

8.5.1. WEB-CONNECTION

Table 23 shows the number of web-connected stores in each area of the four case-studies. As mentioned earlier, the ability to purchase online was not taken into account, therefore the numbers

reflect the amount of stores which have any kind of web-platform where information about the sellers, about the store, about the products sold and about the prices are displayed (site, facebook, blog, myspace, and so on).

Table 23 - Amount of web-connected stores in each case study

<table>
<tr><th></th><th>Vila Real</th><th>Aveiro</th><th>Leiria</th><th>Évora</th></tr>
<tr><td>City</td><td>1 in 5</td><td>1 in 3</td><td>1 in 4</td><td>1 in 4</td></tr>
<tr><td>City center</td><td>1 in 5</td><td>1 in 3</td><td>1 in 3</td><td>1 in 4</td></tr>
<tr><td>Periphery</td><td>1 in 4</td><td>1 in 3</td><td>1 in 4</td><td>1 in 4</td></tr>
<tr><td>Extensions</td><td>1 in 3 (Europa and Universidade Avenue)</td><td rowspan="2">1 in 2 (Forca)
1 in 3 (Santiago)
1 in 5 (Esgueira W)</td><td>1 in 4 (Sismarias)</td><td></td></tr>
<tr><td>Main residential areas</td><td>1 in 7 (Borbela, Mateus)</td><td>1 in 5 (Marinheiros)
1 in 3 (Telheiro)</td><td rowspan="2">1 in 4 (Malagueira)
1 in 6 (Bacelo)
1 in 6 (Sra. Saúde)</td></tr>
<tr><td>Residential areas</td><td>1 in 7 (Lordelo)
1 in 4 (Parada Cunhos)
0 (Folhadela, Constantim)</td><td rowspan="2">1 in 4
(S. Bernardo, St. Joana, Esgueira E, Aradas)</td><td>1 in 5 (Pousos)
1 in 6 (Marrazes)
1 in 6 (Parceiros)</td></tr>
<tr><td>Isolated residential areas</td><td>1 in 17
(Mateus, Arroios)</td><td>1 in 20 (Gândara de Oliviais)
1 in 25 (Pinheiros)
1 in 50 (Andrinos)</td><td>1 in 2,5
(Almeirim, Horta das Figueiras)</td></tr>
<tr><td>Industrial/ commer-cial areas</td><td>1 in 2
(Constantim Industrial area)</td><td>1 in 1,5
(Esgueira Industrial area)</td><td>1 in 3
(Parceiros and Vale Sepal Industrial areas)</td><td></td></tr>
</table>

Because, nowadays, the possibility of establishing an official web-platform for any type of enterprise is of considerable simplicity, it is noticeable that the fluctuation of the amount of web-connected stores is less proportional to the amount of 'individual' or 'chain' stores, to the type of product sold or to the store location, but more proportional to the amount of 'traditional' or 'modern' stores. Actually, around 97%[279] of web-connected stores are 'modern' stores. This is yet another evidence that 'traditional' retailers are slow in complying with the demands of modern commercial transactions, and is yet another justification for their decline in cities. Consequently, it is no surprise that the amount of web-connected stores is lower in Vila Real.

Looking specifically at the city centers, once again there is a distinction between Leiria and Aveiro, and Vila Real and Évora. It could be assumed that this difference could be associated to the existence of more new buildings, but this is not the case. Not only has Vila Real more stores in post 1975

[279] 97% in Évora and Aveiro, 98% in Leiria and 95% in Vila Real.

buildings than Aveiro (Table 8), but also, when considering just these buildings, the percentage of web-connected stores increases in Évora, decreases in Aveiro and remains constant in the other two cities. Therefore, the influence of this variable is not perceptible. On the other hand, the differences in the amount of 'modern' stores, to which are added the differences in multi-commercial spaces and in specific web-prone activities such as high-end 'Services and other activities', account much more for the differences in web-connected stores. That is why Leiria's center has more web-connected stores. The same happens in other service dense areas such as Forca[280].

In the peripheries, practically 1 in every 4 stores is web-connected but the distribution is mostly uneven. Industrial areas, because they are constituted by commercial multi-national warehouses[281] and large scale shopping centers, possess a high degree of web-connected stores (in average 1 in every 2). The 'expansions', because they have rows of multi-family residential/service/commercial buildings and a higher amount of 'Services and other activities', also have 1 web-connected store in every 3 or 4. In residential areas, the degree of web-connection depends not only on the amount of 'traditional' stores, but also, inevitably, on the amount of commercial 'islands' (which are almost always in new buildings), and on the degree of connection to the thoroughfares leading to the center. Malagueira and Sismarias (1 in 4), for example, are then bound to have more web-connected stores than Esgueira (W) (1 in 5), which possesses a 'traditional' commercial area (Figure 48), or Borbela and urban Mateus (1 in 7) who lack strong commercial 'islands' and have a more disperse commercial occupation. The 'main residential' areas of Leiria and Aveiro will always have more web-connected stores than those of Vila Real and Évora. But as the distance from the center increases, so does the number of 'traditional' stores and consequently, the number of unconnected stores. In the extreme, isolated commercial areas such as Gândara de Oliviais or Pinheiros[282] have only 1 web-connected store in over 20, because their commercial landscapes are dependent on first necessity traditional retail.

8.5.2. BUILDING AND STREET OCCUPATION

Shopping is an activity which is either open to the street or encased in specific buildings conveniently signaled and promoted. Therefore, only very rarely do stores are not located either in multi-commercial buildings (where they can occupy all floors) or on the ground floors of buildings containing other uses[283]. In these cases, stores occupy the upper floors, and the access to them has to be made either through a stairwell with direct access from the sidewalk, or else through a common stairwell or elevator inside the building which also serves the other services, stores or residences that that building possesses. In the first case, stores are located in first floor rows with direct street access, that is, the buildings possess two floors of 'door to door' commerce or service and then other uses on the upper floors. This type of occupation usually occurs in specific buildings of denser areas, like the ones depicted in Figure 88. The activities that seek these locations usually belong to 'Services and other activities', namely 'insurance' and 'real estate' agencies (in Leiria and Aveiro), and particularly, in all cities, 'hairdressers' and 'beauty parlors'. 'Restaurants & Cafés' appear in these locations in Vila Real.

[280] In this area 52% of the stores are web-connected.
[281] Many fashion-, car- and home-related warehouse-stores also act as manufacturers and distributors.
[282] This also occurs in Mateus, Arroios and Andrinos, and in isolated areas of Aradas, St. Joana or Almeirim.
[283] Commercial legislation can also eventually hinder the location of commercial use above ground-floors.



Figure 88 - Two-floor commercial rows in service and residential buildings in, respectively, Forca, Dr. Adelino Amaro da Costa Avenue and EN1 Street in Leiria (photographs by author)

In the second case, more than often the buildings do not possess a residential occupation. Generally they are either low height-buildings of solely commercial use, containing, for example, two stores (one in the ground floor open to the street and another on an upper floor), or else they are service buildings (with commerce on the ground floor) but where a specific store has probably occupied a space in an upper floor initially meant for a 'service'. These buildings generally appear in the main commercial axes of the centers[284], and the most common activities they contain are commercial services ('insurance', 'real estate'), 'buy gold' agencies, as well as other technical enterprises[285]. Only rarely are stores located in the upper floors of residential buildings. These are generally associated to 'traditional' and often not official enterprises (such as a local 'needle and thread' business, or a hand-made product store)[286].

Regardless, these stores are found to be commercially insignificant. In most cities, they amount to just 2% of the total number of stores. In Évora, where the building heights are much more limited, and there are fewer strong large-scale central commercial axes, this number is just 0,5%. There is a greater tendency for these stores to be in post 1975 buildings (an increase of 1 or 2 percentage points), which comes as no surprise considering the type of building these stores are in, as discussed in the previous paragraphs. There is a greater tendency still for these stores to be in the center, which also makes sense because it is here that service and exclusively commercial buildings are mostly located[287]. In the peripheries, stores in upper buildings are practically irrelevant, and are less than 0,5% of the total

[284] Leiria's Heróis de Angola Avenue, Évora's Giraldo Square or Aveiro's Dr. Lourenço Peixinho Avenue.
[285] Such as 'Computers', 'Lighting' and 'Electronics'.
[286] These stores were obviously just possible to catalogue when any kind of sign was visible. Generally these either were small publicity signs at the windows or notices written in the doorbells.
[287] 3% of stores are in upper floors in Aveiro's, Leiria's and Vila Real's centers, and 0,7% in Évora's.

number of stores[288]. In Aveiro they are all in Forca, and appear in commercial/service buildings. Yet only one store (occupied by a travel agency) is not empty, which attests either to the newness of the area or else to the fact that these stores 'off the ground' perform worse. One of these empty stores is perceptible in Figure 88, in the right side of the first floor. In the other cities, these stores are either in residential/service buildings, or else in the few exclusively commercial buildings found in the peripheries[289], and include mostly service agencies and food-related establishments.

On the other hand very few establishments have occupied the street space in front of them. Usually, they can have a large advertisement sign, a mascot or other appealing elements at the door, or in the case of traditional 'Food & Beverage' or touristic stores, a small stand displaying a few products. Yet both these elements, with few exceptions[290], are discreet and do not necessarily 'occupy' the street, as they are leaned against the wall of the establishment. Actually, the only perceptible type of occupation that was discovered in the four case studies was the use, by 'Restaurants & Cafés', of esplanades. Even this had, quite unexpectedly, a poor significance. This can be due to financial reasons (as the use of public space is, or should be, paid), to comfort (as it will be seen bellow, Vila Real, the city with most unpleasant climate, has much less esplanades), or simply because there is no *space* in the sidewalks. It was succinctly discussed above (and it will be discussed more carefully in Chapter 9) that the sidewalks are only relevant in the main center new thoroughfares. In the 'old' centers, and in the outer peripheral localities, most streets present reduced sidewalks or none at all. It is then explained why the percentages of the use of 'esplanades' increase when just 'Restaurants & Cafés' belonging to post 1975 buildings are considered. The construction site of new buildings usually recedes a little from the street, allowing enough space for a promenade where esplanades can locate. The same happens in the commercial 'islands', where the store corridors and the entrances to the buildings may not be at street level, but a few steps above, forming semi-public areas where chairs and tables can be inserted. Only, to some extent, central pedestrian commercial streets, contradict this location logic.

Therefore, considering the cities as a whole, only 1 in every 4 'Restaurants & Cafés' has street tables. In Vila Real this number is much less; it is only 1 in every 10. In the centers these numbers are almost exactly maintained[291]. Esplanades appear principally around main squares[292] or else in commercial rows of residential/service neighborhoods[293]. They can also be facing some landmark (such as Aveiro's train station or the river in Leiria). It is practically just in Évora's center, however, that esplanades appear with some relevance in the pedestrian commercial streets[294]. Contrary to what could be expected, these are not the main pedestrian streets, therefore they are smaller and have less of the usual high-street 'fashion' and 'service' commerce. This can be precisely the reason why esplanades

[288] There are just 2 in Vila Real and Leira, 3 in Évora and 5 in Aveiro.
[289] The first case includes two stores in Marinheiros (containing two service agencies), right next to the center boundary, one in Malagueira (food & beverages) and one of the two found in Horta das Figueiras (restaurant). The second, more unpopular because of the presence of multi-commercial spaces, includes two stores in Lordelo, close to the Hospital (one restaurant and one beauty parlor) and an agricultural machine store above a car stand in Malagueira.
[290] For example, the pedestrian street 5 de Outubro in Évora contains various touristic and hand-made product stores, whose display fills the street.
[291] In Vila Real there is an increase to 1 in every 9.
[292] Évora's Giraldo Square, Vila Real's City Hall Square, Leiria's Rodrigues Lobo Square and Aveiro's Peixe Square.
[293] Such as the ones of Vila Real's 'new' center, or in Marquês de Pombal Avenue in Leiria.
[294] Like 5 de Outubro Street and Miguel Bombarda Street.

only appear in Évora's 'traditional' streets. Because of the city's beautiful traditional urban landscape, these small streets become the perfect places for their location.

In the peripheries there is an increase of esplanades in Évora and Aveiro (to 1 in every 3 'Restaurants & Cafés) and a heavy decrease in Vila Real (to 1 in every 12). These number help to ilustrate, once again, that Évora's and Aveiro's areas closer to the center are strongest commercially and urbanistically, and that Vila Real's periphery is diffuse and commercially poor. This is because in the peripheries esplanades are practically only associated to commercial 'islands'. Évora's and Aveiro's peripheries contain more, because of their expansion 'in axes' and not 'in localities' as the other two cities present. Elsewhere, one or two 'Restaurants & Cafés' containing street tables may appear in the central square or main street of a traditional and isolated locality.

Lastly, the number of stores located on the ground floors of buildings which have their upper floors (as far as it could be assessed) unoccupied, is even more insignificant. 10 were found in Évora, 8 in Leiria, 5 in Vila Real and 23 in Aveiro. Obviously, this assertion is only related to low-rise traditional buildings. Therefore, the stores in this situation are located in the traditional commercial districts, in derelict buildings in which only the store space has been rehabilitated (or at least maintained). The most notorious concentrations appear in Aveiro's *Rua Direita* and Vila Real's Carvalho Araújo Avenue. The rest are dispersed, mainly in the center, as this phenomenon is practically non-existent in the peripheries. The truth is that in many of these situations, the store ends up occupying the upper floors, even if it is just for storage space. Because these are medium-sized cities with a relatively recent suburban development, the main traditional commercial streets still maintain residential, and even service, occupation in the upper floors. The fact that it is precisely Évora's and Leiria's centers which do not show this phenomenon can be explained by the obvious importance of Évora's inner commercial axes, unharmed because of the lack of new construction, and the urban rehabilitation (still under way) of most of Leiria's historic center.

8.5.3. THE CASE OF CLOSED AND EMPTY STORES

Lastly, 'closed' and 'empty' stores are analyzed. As was mentioned before, 'closed' stores are those that show signs of occupation but may not be open due to financial, restructuring or even health reasons. On the other hand, 'empty' stores are not occupied by any activity, and are either abandoned and derelict, or waiting to be sold or let, as is the case of store spaces in newly constructed buildings. Stores can also be 'empty' or 'closed' because the activities therein have recently changed their location. Table 24 shows the number of stores according to their status. The percentages in parenthesis relate to the total number of stores in the cities, the centers and the peripheries, respectively, as presented before in Table 6. The same data concerning the various hierarchical divisions of the periphery can be consulted in the overall summary table in Annex 4. Annex 14, on the other hand, presents the A3 maps for the four cities where each store space is signaled according to its 'status'.

Table 24 - Number of stores according to the 'store status' (the percentage in parenthesis relates to the total number of stores, in the cities, in the centers, and in the peripheries, respectively)

Cities		Vila Real	Aveiro	Leiria	Évora
Open stores	**City**	**1.268 (91%)**	**1.815 (82%)**	**1.993 (80%)**	**1.470 (85%)**
	City center	866 (89%)	1022 (82%)	1129 (80%)	733 (87%)
	Periphery	402 (94%)	793 (82%)	864 (79%)	737 (82%)
Empty stores	**City**	**43 (3%)**	**334 (15%)**	**352 (14%)**	**157 (9%)**
	City center	36 (4%)	191 (15%)	185 (13%)	51 (6%)
	Periphery	7 (2%)	143 (15%)	167 (15%)	106 (12%)
Closed stores	**City**	**86 (6%)**	**72 (3%)**	**160 (6%)**	**108 (6%)**
	City center	69 (7%)	42 (3%)	95 (7%)	56 (7%)
	Periphery	17 (4%)	30 (3%)	65 (6%)	52 (6%)

The sum of the percentages of the ‘closed’ and ‘empty’ stores is superior to that of ‘Others’ in the various tables of this chapter[295] (like Table 11 or Table 12) by the simple reason that it was possible, in some ‘closed’ stores, to retrieve some information like the ‘activity’ or the ‘structure’. It is perceptible that, whilst the number of ‘closed’ stores, in percentage, is more or less similar in all cities but Aveiro, the number of ‘empty’ stores is more dissimilar. This is because ‘empty’ stores are mainly related, not to pre-existing store spaces that were left by their former occupants (like ‘closed’ stores), but to store spaces that were never occupied at all, that is, those of newly constructed buildings. If it can be said that 6% is the reference value for the stores that, due to various economic reasons, have closed, the number of ‘empty’ stores is much more dependent of the amount of growth that the cities have witnessed, especially in their peripheries. That is why Aveiro and Leiria present larger values and Vila Real the lowest. This can also be justified by the fact that ‘closed’ and ‘empty’ stores have a preference for post 1975 buildings (between 55%-60% in average). What can be concluded is that many buildings of recent construction have difficulty in occupying their store spaces, and this is much more perceptible in areas outside the center.

Looking specifically at the centers (Figure 89) it is not hard to notice that indeed ‘closed’ stores are often associated to ‘traditional’ areas, whilst ‘empty’ stores usually appear in higher number in new axes composed of recent multi-family commercial/service/residential buildings. That may be exactly the reason why, in Évora’s center, there is a decrease (to 6%) in the number of ‘empty’ stores: there are no new axes. To some extent the same reason may be cited for the lack of ‘empty’ stores in Vila Real’s center. Even though there is indeed a ‘new center’ (where ‘empty’ stores are), this new offer has not significantly endangered the strongly established commercial network. It has rather complemented it to serve the new residential areas without an excessive, or excessively competitive, offer. Therefore, ‘empty’ stores are usually found in most large ‘new’ residential avenues[296]. Because

[295] Even though ‘Others’ also includes multi-commercial spaces.
[296] Like Dr. Adelino Amaro da Costa Avenue in Leiria, Cidade de Ourense Avenue in Vila Real or Força Aérea Avenue in Leria.

the examples are varied it can be said that this is a consequence of excessive confidence by real-estate developers, promoters or even planners. The most notorious example occurs in D. Glória Barata Rodrigues Street in Leiria (1), which has not only a large amount of 'empty' but also of 'closed' stores. This is a case which parallels that of many arcades. This street has tried to imitate the commercial dynamic of Dr. Adelino Amaro da Costa Avenue but it was just one street too far away. Therefore it can be supposed, looking at the unoccupied spaces, that it could not generate enough momentum on its own, and that the residents of this street, and of surrounding neighborhoods outside the center boundary, prefer to shop in the parallel larger avenue or in other more dynamic places, rather than in their own street.

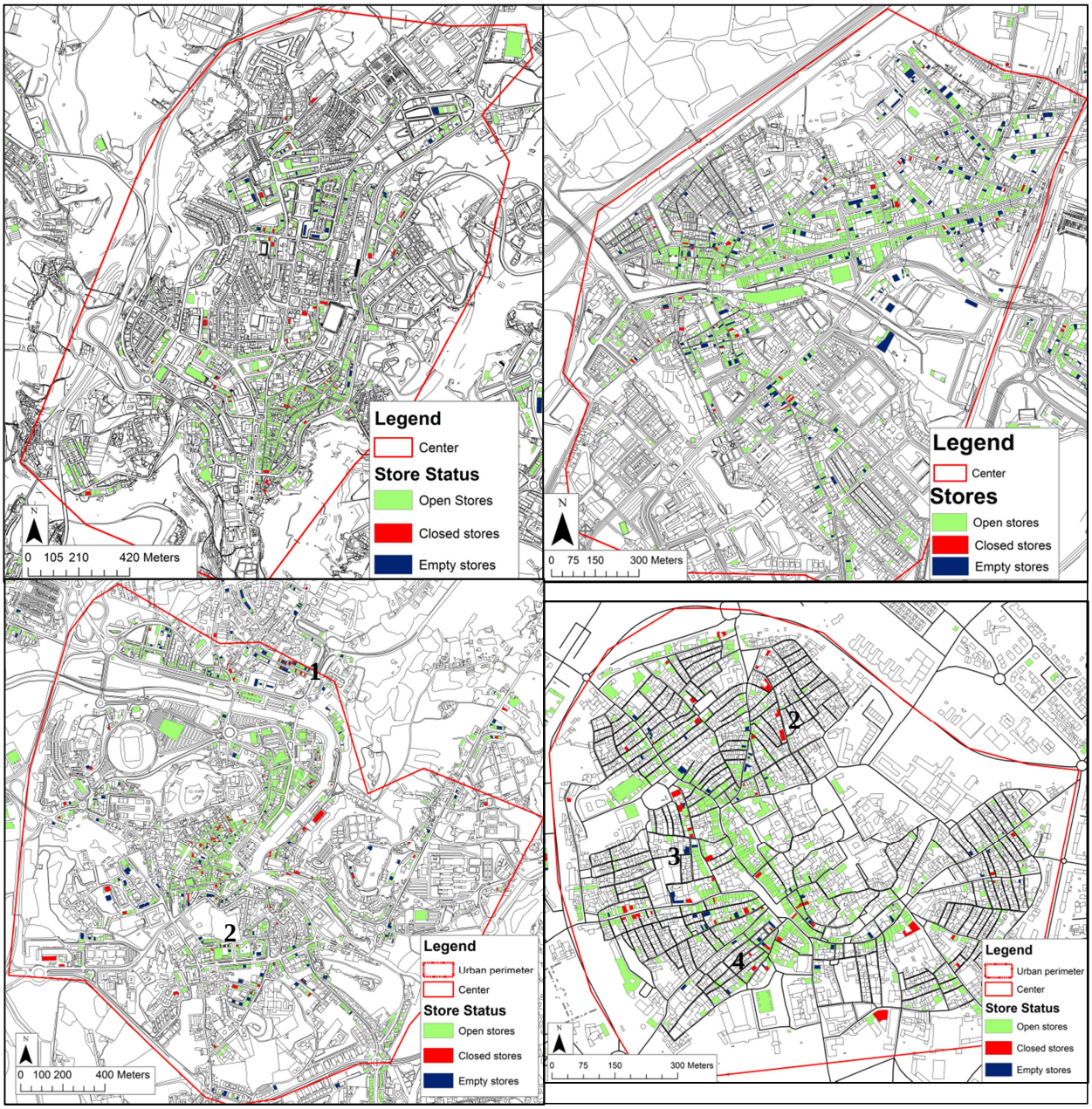


Figure 89 - Store Status in the city centers

This edge effect can also be the reason why some streets in the traditional center also have a greater amount of 'empty' stores. In this case, unlike the ones cited above, these stores were occupied before becoming 'empty', but probably lost gravitational pull as the 'traditional' center expanded to the 'new' center. These are the cases of Avis Street in Évora or Machado dos Santos Avenue in Leiria (2). It can also be the case of many 'traditional' shopping streets in Aveiro and the reason why in this city there are much more 'empty' than 'closed' stores. The combined strength of Forum, Dr. Lourenço Peixinho Avenue and of the multi-commercial spaces has exerted an influence that has started longer. The economic effect, or the commercial renewal, has been more recent in the other cities than in Aveiro. Another reason may be the fact that promoters are keener in transforming some 'closed' stores into 'empty' more quickly, so that they can receive new tenants. That may justify why some newer areas, or traditional ones closer to main commercial axes, have more 'empty' stores, unlike other less important areas whose 'closed' stores are more than often simply abandoned because the areas have lost their potential.

'Closed' stores are therefore less in city centers[297] and are mostly associated to the 'traditional' centers, as it can be seen clearly in Leiria and Vila Real. But whilst Leiria's 'traditional' center has a considerable amount of 'closed' stores, particularly in and around *Rua Direita*, in Vila Real the 'closed' stores are farther from this street. Actually, Vila Real's *Rua Direita* has close to zero non-open stores, which just ilustrates that, whilst in other cities the commercial gravity center has indeed shifted, in Vila Real it has mostly been maintained. The same happens, to some extent, in Évora's center. The lack of a new 'center' has strengthened the area around the Giraldo Square, therefore the non-open store spaces are associated to streets that had an importance before, but now, due to their traditional status, and because they do not have the appeal of the main axes (especially to the new commercial formats), have lost their commercial dynamic[298]. In Aveiro, 'closed' stores are fewer and appear close to *Rua Direita* and the old neighborhood around Peixe Square. A noteworthy fact is that practically all, if not all, stores which were catalogued as 'closed' because they moved to another location, are in the centers. This helps to show the commercial relocations that occurred.

Table 13 and Table 15 show that most of these 'closed' stores are associated to the M1 and C categories, proving their affinity to the traditional centers, especially those of Leiria and Évora. Almost 1 in 10 'Restaurants & Cafés' and 'Food & Beverage' stores are 'closed' in all city centers, and so are 'Home' stores in Leiria and Évora (9% and 13%) and 'Leisure and culture' stores in Vila Real (13%). This can mean that, even if Vila Real's center traditional structure is maintained, the non-food related first necessity 'stationary-news-stand' store is the first either to close or to change its location.

The distribution of 'closed' and 'empty' stores is, like the total number of stores, more or less even between the centers and the peripheries. This means that about half of the city's 'closed' and 'empty' stores are in the centers except in Vila Real's. Here there are 80% of the city's 'empty' and 75% of the city's 'closed' stores. This not only attests to the unbalance in Vila Real's urban perimeter, but also to the lack of new construction outside the center. This also explains the decrease in weight of 'closed'

[297] About 7% of the total number of stores in all centers but Aveiro's (3%).

[298] Examples of these are Fontes Street (3), 31 de Janeiro Street (4) and even Mercadores Street. This street, in English, Merchant Street, proves, by its name, that it was a former important commercial axis. Now, even though it is connected to the Giraldo Square, it has been replaced by wider, more modern, and more integrated streets like Serpa Pinto Street.

and 'empty' stores in Vila Real's periphery. Furthermore, the 'Other' stores in the peripheries are completely related to post 1975 buildings. The numbers are astounding; 93% (in Évora), 89% (in Vila Real), 85% (in Leiria) and 80% (in Aveiro) of the 'Other' stores in these peripheries are in post 1975 buildings. Obviously, peripheral multi-commercial spaces are in recent buildings, but these numbers also prove that 'closed' and 'empty' stores are there as well. Vila Real's periphery not only has the least amount of stores in post 1975 buildings, it also possesses the least number of new residential neighborhoods, which more than often (in the other cities) possess commercial 'islands'. On one way this is good, because just by looking at the numbers, it can be stressed that the amount of 'closed' and 'empty' stores in Vila Real's periphery is much less, which could attest to the city's commercial durability. But this positive perspective hides the fact that the non-open stores are less, simply because first, there are very few overall store spaces in Vila Real's various peripheral localities and, second, there have been no great new developments, which, despite not having *all* of their spaces occupied, have at least *some*. Both these reasons are, obviously, negative. Almost all the outer localities of Vila Real have practically close to zero non-open stores[299] and this happens precisely for these two reasons. And, in spite of the inevitable existence of some non-open establishments in the greatest concentration of stores and multi-family buildings in the 'main residential' area, there are also practically none in the 'extension'. This attests to the degree of development of the Europa and Universidade Avenues (and to the further decline of the outer localities) as in the other cities, it is precisely in newer residential/commercial poles where most non-open stores are located.

This explains the weight increase of 'closed' and 'empty' stores in Évora's periphery. The commercial landscape of this periphery has evolved as a series of poles of residence and commerce (and residence/commerce/services closer to the center) along main rays-of-the-sun expansion axes. What is true here, and in the peripheries of Leiria and Aveiro, is that these commercial 'islands' have been designed in excess, probably because of overzealous promoters. It is hard to find one of these commercial islands with *all* their store spaces occupied, yet most can be described as successful, precisely because they have *most* of their store spaces occupied, and have introduced commercial outposts in areas that had none, or only a very small-scale commercial relevance. What can be perceived, however, is that the construction of a commercial row on a dense peripheral residential neighborhood is not always a guarantee of success. Some indeed have shown indisputable signs of failure. This is the case, for example, of an urbanization in Marinheiro's Cónego José Pereira Lacerda Street in Leiria (Figure 90), where 9 out of 15 store spaces are unoccupied. This commercial 'island' is in a dense residential neighborhood, just one street away from D. Glória Barata Rodrigues Street discussed above, and, like this street, is probably too close to one of the new center's most commercially intense avenues.

Fortunately, most of the other 'inner-residential' commercial 'islands' possess a much smaller number of non-open stores. For instance, the example depicted before in Figure 82, of a commercial island in Malagueira, has only 6 of 20 store spaces not open. Even so, the fact that most of them *have* 'closed' and 'empty' stores is meaningful. And because the peripheries are composed of networks of 'islands' and commercial rows of this nature, the number of 'closed' and 'empty' stores in Leiria, Aveiro and Évora becomes close to 15%.

[299] Namely Mateus, Lordelo, Constantim, Folhadela and Parada de Cunhos.



Figure 90 - Model and aerial photograph of the commercial island in Cónego José Pereira Lacerda Street in Marinheiros, showing the 'store status'. (aerial photograph taken from www.bing.com)

Yet the number of non-open stores is not only a consequence of the excess of developers or of an over-confident market analysis. It can also be related, to a lesser extent, to the age of the buildings and to the degree of development of the areas. In the first case it is perceived that very recent constructions (last year) have practically all their store spaces catalogued as 'empty', but that is simply because they were hardly finished when the field research took place. This is the case of a new residential development in Northeast Bacelo and of some enterprises in Forca. On the other hand, the commercial row, located in Malagueira Avenue in Évora (Figure 62), belonging to Siza's Malagueira social neighborhood, has 17 'closed' and 'empty' stores out of 36, that is, almost half. A similar phenomenon is happening in the parallel Escurinho Avenue. This is a consequence of the well documented social and economic degradation of this neighborhood.

Even so, most 'traditional' and 'isolated' areas have very few non-open stores. This happens first because there are very few overall stores to begin with, and second because these belong to a well-defined, even if small, commercial structure, which does not seem to be much affected by the appearance of the commercial 'islands' of new residential neighborhoods. Actually, these 'islands' serve the new inhabitants that the residential development has brought, and not the pre-existing population which used (and still uses) the pre-existing first necessity store structure. Only when the new neighborhoods are too close to the traditional streets are the stores in these affected. This happens, for example, near the train station in Sismarias. The commercial rows of the residential neighborhoods have expanded to such an extent that the ancient commercial concentration near the station lost its purpose. Of the 12 store spaces found in a one block radius from the train station, 5 are 'closed' and 2 are 'empty'. Because of the amount of overall stores, of the number of commercial residential clusters and of the existence of two commercial axes, Sismarias has 1/3 of the 'closed' stores in Leiria's periphery and ¼ of the 'empty' ones. This is not surprising as similar data is found in other 'extensions'. It is mentioned in order to stress the commercial development of the Europa and Universidade Avenues that, as mentioned above, have a very small amount of non-open stores.

Because of this distribution, it is no surprise, looking at Table 16 and Table 18, that 'closed' stores are related mainly to the M1 and MC categories, those mostly found on the commercial 'islands'. The fact that 8% of stores of the M2 category are 'closed' in Leiria's periphery (against 3% in the other peripheries) may mean that the strength of some peripheral localities closer to the center may be diminishing, or rather, that these not-so-first-necessity stores, which need a larger customer base, are clustering in other places, such as multi-commercial spaces. Also relevant is the number of 'Food & Beverage' establishments that are closing, most notably in Vila Real's periphery (15%), which is another evidence of the influence of large scale establishments. 'Leisure and culture' and 'Fashion'

establishments are the ones that, either in traditional centers, either in the commercial clusters of residential neighborhoods, have the greater tendency to close, sooner or later.

Summary Box nº3

The four case studies have more or less similar percentages and location patterns of 'activities'. The city centers are the undisputed poles of commerce and service inside the urban perimeter, and have most of the food/restaurants and fashion sub-activities (in the traditional centers), and most of the service, home, touristic and entertainment sub-activities (in commercial axes/linkages), all belonging mostly to the M1, C and MC categories. On the other hand the peripheries, more diffused, assume different functions, presenting service (car-related) and industrial sub-activities (which require space) as well as food (first necessity – restaurants, cafés, supermarkets) and home/residence sub-activates (second necessity) that serve the residential areas, particularly the most recent. The 'extensions' complement the center and sometimes possess 100% of specific sub-activities in the entire periphery. Whilst 'Services' and 'Home' locate mostly in the 'extensions', in the commercial 'islands' (as M1) and in the industrial areas, 'Restaurants' are much more dependent on the number of surrounding inhabitants. Commercial 'islands' present little choice but some variety. M1 and C stores are the only ones which significantly occupy residential areas, even the most isolated, so they relate more to single standing stores. Whilst Leiria and Aveiro have the tendency to display high order commercial establishments and services, Vila Real and Évora possess a greater number of small local neighborhood oriented stores. Vila Real has a notable cluster of Home sub-activities.

The dispersion of multi-commercial spaces follows a polynomial (n=2) trend, except in Évora, where it is linear, a consequence of the reduced existing number of spaces. Most multi-commercial spaces are recent, and their slow permeability (especially in Évora) has allowed time for the center (including the traditional) to update itself in terms of store formats, and for the implementation of multinational chains in the main ribbons. In-city shopping centers and arcades, nonetheless, need to be in sync with in-street shopping in order to be successful, that is, they need to be close to main shopping axes, regardless of overall accessibility, and to have a limited number of store spaces. The same happens with commercial 'islands' in the center, whilst in the periphery they can work in isolation. Here, multi-commercial spaces do not follow similar distribution patterns, even though they are in similar areas, either close to the center, in the extensions/main residential areas (arcades and shopping centers), or at the edges of the urban perimeter, in the 'industrial/commercial' areas (just shopping centers). Even if built in less occupied areas, shopping centers never stay commercially alone for long.

Most commerce is 'door to door'. This not only means that commerce performs better in proximity, but also that buildings with commerce are erected close to each other (particularly in the centers) and that larger buildings invest in more than one store space. The growing succession of these constructions forms the commercial 'islands', rows, thoroughfares and finally axis. Stores are also more than often in residential buildings. Despite the commercial renovation of the centers, and the fact that 'traditional' stores only remain in specific locations, the majority of stores is still 'individual', that is, family owned, contradicting popular knowledge. Actually, for example, 95% of M1 stores are still 'individual'. The neighborhood store not only has survived, it has also been able to fit where needed, even in remoter areas.

What stores have become is 'modern'. In the centers the number of 'modern' stores has increased depending, to some extent, on the amount of permeability to larger multi-commercial facilities and the existence of first and second generation shopping centers (spill-over competition effects) and, much more importantly, on the degree of development, that is, on the number of more recent buildings. In the peripheries, however, 'traditional' stores have hardly been updated, and their small amount has to some extent been maintained. This is because new residential areas have been served by new stores which have not affected the limited market influence of the 'traditional' commercial areas. The web-connection is also proportional to the amount of modern stores (97% of web-connected stores are modern), and, to a lesser extent, to the number of high-end services and multi-commercial spaces.

Stores in newer buildings (post 1975) are more, more modern, closer together (door to door), more spatially organized, use more the public space in front of them (esplanades) and have supplied a balanced commercial offer. Even so, in the centers they had the preference for the development of new axes of mostly C stores and services, whilst fashion (MC) and restaurants prefer older areas. In the peripheries, modern buildings, through commercial 'islands', have been able to supply a variety of activities and services generally not found in traditional centers of food and first necessity. Here, for example, with the exception of M1 stores (and S in Aveiro) all categories favor post 1975 buildings, which reflects the importance of these buildings in the development of outer areas. Yet new buildings also present more 'closed' and 'empty' stores, and the causes can be exactly in that development (as most open stores are also in post 1975 buildings).

'Closed' stores are found to be much more related to older areas (especially of the center) which have lost their commercial importance, and so their patterns are more similar between cities. 'Empty' stores, on the other hand, correlate with the existence of new city areas, so they are dependent on the type of growth of cities. In some places (notably commercial 'islands' of the suburbs) the numbers of empty stores are so excessive that they have to mean an overconfidence of the construction market that proved unfounded. In the centers, 'Restaurants & Cafés', 'Home' (in Leira and Évora), 'Leisure and Culture' (in Vila Real) and 'Food & Beverages' establishments, as well as M1 stores (except in Aveiro) and C stores (in Leiria and Évora) are the ones which have been found to be more closed or empty. In the peripheries these are 'Food & Beverage' and 'Leisure and culture' establishments, as well as M1 and MC stores (and M2 for Leiria). Vila Real has less closed and empty stores but this may not be positive. It demonstrates the lack of overall stores in the city and may show the lack of real estate investment on new construction (and stores) especially outside the center. Stores on upper floors are, justifiably, unpopular or else perform worse.

Looking at the case studies there are overall similarities. Leiria and Aveiro have more services, more stores in buildings with services (especially in post 1975 areas), more varied types of stores, more S store and more web-connected stores (especially in the peripheries), illustrating that they are the most developed cities. Their centers also have similar arcade and in-city shopping center distribution patterns, as revealed by the polynomial (n=2) curves. On the other hand Vila Real and Évora are less developed localities, as they also serve smaller and less developed regions, have more stores in solely residential or free standing buildings (especially MC stores for Vila Real), and have more 'Food & Beverage' stores belonging to family-owned companies. Their centers are more traditional and have more 'Home' and M1 stores, whist their peripheries (especially Vila Real's) have fewer stores than their counterparts, although they have, relatively, more M1 and 'Restaurants & Cafés' establishments, revealing a more commercially 'traditional' landscape. Évora and Leiria have been less permeable to

large scale enterprises (although Leiria possesses many arcades) and have a poorer overall representation of 'Food & Beverage' establishments in the center, a sign of the amount of developed residential communities outside. Consequently they have more super- and hypermarkets chain stores in the periphery (especially Leiria). Yet, in the centers, for example, Leiria has more service and necessity goods for home and health, that is, the opposite of Évora's main commercial touristic, food-related and home/traditional landscape. The most interesting pairings, however, are Leiria/Vila Real and Aveiro/Évora.

Vila Real and Leiria have relatively stronger centers in terms of commercial activity, serving larger areas, represented by more perceptible smaller communities in the peripheries. Both cities, as a whole, have more stores in post 1975 buildings and similar shopping center and arcade patterns, even though this does not occur when centers and peripheries are analyzed in turn. Yet the centers of both cities (the least dense and with space for new development) were the ones who witnessed more growth, even though this also translates into more 'closed' and 'empty' store spaces. There are also very few activities which solely exist outside both these centers, although the reasons for this are different. In Leiria this is because of a wider range and an even distribution of activities (to some extent the same happens in Aveiro), and a greater consolidation, represented by a more continuous and spatial organization of residential neighborhoods. That is why Leiria has, for example, the same amount of MC and C stores in the center or more concentrations of 'Restaurants & Cafés' in the periphery. Even so, the commercial importance of areas close to the center may be diminishing (less M2 stores) or else the stores are grouping in multi-commercial facilities. On the other hand, in Vila Real there are few activities which exist solely outside the center because the city is very center-oriented. The periphery has only 30% of the city's stores and less than 40% of the city's services, and most activities are either in the center or in the 'extension' of the Europa and Universidade Avenues. Vila Real's commercial landscape is still characterized by specific types of stores (M1 and C) and a clear deficiency of services and high-order goods. The commercial strength of the *Rua Direita* has been maintained and the main activities/axes are still linked to this traditional center in a way that the 'new center' has not been able to replace. This is mostly because there are no connecting shopping ribbons, multi-commercial facilities are poorly linked with street shopping and the new center presents few or none multi-commercial facilities. Furthermore, there is a lack of real-estate development outside the center, as proved by the small number of stores (overall and those in post 1975 buildings), the small number of commercial 'islands', and the small number of shops in buildings with services. Furthermore, in this periphery the localities are more isolated (less connecting urban and commercial ribbons) and the stores are always farther apart (less clustered), more single-standing, practically all (80%) 'individual' and represent more traditional/specific activities, such as restaurants, cafés, home and car-related types (C). All this causes Vila Real's poor center and peripheral development, and justifies the difficulty in the transition to 'modern' formats. The city also does not possess an industrial area with the appeal of a shopping center. The only peripheral 'balance' is given by the 'extension', which has a great concentration of activities, open stores and even a large-scale multi-commercial space. This may not be a sign of growth but simply of compensating a flaw in the rest of the urban perimeter.

On the other hand in Évora and Aveiro the center stores are more closely connected through continuous shopping ribbons and the old main thoroughfares still withhold. This translates into more 'door to door' stores, especially in Aveiro (not only in the center, but also in the periphery), where the commercial clusters are more akin to residential areas. Both cities possess more MC stores, reflecting their well-established commercial centers. At the same time, their 'extensions' and 'main residential

areas' have more commercial strength, as they are more linked to the center. This justifies why both peripheries have more buildings with services, more chain stores and more M2 and S stores. In Évora this phenomenon is more striking and easier to understand. The new commercial and service thoroughfares have all developed outside the city wall, as the center is virtually unable to have new construction. In consequence this center has more 'traditional' activities, although a decreasing number is directly associated with resident population, being touristic-oriented instead (more restaurants than services for example). For the same reasons the activities outside the main axes are more dispersed and the free-standing locations (particularly regarding S stores) are also more common. Activities which prefer residential areas, such as services, and others which require space (both that the center could not hold) have established themselves in the periphery. The new poles of the outer ring present more 'door to door' stores and stronger commercial clusters, which are repeated in the rest of the periphery in the commercial 'island' model. Despite this, the peripheral commercial occupation of Évora is also constituted by many single standing and neighborhood-oriented stores, which also means more 'individual' stores. To this also contributes the city's very small permeability to multi-commercial spaces, that may be on the brink of changing, and the extensive industrial/commercial area South of the center. Aveiro, on the other hand, has the densest center, with strongly defined axes (that are not of new construction) and a great articulation between multi-commercial formats and street shopping. To this is added, despite the more erratic urban expansion of the periphery, a more diversified amount of stores and a massive representation of multi-commercial spaces (4 shopping centers) and services (Forca). The number of 'door to door' stores also reflects the linear commercial expansions and meaningful concentrations, in 'islands', in roundabouts and in thoroughfares.

9
MORPHOLOGICAL CHARACTERIZATION

9.1. OVERVIEW

As was mentioned throughout the thesis and stressed more carefully in Chapter 5, there are reasons to believe that the morphological characterization of the locations which possess commercial spaces is intrinsically connected to the very (commercial) nature of those spaces. That is the reason why in the previous two Chapters (7 and 8) the overall description of various morphological elements inevitably appeared when commercial spaces where being characterized. Because this occurred naturally it strengthens the hypothesis that the relationship between these two elements is symbiotic. In this Chapter, to complete the case-study analysis, a closer look is given to those morphological elements, so that the final links between the morphological and the commercial can be discovered. In accordance with the elements collected (described in Figure 27) this Chapter is divided in three major parts, relating to buildings, blocks and streets. The Space Syntax analysis gives an accessibility dimension to the characterization of streets.

9.2. BUILDINGS

9.2.1. HEIGHT

As mentioned before, one of the variables that was collected during the field work was the number of floors of the buildings the stores are in. The results are presented in Table 25, and the A3 maps showing buildings heights (just for buildings containing at least one store) are represented in Annex 15. Each store was considered individually, so the numbers (and the colors in the maps) do not relate to entire buildings, but to parcels, one for each store. This means that two stores (in a row) belonging to the same building count twice and not once. For example, when the Table shows, for Évora, the number of 0,6% (that is 10) related to 5 story buildings, this does not mean that there are 10 buildings, 5 stories in height, containing commerce, but rather 10 stores that are located each in a building with 5 stories, even if they are all in the same building. The graph on Figure 91 presents in a more visually appealing way, for the cities, the most common number of floors, the maximum number of floors and the floor average, associated to these store parcels.

Table 25 - Percentages of the number of floors of the buildings stores are in, by cities, by city centers (cen.) and by peripheries (per.)

	Vila Real			Aveiro			Leiria			Évora		
	City	Cen.	Per.	**City**	Cen.	Per.	**City**	Cen.	Per.	**City**	Cen.	Per.
1	**13,7**	7,4	27,9	**11,9**	3,6	22,9	**15,1**	7,1	25,6	**24,4**	7,0	40,6
2	**23,2**	20,3	30,3	**18,4**	20,0	16,6	**11,8**	9,4	14,8	**38,0**	47,7	29,1
3	**17,5**	19,9	12,2	**23,8**	29,3	16,2	**19,9**	23,4	15,5	**28,2**	38,6	18,6
4	**14,4**	13,5	16,2	**17,4**	16,5	18,5	**20,5**	21,9	18,6	**8,8**	6,7	10,7
5	**13,1**	15,2	8,5	**8,6**	7,3	10,4	**16,9**	15,1	19,3	**0,6**	0	1,1
6	**6,5**	9,3	0,5	**9,5**	12,5	5,6	**7,2**	9,9	3,6	**0**	0	0
7	**3,3**	4,7	0	**5,4**	6,1	4,7	**3,4**	5,3	1,1	**0**	0	0
8	**3,8**	5,5	0,2	**1,8**	2,0	1,5	**1,7**	1,9	1,6	**0**	0	0
9	**2,5**	3,3	0,2	**0,9**	0,2	2,0	**3,0**	5,3	0	**0**	0	0
10	**0,6**	0,4	1,2	**0,8**	1,2	0,3	**0,5**	0,9	0	**0**	0	0
11	**1,1**	0,2	2,8	**0,3**	0,5	0,1	**0**	0	0	**0**	0	0
12	**0**	0	0	**0,6**	0,6	0,6	**0**	0	0	**0**	0	0
13	**0,2**	1,3	0	**0,1**	0,2	0	**0**	0	0	**0**	0	0
14	**0**	0	0	**0,4**	0,1	0,8	**0**	0	0	**0**	0	0
TOTAL	**100**	100	100	**100**	100	100	**100**	100	100	**100**	100	100

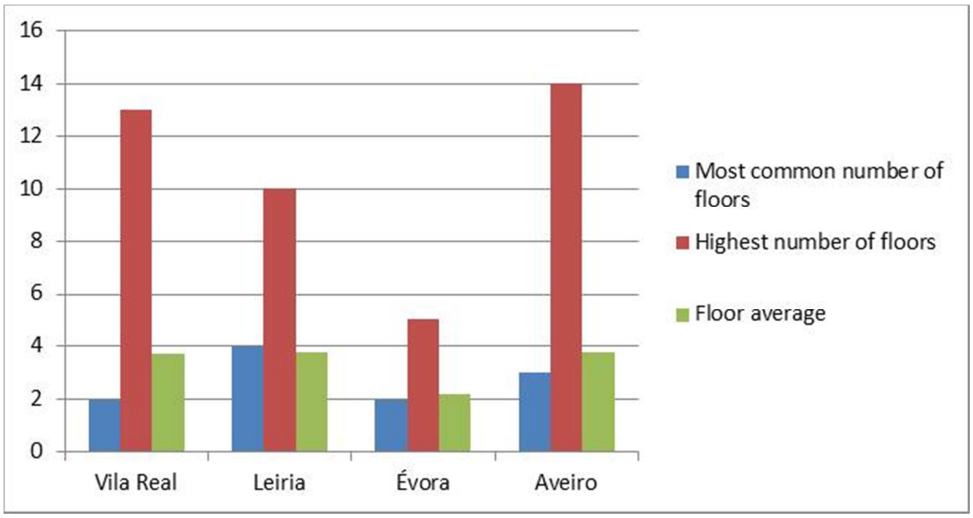


Figure 91 - Indicators concerning the number of floors of the buildings stores are in

Incredibly, considering all the stores in the urban perimeter, the floor average is exactly 3,7 in all cities but Évora (2,2). Actually, looking at the Table, it is clearly perceptible that Évora is the exception. Whilst the other cities can contain buildings with commercial spaces that have 10 or more stories, in Évora the maximum is just 5, and even this height just accounts for less than 1%. This is more than understandable in the center, a world heritage site, but the periphery maintains this height average. This is even more surprising when it is remembered that the population of Évora's periphery is the second highest, close to that of Leiria's periphery (37.000 inhabitants). Instead of high-rise developments close to the center which contrast with less endowed areas, Évora's periphery is more constant in construction and density, with three large, although low-rise, residential neighborhoods. But even in the other cities, the amount, either in the center or in the periphery, of higher buildings containing commerce, falls shy to the amount of low-rise ones (1-3 story), therefore the average remains between 3 and 4 floors. If on one hand this can be regarded as a consequence of the (medium-sized) nature of the case-study cities, on the other it can be seen as a predisposition of commercial construction. Even in the centers the most common number of floors is 3.

On the other hand, when just buildings constructed after 1975 are considered, the floor average stays constant in Évora but increases in the other cities (to 4,5). The obvious conclusion is that buildings constructed after 1975 containing shops are higher. These not only correspond to those present in the edge-axes of triple land use in the centers (which do not exist in Évora), but also to the multi-family high-rise peripheral buildings in which commercial 'islands' are located.

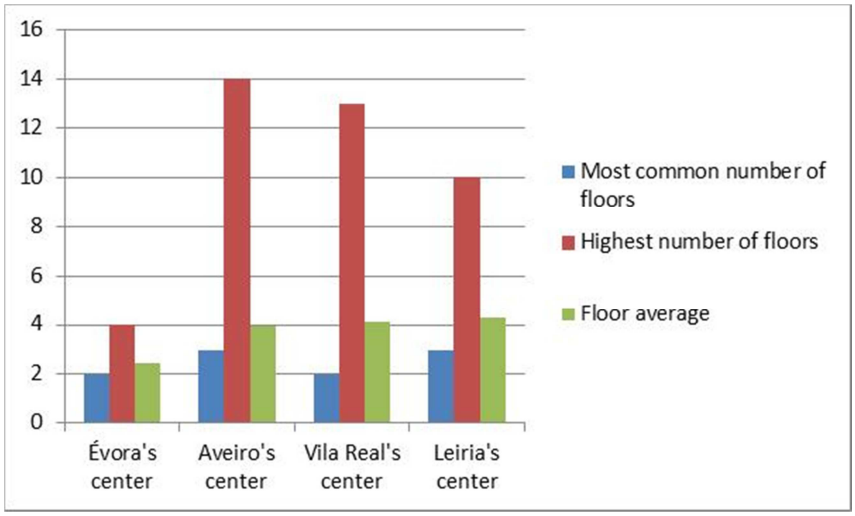


Figure 92 - Indicators concerning the number of floors of the buildings stores are in, for the centers

In the centers (Figure 92, Figure 93) the building-height average is obviously higher, but not much[300]. The areas in the centers with the lowest heights are those corresponding to single-family residential neighborhoods, which are in reduced number and don't possess any considerable amount of store spaces. The lowest heights in commercial buildings therefore usually occur in the traditional center, around *Rua Direita*. As there are very few 1 story buildings with stores (purpose built buildings) in the centers, as discussed earlier in store 'integration', most of the commercial buildings in these 'traditional' areas possess 2-3 stories. These account for 30-40% of the stores in Leiria and Vila Real (cities with well-defined and contained 'traditional' centers), 50% in Aveiro's center (because of the

[300] It increases in about 0,3 to become 2,5 in Évora's center and around 4 in the others.

prolongation of the traditional commercial axis to the South) and, justifiably, over 85% in Évora's center. Near main squares they can have one or two floors more, and that is why a contrast is perceptible in Évora's central Giraldo Square.

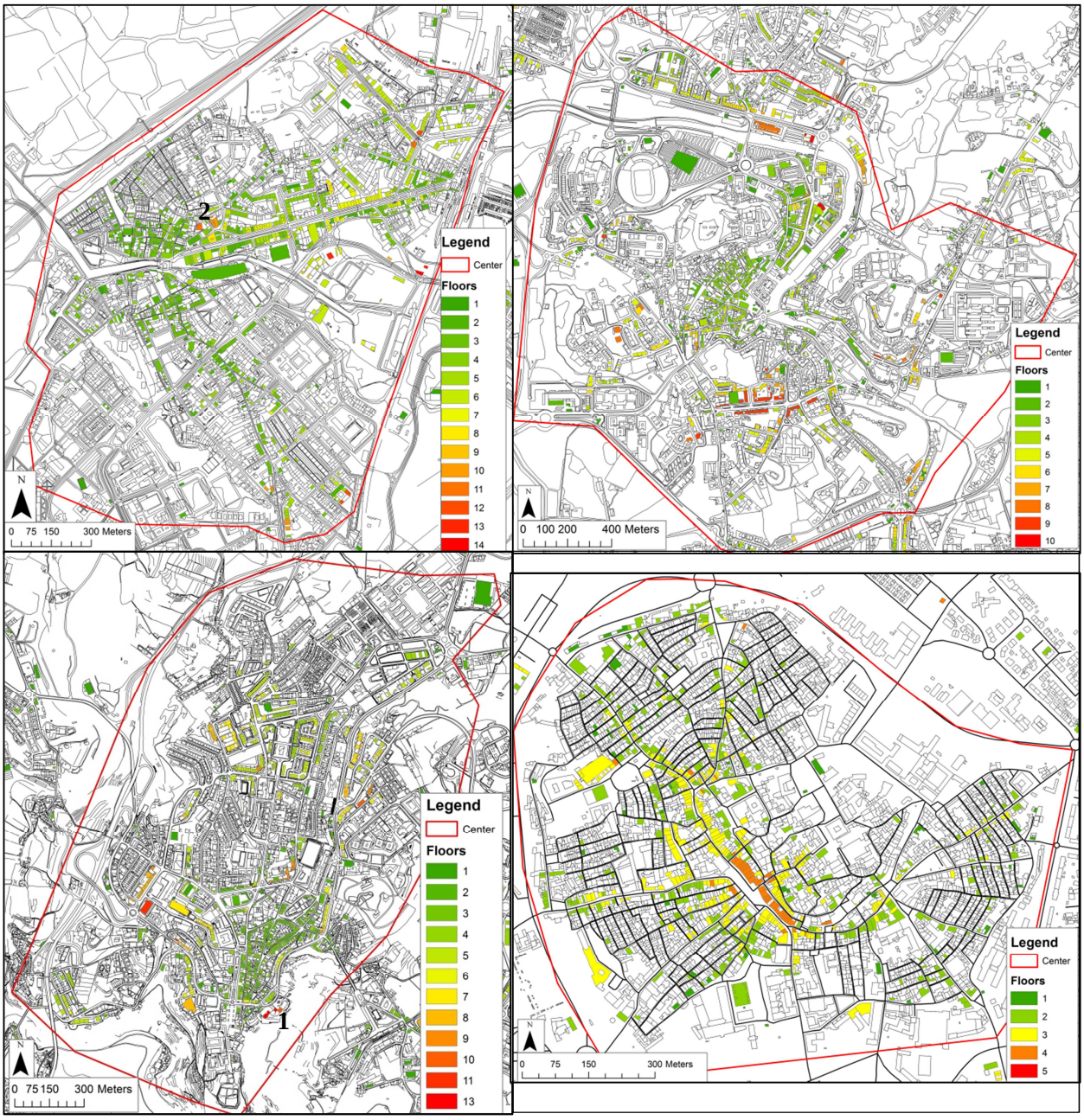


Figure 93 - Number of floors of buildings containing stores in Aveiro's, Leiria's, Vila Real's and Évora's city centers

This is also why the activities and categories (Table 13, Table 15) associated with the traditional centers are also the ones which are more akin to buildings with lower heights. More than half (and almost 100% in Évora) of the 'Restaurants & Cafés' are in buildings with 3 stories or less[301], and so

[301] The numbers are 97% in Évora's center, 67% in Aveiro's and around 50% in Leiria's and Vila Real's centers. The above mentioned confinement of the traditional areas of both these centers and the fact, already proved, that these are the centers which most have grown, may be the cause for the lower percentage.

are over 80% of the 'Fashion' and MC stores (in Vila Real and Évora), and *all* of Évora's 'Food & Beverage' establishments. In all centers but Leiria's, around 80% of the 'Hygiene and personal care' stores are also in 2-4 story buildings. On the other hand, only in Aveiro's center do M1 stores favor more clearly low-rise buildings. This may be caused by the extended traditional center axis and the tighter relationship between the city's commercial axes and the residential neighborhoods[302].

The rest of the buildings containing commerce in all centers but Évora's have mostly between 4 and 6/7 floors in height. These are associated to the new axes which constitute either the commercial linkages or the edge-thoroughfares. Therefore, obviously, just considering buildings constructed after 1975, the floor average increases to 5,3. These multi-family buildings containing more than often the three different types of occupation will obviously favor activities and categories like 'Services and other activities'[303], S stores or 'Home Appliances and electronics'. And it is in Leiria that these occupy buildings with higher number of floors[304]. This is because, although in this center there are no buildings with more than 10 floors, it is precisely here that more continuous rows of commerce in larger buildings (rather than isolated incidents) are perceived. This occurs for two reasons. First because Leiria's center has the most relevant edge residential/commercial/service thoroughfares. Whilst the 'linkages'[305] hardly have buildings with more than 7 floors, the edge-thoroughfares[306] generally have between 8 and 10, and these are much more common in Leiria. For example, the amount of stores in 10 floor buildings in Marquês de Pombal Avenue is highly perceptible in Figure 93. Second because in Vila Real and Aveiro higher buildings (over 10 stories) are usually isolated incidents. Vila Real, contrasting with its traditional center and lack of peripheral real-estate development, has seen sporadic cases of uncontrolled investment and enormous building heights. What is worse, these occur mostly close to the traditional city center[307]. In Aveiro these are associated to service and commercial arcade buildings in Conselheiro Luís Magalhães Street (2) or, for example, to the new residential developments in the former industrial area, East of the city center.

Because of the dual division of heights between 1-3 stories closer both to traditional centers and residential areas, and 4-7 stories in the new commercial axes (to which is added slightly higher heights in specific locations) most activities and categories have practically a 50-50 distribution. 'Home', 'Leisure and culture', M2 and M1 stores, for example, have practically 50% of the stores in 1-3 story buildings and the rest in 4-7.

In the peripheries, building height average obviously decreases[308] (Figure 94) due to the amount, not only of low-rise buildings in 'residential' and 'isolated residential' areas, but also of 1 story warehouses in 'commercial/industrial' areas. The average only slightly increases when just buildings

[302] In this center over 50% of S and 'Food & Beverage' stores are also in 1-3 story buildings.
[303] With the exception of Évora's city center, 60% of 'Services and other activities' are in 3-6 story buildings and 30% are in over 6 story buildings.
[304] For example, 60% of 'Home appliances and electronics' stores and 51% of S stores are in 4-7 story buildings in Leiria's center.
[305] Such as Aveiro's Dr. Lourenço Peixinho Avenue, Leiria's Heróis de Angola Avenue and Vila Real's 1º de Maio Avenue.
[306] Like Leiria's Marquês de Pombal Avenue and Dr. Adelino Amaro da Costa Avenue, Aveiro's Força Aérea Avenue or Vila Real's Cidade de Orense Avenue.
[307] The Miracorgo area (signaled with '1' in Figure 93), for example, has 13 story buildings, shielding the traditional center from the valley landscape.
[308] In Évora's periphery, each store is in average in a building with 2 floors, whist in the other three peripheries the average is 3,2.

constructed after 1975 are considered. Even though commercial 'islands' are in medium-rise multi-family residential neighborhoods, new constructions have also complemented pre-existing commercial axes and therefore have mostly kept the pre-existing building heights. The peripheral demands are also limited (with the exception of a few areas in the 'extensions'), and therefore greater building heights would be out of place.

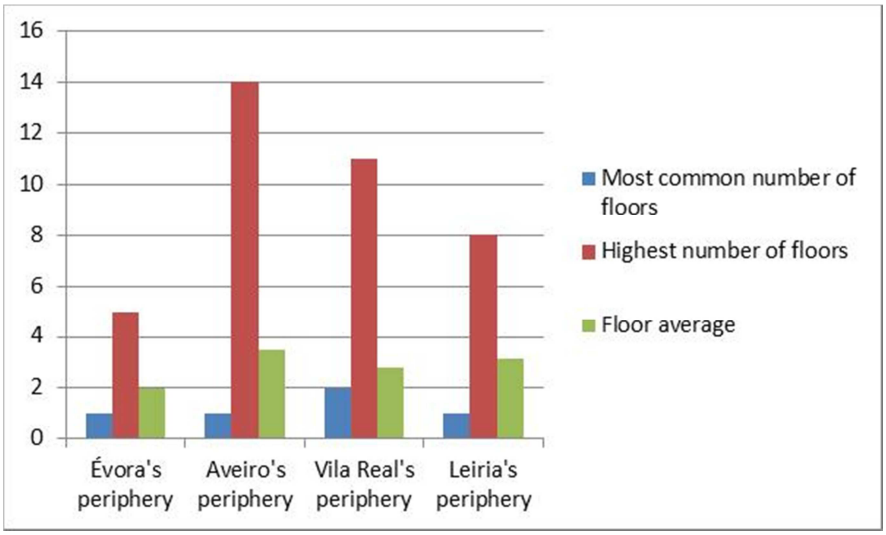


Figure 94 - Indicators concerning the number of floors of the buildings stores are in, for the peripheries

Heights therefore vary according to the type of commercial occupation and the type of function of each hierarchical area. In the 'extensions' of the city centers, close to the main thoroughfares, multi-family buildings (many also possessing services) have about 4-6 stories in height. Commercial 'islands', throughout the peripheries, even if not facing main axes, will follow this model. Occasionally there are exceptions, particularly if the 'extension' is more linked to the center, and therefore higher number of floors can appear[309]. Table 16 and Table 18 show that MC stores, as well as 'Hygiene and personal care', 'Home appliances and electronics' and 'Food & Beverage' prefer higher buildings. But this can be deceiving, because these store types are practically non-existent in 'isolated residential' areas, so it is natural that they show predisposition for higher heights. On the other hand, other store types may also favor higher buildings, but because they also exist in other low-rise areas, their percentages will obviously decrease. This is the case of 'Services and other activities'. As it was seen in the previous Chapter, this activity is present in most commercial 'islands' and important roundabouts of the periphery, in the form of special types of services, such as 'hairdressers' or 'banks'. But because there are other types of services (car-related for example) in 1 story industrial areas, this activity will not show a preference for higher heights. Even so, it is relevant to note that multi-comparison shopping needs clustering (which can only be found in the 'islands', hence in higher heights) and that 'Food & Beverage' establishments are still in majority in higher buildings, despite the existence of 'traditional' minimarkets and grocery stores, and of larger facilities in 1 story warehouses. This denotes, once again, the growth in importance, particularly in Portugal (as stressed in the literature review), of the neighborhood supermarket, which seeks the most important residential

[309] Both in Sismarias and Europa and Universidade Avenues 8 story buildings appear, whilst in the 'extensions' of Aveiro, due to their affinity with the center (and the center's lower amount of high-rise residential buildings), the number of floors can be over 10.

areas. 'Fashion' has also a particularly high concentration in 4-7 story buildings in Vila Real, but like the case of other activities in this city, it is a consequence of being almost exclusively in the 'extension' Europa and Universidade Avenues. Notwithstanding, all the 'extensions' also possess low-rise areas, therefore 40% of the stores in these locations are in buildings with less than 4 stories[310].

Outside the 'extensions', there are no stores in buildings over 5 stories in Évora, and hardly any over 7 stories in Leiria and Aveiro. In Vila Real, high-rise buildings sporadically appear as isolated monoliths in an otherwise low-rise landscape. In 'main residential' and 'residential' areas the same pattern as in the 'extensions' is found, although the weight of low-rise areas continually increases. The average height of a building with stores is 4-6 floors, in 'main residential', or 3-5, in 'residential' areas. This height is more elevated in particularly relevant commercial clusters[311], and when the commerce in a given area is practically all in the 'islands', the percentage of stores in buildings over 4 stories likewise increases. Marinheiros, for example, has 77% of its stores in 4-5 story buildings. The other 'main residential' and 'residential' areas have a more even distribution of stores between medium-rise and low-rise buildings. These last ones will appear closer to residential or traditional areas, and therefore their percentage will increase according to how 'residential' and 'traditional' the area is. Consequently, the percentage of stores in low-rise buildings is over 60% in the 'main residential' areas of Vila Real and Évora (the cities with less buying power) and in all city's 'residential' areas. The residential suburb of Bacelo, for example, has 75% of stores in 1 or 2 story buildings, a percentage slightly higher even than other traditional localities of lower hierarchical layers in other cities.

In 'isolated residential' areas most stores are in low-rise buildings. In Évora's and Aveiro's 'isolated' areas, heights in residential buildings can eventually go to 3 or 4 floors, but the reasons for this are obvious. In both cities these areas are not closed on themselves and relate to more than one hierarchical layer. Therefore, they receive influences from the 'residential' and 'industrial' areas. In Leiria and Vila Real, on the other hand, these localities were villages before slightly growing and becoming part, as a construction and growth pre-investment, of the urban perimeter. In many, or most, of these areas, the urban development suitable for areas inside the urban perimeter has never materialized. Therefore, in most of these areas[312], commerce is practically on its own (single standing) either in purposely built buildings (1 story) or in 2 (seldom 3) story residential buildings. Almost 90% of stores in these areas are in 1-2 story buildings. It is because of the influence of these areas that M1 stores, in the peripheries, show a clear preference for low-rise buildings.

C stores (mostly 'Home') are the other category which shows a preference for low-rise buildings. This is perfectly justifiable knowing that these store types are common in 'industrial/commercial' areas, where the most usual building type is a 1 story warehouse. Both in Parceiros and Almeirim and Horta das Figueiras, building heights can increase, but this is because of the existence of residential pockets amidst the industrial/commercial axes.

[310] In Sismarias and in the Europa and Universidade Avenues these are close to the train station, and in Esgueira they are in the old center, as depicted in Figure 48.
[311] In Marinheiros and Telheiro there are 8 story buildings, in Borbela and urban Mateus there are 9-11 story buildings, in Parada de Cunhos an 8 story multi-family building with stores appears in the area closer to the center, and in São Bernardo Road 7 story buildings can be found.
[312] Gândara de Olivais, Andrinos, Pinheiros, Mateus and Arroios.

9.2.2. AREAS AND VOLUMES

As mentioned before, a 'store' and its characteristics were inserted into the model in the rectangle that depicted the building the store was in. It was assumed that the store covered the whole footprint of the building, except when a building possessed more than one store space. In this case the building was divided into equal parts, once again except when it was clearly perceptible that one store occupied a much larger area than another. Therefore, in the ArcGIS model it is possible to calculate store areas. Furthermore, because to each store is associated the number of stories of the building it is in (and considering that each floor is 3 meters in height), building volumes can also be obtained. These areas and volumes will obviously not translate real figures. First because the stores *do not* cover the entire footprint of the building, so the areas will always be greater than the real ones. Second because when a building possesses more than one store or service space, its total building volume will be divided by as many parcels. If one of those spaces is a non-commercial service, for example, the total area of the building, as calculated in this research, will miss a parcel, that is, it will be smaller than the real value.

Even so, it is assumed that these values represent reference figures that not only should be of the same order of magnitude as the real numbers, they also allow for a comparison between cities and city areas, because they have all been calculated in the same way. Consequently, the average numbers for the cities, the centers and the peripheries, of the area, the height and the volume of the buildings stores are in, are presented in Table 26. The 'volume per building with store' was calculated by dividing the 'overall building volume' for the 'number of buildings'. The 'overall building volume' was, in turn, calculated as the sum of the partial 'building volumes' associated to *each* store. Therefore, this variable can present the problem mentioned in the previous paragraph, for buildings possessing more than one store or service space.

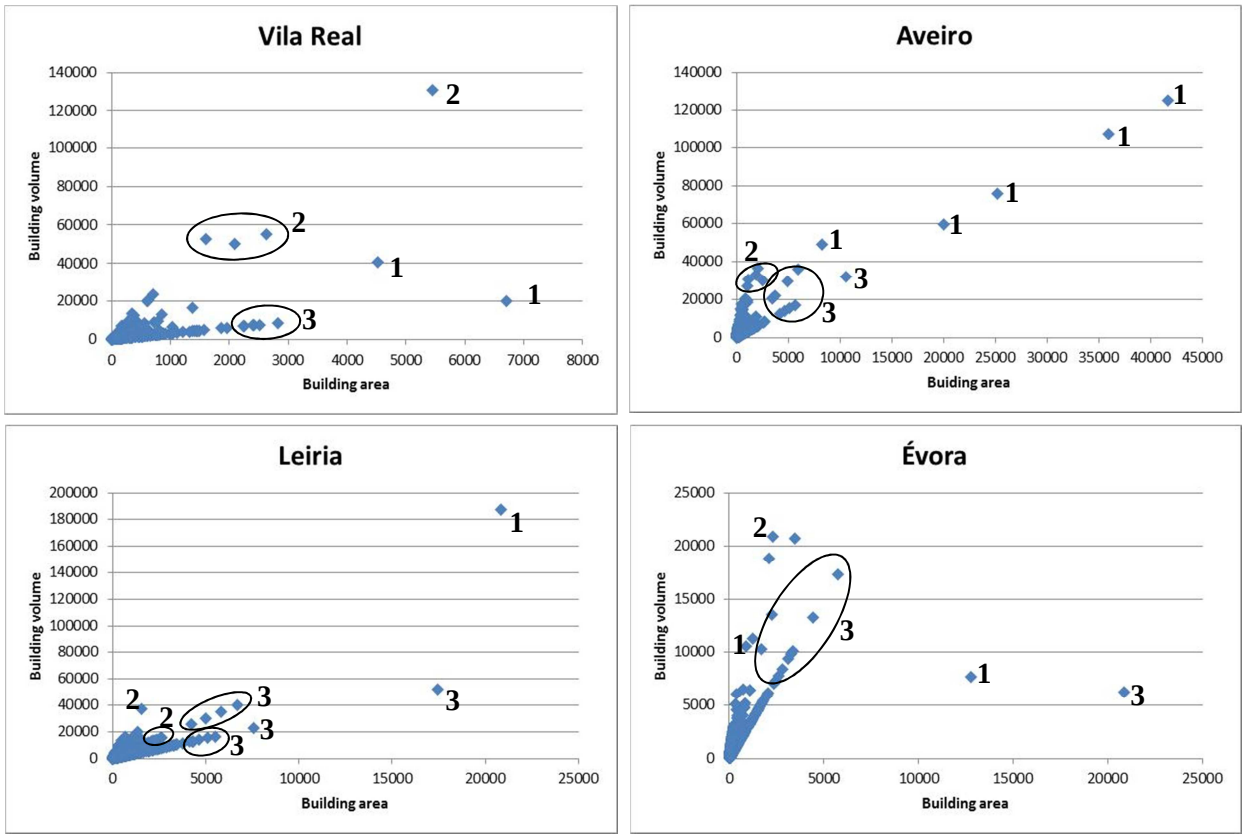
Table 26 - Average area, height and volume of the buildings the stores are in, by cities, by city centers (cen.) and by peripheries (per.)

Cities		Vila Real	Aveiro	Leiria	Évora
Average store area (m^2)	**City**	**183**	**258**	**244**	**204**
	City center	140	147	144	101
	Periphery	292	403	376	300
Average number of floors	**City**	**3,71**	**3,76**	**3,77**	**2,23**
	City center	4,1	3,97	4,26	2,45
	Periphery	2,82	3,49	3,14	2,03
Volume per building/parcel with store (m^3)	**City**	**1.891**	**2.055**	**2.005**	**1.080**
	City center	1.768	1.738	1.710	736
	Periphery	2.287	2.471	2.405	1.264

In chapter 6.2.2. it was shown that there was a distinction between the overall commercial areas of Aveiro and Leiria, and those of Vila Real and Évora. In the first two cities there is about 600.000 m^2 of commercial floor-space (or rather commercial building footprints) whilst in the other two there is about half of that area. It was also stressed that these differences seemed logical because all cities had

practically the same number of stores if the differences in the numbers of inhabitants and in the urban perimeter areas were taken into account. Yet looking at the average store area, that is, the total commercial area divided by the number of stores, the differences between the two groups of cities remain. There are, in average, 50 m^2 more per store in Aveiro and Leiria than in the other two cities. This can mean that the buildings containing stores in Aveiro and Leiria are larger (and theoretically more modern), but also that these cities possess more multi-commercial spaces (which is true), naturally of greater area. Consequently, even though there is an uncanny similarity in the average commercial building height in all cities but Évora (an incredible 3,7), the overall building volumes, and the building volumes per store, will continue to show the distinction between the littoral and the interior cities. In Leiria and Aveiro the volume of the buildings containing at least one store space reaches an amount of almost 5.000.000 m^3, that is, about 2.000 m^3 per store parcel. Because of the increased height average in Vila Real, the total volume will be slightly more than half of that in Leiria and Aveiro (2.700.000 m^3), whilst in Évora, for the inverse reason, it will be less than half (1.900.000 m^3). But once again, Vila Real presents an almost similar indicator per parcel to that found in Leiria and Aveiro, whilst Évora presents a lower one.

Like in the work of Yoshida and Omae (2003), analyzed in the literature review, areas and volumes can be plotted so that patterns and outliers can be understood (Figure 95).



1. Shopping centres / 2. Commercial arcades / 3. Individual warehouses (industrial areas/markets/chain stores)

Figure 95 - Store distribution by area and (partial) building volume

Considering all the stores in the city it is perceptible that their distribution per area and volume follows various linear distributions. This symbolizes not only the smooth increases and decreases of building

height from area to area, but also the same phenomenon in terms of building footprints, from more confined ones in the centers, to more expansive enterprises in the periphery.

The outliers are obviously large scale shopping centers. They often have reduced heights (2-3 stories) but possess large footprints. But even their 'growth', as is clearly perceptible in Aveiro's graph, follows a linear logic. Commercial arcades usually are located in high-rise multi-family buildings, but because they are mostly in the centers, their building areas are more reduced. The inverse happens with 1-2 story warehouses, generally belonging to industrial areas or 'extensions'. Large scale stores such as AKI or MediaMarkt possess large areas but small heights. Excluding these outliers, the store types which are at the edges of the more compact point 'cloud', because they have larger areas, larger volumes (location in higher buildings) or both, are those belonging to 'Services and other activities' and 'Home'. Both these store types are common in industrial areas, yet they also locate in commercial 'islands', roundabouts and in the commercial/service/residential axes of the center. It is 'Service and other activities' which is, with very few exceptions, the activity that occupies the greatest commercial area in all localities[313].

Looking specifically at the centers it can be seen that, although Leiria's and Aveiro's have more stores and more floor-space, Vila Real's center has practically the same average store area, average building height, and volume per building or building parcel[314]. These similarities, added to all others found so far, are extremely revealing. Regardless of the strength of the regions and the role the city centers performs in the urban perimeter, the commercial landscape, the activity distribution and the direct morphological variables associated to commercial buildings are *indeed* similar. These values may once again be proposed as references for Portuguese medium-sized city centers. Évora's city center, however, smaller and with small building heights, will always present lower indicators. This, due to the circumstances, can be viewed as a justified exception. Furthermore this center also possesses a distinctive dissimilarity to all others. Whilst 'Services and other activities' is the activity which occupies the greatest amount of commercial area in the other centers[315], in Évora's it is 'Restaurants & Cafés' which occupies the largest area (27%). This just corroborates the conclusions made above about the role Évora's centers is currently performing.

Once again, areas and volumes can be plotted. These graphs (and also those for the peripheries) are displayed in Annex 16. Like in the city-scale analysis, these graphs reveal that in the centers stores are grouped in several linear distributions, especially where the point 'cloud' is densest. The greatest outliers are obviously once again the multi-commercial spaces. Shopping centers have larger areas and reduced building heights[316], whilst shopping arcades are in high-rise buildings. In Vila Real's center, for example, it is clearly perceptible that the in-city commercial arcades are in buildings whose height clearly contrasts with the average. What the center graphs reveal, however, that the city graphs did not, is that 'Food & Beverage' establishments also favor larger areas and volumes. Fairs and markets, considered as 'Food & Beverage', are farther from the point 'cloud' and appear isolated in Leiria's

[313] Considering the cities as a whole, this activity is responsible for 35% of the commercial area in Leiria, 32% in Vila Real, 28% in Évora and 26% in Aveiro.
[314] Respectively, about 140 m^2, 4 and 1.700 m^3.
[315] 26% in Vila Real's, 22% in Aveiro's and 29% in Leiria's.
[316] The volume of Forum, in Aveiro, may appear excessive but that is because, above the two floors relating to the shopping center, there are other floors of services and residences.

and Évora's graph[317]. On the other hand, those closer to the denser point 'cloud' relate mostly to chain supermarkets. This confirms their predisposition to be located in high-rise multi-family buildings, as had been suggested before. 'Services and other activities' and 'Home' are also the other activities which appear at the edges of the denser 'cloud'. 'Banks' is, in this case, the sub-activity which is most prominent, as it also favors multi-family high-rise (modern) buildings. In a second ring, closer to the core of the 'cloud', 'Restaurants & Cafés' and 'Leisure and Culture' establishments appear. These have, particularly, lower areas and larger volumes. This corroborates the fact that both these activities locate one turn away from the main axes, closer to residential areas, and in the main intersections/roundabouts. The rest of the activities are more difficult to discern, as they are closer to the core of the 'cloud'.

Considering now the peripheries, it can be seen, looking at Table 26, that once again, even though the total commercial area, average store area and total building volume in Vila Real's periphery is much lower than that of Aveiro's and Leiria's, surprisingly the average number of floors and the average volume per building or building parcel is similar in these three peripheries (around 2.400 m^3) [318]. This can have two explanations. First there is a reduced number of stores in Vila Real's periphery (the denominator). If this explains the average, it does not explain the overall volume amount, that is smaller than in the other cities, but not proportionally. So, second, although there are very few commercial 'islands' and large scale multi-family buildings with stores in Vila Real's periphery, and although most of the landscape of the residential areas is constituted by traditional low-rise buildings, there are nonetheless two exceptions. The first is the 'extension' of the Europa and Universidade Avenues, which contains not only large rows of multi-family 4-6 story buildings, all of which possessing stores, but also a large scale shopping center. The second is the fact that the few existing commercial 'islands' have indeed unnatural great heights (10 floors or more), as mentioned in the previous section. Both these elements drastically increase the volume average per store parcel of commercial buildings. If before it was mentioned that there was a deficiency of stores in Vila Real's periphery, maybe the similarity of these indicators may restore some balance to the deductions made, and help justify why the periphery is still functioning commercially. Yet this is, nonetheless, a segregated periphery, with densely concentrated commercial pockets and a much reduced commercial dynamic in the rest of the area. In Évora, the average volume is about half of the value for the other three peripheries, which can be assumed to be a consequence of the low building height average.

Looking at the areas and volumes graph presented in Annex 16, it is with no surprise that multi-commercial establishments once again are seen to constitute the major outliers, followed by the 'industrial/commercial' area warehouses, most notably those of 'Services and other activities', 'Home' and 'Food & Beverages'. The extremities of the core 'cloud' are generally composed by other stores of these three activities, which will inevitably be associated to the most relevant commercial elements of the peripheries, namely the commercial axes of the 'extensions' and the 'commercial islands'.

[317] In Leiria, for example, this outlier relates to the fair ground near the city's football stadium. Therefore this is not a permanent structure, but rather a weekly or monthly temporary structure.

[318] Vila Real's periphery has only half of the stores of the other three peripheries, and hence the lowest total commercial area, amounting to just 125.000 m2 (against 270.000 m2 in Évora's periphery and 400.000 m2 in Aveiro's and Leiria's). Along with Évora's periphery, it presents about 300 m2 per store, whilst Leiria's and Aveiro's have close to 400 m2. Likewise, the total commercial building volume for Leiria's and Aveiro's peripheries (2.500.000 m3) is almost 2,5 times greater than that existing in Évora's and Vila Real's peripheries.

'Services and other activities' is, once again, the most representative activity in terms of area weight. Its amount varies from about 20% to almost 60% in some 'industrial/commercial' areas. Nevertheless, exceptions appear both in Évora and Vila Real, where obviously, by what has been discussed in the previous Chapter, 'Restaurants & Cafés' appear as the activity occupying the greatest area. These are either extremely isolated or traditional areas, or else almost exclusively residential[319]. The only locality in all the four cities that does not have in 'Services and other activities' or 'Restaurants & Cafés' the most representative activity, area-wise, is Parada de Cunhos. 'Home' amounts to 38% of the commercial area, something which can be a consequence of the proximity to the center, the existence of a very thin first necessity commercial structure in the traditional main intersection and the recent construction of a large residential neighborhood.

The deductions made in this sub-chapter corroborate, to some extent, the works of Yoshida and Omae (2003). Even though only buildings containing commercial spaces were analyzed (and so a comparison with exclusively residential or service buildings cannot be done) the truth is that indeed there is a wide range of areas and volumes in buildings containing commerce. In the peripheries, commercial buildings have indeed larger area and larger volume, and in the case of commercial 'islands' in multi-family buildings, also bigger heights. This is easily explained by the fact that in the peripheries over 2/3 of stores are in post 1975 buildings. Whilst the weight of pre-existing commercial rows in traditional main streets is practically insignificant in terms of area and volume, the morphological weight of the 'extensions' and of the 'industrial/commercial' areas is much more substantial. Yet the same deductions do not seem to apply to the full extent of the centers. Yoshida and Omae (2003) argue that buildings with low cubic content are economically pointless and small volumes either of blocks or buildings are few in commercial zones. If this model may be valid for strong CBDs of incredibly large cities like New York or Tokyo, in the small 20 km^2 Portuguese medium-sized cities with 2 km^2 centers this is more difficult to withhold. These cities have first considerable smaller influence areas, either in the peripheries or in the surrounding region, second clearly defined traditional commercial centers, even if they have been to some extent replaced, third seldom more than 10 floor heights, and fourth very few exclusively service or commercial buildings. Not only is the majority of commerce in contained residential or residential/service buildings, also only a parcel is in the 'new centers'. As seen in Table 8 less than 50% of the stores in the centers are in post 1975 buildings. This number is even smaller in Aveiro (27%) and in Évora (1%). Therefore, in these cities, only small areas in the centers follow the model proposed by the above mentioned authors. Here, in the new expansion commercial axes, high-rise buildings containing commerce and services appear in larger blocks, with the stores selling 'Services and other activities', 'Home', and to a lesser extent 'Food & Beverages' and 'Leisure and culture' products. The rest, or rather the majority of the stores (in the denser area of the point 'cloud' following linear volume/area distributions) are

[319] In Bacelo, the low-rise residential locality North of Évora's city center, 'Restaurants & Cafés' represent over 1/3 of the commercial area. This is because the service agencies are located closer to the center, mostly in Malagueira, and 'warehouse' services are concentrated in the opposite side of the urban perimeter in the industrial/commercial area of Almeirim and Horta das Figueiras. Bacelo has practically no other function than being a residential suburb, so it has only first necessity commerce. On the other hand, the localities in Vila Real's periphery that do not have in 'Services and other activities' the major contributor to the commercial area are more, stressing the lack of services outside the center. Constantim, Mateus and Arroios, and Folhadela, all traditional residential localities with a residual amount of stores, have respectively 43%, 56% and 75% of their commercial area allocated to 'Restaurants & Cafés'.

located in smaller commercial buildings, either in area or in volume, mostly in residential or mainly residential localities, or in low-height traditional commercial centers.

9.2.3. AGE

The variable 'building age' (notably in terms of the distinction between pre and post 1975 buildings) has been constant and crucial in all the analyses made in this and in the last two Chapters. Therefore, it would be redundant to repeat them thoroughly in this sub-chapter. Instead, the main conclusions about the influence of building age in the commercial and morphological characterization of spaces are presented. These are as follows:

- About half of each city's stores are located in buildings constructed after 1975. In Leiria these are slightly more (60%) and in Évora slightly less (40%). These buildings, which have accommodated the city's urban, demographic and economic growth of the past 30 years, have not simply offered a competitive alternative in newer areas to the pre-existing store spaces in traditional buildings. They have both created new commercial zones in new urban areas, or else offered extensions and complements to the pre-established commercial offer. Here, they have filled vacant urban lots or replaced older construction, introducing activities in areas that before were either utterly dependent on the city center or else presented only a type of local, first necessity retail.
- In the city centers it is clear that the growth of commercial spaces has followed land development, namely that of residential multi-family buildings with stores on the ground floors, which have produced new commercial concentrations and/or ribbons. In the centers of Vila Real and Leiria, which have had more space for growth, distinctive 'new centers' have been created. That is why in these two cities the percentage of stores in buildings constructed after 1975 still orbits 50%. In Aveiro (27%) and in Évora (1%) this percentage is much more reduced. In Aveiro the main traditional commercial axes were well established and have grown over the past century, despite the more recent edge-of-center commercial/service/residential construction. In Évora, the center is completely defined and constitutes a world heritage site, so new construction is practically not allowed.
- In the peripheries, there is an uncanny similarity in the percentage of stores located in post 1975 buildings. In all cities but Vila Real (66%) this percentage is 72-75%. The new buildings have been fundamental to the creation of new peripheral commercial poles, changing centralities, and, theoretically, increasing the peripheral accessibility, because they have helped to shape new axes/thoroughfares. Yet the expansion/penetration of these new buildings has not been similar, and varies inversely to the distance to the center. Isolated residential areas hardly changed their morphological and commercial structure, whilst some main residential areas, extensions of the city center and industrial areas are almost completely new. In intermediate areas, even though the traditional rows still exist, commercial centralities have shifted, attracted by the more convenient conditions and the proximity to a larger clientele offered by newly constructed commercial 'islands'.
- The newly constructed axes (or the pre-existing axes enhanced by new construction) assume paramount importance; they are the distributors of development throughout the peripheries (linking it with the center), and most localities (and stores) have grown, developed or have been formed around/facing them. Yet new high-rise, multi-family

buildings inside the residential neighborhoods (even if in out-of-the-way streets) have contradicted this commercial expansion logic, as they have been erected with rows of store and service spaces (commercial 'islands'). Unfortunately, not all of these real-estate ventures have been successful.

- There is a greater tendency for 'modern' stores to be located in post 1975 buildings. Actually, the number of 'modern' stores in the city centers has increased depending less on the amount of permeability to multi-commercial spaces and new commercial formats and more on the degree of development, that is, on the amount of newer buildings. These mean growth, clientele (inhabitants), services, more appropriate spaces for commercial amenities (such as esplanades) and new store layout formats. In the peripheries this dependency is less evident. New residential areas are served by new commercial 'islands' that were constructed simultaneously, so they have not affected the limited market influence of 'traditional' stores in isolated residential poles. If on one hand this phenomenon has not hindered the existence of this 'traditional' network, it has, on the other, failed to supply it with sufficient momentum for its update.
- Practically all, if not all multi-commercial buildings (inherently modern) are of recent construction.
- New buildings have also given a more 'clean' spatial organization to commercial spaces, as well as a continuity (door to door). When just post 1975 buildings are considered, the percentages of 'door to door' stores immediately increase and those of 'single standing' stores decrease. The axes and new thoroughfares that new construction has created have formed continuous rows of commercial spaces (more perceptible, for example, in Aveiro). Furthermore, new construction has also served as a linking element, not only between commercial areas (the older and the new center for example) in terms of shopping linkages, but also, at a smaller scale, between stores or groups of stores (by filling empty urban lots or replacing derelict construction). By also structuring strategic locations (such as roundabouts or intersections) and producing commercial clusters (islands) new construction (which usually entails more than one store space per building) has significantly increased the number of 'door to door' stores in the peripheries.
- New construction has supplied a balanced commercial offer, that is, the percentages, when just buildings constructed after 1975 are considered, do not significantly change, with a few exceptions. In the centers, the activities which need more space, centrality and a vaster number of clients obviously drift to the linkage axes, 'new centers' and the edge-axes of more recent construction. The activities which show a clear tendency for post 1975 buildings are 'Services and other activities' and 'Home appliances and electronics', whilst the categories which show this preference are C and S. 'Fashion' (MC) and 'Restaurants & Cafés' are usually in older buildings, as they are a prerogative, not only of traditional commercial axes (historical areas), but also of family-owned (individual) companies. In the peripheries, modern buildings have once again been crucial for development, as they have been able to supply a variety of activities and services generally not found in traditional centers still characterized by food and first necessity stores. Here therefore, with the exception of M1 stores (mainly 'Restaurants & Cafés'), and S stores just in Aveiro, all categories favor post 1975 buildings. By discovering that in most localities practically all store activities and categories are preferably in recently constructed buildings, then the importance of these buildings in the creation of the commercial landscapes of the suburbs can be easily understood.

- New buildings will obviously also attract more 'chain' stores than older buildings. Not only do these stores prefer the commercial/service/residential axes of the center (linkages and edge-axes) but also, when in the suburbs, the commercial 'islands', where commerce and a greater number of residents cluster. Furthermore, multi-commercial spaces and most industrial areas, usual places for the location of 'chain' stores, have also been constructed in the last 20-30 years.
- Building age also influences building height, or rather, all higher buildings are of more recent construction. This is true for all case studies but Évora, because of the restrictions of the construction in height and the city's own necessities. When just buildings constructed after 1975 are considered, the floor average, for the entire city, remains constant in Évora but increases in the other three cities (to 4.5). Higher buildings include those present in the edge-axes of triple land use of the centers (which do not exist in Évora), and also those, in the periphery, in which commercial 'islands' are located. All of these are of recent construction. If in the centers (for Leiria, Aveiro and Vila Real) the building average in post 1975 buildings increases even more (to 5,3) in the peripheries it only slightly increases. This is because new construction has also complemented pre-existing commercial axes and therefore it has mostly kept the pre-existing building heights. The peripheral demands are also limited (with the exception of few areas in the 'extensions'), and therefore greater building heights in new construction would be out of place. Building volumes, naturally, are also greater in post 1975 buildings.
- The variable 'post 1975 building' does not influence directly a store's web-connection as much as it could be expected. Web-connection is much more dependent on the classification of a store as 'modern' or 'traditional'. But because most 'modern' stores are preferably (or mostly) in post 1975 buildings then there is an indirect link between these two variables.
- New buildings also have a greater tendency to accommodate stores in the upper floors. This is because these stores are in 2-floor commercial rows or in the upper floors of service buildings, commercial buildings or, more rarely, medium-rise residential buildings. All these building types relate to more recent constructions.
- Lastly, it should be stressed that the appearance of new buildings with commercial spaces is not always a consequence of a market need, but rather of an economic investment, that sometimes can fail to have the expected return. The consequence is the appearance of 'closed' and 'empty' stores, and the reasons can be economic and commercial, but they can also be morphological. Between 55% and 60% of the 'closed' and 'empty' stores in all case studies are indeed in buildings constructed after 1975, so a tendency, even if slight, is revealed. This tendency can be explained precisely by the development of cities, that is, the construction of new buildings. These buildings, therefore, have more difficulty in occupying their store spaces, either because of their location, or because, simply, there was no market need for more store areas. This seems to be coherent with the finding that in the centers of Leiria and Vila Real (those which have grown more and housed more new construction) the tendency for non-open stores to be in post 1975 buildings is more acute than in the other two centers (less pervious to new construction). On the other hand this tendency is much more perceptible in the areas outside the center, where over 2/3 of shops are in new buildings, and there are more out-of-the-way structures. In the peripheries, the percentage of 'Other' stores (multi-commercial spaces and non-open stores) in post 1975 buildings is 93% (in Évora), 89% (in Vila Real), 85% (in Leiria) and 80% (in Aveiro), which reveals an astounding tendency. Whilst 'closed' stores have a

greater tendency to be associated to older areas (especially of the center) which have lost their commercial importance (less economic potential to interest new promoters), 'empty' stores are clearly correlated with new city areas and new construction. If some of these spaces are 'empty' because they are in the last stages of construction or in the first stages of marketing and selling, most are 'empty' simply because they have no interested tenants. In some places (notably commercial 'islands' of the suburbs) the numbers of 'empty' stores are so excessive that they have to mean an overconfidence of real-estate development that proved unfounded.

9.3. BLOCKS

Because of the proposal made by Joosten and van Nes (2005) that in Berlin the location of stores is dependent, almost exclusively, on block typology, a careful examination of this variable should be a prerogative of morphological commercial studies. The authors suggest, exclusively for the Berlin scenario, that most of the stores are located in full block typologies. Furthermore, these blocks are also characterized by high floor space indexes (like Yoshida and Omae, 2003, suggested) and build up street sides, although they are not of very large proportions, and are located in medium-density zones near main junctions or along main streets. The only exception to these findings, according to the authors, is the location of chain-stores and shopping centers, which tend towards non-blocks. On the other hand they also stress that hollow blocks contain very few stores, which always face the main streets (Figure 12).

By what has been discussed so far in this research it is difficult to believe that stores would depend entirely on one single morphological variable. And even if they do depend, to some extent, on block typology, it should be taken into account that a city like Berlin (like Tokyo in the Yoshida and Omae study) is very different from, for example, the four case studies of this research. It could be assumed that there could be similarities between the observations in Berlin and *some* areas of these city centers, but it is hard to believe that these patterns would be maintained in the peripheries or in the 'isolated residential' localities closer to the border of the urban perimeter, where urban form (and commercial occupation) is very different.

Using the sub-sections provided by INE as the closest approximation possible to the 'city block', two types of block analysis were made in this research. The first concerns numerical data related to the blocks (area, volume, number of stores therein). The second concerns the classification of the blocks containing stores (full, hollow, non-block), and the location, within the block, of the stores (larger edge, shorter edge).

Table 27 summarizes the numerical data concerning the relationship between the blocks and the stores therein. Immediately it is striking how very differently structured cities, Leiria and Évora, have almost exactly the same number, to the unit, of blocks containing commerce. The similarity in the number for the entire city could be a coincidence but because this similarity is maintained looking just at the centers and just at the peripheries, then something more than chance can be at work, especially because, for example, the areas of these blocks are completely different. Aveiro and Vila Real have, on the other hand, fewer blocks containing stores. In Vila Real this can easily be explained by the fact that, not only is the average block containing commerce larger, also both in the center and in the periphery commerce clusters in more confined areas. In Aveiro, the number of blocks containing

commerce is of the same order of magnitude as in Leiria and Évora (which strengthens the similarities between cities), but the city's aptitude for commercial axes and 'door to door' expansion may cause this reduction.

Table 27 - Block data

Cities		Vila Real	Aveiro	Leiria	Évora
Number of blocks with stores	**City**	**233**	**358**	**442**	**441**
	City center	99	154	173	172
	Periphery	134	204	269	269
Stores per block	**City**	**6**	**6**	**6**	**4**
	City center	10	8	8	5
	Periphery	3	5	4	3
Average commercial block area (m^2)	**City**	**63.157**	**41.065**	**59.496**	**14.529**
	City center	24.060	11.403	19.668	4.849
	Periphery	92.042	63.456	85.111	20.718

Yet even these dissimilarities fade when an average indicator is calculated, once again proving that the cities have similar thresholds. In average, each city has 6 stores per block. In Évora, the average block area is so reduced when compared with the other cities (just 15.000 m^2) that that may justify why, in average, it has only 4 stores per block. Obviously, if Évora has the same number of blocks with stores as Leiria but 700 stores less, the indicator 'stores per block' will supply a lower number. But this appears to be more than just a question of mathematics. Évora is a compact city and there is a close accessibility to the main shopping axes and commercial 'islands'. Even though it is the smallest city and has the smallest blocks, its structure, and the commercial orientation and distribution within that structure, may well be similar to that found in the other cities.

Leiria and Vila Real have the largest commercial block areas (around 60.000 m^2), which is coherent with the fact that these are the largest and least dense cities. Yet only in Vila Real is the average area of blocks containing commerce lower than the city's average overall block area[320]. This means that, except in this case, commercial spaces seek the larger blocks. When the average volume of blocks is roughly estimated[321] it is seen that Vila Real and Leiria present numbers of similar order of magnitude, whilst Aveiro and Évora present lower ones.

Looking specifically at the centers, it can be seen that the differences between cities in the number of blocks with stores are maintained, whilst 'stores per block' is no longer equal in three cases. Aveiro's and Leiria's centers, the strongest, have in average 8 stores per block, whilst Évora's has only 5,

[320] These figures, for all cities and city areas, are presented in the Table of Annex 4.

[321] In this research just an approximation of the 'average block volume' was made, by multiplying the average area of the blocks by the average commercial building height. A more realistic, yet time consuming, way to calculate this volume would be to multiply, for each block, its area by the average building height related to the stores present in just that block.

because it has about 400 stores less (numerator) in its more compact city center, and Vila Real's has 10, because it has less blocks containing stores (denominator). This also suggests a compactness in Vila Real's city center, but it is of a different nature than that found in Évora. Whilst in Vila Real the center stores are highly concentrated in two distinct areas, in Évora this happens simply because the center is 3 times smaller.

In all city centers, the average area of the blocks containing commerce is larger than the average considering all the center's blocks. This means that even in the center stores choose larger blocks, even though it is the existence of the 'new' commercial areas that influences this average. In Évora's and Aveiro's centers, those with less growth, there is less than 200 m^2 difference between the averages, whilst in the other two centers this difference is over 1.000 m^2. On the other hand the average commercial block area of the centers is about, for all cities, 1/3 of the average commercial block area for the whole urban perimeter. Therefore, the coherence between cities remains, which means that Vila Real's and Leiria's centers have larger blocks (of about 20.000 m^2) and somewhat similar block volumes, whilst in Aveiro's center the average commercial block is smaller by half and in Évora's by one fourth.

Even so, the distribution of stores within these blocks, and their nature, is similar between all centers. There are two types of commercial blocks in the centers which correspond to the two types of commercial sub-centers. First, in the so called 'traditional' centers blocks containing commerce are generally full (Figure 96). Here, and in denser commercial areas (like the 'linkages' of Leiria), stores may appear in all sides of the blocks. Yet their preference is for the largest edge, or larger side, of these, in strong commercial areas (such as in *Rua Direita*), and, occasionally, for the shortest side, in the less commercially intense and more residential neighborhoods of this area. The store's preference for the largest edge of the blocks occurs mostly because it is that edge that is facing the main streets, as the blocks are usually erected *parallel* to them. The dense and narrow network structure also contributes to the appeal of the side of the principal street. That is also the reason why, regardless of the block type and the side of the block stores are in, they always face the main traditional squares. The exception is the case of Évora, where most blocks are *perpendicular* to the main axes (therefore, the stores are in the shorter edge of blocks), except in specific, central and commercially intense zones (such as Giraldo Square). This is easily explained. Évora's entire city center has the same type of morphology as the smaller 'traditional' areas of the other centers. Therefore, only the commercial core of Évora's center has the same type of occupation as the traditional shopping axes of the other cities (parallel blocks and stores in the larger edge). The whole extent of the rest of Évora's center will mimic the less commercially endowed areas of the other traditional centers (perpendicular blocks and stores in the shorter edge).

In the 'new centers' and in the shopping linkages, blocks containing commerce are generally semi-hollow. As the city progresses from the 'old' to the 'new' center, the blocks become a little larger (reaching a medium-size), hollower (becoming semi-hollow), wider and even more geometrical, although they still face the main central streets (therefore stores keep on the larger side). This regularity and geometry of the blocks is kept in practically all cities but Leiria. Here the blocks have more irregular shapes, because the street pattern is also irregular, a consequence of the geographical landscape of the city. The characteristics of the terrain also give some irregularity to Vila Real's blocks, especially in the traditional center. Because the most regular center blocks appear in Aveiro

and Évora, that is, in the 'plain' centers, it can be proposed that there can be a relationship between the variables 'geometry of the blocks' and 'terrain topology'.



Figure 96 - Model and aerial photograph of a full block in Aveiro's center, where the commerce, despite being in all sides, has the tendency to be located in the largest (*Rua Direita*) and facing the main square.

The 'hollowness' of the blocks is dependent on the type and size of the multi-family buildings constructed in the new axes. That is why, for example, in the areas of Vila Real's new center, blocks can be almost hollow, as their interior space contains amenities (such as a small green space) related to the buildings on the edges. This tendency, however, which so prominently is displayed in the commercial 'islands' of the peripheries, is seldom seen in the center. The edge-thoroughfares usually present a semi-hollow occupation.

In the peripheries the number of blocks with stores increases, in relation to the center, in about 100 blocks in Leiria and Évora, and in about 50 blocks in Aveiro and Vila Real. The fact that Évora's periphery has almost exactly half of the area of Leiria's and almost exactly twice the number of stores and inhabitants per area may in some way help justify the similarity in the number of commercial blocks in these two peripheries. Yet, once again, because the overall numbers are not the same, the indicators are different, and Évora and Vila Real, the 'less economically empowered' peripheries, have less stores per block than Leiria and Aveiro.

On the other hand, the relationship between the average area of blocks containing commerce in the peripheries and the same value for the entire city is (as it was when the centers were analyzed) exactly the same in all cities. It is, in this case, 1,5 times higher. Consequently, the average area and volume is still similar in Leiria and Vila Real and smaller in the other two peripheries. Furthermore, stores still favor the larger blocks. As it can be seen in the Table of Annex 4, in practically all peripheral areas the average area of the blocks containing commercial spaces is higher than the overall average block area. The difference between the two averages is higher in areas with the dual occupation; traditional neighborhoods, mostly without stores, and new neighborhoods with commerce. This is the case of localities such as Marrazes or S. Bernardo. There are, however, some localities where the average area of the blocks with commerce is smaller than the overall average. This is the case of localities which possess large extensions of unoccupied area (hence some much larger blocks), such as the 'isolated'

localities of Vila Real or Esgueira (W)[322]. Industrial areas, on the other hand, have practically the same average block area considering either all blocks or else only those containing commercial spaces. This is because here almost all blocks contain stores and warehouses.

The type of blocks, and the disposition of stores therein varies with the distance to the center, and the distance to the commercial poles. Because in the periphery commerce (and urban expansion) follows mainly a road-side logic (particularly in Évora and Aveiro) there are fewer or none full blocks. In the 'extensions' for example, where there are still strongly defined commercial axes, commerce stands at the edges of these hollow and semi-hollow irregular blocks, mainly on their larger side. Because these localities, as well as the residential areas, may still possess some traditional commercial networks[323] sometimes (in these locations) commerce can be in smaller and more regular blocks. Yet, in outer residential localities, seldom commerce will be in these, even though these blocks also become larger and hollower (as many localities just have 1 or 2 block rows beyond the main axis). Likewise, some residential neighborhoods (especially low-rise ones) can also form full blocks but commerce still does not located in these. It is rather closer to the multi-family high-rise buildings which, due to their nature, either create blocks by themselves (islands[324]) or, when facing main peripheral thoroughfares, generally entail semi-hollow and eventually hollow blocks, which are in average medium-sized and often geometrical. Stores form partial commercial axes in the larger edge of these. In 'residential' and 'isolated residential' areas this model can vary slightly, as the blocks become more irregular (whilst almost always facing the main axis) and change in size, from being more contained in better structured localities[325] to being wider in pre-existing less developed areas[326]. They will obviously be either hollow or practically hollow. In localities which just possess a main central street, or in out-of-the-way locations, commerce will be in non-blocks. In Mateus and Arroios, for example, there are hardly any blocks. This also holds for the morphological structure of the 'industrial/commercial' areas organized along one single axis[327]. In the other commercial/industrial locations[328], where there is a somewhat regular grid, the warehouses are single standing in all sides of large, regular, semi-hollow blocks, although they favor the structuring thoroughfares.

Comparing these conclusions with those of Joosten and van Nes (2005) it can be seen that, as predicted, they only partially fit the reality of these four Portuguese medium-sized cities. The first, and strongest point the authors made was that stores were located in full block typologies, except in the case of 'chain' stores and shopping centers, which were in non-blocks. In the Portuguese case studies it is seen that stores are located in full block typologies *only* in the pre-existing traditional centers of commerce or else in densely occupied 'new areas' (mainly linkages) of the center, which could be said to be these center's CBD. Yet immediately outside these areas, due to the building typology (multi-family buildings in thoroughfare axes or 'islands') and the type of urban expansion (along axes) commerce is located in hollow or semi-hollow blocks[329]. 'Chain' stores (in the form of warehouses) and shopping centers may indeed be in non-blocks, yet, when they cluster in clearly defined and

[322] Due to the large, mostly unoccupied area North of Aveiro's center.
[323] Like Esgueira or Borbela.
[324] Figure 90 represents perfectly the example of a commercial island in a semi-hollow block.
[325] Marrazes or Pousos for example.
[326] Like Folhadela, Santa Joana or Aradas.
[327] Namely Parceiros, Vale Sepal and Esgueira, when facing the N109.
[328] Constantim, Almeirim/Horta das Figueiras and the rest of the Esgueira industrial area.
[329] Because, actually, it has no other choice, except if it chose to be in traditional low-rise residential neighborhoods.

geometrical 'industrial/commercial areas' they are, inevitably, located in semi-hollow or hollow blocks. Furthermore there are many 'chain' stores outside these areas, especially in the greatest shopping axes of the city centers, which constitute full or semi-hollow blocks.

Then the authors suggest that the stores are in blocks with high floor space indexes and build up street sides. It is indeed true that stores prefer larger blocks, but the building heights vary from activity to activity and from area to area. Therefore, there are stores either in high volume buildings and small volume buildings. If the floor space index is usually high in the main center commercial axes and in commercial 'islands', it is much more reduced in the other locations. Stores in pre-1975 buildings account for half of the stores in these four cities, all of them have traditional commercial centers both inside and outside the 'center' and, particularly in the peripheries, building heights are very much reduced. Neither central Tokyo nor central Berlin possess this type of morphological structure. Furthermore, even though stores are usually 'door of door', the peripheries have a great share of single standing stores in hollow or semi-hollow blocks, which do not possess full build up street sides.

If it is true that in this research it was also found that blocks containing commerce are of medium-dimensions, they are nonetheless larger than the average block of the city. Furthermore, they are not all, as the authors suggest, in medium-density zones. Depending on the city area, they can be in highly dense zones (commercial linkages, 'extensions') or in extremely low-density zones ('isolated residential' areas). What this research can corroborate is that these blocks containing commerce are indeed oriented to face the main streets and the main junctions, but it can be assumed that this is a universality of commercial spaces. The authors finally stress that hollow blocks contain very few stores. Once again, the peripheries of the four studied Portuguese medium-sized cities prove this point wrong. Even if they possess very few stores in the overall context of the city, it is the hollow and the semi-hollow blocks that structure most of the peripheral localities, hence they are crucial for their commercial survival.

9.4. STREETS

9.4.1. CHARACTERIZATION

The last morphological element to be analyzed in this research is 'streets'. The interpretation of the relationship between this element and the location of stores was made in three stages. The last, which entails the use of Space Syntax to measure the degree of 'integration' and 'choice', in the network, of the streets stores are in, was considered the most relevant, and is presented in Section 9.4.3, the last of Chapter 9 and of the case-study analysis. The other two stages are presented forthwith. The first (in this section) consists in the analysis of the type and cross-section of the street. This characterization was already hinted to in Section 7.3., when the physical distribution of commerce was being defined. This consists on seeing if the streets containing commercial spaces are pedestrian or of car traffic (and if so, its orientation) and on measuring their size (number of lanes), and the size of their sidewalks. The second stage (Section 9.4.2) is an overall assessment of the network of the public transport system. The detailed images on the above mentioned Section 7.3. should offer additional support to the analysis made here.

In the city centers there are usually three different types of streets which, once again, seem to perfectly match with the three different types of commercial occupation. Therefore, this variable seems to be

less dependent on 'the activity' performed, and much more on 'where' it is performed. Consequently, in the 'traditional' centers, streets containing commerce are practically all narrow (just enough space for a single car to pass), present narrow sidewalks (less than a meter), and are one-way. If a few decades ago only portions of the *Rua Direita* were pedestrian, now this tendency is expanding to the other streets of the 'traditional' center. The most prominent case is that of Leiria. As this research was taking place, most of the traffic of the *Rua Direita* and immediately surrounding streets was closed, and rehabilitation work was taking place. In this city, as well as in Vila Real and Évora, some of these streets possess no sidewalks at all. Still in the traditional center, but closer to the residential neighborhoods, streets are still one way, but can accommodate a parking lane (Figure 97). Sidewalks, in this case, are still narrow. In Évora, *all* the center area is composed of these two types of streets. The main commercial axes are one-way streets with narrow sidewalks, but possess at least one side with parking spaces (even if not 'official'). The other streets (as is the case depicted in Figure 97) are narrower still and possess no sidewalks. Only one, 5 de Outubro Street, is (almost) officially pedestrian.



Figure 97 - Left: Arrochela Street near Aveiro's traditional commercial center. It allows just for one-way traffic and one parking lane, and has narrow sidewalks / Right: Padre Pina Alleyway in Évora's traditional center. It is narrow, has no sidewalks, and the car traffic is mostly limited to residents.

On the other hand, the other three centers possess two other degrees of streets corresponding, respectively, to the 'shopping linkages' and the 'edge-thoroughfares'. Shopping linkages are still usually one-way, although parallel linkages complement one another. For example, in Leiria, in Heróis de Angola Avenue the traffic flows Northward, whilst in Capitão Mouzinho de Albuquerque Street it flows Southward (Figure 98). Yet despite being one-way, these linkages are significantly larger, with average, and sometimes larger, sidewalks (depending on building occupation and the importance of the street). The edge residential/commercial/service axes, on the other hand, are usually larger avenues, possessing two-way traffic with, in average, two lanes per orientation. Many of these[330] even possess a separation (a small green corridor) between the two different orientations of traffic. Sidewalks in these multi-family areas are usually larger, as the buildings (and the stores) are more than often a little set-back from the street.

[330] For example Marquês de Pombal Avenue, Dr. Lourenço Peixinho Avenue, Dr. Adelino Amaro da Costa Avenue and Força Aérea Avenue.



Figure 98 - Left: 'Linkage' Capitão Mouzinho de Albuquerque Street with 2-lane one-way traffic and slightly larger sidewalks / Right: 'Edge-axis' Força Aérea Avenue with two-way traffic (2 lanes each), a parking row, and a small green belt dividing the orientation of traffic.

In the peripheries the three types of streets (2-way, complementing 1-way, and 1-way) remain, with decaying complementarity and size, as the distance from the center increases. In the 'extensions' the main commercial axis, or thoroughfares[331], are two-way streets, significantly large, with appropriate sidewalks and parking rows, and eventually separation of traffic. The commercial spaces which are not in these axes are usually closer to the residential neighborhoods where the format of complementing one-way streets with reduced sidewalks is more common. In the 'traditional' areas[332] the width of the street diminishes and sidewalks may disappear. In Esgueira there is even a small pedestrian street, containing residual stores. This is a consequence of the former commercial existence of this locality before growing and becoming one of the main residential areas of the center.

In all the residential areas the same happens. The main thoroughfare or the main local road passing through the center of the locality has two-ways of traffic. Yet if in the 'extensions' it could have double lanes in each direction, as the distance from the center increases not only just one lane remains, but also the size of this lane significantly decreases when the principal road ceases to be a thoroughfare to become just a local street. As it was seen before, the number of stores outside these roads is very small. In average traditional blocks the streets and the sidewalks decrease in size (or cease to exist) when one travels from the newer (or central) to the older (or peripheral) areas. Obviously streets are mostly all one-way, and they do not have, necessarily, a direct parallel complement. This is more striking, for example, in the irregular network of Aveiro's peripheral residential localities. In Évora's, on the other hand[333], the complementarity between one-way streets is much more regular. The streets only widen either near main intersections or roundabouts, or else near commercial 'islands', but that is a direct consequence of the construction of the buildings, which usually are set-back from the street (sometimes allowing for parking spaces and larger sidewalks) and can occupy the whole block (Figure 99). Although they can be inside the residential areas, these 'islands' usually seek the main thoroughfares[334], so they face the local main two-way streets. In some traditional localities (Mateus and Arroios), as there is hardly any block and the building structure is all road-side, all stores face the regional 2-way road (without or with much reduced sidewalks).

[331] Like the Figueira da Foz Road in Sismarias, Dr. Mário Sacramento Street in Santiago or the Universidade Avenue.
[332] Like the one found in Esgueira or near the train station in Sismarias.
[333] Bacelo, Malagueira and Sra. da Saúde.
[334] Such as in Leiria's localities of Marrazes or Parceiros.



Figure 99 - Left: Main regional road N2 of Parada de Cunhos, with one lane two-way traffic and no sidewalks and no 'official' parking row / Right: Commercial 'island' in Dr. João Luís Street in Northern Malagueira, with one lane two-way traffic, but a parking row and average sidewalks on the side of the multi-family buildings.

Lastly in the 'industrial/commercial' areas, the streets that compose this closed network are usually large (as they need to accommodate larger vehicles) and possess two-way traffic, although often there is just one lane on each direction. Nevertheless, there are exceptions, notably when these areas are structured facing only one main thoroughfare. This is the case of Parceiros and Vale Sepal industrial areas, served by ring-roads of the city that eventually become motorways (so they have multiple lanes) and of the M1249 in Constantim Industrial area, whose main portion even possesses a separation between lanes of traffic (see Figure 70). In Vila Real's and Évora's industrial areas these streets generally have sidewalks, even if of a reduced width. In Leiria's and Aveiro's these are rarer. In Évora the industrial area has the advantage of being surrounded (and penetrated) by new residential neighborhoods, which seems to increase the quality, or at least the pedestrian accessibility, of the streets (Figure 100).



Figure 100 – Centro de Formação Profissional Street in Almeirim and Horta das Figueiras Industrial area

9.4.2. PUBLIC TRANSPORT LINES

The analysis of the public transport lines, on the other hand, proved more fruitless, or rather, could not provide the same type of correlations present in other studies, as seen in the literature review, because the conditions were not the same. First because these four Portuguese medium-sized cities do not possess any kind of metro or light rail system, and each has only one single train station, which has stood in the same place for decades. Furthermore, the track, with the exception of the city of Aveiro,

does not interfere with the urban elements inside the urban perimeter[335]. Therefore, the only public transport system is, in all cities, the 'bus'. But because of the existence of peripheral localities outside these urban perimeters (smaller cities, villages and sometimes rural settlements), which more than often depend on the main city, and due to the lack of public enterprises that could assure these connections, concessions were granted to private networks of regional bus lines. These networks unite the city center with various outer localities, which may or may not include those that are still inside the urban perimeter. Regardless, they have to pass *through* them to reach the outer areas. This competition, or complementarity, has, to some extent, conditioned the reach of the public bus network. This is more perceptible in Leiria, where the public bus line practically only serves the center. The second reason is because, as mentioned in Chapter 5, the specific location of stops was not obtained, because only field research could provide this information, and a choice was made not to increase the weight of that work, which was comprehensive enough. For the same reasons, the bus lines depicted in Figure 38 to Figure 41[336] may not perfectly correspond to the real ones, because only the names of the stops were available in the respective sites of the companies[337]. Therefore, the streets where the bus actually passes through were estimated by comparing the names of the stops with the names of the streets and the neighborhoods.

Looking at the maps it is clear that only the main streets are crossed by the bus lines. As it is also in these streets that most stores are located, an overall proximity between commerce and bus lines can be said to exist. Évora is immediately perceived as the city whose lines reach more areas, and, consequently, more stores.

In the centers (Figure 101) all the main commercial axes are served by public transport lines. This means that the edge-axes, and especially the 'linkages' have a high relationship with the bus network, whilst the stores in the 'traditional' center and inside the residential neighborhoods have a poorer connection. Vila Real has the most number of lines passing through its center, and, because here commerce is more confined in specific areas, it is seen that almost every single store (with the exception of those inside the blocks of the 'traditional' center) is either facing a bus route or else is one single street away from it. In Aveiro's center, despite the more limited number of streets in which the bus lines pass, there is also a good connection, because of the weight of the Dr. Lourenço Peixinho Avenue. Nevertheless, because the 'traditional' center is, actually, cornered, and because of the size of the streets, most stores West and Southwest of this Avenue are not served. The bus connection between the two main axes of commerce[338], is not made by the same axis (more narrow and 'traditional') where commerce is located, but rather by a larger street with very few stores (that is, with more homes and potential clients for the bus). The 'cornered' argument can also be used to justify why some edge-exes (like Força Aérea Avenue) are not served by these lines[339]. The form of the center, therefore, as well as the location of major residential neighborhoods without stores, also influences, obviously, the accessibility of the stores to the public transport. It is noteceable how in Leiria's center the bus lines cover the West side (where residential neighborhoods are located) and the

[335] That is, the station is practically on an extremity of the urban perimeter, so the track does not morphologically condition the city.
[336] The A3 maps of these figures are shown in Annex 3.
[337] The companies are Mobilis (Leiria), Trevo (Évora), Corgobus (Vila Real) and MoveAveiro (Aveiro).
[338] Dr. Lourenço Peixinho Avenue and S. Sebastião Street.
[339] In this case the route makes the obvious choice to turn left (to Esgueira) rather than right at the end of Luís de Carvalho Street.

East side (where the 'linkages' are) of the center, but the connections to the 'middle', to the traditional center, are not made. Both sides are connected only at the extremities, in the edge-thoroughfares. Finally, in Évora's center, due to the size of the streets, the bus network is more limited, each line covering specific 'quarters' of the center. Even though these 'quarters' are not connected to each other, there is, however, an advantage. Some lines passing through the center's main axes have no stops. They follow a pre-defined route (marked by a painted blue line in the pavement) and the mini-bus stops in any point of that route on request. The stores facing that route have, literally, the bus at their door.

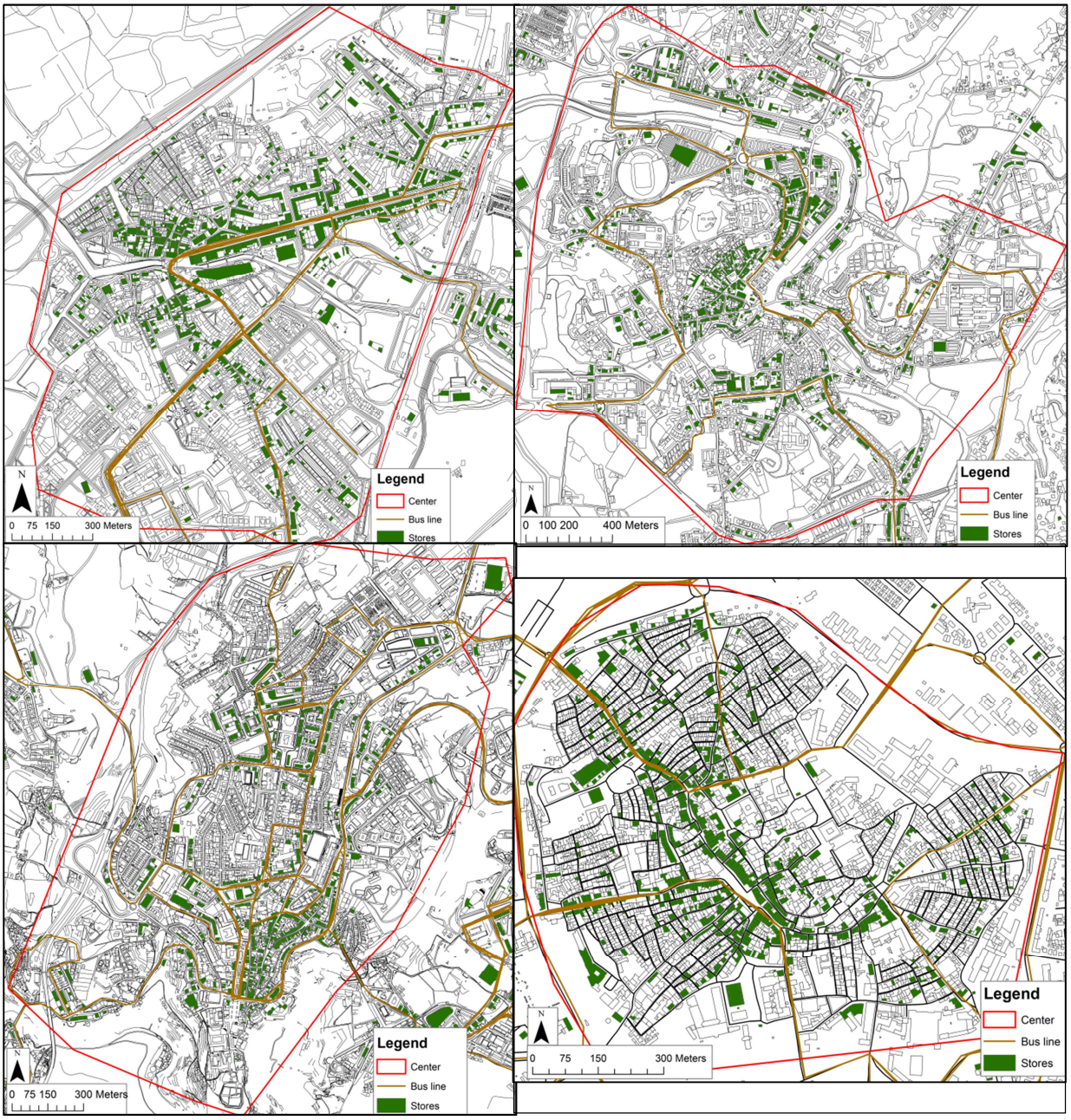


Figure 101 - Bus routes in the four city centers

In the peripheries, the relationship between the stores and the bus routes is more distinct, and varies inversely with the distance to the center. Leiria is the exception, in this case, as the Mobilis lines only slightly cross the center boundary to serve a few residential neighborhoods in Telheiro. This, as mentioned, does not necessarily mean that all the stores (and residential areas) outside of Leiria's center are not served by other (private) bus companies.

In the other cities, all the 'extensions' and 'main residential' areas have, as it would be expected, a very high degree of service by the bus lines. These areas contain the highest density of residents, most of which work in the city center, so this is more than coherent. If in Aveiro only the main streets of these areas are crossed by a bus route (so the access to stores is more confined[340]), the main residential areas of Vila Real and Évora are thoroughly served. Obviously, there is a preference for the main axes, but it can be seen in Évora that all the inner main local streets are also covered. This is coherent with the deductions made above about the role of Évora's outer residential neighborhoods. Commercially, this is very positive, because not only are the main commercial axes crossed by the bus route, the commercial 'islands', inside the neighborhoods, are also practically all covered. In Vila Real's periphery, because most commerce follows the line of specific main axes, the access of stores to the bus route in the 'extension' and the 'main residential' area is also practically direct. Farther from the center, in 'residential' localities, this logic is somewhat maintained, in this city, because although only the main streets are served by the bus route, commerce is seldom anywhere else. This means that only the traditional squares or former main streets of these localities are not crossed by the bus line, which has always a stop in the current main street. In Aveiro's 'residential' areas, the same logic is at work. Only the main streets are served by public transport[341]. But as most stores are, as seen, in these locations, there is a good correlation. Most residential neighborhoods (and sporadic 'islands'), however, present inside the erratic network in-between these main travel-through axes, are not served by the bus route. There seem to be more people farther both from the transport lines and the stores in this area than in the corresponding localities in Vila Real and Évora. Actually, as mentioned, only in Évora do the bus lines really penetrate inside the neighborhoods. That is why the commercial 'islands' in the 'residential' areas in this city are so well served. On the other hand, the main streets of the 'isolated residential' areas are usually not served by the bus routes. If this can be negative for the residents of these areas, it actually will not affect much the commercial spaces, as they are mostly M1, therefore of pedestrian accessibility. This can also be the justification for the lack of 'penetration' in Aveiro's network, which does not possess such strong 'inner islands' as Évora. Lastly, Évora's industrial area, once again, seems to favor from having residential pockets in its mist. Both these neighborhoods and the main industrial/commercial axes seem to be well served by the public transport lines. There is even a line that goes as far as the Industrial and Technological Park. The other industrial areas have one single route going through their main axis, so only the stores in that axis are directly served.

[340] This is more particularly so in Forca, a closed neighborhood.
[341] It should be noted that the main streets of Aradas, São Bernardo, St. Joana and Esgueira (E) are practically all parallel to each other and follow a straight line from the N109.

9.4.3. SPACE SYNTAX ANALYSIS

9.4.3.1. In cities

The last, and most important, stage of the 'street analysis', which also constitutes the last analysis performed in this research project, is the assessment of the relationship between the stores and the syntactic characteristics of the axis of the grid that serve them. As explained in Section 3.2.2. in the literature review, the network of streets of a particular city can be converted into an axial (or a segment) map, where every axis (or segment) is imbued with particular data concerning its measure of 'integration' (affinity for to-movement) and measure of 'choice' (affinity for through-movement). In Section 5.2.5. it was further explained that, as this is not intended to be a profound study on Space Syntax, some concessions were made, namely in the construction of the segment map. Nevertheless, despite the simplification, there was no drop in overall coherence, as the values for all segments in all cities were calculated in the same way. Consequently, the following analysis will dwell less on the specific values obtained, because these are approximations, and more on their relative comparison, in terms of percentages, between cities and between city areas.

Using the segment maps, one for each of the four case studies, obtained through the methodology explained in Section 5.2.5., the values for 'integration' and 'choice' were calculated for the entire network and for 16 different radii, from the local street scale to the entire global (n) scale[342]. As mentioned, the resulting graphs and the attribute table containing the information for each segment were uploaded in the ArcGIS model and each store was associated to the segment that serves it.

The graphs depicting the variation of 'integration' and 'choice' for all radii are presented in the following pages in Figure 102 to Figure 109. Because an exhaustive study fell out of the range of this investigation, the graphic presentation of the results of Space Syntax was substantially simplified. The values either of 'integration' and 'choice', for each city, were divided only into six groups, or six quantiles, based on Jenks' 'Natural Breaks'[343]. The color code in the above mentioned Figures corresponds, for 'integration', exactly to each of these divisions. For 'choice', a logarithmic normalization was made, so that the distinctions between classes could be more easily perceptible to the naked eye. It is for this reason that for lower radii some segments do not appear in the maps. As they are very much segregated ('choice' close to zero), their values are without meaning (as log(0) is undefined).

Consequently, the first quantile, both for 'integration' and 'choice', depicted by the red color, represents the segments which present the highest values, that is, those in the first of the six groups. These segments are hereafter known as 'reds'. The stores served by these segments will have, respectively, a high accessibility (integration) and high betweenness (choice). Using the same logic, the second and third quantiles are represented by two shades of the yellow color and the respective segments are hereafter known as 'yellows'. These are intermediately accessible and chosen lines, as they are still on the top half of the value division. Lastly, the fourth, fifth and sixth quantiles are depicted by increasingly darker shades of the color blue, and the respective segments are hereafter

[342] These radii are, in meters, r= 100, 250, 500, 750, 1.000, 1.250, 1.500, 2.000, 2.500, 3.000, 4.000, 5.000, 7.500, 10.000, 15.000 and n.

[343] This division is, upon selection, made automatically by ArcGIS. According to ArcGIS Desktop Help '*Classes are based on natural groupings inherent in the data. ArcMap identifies break points by picking the class breaks that best group similar values and maximize the differences between classes. The features are divided into classes whose boundaries are set where there are relatively big jumps in the data values*'.

known as ‘blues’. These segments have, likewise, increasingly higher values of segregation, as they are neither destinations nor travel-through axes.

A summary of the main percentages analyzed in this Chapter is contained in Table 28, in the pages following the ‘integration’ and ‘choice’ graphs. These values can be complemented by the information present in the overall summary Table of Annex 4, in the various Tables and Figures present in this and in the next two sub-chapters, and in the various Annexes (17 to 21) which the following text will refer to. Once again, because the possibilities of analysis are vast and the interpretations made were thorough, some considerations are presented either in Annex or as footnotes, so as to unburden the flow of the text.

Looking at the cities as a whole (that is, considering all the stores in the urban perimeter) the first thing that can be immediately perceived is that stores are more inclined to be located in the ‘yellow’ segments, that is, those belonging to the second and third quantiles. This statement is not compatible with the usual assumptions made concerning Space Syntax, namely that stores will favor the highly integrated and chosen lines (‘reds’), but it is closer to the discoveries of Teklenburg *et al* (1994) in the Dutch suburbia. For one, size of the city can be an influencing element. The network of these four medium-sized cities presents much more ‘yellow’ axes than ‘red’, a consequence of their size and structure (few relevant main thoroughfares). As the radius increases, highly integrated and chosen lines in the system are actually fewer than middle term ones, therefore this can have a direct bearing on the number of stores in ‘reds’. Yet this can also be a consequence of the fact that stores do not have enough economic power to compete with the land values of the most integrated lines of the system or of the most obvious travelling axes, so they choose the second best ones. Furthermore, because stores seek both movement rich locations and areas closer to a larger clientele (i.e. residential areas), they sometimes stand in intermediate axes of the network. Lastly, they also favor corners, and many are in perpendicular roads to the main streets.

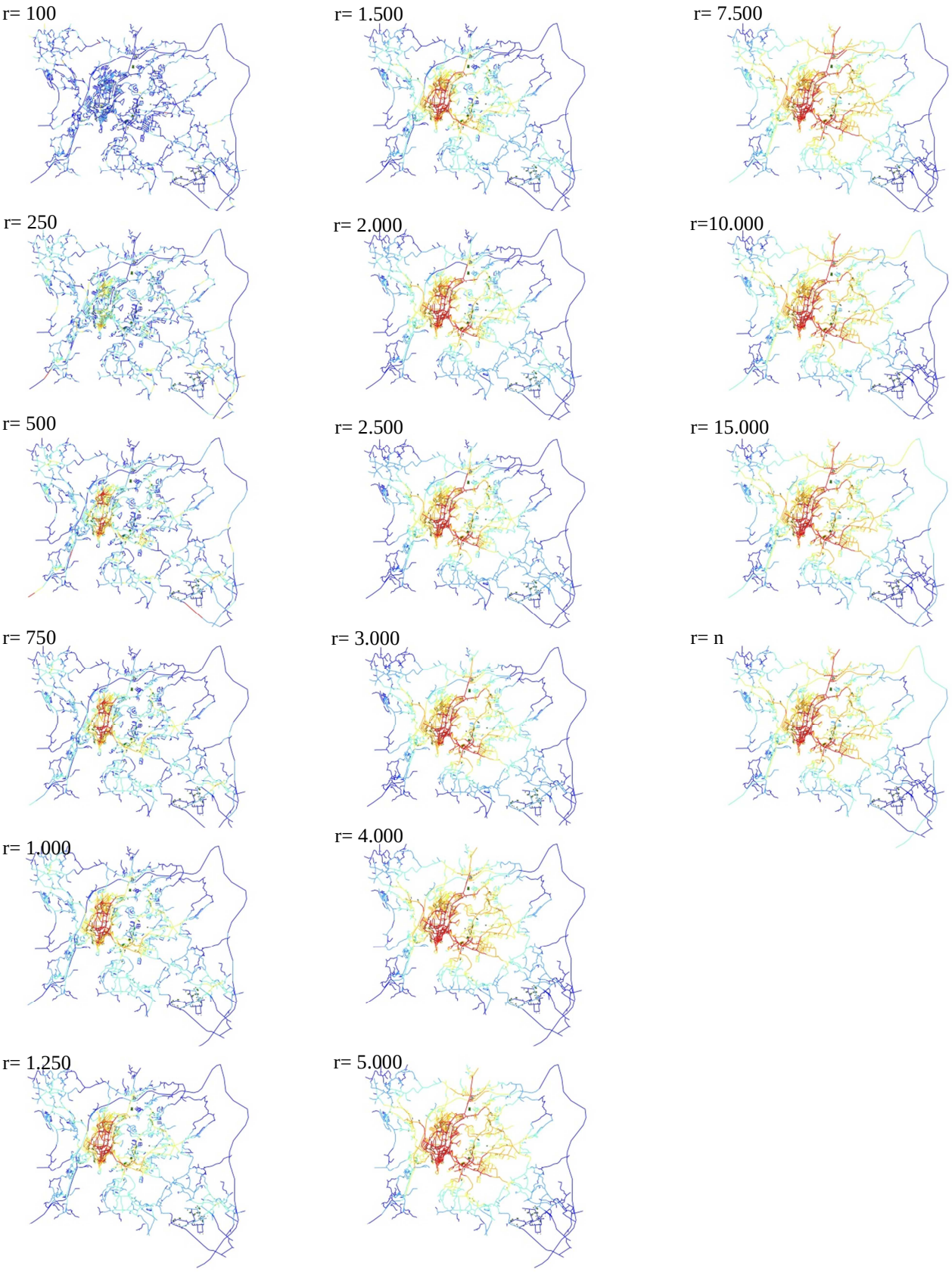


Figure 102 - Vila Real's integration

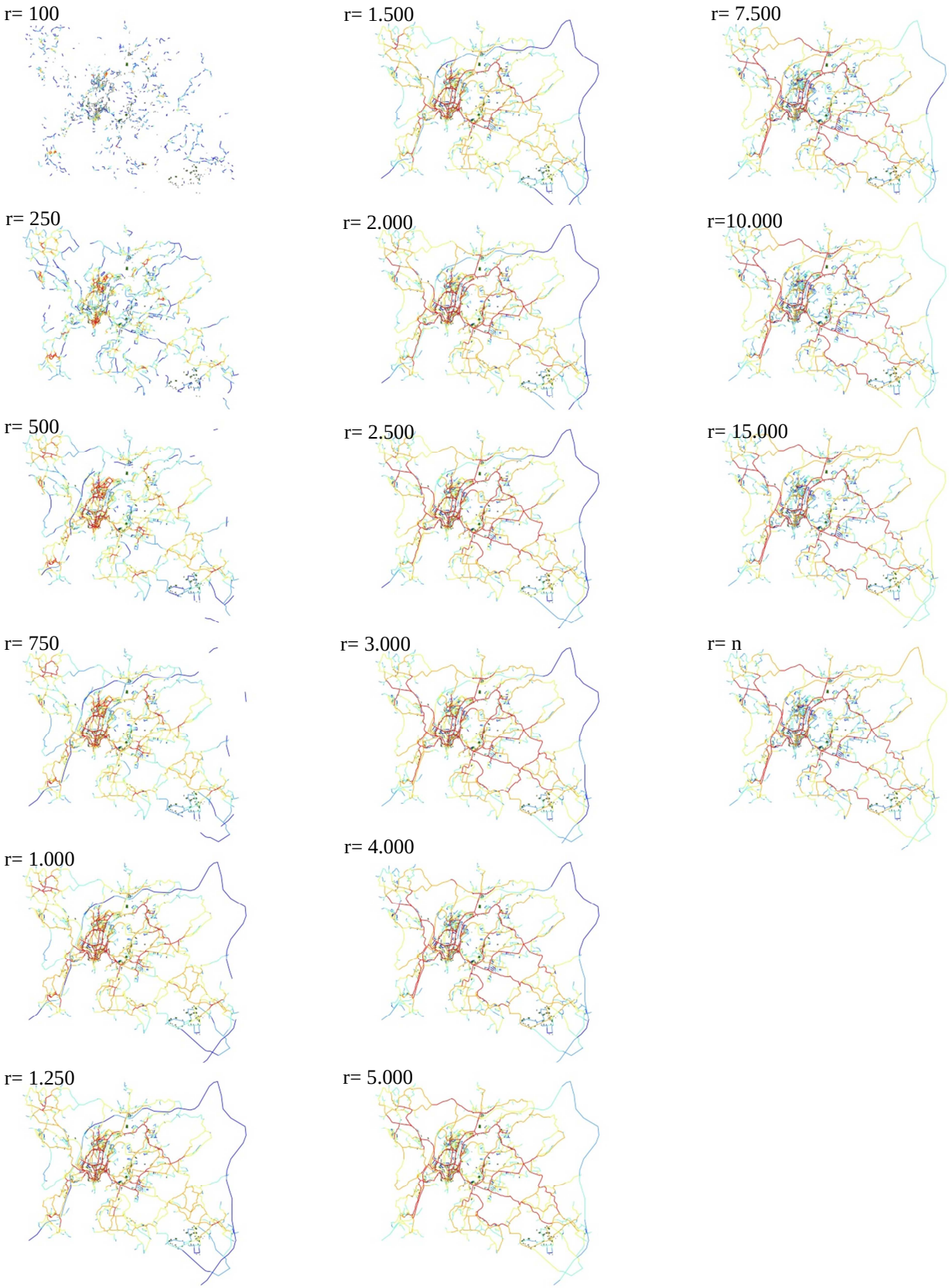


Figure 103 - Vila Real's choice

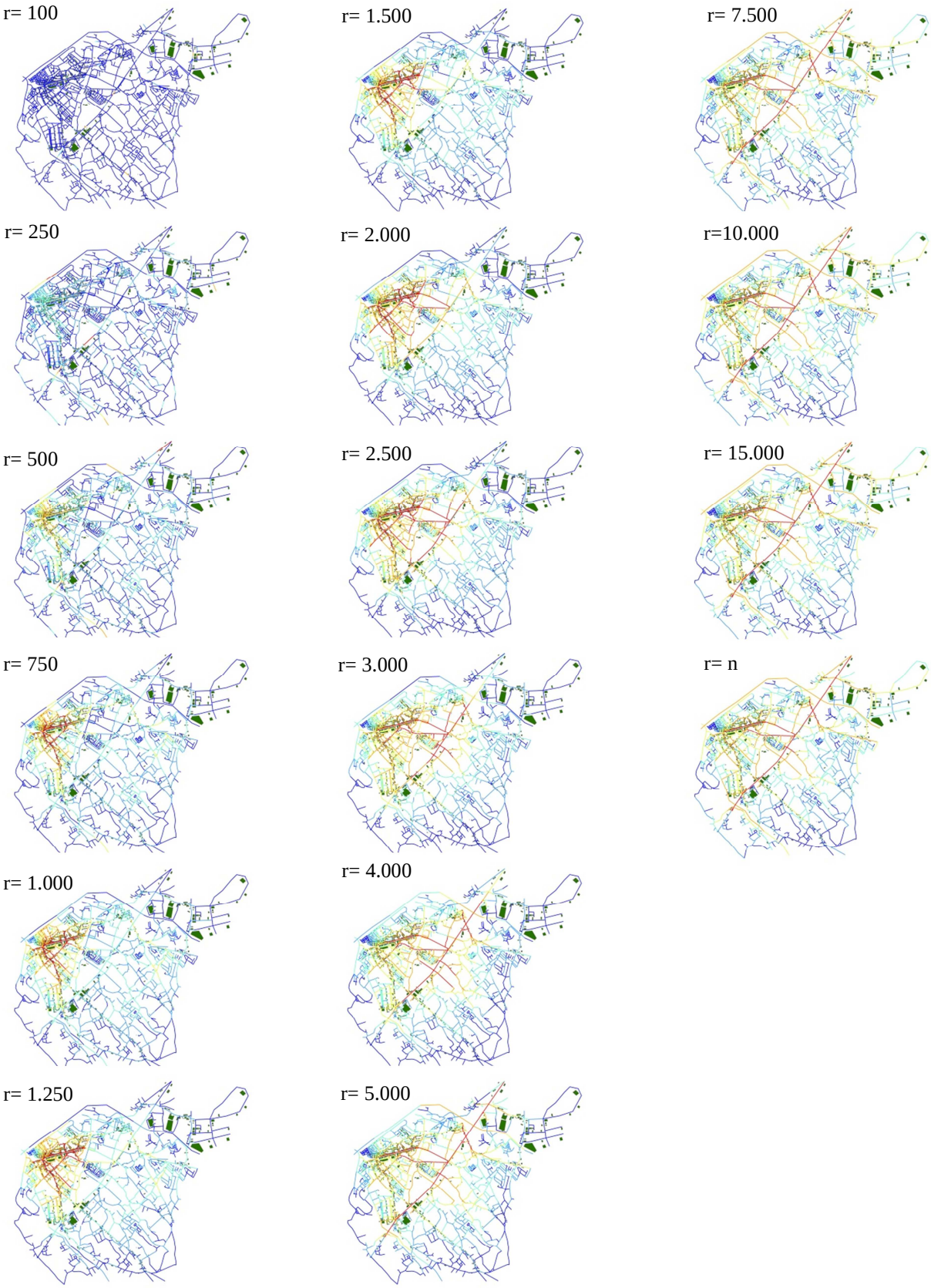


Figure 104 - Aveiro's integration

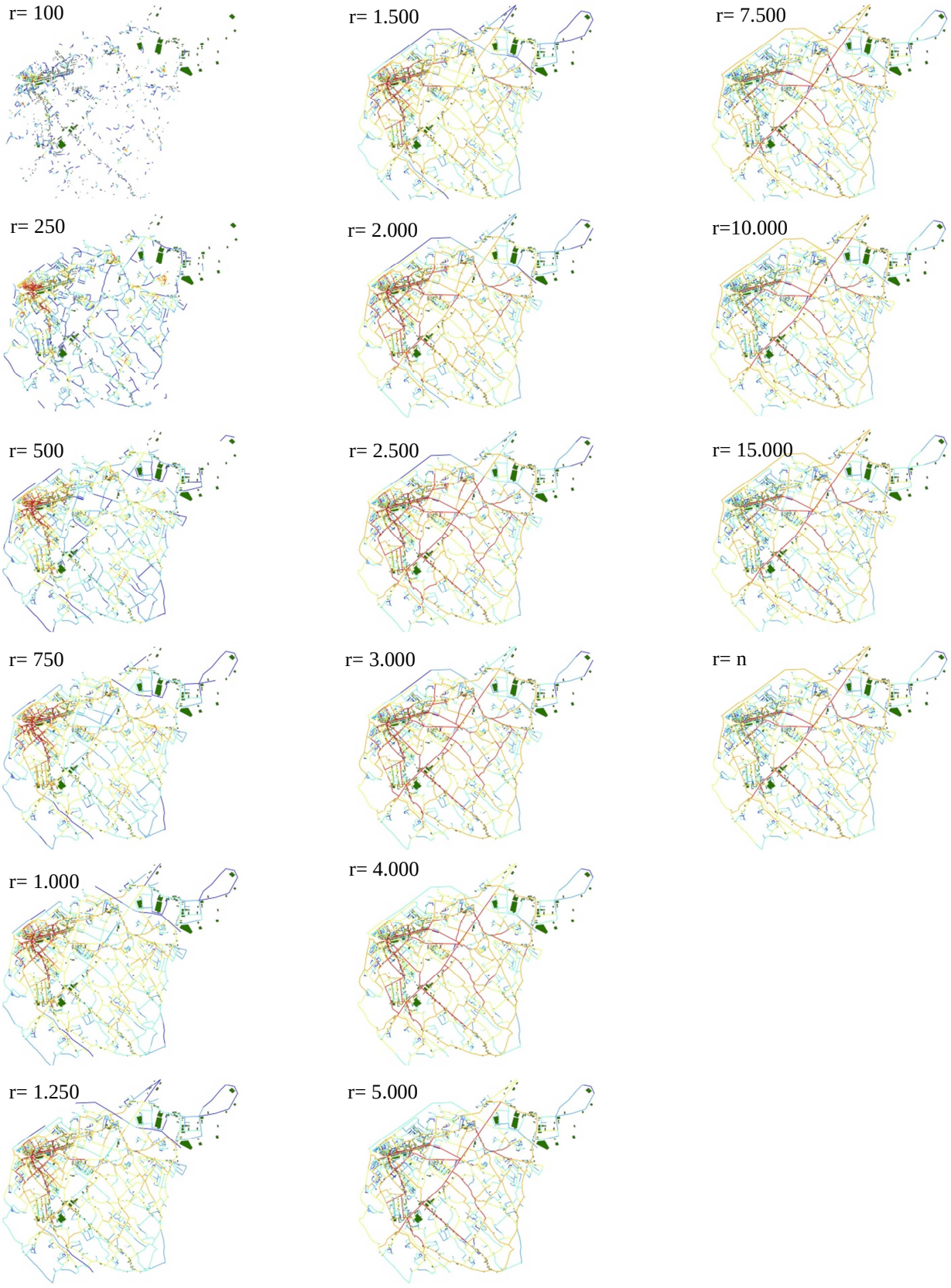


Figure 105 - Aveiro's choice

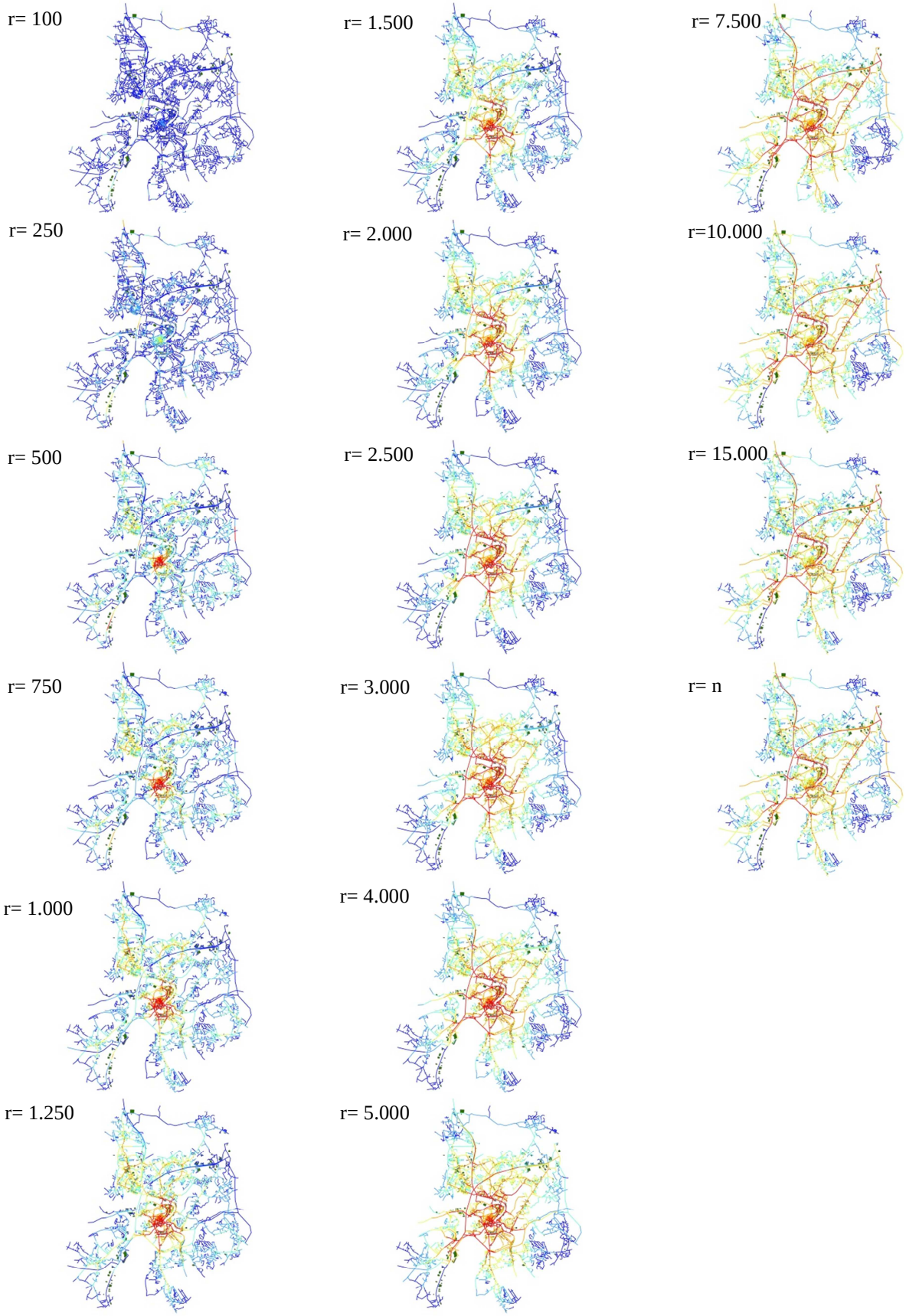


Figure 106 - Leiria's integration

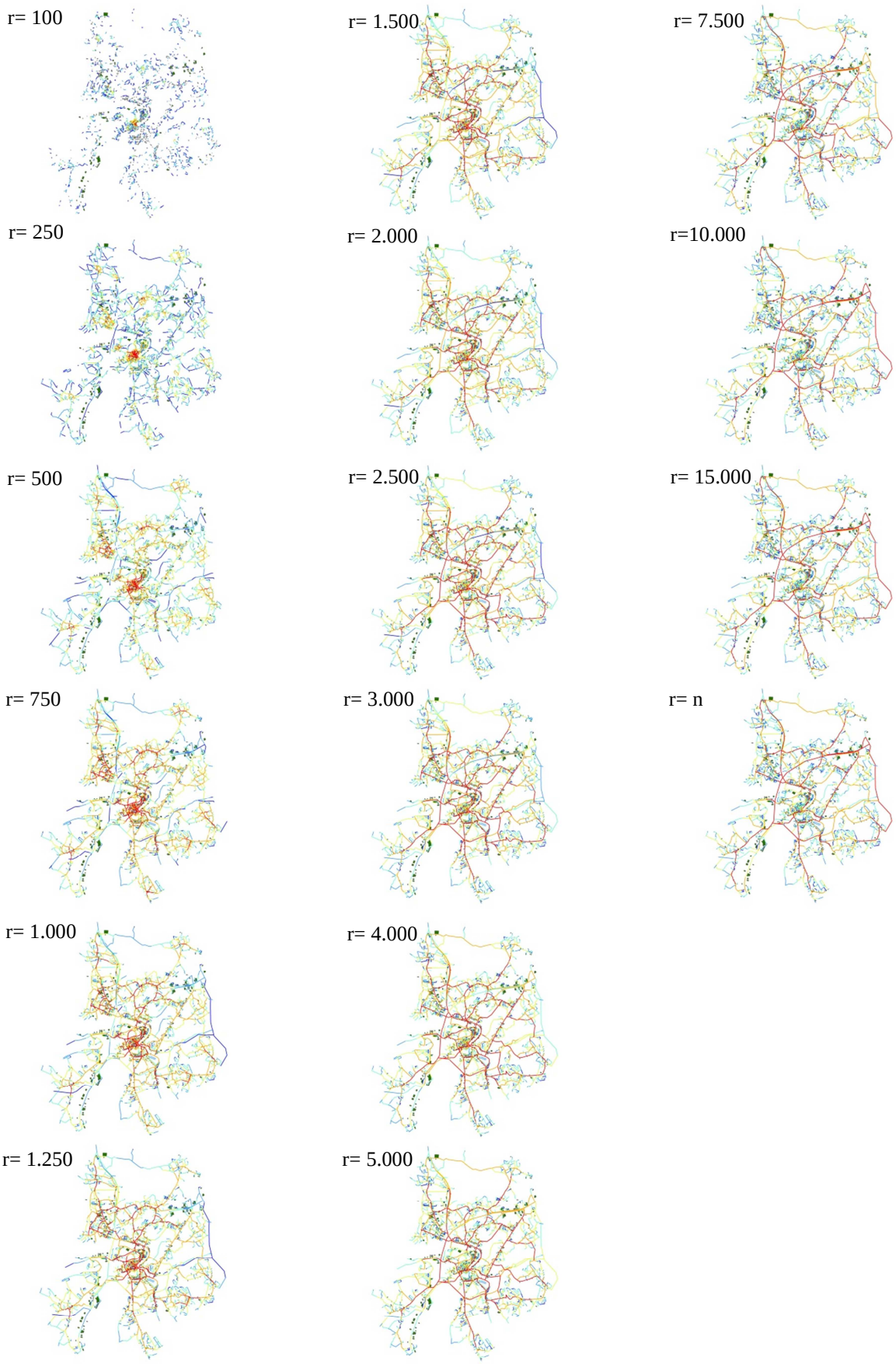


Figure 107 - Leiria's choice

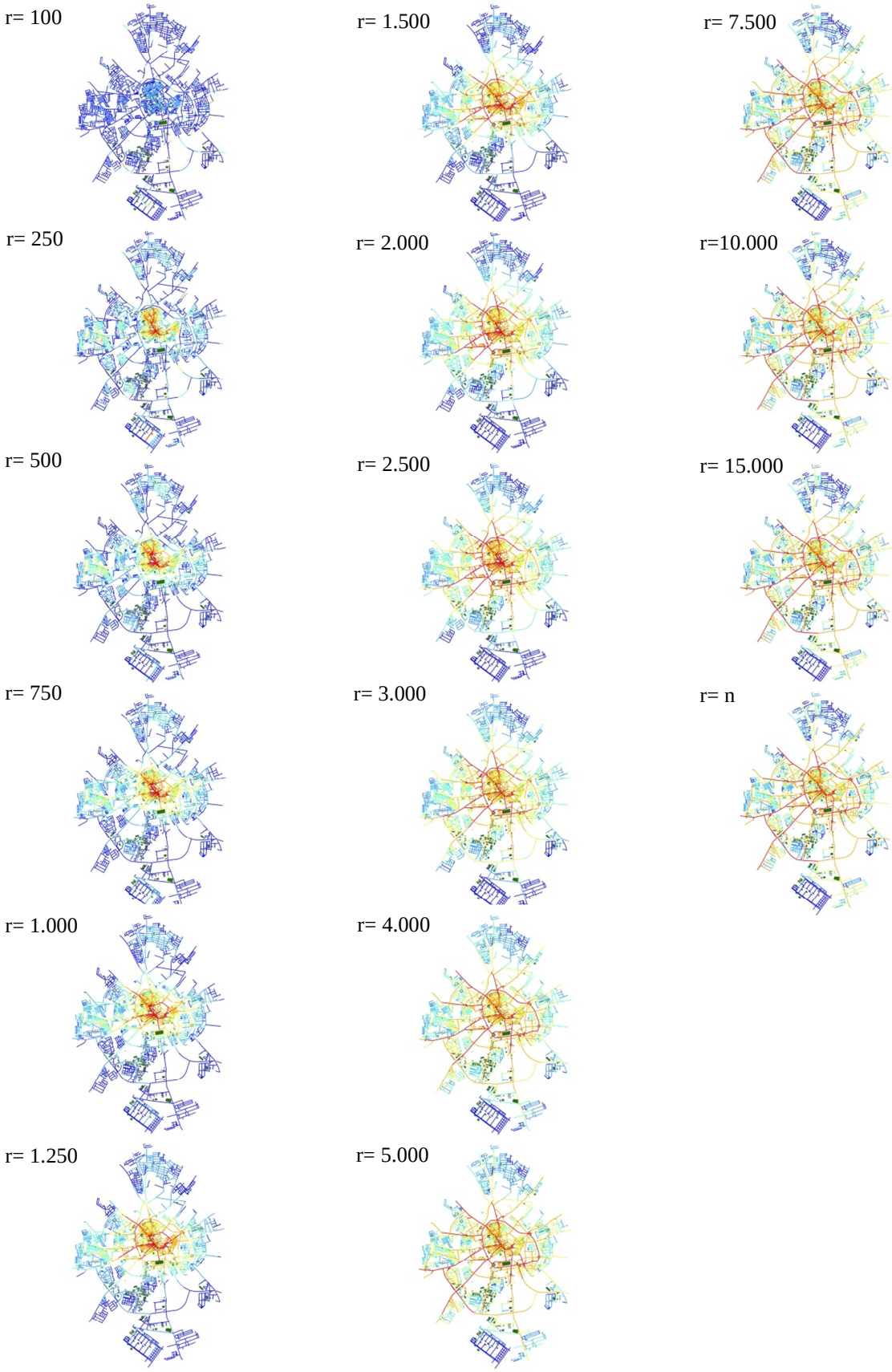


Figure 108 - Évora's integration

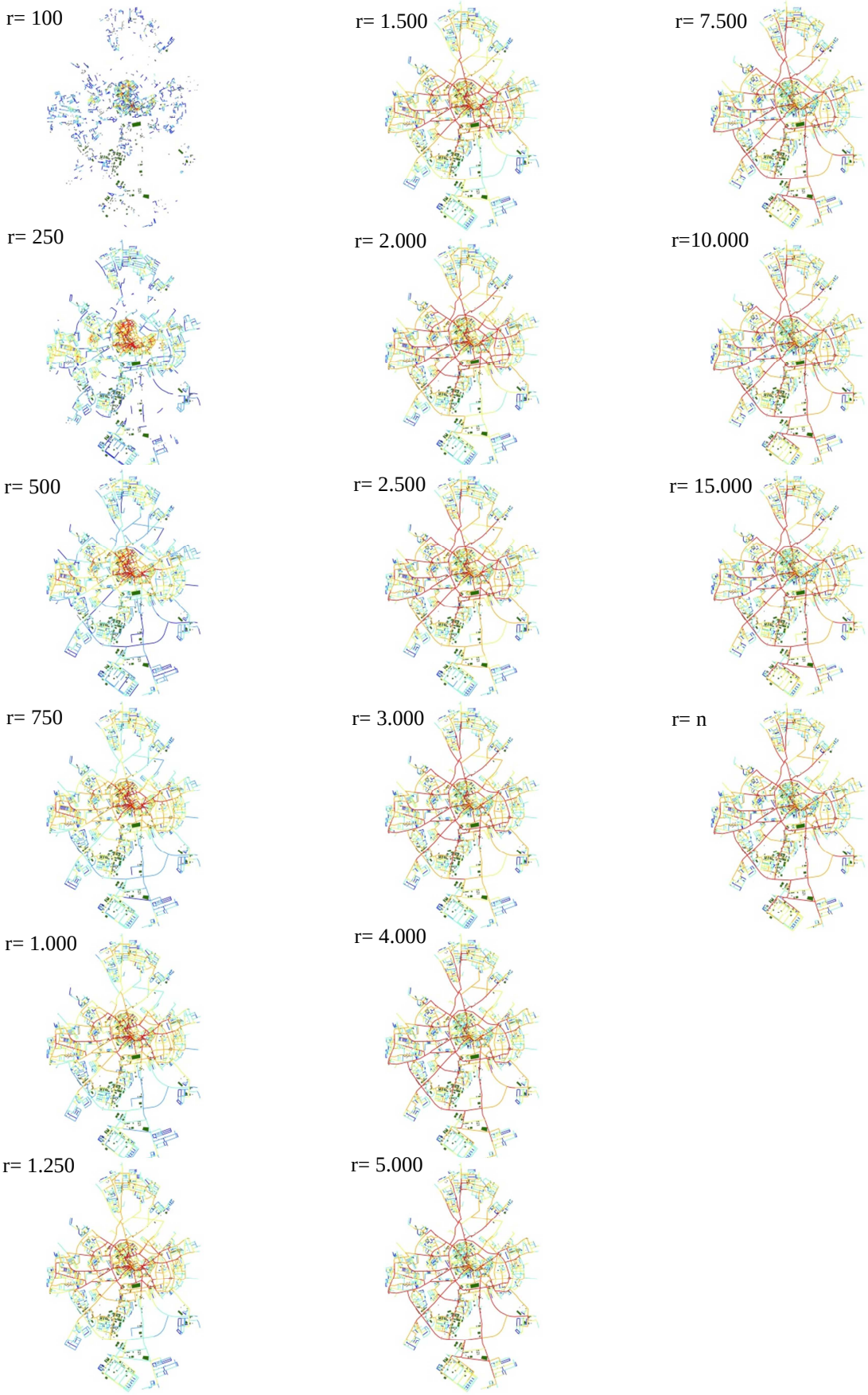


Figure 109 - Évora's choice

Table 28 - Percentage of stores located in the main axes of choice and integration; overall, in post 1975 buildings and those closed and empty

City	Locality	Integration			Choice			Integration		Choice	
		% of the total number of stores located in the first quantile of integration (r=n)	% of those stores in post 1975 buildings	% of the total number of stores in post 1975 buildings in the first quantile of integration (r=n)	% of total number of stores located in the first quantile of choice (r=n)	% of those stores in post 1975 buildings	% of the total number of stores in post 1975 buildings in the first quantile of choice (r=n)	% of closed and empty stores located in integration segregated lines (r=n)	% of those stores in post 1975 buildings	% of closed and empty stores located in choice segregated lines (r=n)	% of those stores in post 1975 buildings
Leiria	**City**	**16,29**	**70**	**18,02**	**26,54**	**70,21**	**29,44**	**22,26**	**84,48**	**39,35**	**77,56**
	Center	**25,12**	**67,8**	**30,3**	**25,34**	**66,11**	**29,8**	**6,43**	**88,89**	**40,36**	**69,03**
	Periphery	**5,11**	**83,93**	**5,87**	**28,38**	**74,92**	**29,09**	**42,24**	**83,67**	**39,66**	**88,04**
	Sismarias	1,35	100	1,83	20,95	74,19	21,1	53,73	83,33	49,25	87,88
	Marinheiro	19,28	86,05	18,41	34,98	89,74	34,83	20	86,67	40	96,67
	Telheiro	2,19	66,67	1,96	38,69	73,58	38,24	27,27	100	27,27	50
	Marrazes	0	0	0	43,82	66,67	45,61	39,13	88,89	34,78	100
	Parceiros	0	0	0	50,98	69,23	51,43	0	0	0	0
	Pousos	0	0	0	34,04	50	25,4	100	95,45	27,27	100
	Gândara de Olivais	0	0	0	9,62	60	15	28,57	0	14,29	0
	Andrinos	0	0	0	0	0	0	100	0	0	0
	Pinheiros	0	0	0	5,56	0	0	100	33,33	66,67	50
	Parceiros industrial area	3,8	33,33	2,04	1,27	100	2,04	66,67	75	100	83,33
	Vale Sepal Industrial area	6,82	100,00	7,32	31,82	100	34,15	0	0	0	0
Vila Real	**City**	**51,86**	**30,89**	**31,49**	**30,71**	**42,79**	**25,83**	**6,06**	**25**	**38,64**	**66,67**
	Center	**64,78**	**23,53**	**33,56**	**30,18**	**35,15**	**23,36**	**0**	**0**	**42,86**	**64,44**
	Periphery	**25,59**	**73,39**	**28,27**	**33,8**	**58,33**	**29,68**	**33,33**	**25**	**25**	**83,33**
	Europa and University Avenues	57,14	68,33	50	31,43	54,55	21,95	0	0	0	0
	Borbela and Urban Mateus	30,63	79,59	34,45	46,25	68,92	46,36	14,29	100	35,71	100
	Lordelo	0	0	0	10,26	50	10,53	100	0	50	0
	Constantim	0	0	0	23,53	0	0	100	0	0	0
	Folhadela	0	0	0	52,94	33,33	60	no closed or empty stores		no closed or empty stores	
	Parada de Cunhos	0	0	0	45,83	72,73	50	no closed or empty stores		no closed or empty stores	
	Mateus and Arroios	0	0	0	52,94	22,22	40	100	0	0	0
	Constantim Industrial area	0	0	0	0	0	0	no closed or empty stores		no closed or empty stores	

City	Locality	Integration			Choice			Integration		Choice	
		% of the total number of stores located in the first quantile of integration (r=n)	% of those stores in post 1975 buildings	% of the total number of stores in post 1975 buildings in the first quantile of integration (r=n)	% of total number of stores located in the first quantile of choice (r=n)	% of those stores in post 1975 buildings	% of the total number of stores in post 1975 buildings in the first quantile of choice (r=n)	% of closed and empty stores located in integration segregated lines (r=n)	% of those stores in post 1975 buildings	% of closed and empty stores located in choice segregated lines (r=n)	% of those stores in post 1975 buildings
Évora	**City**	**24,44**	**14,62**	**9,08**	**29,63**	**24,12**	**18,16**	**36,8**	**93,94**	**26,39**	**67,61**
	Center	**37,74**	**0**	**0**	**37,98**	**0**	**0**	**0**	**0**	**14,95**	**6,25**
	Periphery	**11,96**	**57,94**	**9,21**	**21,79**	**63,59**	**18,42**	**62,66**	**93,94**	**34,81**	**85,45**
	Bacelo	1,56	50	0,85	8,59	81,82	7,69	100	96,67	46,67	100
	Malagueira	15,18	64,71	12,09	24,55	52,73	15,93	61,29	100	29,03	100
	Sra. da Saúde	20,67	45,16	16,67	28,67	46,51	23,81	40,63	84,62	21,88	57,14
	Almeirim and Horta das Figueiras	10,18	62,5	8,62	21,88	76,74	22,76	52,94	83,33	47,06	68,75
Aveiro	**City**	**9,36**	**18,27**	**3,69**	**14,08**	**41,53**	**12,61**	**34,15**	**64,03**	**44,96**	**63,39**
	Center	**12,67**	**6,92**	**3,24**	**15,54**	**20**	**11,47**	**23,18**	**44,44**	**41,63**	**43,3**
	Periphery	**5,07**	**55,1**	**3,91**	**12,22**	**77,12**	**13,17**	**49,13**	**76,47**	**49,71**	**86,05**
	Bairro de Santiago	2,7	100	2,99	19,31	86	18,38	50	94,59	63,51	93,62
	Forca	6,3	75	4,88	5,51	71,43	4,07	39,13	88,89	47,83	90,91
	Esgueira (west)	4,14	33,33	2,27	0	0	0	28,57	87,5	42,86	66,67
	São Bernardo, etc	6,15	54,55	6	17,04	70,49	21,5	65,96	48,39	34,04	75
	Esgueira Industrial area	7,79	0	0	0	0	0	0	0	0	0

All these elements contribute to the increasing number of stores in 'yellow' axes. As it can be seen on Figure 110, particularly for radii over r = 3.000, over half of the stores are in 'yellow' 'integration' lines (with the exception of Vila Real) and between 40%-50%[344] of the stores are in 'yellow' 'choice' lines. Globally, stores favor the medium integrated and betweenness axes, and the similarity of the 'choice' values (both for 'reds' and 'yellows') shows once again how cities can be structured in the same way. Locally, however, this is not that straightforward. At very small radii stores are mostly in segregated lines ('blues'), yet as the radius increases, local main streets (which coincide with main shopping streets) are highlighted in 'red'. Even so this weight is usually not enough to surpass the

[344] 40% in Leiria and Vila Real, and 50% in Aveiro and Évora.

stores in 'yellow' lines, and only between specific radii in Leiria and Vila Real does the number of stores in 'reds' become superior to that in 'yellows'[345].

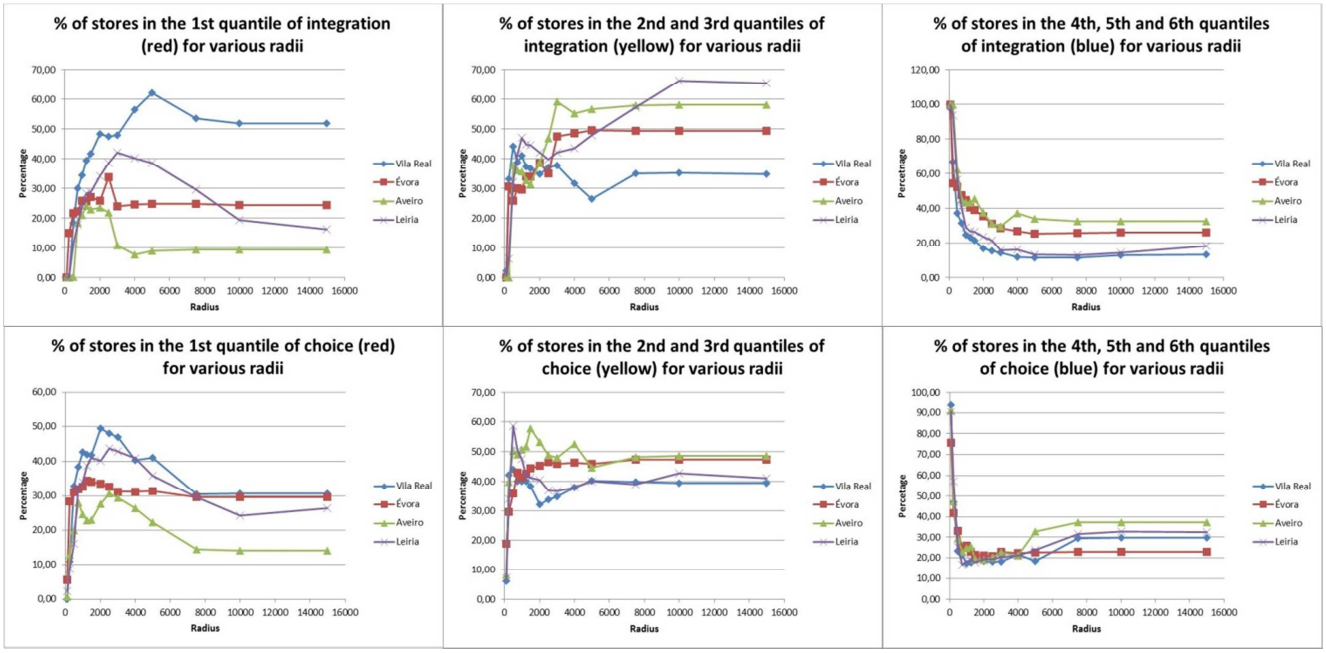


Figure 110 - Percentages of stores in the different quantiles of integration and choice, for various radii, in the four case studies

The values prove that Vila Real is clearly the exception. The numerical deductions made above about the distribution of activities and buildings showed that Vila Real's center was very strong and that the periphery was segregated in terms of buildings, stores and services. The Space Syntax analysis corroborates just that. Vila Real's center is a *destination* for the entire urban perimeter. Even for r= n, there are over 50% of stores in 'red' integrated lines, against less than 30% in the other cities. On the other hand, Aveiro has very few stores in both high 'choice' and high 'integration' axes[346]. This is a consequence less of the store location decisions, and more of the actual form of the city. Aveiro has an off-center center, lacks a urbanized ring road and has a 'rays of the sun'-type of expansion. All this conditions the center's overall accessibility and denies the city a large number of integrated and highly movement distributional axes. These nuances will be explored more particularly in the next two sections, dedicated to the centers and to the peripheries, respectively. Here as well will be explained the reasons why the greatest fluctuations in accessibility and betweenness, as it was discussed in the above paragraphs, occur in specific points. It can be said, in general, considering the whole city, that these happen roughly around three different radii: r= 750, r= 2.000 and r= 5.000. Below the first, only the center and a few main axes of the periphery are highlighted in 'red'. Around r = 750 the localities' centers usually have the greatest number of their commercial axes both fully integrated and fully 'chosen', therefore it can be assumed that the local dynamics of the centers are maximized at this distance. At around r= 2.000 the 'red' lines usually go beyond the limits of the city center (and connect, forming thoroughfares and rings, in 'choice'), that is, the main peripheral axes start to become 'red'. This 'growth' subsides at around r= 5.000. Most 'red' axes are replaced by 'yellow'

[345] In Leiria this happens just for 'choice' (between r= 2.000 and r= 5.000) and in Vila Real both for 'choice' (between r= 1.000 and r= 5.000) and 'integration' (over r = 1.250).
[346] Less than 15% for r= n.

ones (that is, loose relative importance), and many of these become 'blue'. Apparently, the smaller the city, the quicker this process, that is, these 'stages' occur at lower radii.

As it can be seen in Figure 111, most of the stores that appear in the medium and high 'integration' and 'choice' axes in Vila Real and Leiria are in buildings constructed after 1975. This is obviously connected to the overall number of stores in these buildings, which is also greater in these two cities, and which have the obvious tendency to be in more central and travel-through peripheral axes (hence the 'choice' percentages are higher). Likewise, Évora, the city with less overall stores in post 1975 buildings, has the least number of stores in 'red' and 'yellow' segments that are located in these buildings.

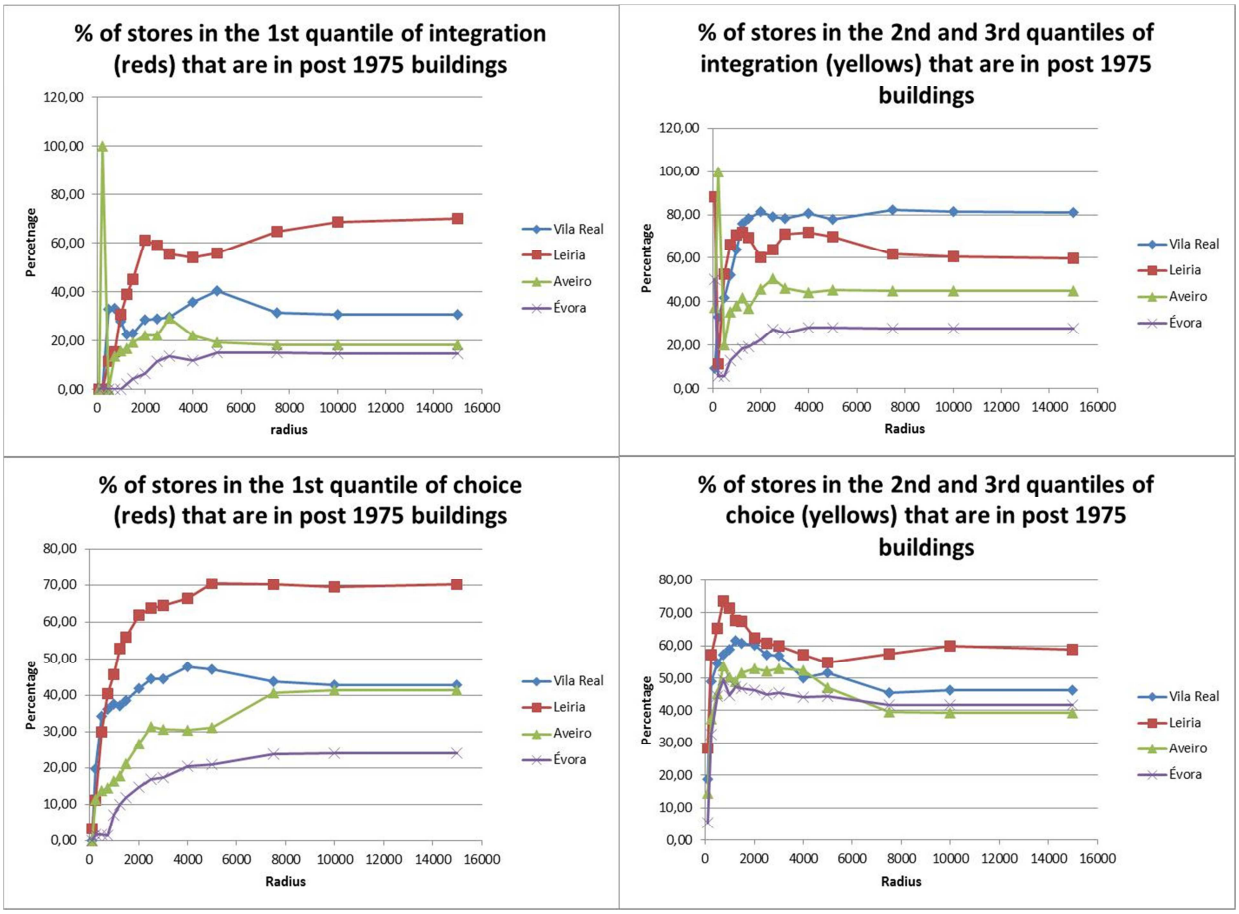


Figure 111 - Percentage of stores in the medium and higher quantiles of integration and choice that are in post 1975 buildings for all radii

But the deduction can be made the other way around. New buildings may prefer the more central and travel-through axes, but they can, on the other hand, *create* them by their construction in a row. Therefore, it could be proposed, particularly for Leiria's case, that the 'new' buildings have indeed created axes that have increased the accessibility and betweenness of the commercial network. Yet both in Aveiro and Évora for 'integration' (that is, centrality) and in Évora for 'choice', this does not seem to be the case. The graphs also clearly show the distinction between Vila Real's main commercial center, fully integrated (but with only 30% of post 1975 stores in 'reds') and the rest of the main commercial areas (the new centers and the extension), less integrated ('yellow') but with

over 80% of stores in post 1975 buildings. Once again, for r= n, more similarities are found between cities in 'choice', namely in Aveiro and Vila Real for 'reds' and all cities but Leiria for 'yellows'.

In order to prove the affinity of new construction to the best axes of the network, the calculations can be made considering the building, not the axis, as the central element. That is, it can be seen how the total number of stores located in buildings constructed after 1975 is distributed by each quantile. The graphs are displayed in Figure 112 and the overall conclusions prove to be similar as those above.

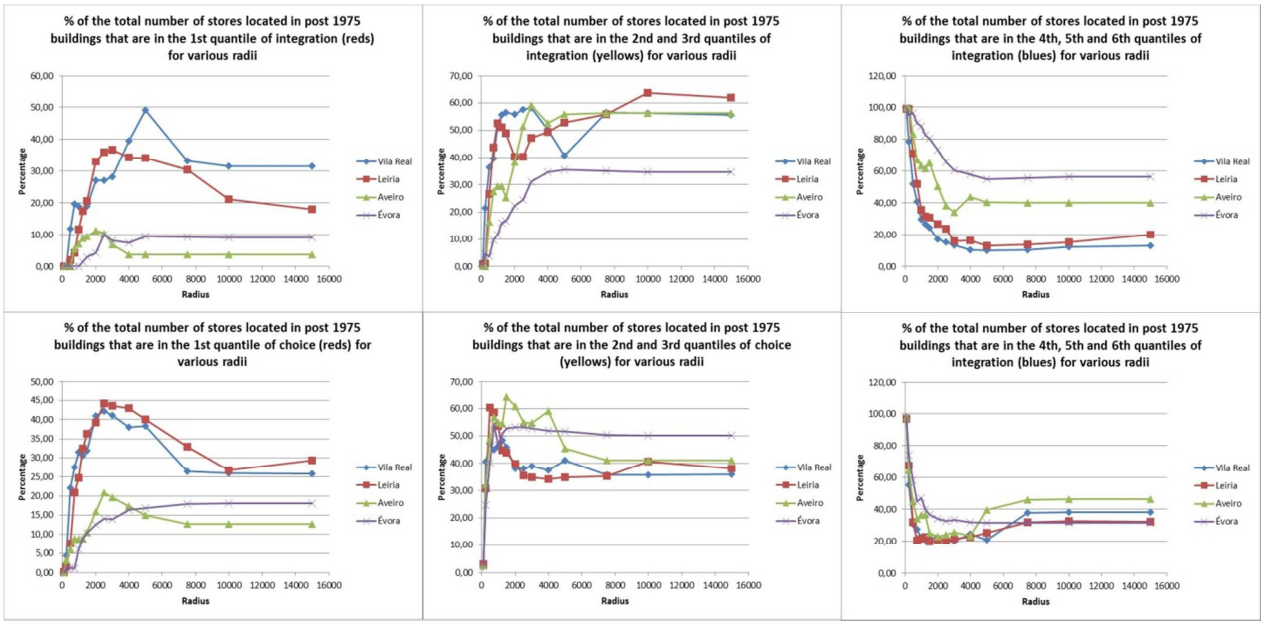


Figure 112 - Percentage of the total number of stores located in post 1975 buildings that are in each quantile of integration and choice, for all considered radii

It can be seen that Aveiro and Évora have very few stores located in buildings constructed after 1975 in first quantile axes, both in 'integration' and in 'choice'[347]. Actually, in all cities but Évora, the 'yellow' axes contain most of the stores that are in post 1975 buildings[348], meaning that these new axes not only created most of the store areas that today exist in these cities, they also contain most of the 'new' stores. Another obvious conclusion is that the main accessible and travelling axes of these cities' networks ('reds') have been defined for decades and the introduction of new buildings and new shops has not challenged their importance, especially as destinations. Locally, however, the centralities might have changed, and that is why the detailed analysis of the center and the periphery is made ahead. An example of this appears to be happening in Aveiro at around r= 2.000. The percentage of post 1975 buildings' stores increases in 'red' and 'yellow' segments and decreases in 'blues'[349]. At this distance, for this city, the stores in new buildings seem to have maximum accessibility and betweenness.

The fact that Évora's center has only 1% of stores in post 1975 buildings clearly influences the percentages in Figure 112, as it is in the centers, particularly for lower radii, that the most integrated and 'chosen' lines are located. In this city, globally, over 60% of stores in post 1975 buildings are in

[347] Less than 10% and 20% respectively.
[348] This value is almost 60% for 'integration' and almost 40% for 'choice'.
[349] The increase is particularly high in 'yellows' becoming 65%.

segregated centralities ('blue integration'). Not only are the peripheries usually less integrated (except main thoroughfares), but Évora's commercial-island-type-of-expansion conditions the location of most modern stores, pushing them to the inside of the neighborhoods. On the other hand, Vila Real's and Leiria's low integrated areas have a similar amount of stores in new buildings, showing the similarity in these cities' overall expansions, which has already been found before. Furthermore, these two cities also possess, for 'choice', the same amount of post 1975 buildings' stores in 'blue' and in 'yellow' segments (around 40%) and similar curves for 'reds'. The new travel-through high 'choice' segments, although not frequent because these cities expand in 'localities' rather than in 'axes', have nonetheless the same functions and serve similar amounts of stores. Consequently, especially in the peripheries, stores will be mainly in 'yellow' and 'blue' axes. This once again proves that the affinity of stores (in this case those in modern buildings) to 'red' segments can indeed be put into question.

The fact that the fluctuations in the 'choice' axes are less dependent on newer construction may be the reason why, as has been noted, 'choice' has a more constant pattern between cities than 'integration'. Furthermore, by what has been seen, the form can also be an influencing factor. For example, of all cities, Évora is the one with the greatest similarities between 'choice' and 'integration'. This may be because this city has the most symmetrical pattern[350] and because the main axes present a dual role.

In all the graphs above it is seen that the stores in segregated lines are obviously more at lower radii, and become increasingly less as the radii increase, until they stabilize at a given percentage closer to r= n. In Vila Real and Leiria, probably because they have stronger and gravitational centers, this decline of the percentage of stores in the 'blue' segments is more accentuated, and it is compensated, obviously, by increases of stores in 'red' and 'yellow' segments. This appears to be happening as well because of the type of expansion in 'localities' these two cities possess. At lower radii, the smaller communities outside the center in these two cities[351] show perceptible signs of local significance through the highlighting in 'yellow' and 'red' of their main streets. These are the communities that had an existence of their own before the expansion of the city engulfed them in the urban perimeter, so their syntactic structure is a micro-reflection of what happens in the centers. Therefore, locally (when they are still relevant), these small commercial axes contribute to Vila Real's and Leiria's number of stores in medium or high 'integration' and 'choice' segments. This effect happens to a much lesser extent or not at all in the peripheries of Évora (mostly constructed to be residential complements of the center) and of Aveiro (whose linear expansion is reflected into a network in which the creation of centralities is more difficult to achieve).

This difference between the two groups of cities is somewhat maintained in the interpretation of the number of 'closed' and 'empty' stores in segregated segments. It is a common notion of Space Syntax that stores will underperform in segregated axes, both in terms of 'integration' and 'choice'. But in the case of these medium-sized cities this is not exactly so, as the graphs in Figure 113 show.

[350] A central circular center with a North-South, East-West expansion, following major travelling axes in the form of the rays-of-the-sun which serve the major suburbs.
[351] Namely Marrazes, Parceiros and Pousos in Leiria, and Constantim and Lordelo in Vila Real.

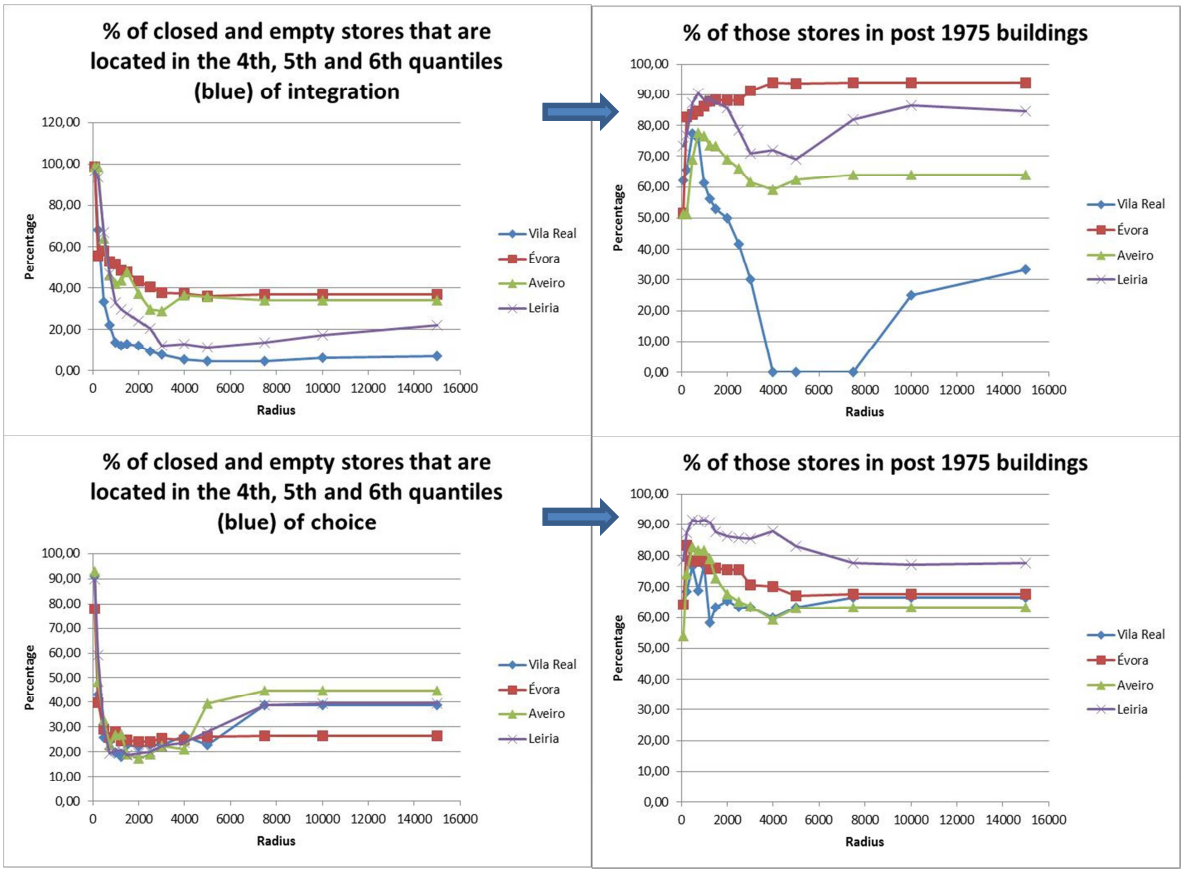


Figure 113 - Percentage of closed and empty stores that are located in segregated lines, both for choice and integration, and the respective percentage in post 1975 buildings

Excluding the local scale, less than 40% of the non-open stores are in 'blue' axes, that is, there is not a strong correlation between segregation and these stores. One reason is because most centers have hardly segregated lines, especially in 'integration' for higher radius. It is in the centers that over half of the store spaces are located, and consequently it is also there that the greater part of the 'closed' (traditional areas) and 'empty' (new axes) store spaces are. Furthermore, looking at the 'integration' graph, it can be seen that it is in Leiria and Vila Real that this correlation is lowest, even though these two centers are the ones which possess more 'new' construction and consequently, theoretically, more aptitude for 'empty' stores. This shows that these two centers are stronger and serve much more as 'destinations' than the other two, as it had been seen before. Another reason is in the form of the peripheries. Leiria's and Vila Real's localities have stronger integration axes that act as 'destinations' in the middle of the outer localities, and the commercial structure is mostly oriented to these axes. On the other hand, in 'choice' the patterns are all but similar except in Évora. Because the form of this city, especially in the periphery, is composed of a series of travel-through thoroughfares, the number of high 'choice' axes is considerable. Even the commercial 'islands' are located in streets that are well connected to other locations, even if they are segregated in 'integration'[352]. In Aveiro, for example, this does not happen, because there are few travel-through axes with stores, and in the periphery many commercial spaces are inside a segregated confuse network.

The influence of post 1975 buildings can also be decisive in these percentages. As depicted in Figure 113, with the exception of Vila Real for 'integration', over 65% of non-open stores in segregated

[352] They are also, as seen above, very well served by public transport lines.

segments are in 'new' buildings. This illustrates two things. The first is that, overall, most 'closed' and 'empty' stores are indeed in new buildings, which once again shows how a great deal of construction in these cities has been made without a proper assessment of the market conditions. The second is that new buildings, especially in the peripheries, have not so much improved the commercial network by forming 'destinations' or composing travel-through axes. A justification is that in the periphery commercial 'islands' are *inside* the neighborhoods and have only the function of serving the residents therein. Another is that new buildings are in edge (hence peripheral) axes of the center. Both, with obvious exceptions, serve more the 'local' than the 'global'. The exception of Vila Real can be explained by saying that first, the number of post 1975 buildings outside the 'center', the 'extension' and the 'main residential area' is much more reduced, second there are very few 'closed' and 'empty' stores in the city (especially outside the center), as has already been discussed, and third the peripheral localities (which have few post 1975 buildings) are very much segregated in terms of 'integration', although they have a high betweenness ('choice') because they need to be well connected to the center.

Lastly, two further calculations were made. The first was to select the segments corresponding to each color code ('reds', 'yellows', 'blues') and see, for each of those lines, the category distribution therein. For the city-scale, this was made just for r= n, and the results, just for the first quantile, are summarized in Table 29. Annex 17 contains the tables for the 'yellows' and the 'blues'. In the following sections, for the center and the periphery, respectively, these calculations were made for selected radii, namely those which were considered to be the most relevant[353].

The second calculation consists on looking at the problem from the inverse angle. Considering each category, it was seen how the stores belonging to it were distributed into each of the quantiles. For example, it was seen how many of the total of M1 stores were in the 'red', the 'yellow' and the 'blue' segments. Table 30 shows these results for the first quantile ('reds') and for r=n. Annex 17 again shows similar tables for 'yellows' and 'blues'. For the centers and the peripheries the values for the radii mentioned in the previous paragraph were also calculated.

It can be seen that the M1, MC and C categories are the ones which are most found in the 'red' lines. Because this happens both for 'choice' and 'integration' it contradicts Sarma's (2006) paper where he states that MC and C stores do not correlate with 'choice'. For 'integration', M1 stores are more significant[354] in Évora and Vila Real, the more 'traditional' localities. It can be seen that this is because of the weight of these stores in the periphery. The opposite happens in Aveiro, whose peripheral local centers are much more segregated. Here MC stores (mostly due to the center's weight[355]) are the most relevant. In Leiria the distribution of activities is much more even, showing what was found in Chapter 8. For 'choice' it can be seen that M1 stores are still in the 'red' travel-through axes (corresponding to the theory that M1 stores are a constant in all areas), but MC stores favor them much less (they prefer to be in central destinations). C stores obviously seek the thoroughfares ('choice'), a tendency that is much more perceptible in Vila Real.

[353] According to the discoveries made in this sub-chapter, the radii chosen were r= 250, r= 750, r= 1.250, r= 2.500, r= 3.000, r= 5.000, r= 7.500 and r= n.
[354] They constitute about 1/3 of the stores found in the first quantile segments.
[355] Indisputably, the influence of Dr. Lourenço Peixinho Avenue.

Table 29 - Percentage of stores in the first quantile ('red') by retail category, for r= n

	Vila Real			Aveiro			Leiria			Évora		
	City	Cen.	Per.	**City**	Cen.	Per.	**City**	Cen.	Per.	**City**	Cen.	Per.
Integration (to-movement)												
M1	**35,6**	34,5	42,2	**17,8**	18,2	16,3	**22,9**	23,2	35,7	**33,5**	28,7	47,7
M2	**9,3**	9,5	8,3	**12,0**	14,5	4,1	**12,4**	13,0	8,2	**11,8**	11,4	13,1
MC	**22,0**	24,6	6,4	**31,7**	39,0	8,2	**18,3**	20,3	6,9	**26,9**	34,4	4,7
C	**23,0**	21,0	34,9	**22,1**	10,7	59,2	**23,7**	19,5	27,4	**17,9**	15,8	24,3
S	**5,1**	5,4	3,7	**7,7**	7,5	8,2	**9,5**	10,5	7,5	**5,0**	5,4	3,7
Others*	**4,9**	4,9	4,6	**8,7**	10,1	4,1	**13,2**	13,6	14,3	**5,0**	4,4	6,5
Total	**100**	100	100	**100**	100	100	**100**	100	100	**100**	100	100
Choice (through-movement)												
M1	**35,2**	34,5	36,8	**21,1**	20,0	22,9	**28,0**	21,3	35,7	**34,4**	31,3	39,5
M2	**7,8**	7,5	8,3	**11,2**	13,8	6,8	**12,0**	13,4	10,3	**9,9**	11,0	8,2
MC	**10,8**	13,0	6,3	**23,0**	34,9	3,4	**16,0**	23,2	7,7	**22,8**	32,0	7,7
C	**35,2**	31,7	42,4	**24,6**	13,3	43,2	**23,7**	21,3	26,4	**21,4**	15,0	31,8
S	**5,9**	7,2	3,5	**7,7**	7,2	8,5	**8,8**	9,8	7,7	**5,3**	5,6	4,6
Others*	**5,0**	6,1	2,8	**12,5**	10,8	15,3	**11,5**	10,9	12,2	**6,2**	5,0	8,2
Total	**100**	100	100	**100**	100	100	**100**	100	100	**100**	100	100

* Multi-commercial or of Category unknown (closed or empty)

Around 60% of the stores in 'integration' segregated axis ('blues') are either M1 or C. This is an obvious consequence of the fact that these two categories are the ones most found in residential areas and in commercial 'islands', which are clearly not 'destinations' at a global scale. In Vila Real this number is even higher (90%). This just helps to show how in Vila Real these residential areas are much segregated, even though this percentage may be higher because the percentage of 'Others' is much more reduced.

For 'choice' much of the same happens. M1 and C stores represent between 50-60% of the stores in 'blue' lines[356]. The decrease in percentage is caused by the appearance of MC stores (around 10%). As 'choice' relates to travel-through axes, they include the center-thoroughfares and the main edge-thoroughfares leading from the center to the suburbs, where MC stores can locate.

[356] 70% in Vila Real.

Table 30 - Percentage of stores of each type of retail category that are in the first quantile ('red') for r= n

	Vila Real			Aveiro			Leiria			Évora		
	City	Cen.	Per.	**City**	Cen.	Per.	**City**	Cen.	Per.	**City**	Cen.	Per.
Integration (to-movement)												
M1	**50,2**	61,1	27,2	**5,5**	7,3	2,9	**12,2**	20,1	3,3	**21,8**	29,9	14,7
M2	**62,7**	74,1	31,0	**14,1**	22,3	2,7	**23,7**	34,1	6,3	**36,2**	48,6	21,9
MC	**81,0**	86,1	35,0	**19,6**	24,0	5,1	**22,5**	26,3	5,0	**42,9**	55,1	7,4
C	**41,1**	55,2	21,7	**8,9**	8,8	9,1	**15,6**	24,4	8,3	**19,4**	36,8	10,2
S	**46,3**	58,6	16,7	**9,0**	11,0	5,8	**20,1**	33,6	2,4	**17,9**	25,8	7,8
Others*	**53,7**	53,4	55,6	**5,5**	8,5	1,4	**14,7**	24,1	3,6	**12,8**	25,9	6,4
Total	**52,8**	64,8	25,6	**9,4**	12,7	5,1	**16,4**	25,1	5,1	**24,6**	38,1	12,0
Choice (through-movement)												
M1	**29,4**	28,5	31,4	**9,8**	9,9	9,6	**24,2**	18,6	30,5	**27,2**	32,9	22,2
M2	**30,9**	27,2	41,4	**19,8**	26,2	10,8	**37,2**	35,6	40,0	**37,0**	47,3	25,0
MC	**23,5**	21,1	45,0	**21,4**	26,4	5,1	**32,0**	30,3	40,0	**44,0**	51,5	22,1
C	**37,2**	38,9	34,9	**15,0**	13,4	15,9	**25,4**	26,9	24,2	**28,1**	35,3	24,3
S	**31,7**	36,2	20,8	**13,5**	12,8	14,5	**30,4**	31,8	28,6	**23,1**	27,3	17,6
Others*	**32,8**	31,0	44,4	**11,8**	11,1	12,8	**20,9**	19,6	22,5	**19,5**	29,6	14,5
Total	**31,3**	30,2	33,8	**14,2**	15,6	12,3	**26,7**	25,3	28,4	**29,8**	38,3	21,8

* Multi-commercial or of Category unknown (closed or empty)

But even though they represent between 1/5 and 1/3 of the stores in the first quantile, M1 stores are actually not very much drawn to them. This only happens in Vila Real, where over half of the M1 stores are indeed in 'red' 'integration' axis. Yet it can be seen that, for 'integration', this tendency occurs, for this city, in all categories, which means that commerce in Vila Real is much concentrated, and is drawn to the most central segments. The opposite happens in Aveiro where there are very few highly integrated ('red') axes, so the percentages of all categories are smaller. It can nonetheless be seen that it is the MC category, for 'integration', that prefers, in this city, the first quantile segments[357]. The other activity which shows this tendency is M2. Both M2 and MC stores need to be in 'destinations', in accessible central areas of the grid. Leiria, once again, shows a much more even distribution of activities.

This evenness is also noted, for 'choice', in Vila Real, where practically 1/3 of all categories are in 'red' axes. It can be said that this is because, mainly in periphery, store clusters (with all ranges of categories) are precisely facing these axes, as the localities they are in need to be connected to the center and survive with travel-through traffic. The same happens in Évora, whose structure naturally

[357] The percentage of MC stores in Vila Real 'drawn' to first quantile segments is also very distinct (81%).

creates high 'choice' axes. That is why the percentages of activities facing them are the highest in all cities[358]. Like for 'integration' it is also the MC and M2 categories that most avidly seek the first quantile segments. The only exception is Vila Real, where, relatively, more C stores are located in these. This should be a consequence of the 'Home' cluster in this city, and of the need these stores have to be in thoroughfares (more space and more travel-through potential).

For 'integration', again with the exception of Vila Real, most 'Other' stores are drawn to the 'blue' lines[359]. This may help to justify the lack of success of the 'closed' and 'empty' stores and prove that commercial spaces require some degree of centrality. The percentages are lower, but also with some significance (30-40%) for 'choice'. In terms of activities, with varying percentages according to the cities, C stores appear to be the ones which are more on 'blue' 'integration' segments. This can be a consequence of the warehouses in 'industrial areas' and in 'isolated residential areas'. The exception occurs in Aveiro and this can be precisely because this city has clusters of C stores near clearly defined thoroughfares. The similarity between the structures of Leiria and Vila Real is made evident when it is seen that, other than C stores, M1 and S stores have, in both cities, similar percentages in segregated segments. M1 and S stores are precisely the ones with the highest percentage in Aveiro, and M1 stores are also drawn to Évora's 'blue' 'integration' segments. If in the case of M1 and C stores it can be said that, respectively, they need to be close to out-of-the-way residential areas, and they need the space and clustering that only outer areas can provide, the case of S stores is more difficult to explain. Maybe, as proposed before, the weight of these services and single isolated purchases (like bowling alleys for example), is enough to attract a clientele, so they do not need to be in 'destinations' in the network, as they themselves are the destination that people seek.

In 'choice' this category distributions is more uneven, because it depends on each city's organization. M1 are often in segregated 'choice' segments but they are never the category that is there with the highest percentage. S stores in Aveiro and Leiria seek 'blue' 'choice' segments[360]; and so do C, M1 and MC stores in Leiria (around 30%); and M2 and MC in Vila Real (32%). Even though, as mentioned above, these two categories need to be in 'destinations' rather than in 'travel-through' axes, in Vila Real there are very few destinations other than the center, and furthermore 'choice' and 'integration' axes may coincide. C and M1 stores need to capture less the travel-through traffic as they are closer to residential areas, and S stores appear to be their own destination, so they can locate in segregated areas.

The justification for all the elements presented in this section is further obtained by analyzing more closely the centers and the peripheries, which is the object of the next two sections.

9.4.3.2. In city centers

Considering just the stores located in the city centers, it can be seen that the preference for the second and third quantiles ('yellows') of 'integration' and 'choice' is maintained. Yet, as Figure 114 shows, this does not happen for all radii. This preference only occurs either at a local scale (below r = 750 –

[358] For example, 44% of MC stores are in 'red' 'choice' axes, against 32% in Leiria and a little over 20% in the other two cities.
[359] For example, in Évora, 43% of 'Other' stores are in the 4th, 5th and 6th quantiles of integration.
[360] 40% and 30% respectively.

1.000), or for higher radii (above r = 3.000 for 'integration' and above r= 7.500 for 'choice'). For r= n, when the whole urban perimeter is being considered, over 60% of the center stores (except in Vila Real[361]) are in 'yellow' 'integration' segments and between 40%-50% are in 'yellow' 'choice' segments.

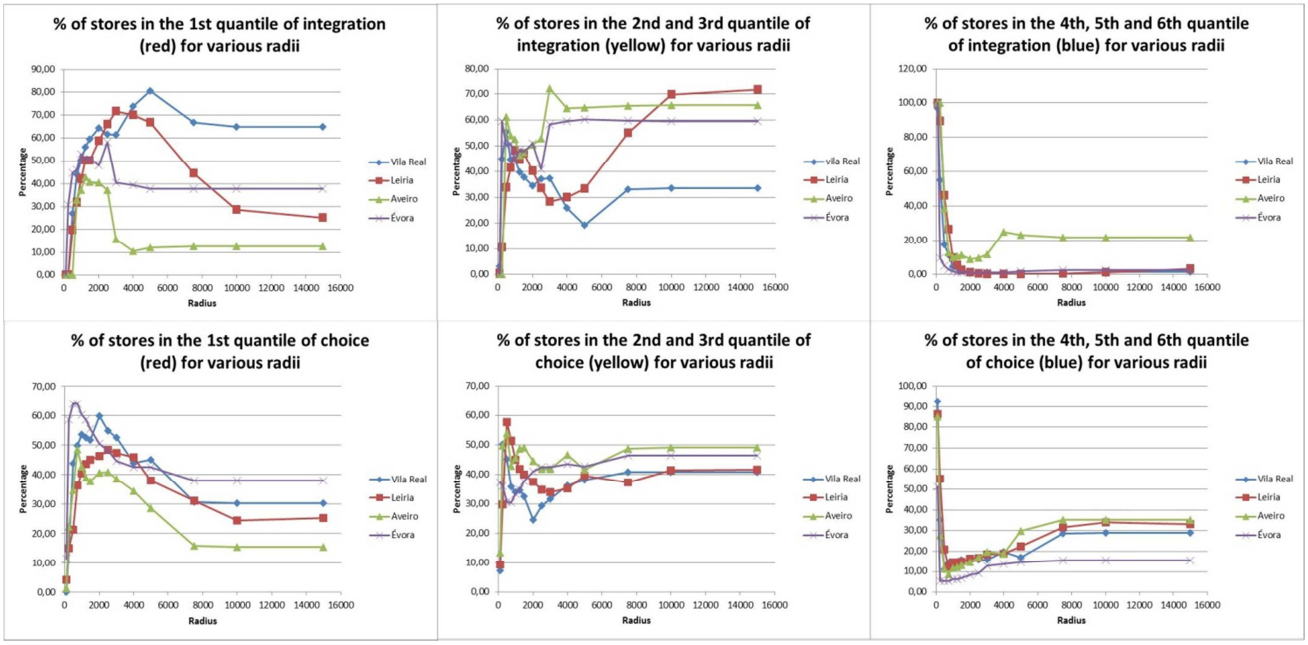


Figure 114 - Percentage of stores located in the different quantiles of 'integration' and 'choice' for various radii, in the city centers

Between the above mentioned radii, except in Aveiro's center, stores are preferably located in the segments corresponding to the first quantile of integration ('reds'). This means that for intermediate distances the center stores are in both travel-to and travel-through destinations, being that for 'choice' the influence of the centers' 'red' segments reaches larger distances, which makes perfect sense.

Trying to explain why this transition occurs at these radii, a closer look is given at the evolution of 'integration' and 'choice' in the centers. In 'integration'[362], the segments with stores only achieve a relevant local centrality after r= 250 ('yellow') and r= 500 ('red' - depicted in Figure 115). The main traditional centers (in and around *Rua Direita*) are the areas which present the greatest local accessibility, which comes as a natural consequence of their inherent definition. As the radius slowly increases, the 'middle term' commercial axes and the 'shopping linkages' also become places of relevant integration. In Évora and Leiria (where the center is 'central' and where a North-South/ East-West expansion occurs) this flow starts in the traditional core (which becomes almost perfectly integrated) and slowly expands through the linkages until it encompasses the newer areas. In Vila Real, it is clearly perceptible the separate existence of the two centers, the traditional and the new one[363]. In Aveiro, because the center functions only around two perpendicular main axes[364] these

[361] As it will be explained below.
[362] Figure 102, Figure 104, Figure 106 and Figure 108.
[363] They only connect at r= 500 ('yellow') and r= 750 ('red'), through Don Dínis Avenue, which is a structural, but not a commercial, linkage.
[364] Dr. Lourenço Peixinho Avenue and the axis composed of *Rua Direita*, Eça de Queirós Street and S. Sebastião Street.

become immediately integrated, but are 'red' only at r= 750. This is one of the reasons why, at higher radii, this center will present the least number of stores in the first quantile.

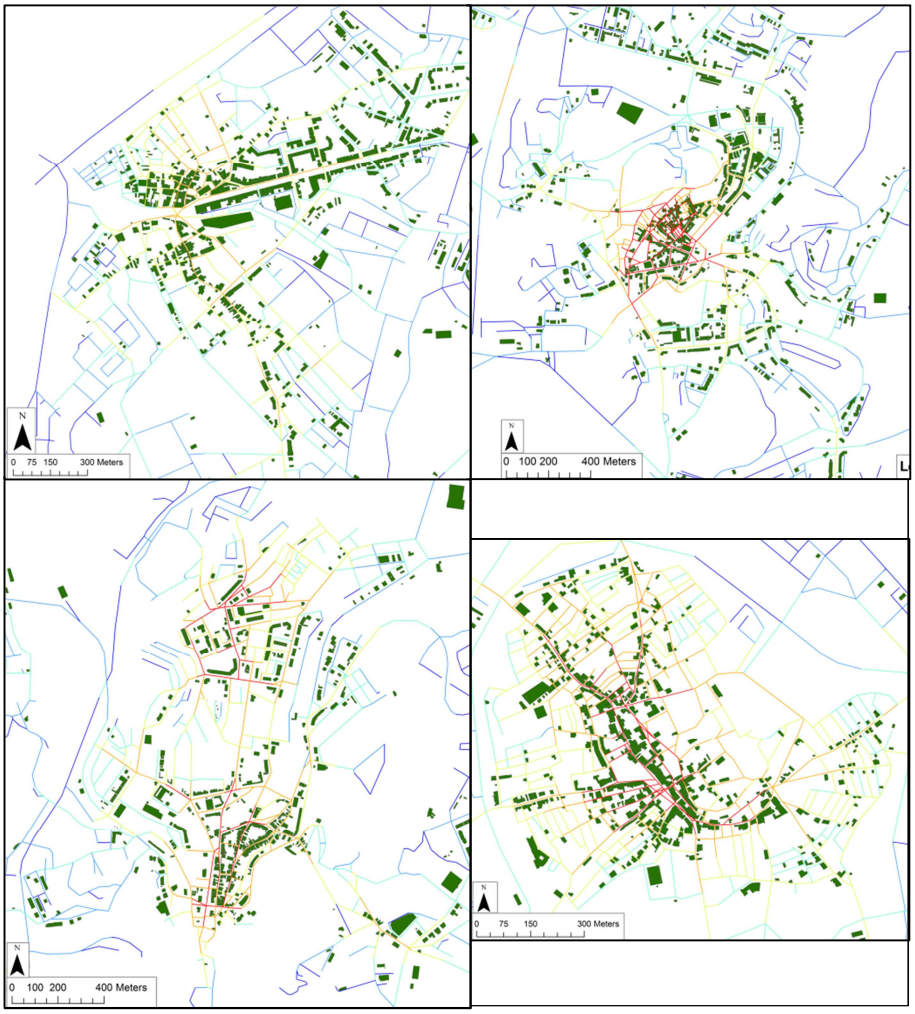


Figure 115 - Depiction of the 'integration' in the city centers of Aveiro, Leiria, Vila Real and Évora at r= 500.

Yet despite these differences, locally (bellow r= 1.000), as it can be seen in Figure 114, all cities present similar curves. After r= 1.000 all the traditional center, all the linkages and, increasingly, the segments in the edge-thoroughfares are 'red', so stores inevitably correlate more with them. At these radii the number of segregated segments in the centers with stores is very little, as they are related to solely residential areas. This tendency is maintained until more or less r= 3.000, after which more stores locate in the segments of the second and third quantile ('yellow') than in those of the first. It can be proposed that this occurs due to the size of the center. These city centers have, in average, about 2 km in diameter in their larger side[365]. Therefore, when the integration radius in under 2,5 – 3 km[366], that is, when the centers are practically just considering themselves[367], then it can be seen, by what has

[365] Only Évora's has a smaller diameter of 1 km.
[366] It should be remembered that the radius is a distance measured through the network, not as the crow flies.
[367] Obviously, segments closer to the center boundary will, when r= 3.000 is considered, take into account areas outside the center. Yet as the center's centers, where the greatest amount of stores is located, usually occupies a

been described above, that they constitute places of high local accessibility. Only when the distance considered extends beyond the limits of the center (above r= 3.000), ring-roads, 'rays-of-the-sun' axes and main streets in peripheral localities also become destinations so, relatively, the importance of many central segments will decrease. There are, nevertheless, two exceptions. In Vila Real, the traditional center (where most stores are located) does not cease to be highly integrated, even when the whole network is considered. At r= n, 65% of the center's stores are still in the first quantile of 'integration'. The city's traditional center is still a destination for the entire urban perimeter, which can be one of the causes for the lack of development outside the center and, as well, for the lack of modernization this area shows. It can also be the reason why this traditional center has been able to survive nonetheless. In Aveiro, once again the opposite happens. By all the morphological reasons described so far[368], the center axes have a very reduced accessibility. This is also the reason why Aveiro's center is the only one where stores show a noticeable correlation with segregated lines over r= 3.000 (20%). In this case, the stores in the second and third quantiles are never less (for any radii) than those in the first quantile. There is, however, a clear drop of 'yellow' in favor of 'red', between r= 1.250 and r= 3.000, a reduction that matches the phenomena perceived in the other three centers.

In Leiria's center, the passage from 'red' to 'yellow' is more gradual because there are more locations in the outer rim that are more directly connected to the center, hence the center serves as a destination for higher distances, although it will not keep this importance (as Vila Real's center does) as the radius increases. That is why Leiria's center shops correlate more with 'red' integrated segments until r= 7.500. In Évora, due to the size of the city center, this process happens more quickly (Figure 116). Even so, it is precisely in these two centers, Leiria's and Évora's, that the highest correlation of center stores with the segments in the first quantile of integration[369] occurs at the center's principal changing point (r= 2.500 – 3.000). It is at this distance that the center becomes fully saturated in terms of accessibility and at this distance that the center stores best serve the community in the urban perimeter. This occurs at a lower radii in Aveiro, because of the centers' global segregation, and at higher radii in Vila Real, where the center is, once again, proven to be the ultimate destination of the region[370].

Considering now the evolution of 'choice', it can be seen that although stores start to correlate more with the first quantile segments more or less at the same radii as in 'integration' (r= 750 or below), this relationship is maintained until a distance over 2 km superior (r= 5.000 – 7.500). In trying to understand why this happens it can be proposed that, if stores correlated more with 'yellow' 'integration' segments only after r= 3.000 because that was the travelling distance, in average, through the network, needed to reach the limits of the city center (where the relative importance of many central axes would decrease) then, in 'choice', the decrease in the relative through-movement capacity

central position in the network, and because main residential areas just outside the center have center-like qualities, it can be assumed that this assumption is correct.

[368] The off-center center, the fact that this center is surrounded/enclosed by three main residential areas/extensions and the existence of very few points where the connection to the periphery can be established.

[369] 70% and 60% respectively.

[370] In Aveiro, the highest correlation occurs at r= 1.250 (40%), but in Vila Real only at r= 5.000 (80%). In Aveiro this can be because the two main commercial and integrated axes, have precisely about 1,2 km in length measured from the central square where they meet until they reach the limits of the center. Their area of influence is responsible for most of the stores in the center. After that distance, because of the center's overall segregation, their importance decreases. On the other hand Vila Real's center shops, because of the morphological and commercial structure of the city, have to serve a larger area. It then makes sense that the center stores are destinations at higher distances from the center.

of the center segments may occur at r= 5.000 – 7.500 because this is precisely the distance needed to reach the limits of the intervention area, that is, the urban perimeter.

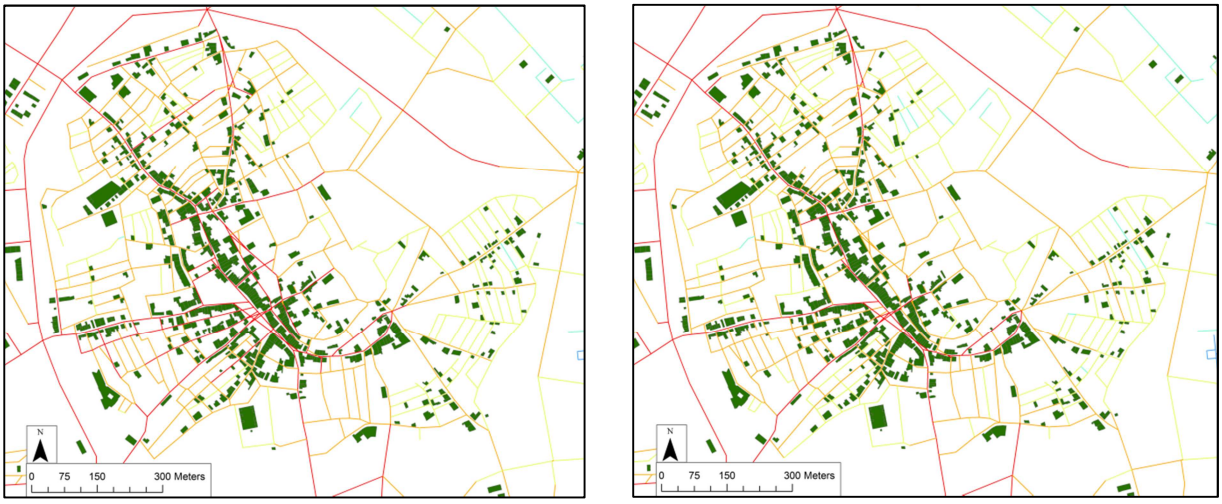


Figure 116 - Example of the 'drop' in center 'red' integration lines in favor of 'yellow'. In this case, in Évora, this occurs between r= 2.500 and r= 3.000. Only the main axes remain highly integrated.

Locally, for lower radii[371], it is also the traditional center which first presents high 'choice' values[372]. Yet the importance of these core areas as travel-through axes logically decreases as the radius considered increases. The greater 'choice' values therefore move to the most important distributional axes ('linkages') which connect the center with the outer areas. Leiria's and Évora's centers, circular, more spatially organized and with a clear commercial and syntactic hierarchy from the core to the outer rim, have a very high betweenness in their main axes at a local scale, and that is why it is at lower radii (r= 250 or r= 500) that the number of stores in 'reds' becomes superior to that in 'yellows'. For the other two cities, both with off-center centers and less straight connections to the peripheral localities, this only happens after r= 750[373].

In all cities but Aveiro, this affinity to the second and third quantile is maintained until, as mentioned, r= 5.000 – 7.500. At this distance, the relative importance of less significant travel-through axes of the center will become lower than that of peripheral main thoroughfares that reach from the center to the limits of the urban perimeter and of other city-scale structuring elements like ring roads. Therefore, only the main central axes of the center, which connect to these outer elements, are highlighted in the 'red' color. For that reason, centers with more commercial axes linked to the outer thoroughfares will have more stores, for r=n (Figure 117) in the first quantile of 'choice'. That is why Évora has the highest correlation and Aveiro the lowest[374]. Likewise, there is a higher correlation with segregated

[371] As it can be observed in Figure 103, Figure 105, Figure 107 and Figure 109.
[372] Likewise, in Vila Real, the dual centers also appear perceptibly distinct.
[373] In Aveiro's center this happens exclusively at this radius because at higher distances only the two main commercial axes will belong to the first quantile. The isolated peak at this radius is clearly perceptible in the graphs of Figure 114, and Aveiro's center will also have, as the radii increase, the lowest amount of stores in 'red' segments and the highest in 'blue'. Because the two main thoroughfares cross practically the whole center, they are the distributors of movement and the travel-through axes. There is no need to travel in other segments to reach the main central destinations.
[374] In Évora's center there are 40% of stores in the first quantile of 'choice' for r=n, whilst in Aveiro's (which has only one main axis directly connected to the exterior) there are only 15%.

lines than there was for 'integration'[375], which just shows that city centers act as 'destinations', not as 'distributors'.

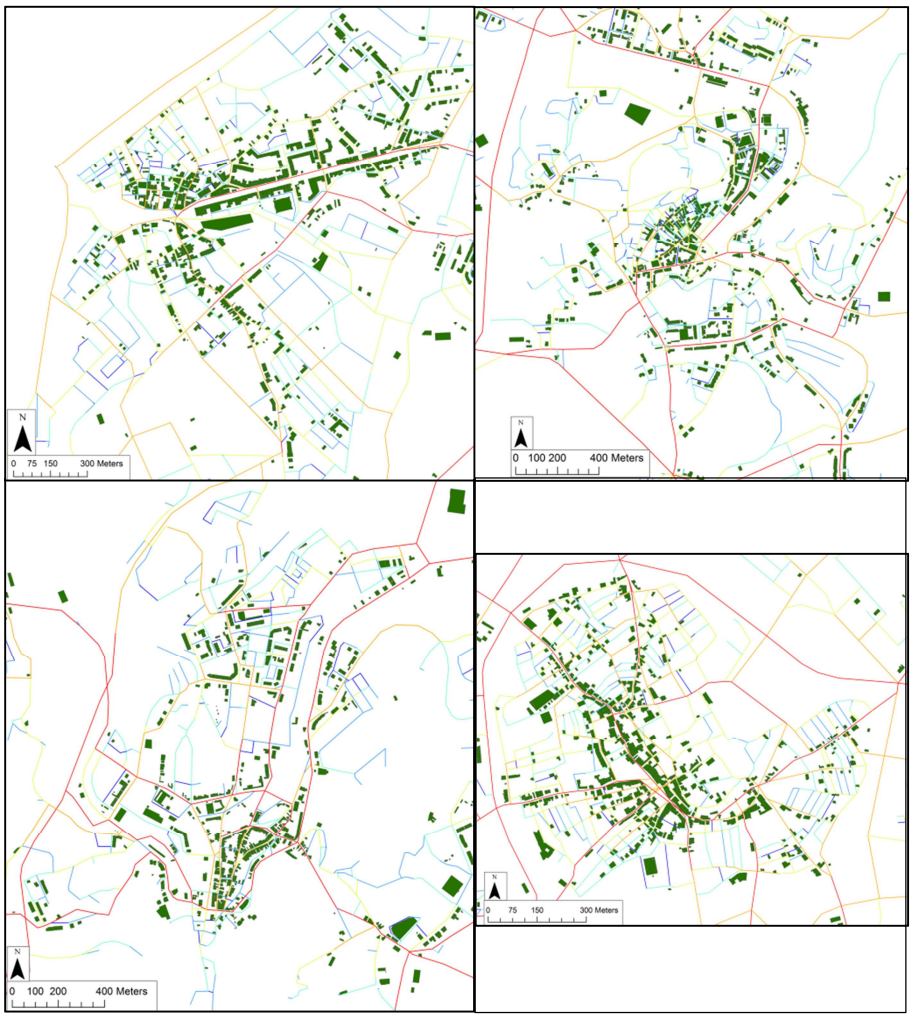


Figure 117 - Depiction of the 'choice' in the city centers of Aveiro, Leiria, Vila Real and Évora at r= n.

And in this regard, the centers of Leiria and Vila Real prove to be, once more, more connected. Their main shopping axes act as 'distributors' not only within the center, but also in serving the periphery, and linking the peripheral localities. In these two centers, the highest correlation of the segments in the first quantile of 'choice' with center stores occurs at higher distances (r= 2.000 – 2.500[376]), that is, they serve larger areas and have more stores in strategic edge-of-center locations which will also compose travel through-axes. In Aveiro and Évora, this peak occurs at a much lower radius (r= 750[377]). Not only these centers serve smaller overall areas, they also possess less main through-movement axes at a

[375] Around 30% for higher radii in all centers but Évora's (15%). The size and structure of Evora's city center allows for very few segregated segments both of 'choice' and 'integration', mostly in residential blocks that do not present shops.
[376] 50% and 60% of stores in Leiria and Vila Real, respectively.
[377] 50% and 64% of stores in Aveiro and Évora, respectively. In Évora at r= 500 there is also the same number of stores.

global scale, even though these appear to be more clearly defined[378]. In Évora, for example, although the stores are also in important travel through-axes *within* the center, seldom will a traveler pass through them to reach another suburban location. The ring road that circles the city walls will serve this purpose more neatly[379]. It can be seen, furthermore, that even at these peaks, for all centers, there are less stores in 'red' 'choice' segments than there were in 'red' 'integration' segments, which corroborates the notion of the center's role as a 'destination'. Yet, like it was seen for the city-scale analysis, the 'choice' patterns are more constant between centers than the 'integration' patterns. It can be proposed that the main travel-through axes of each center serve the same purposes. And again, Évora's symmetry and the dual importance of its main axes (travel-to and travel-through) provide this center with the greatest similarities between 'choice' and 'integration'. For the centers one further similarity is perceived that was not when considering the city's whole stores. Close to r=n, the number of stores in both 'choice' and 'integration' first quantile segments is similar in Aveiro's and Leiria's centers. The explanation is simple. The main axes of these two centers[380] are both destinations and important access routes to other locations. This dual importance can be even regarded to be one of the main reasons for their commercial success. In Vila Real, although there are some thoroughfares where this holds true[381], the streets of the traditional center (with most stores and most 'integration') have very poor 'choice' values, which influences negatively this center's similarity between 'choice' and 'integration' patterns.

The graphs of Figure 118 show the percentage of center stores, for the first three quantiles of 'integration' and 'choice', that are in buildings constructed after 1975. Obviously, Leiria's and Vila Real's centers have the highest percentage of these, both for 'choice' and 'integration'. But whilst in Leiria the numbers are over 50% in these two variables[382], in Vila Real this is less perceptible for 'red' 'integration' (25%) due to the weight of the traditional center[383]. This means that if in the two centers 'new' buildings have been crucial in promoting their stronger growths, in Leiria the new construction has also drastically improved the overall accessibility and travel-through capacity of the center, whilst in Vila Real, although it has also substantially improved these elements, especially in the Northern part of the center, it has not been able to replace the importance of the traditional center as the main destination at a global scale. In Aveiro and Évora the new construction with commerce has not occurred in the extensions formed by the main axes and thoroughfares of the center, nor has it been able to replace their importance. Whilst Évora's city center has close to zero stores in post 1975 buildings, Aveiro's has between 20-30% of those found in 'choice' and 'integration' segments. The fact that at lower radii there are perceptible increases in these percentages reveals that locally, for this city, new construction has assisted the center's accessibility and betweenness to segments with stores, but that globally this influence is not relevant.

[378] Or rather the contrast to the other axes is much more perceptible.
[379] In this center, precisely because most stores face these thoroughfares, the decrease in importance of other segments will affect less the amount of stores in high 'choice' segments than in the other centers.
[380] Dr. Lourenço Peixinho Avenue or Dr. Adelino Amaro da Costa Avenue, for exemple.
[381] 1º de Maio Avenue or Aureliano Barrigas Avenue.
[382] In Leiria's center 50% of the stores in the second and third quantiles are in post 1975 buildings and almost 70% of the stores in the first quantile are in these. This occurs both in 'choice' and 'integration'.
[383] In Vila Real's center both 'red' and 'yellow' 'choice' segments have 40% of their stores in post 1975 buildings, yet for 'integration', whilst for the first quantile only 25% of the stores are in post 1975 buildings, for the second and third a massive 90% of stores are in those.

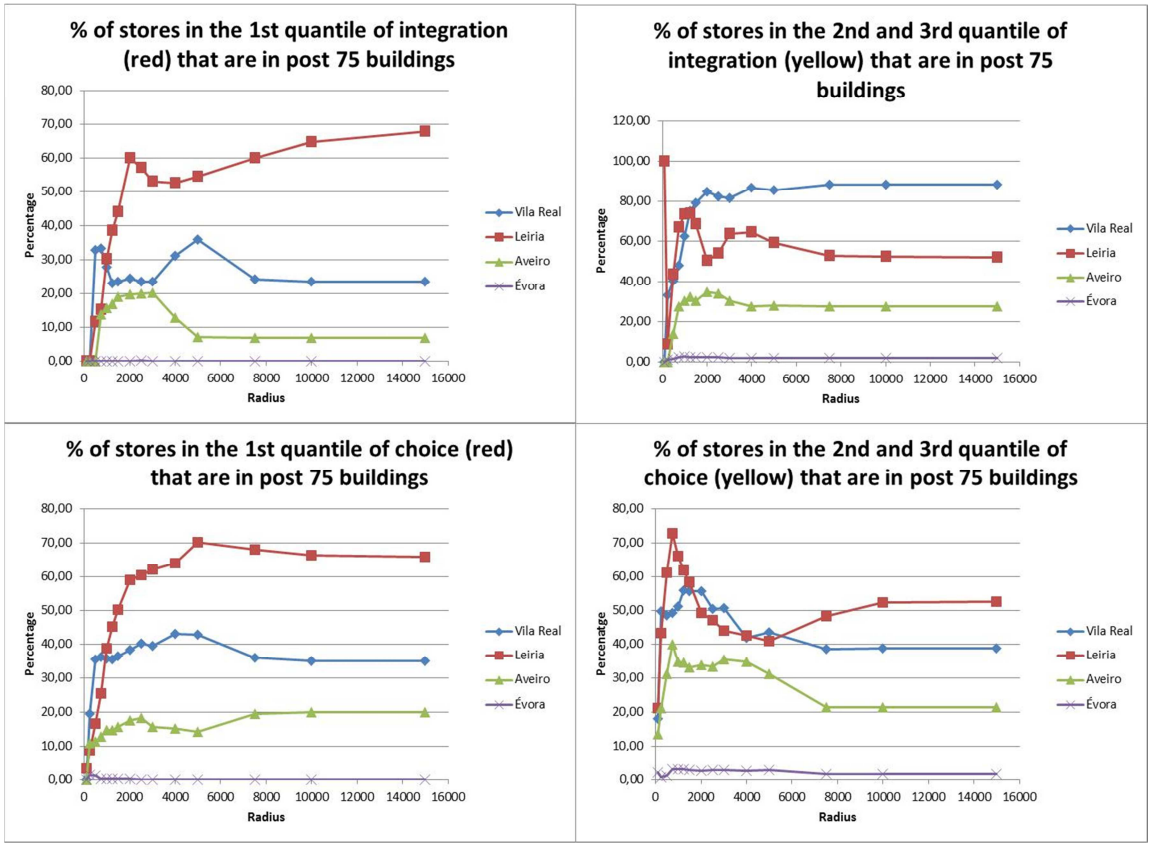


Figure 118 - Percentage of stores, in the centers, located in the medium and higher quantiles of 'integration' and 'choice' that are in post 1975 buildings, for all radii

Looking at the problem from the inverse angle, that is, calculating what percentage of all center stores located in buildings constructed after 1975 are in each quantile, the graphs of Figure 119 are obtained.

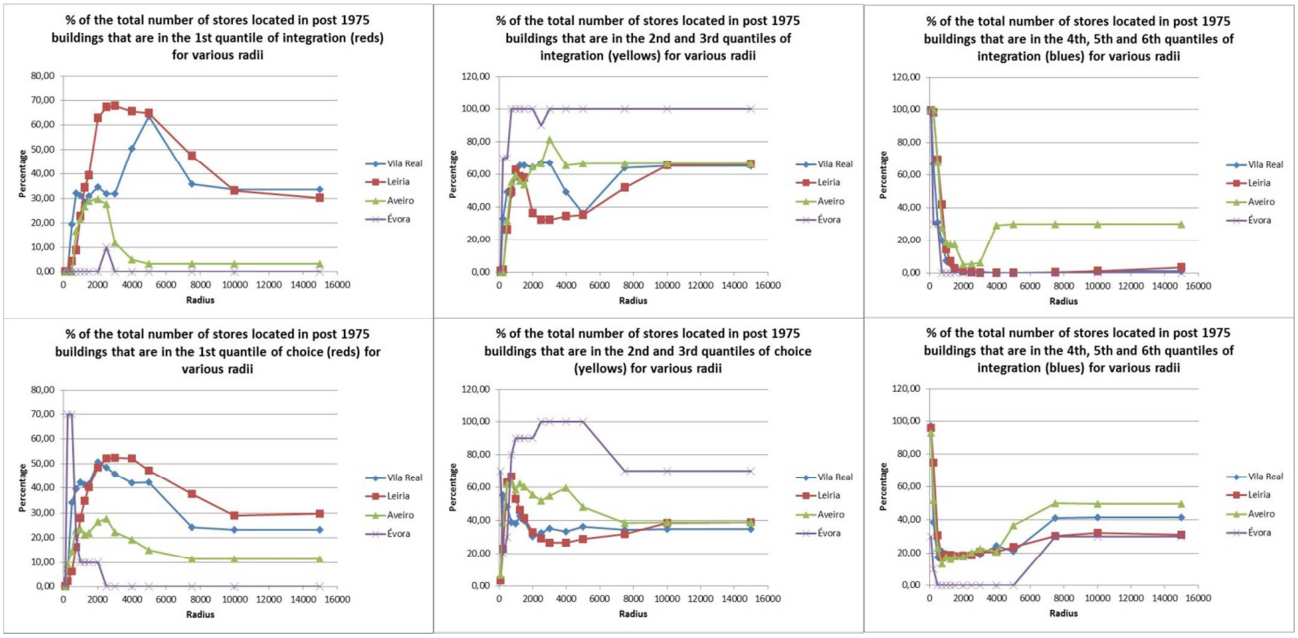


Figure 119 - Percentage of the total number of stores in the centers, located in post 1975 buildings that are in each quantile of integration and choice, for all considered radii

Of Évora's city center 10 stores in post 1975 buildings only one, for brief moments, is seen in segments of the first quantile either of 'integration' or of 'choice'. For 'integration', however, they are all in the second and third quantiles in practically every radii, as they are in streets not in, but close to, the main axes of the center. Yet although these streets have a somewhat relevant importance as destinations, they are not travel-through axes, so all stores only appear in 'yellow' 'choice' segments at lower radii[384]. In Aveiro, as it would be expected, center stores in post 1975 buildings also have a poor correlation with 'red' segments. Only locally is this correlation perceptible[385], as globally the value is never higher than 10%. Actually, it can be seen that Aveiro's stores in post 1975 buildings are the only ones which have any significant correlation with segregated segments in terms of 'integration'. This may be justified by the fact that the edge-thoroughfares are cornered and poorly connected to the periphery[386]. But what is actually surprising is that for all the other centers, for 'integration', practically *none* of the stores in post 1975 buildings are in segregated segments. This can only mean that new construction with stores either chooses central locations (destinations) or, by their mere creation and attraction capability, become central destinations in their own right. As it can be seen this does not hold true for 'choice'[387]. This means that new axes are almost always 'destinations' but not necessarily distributors of movement[388].

Another striking element the graphs reveal is, not considering Évora's particular case, how similar the global percentages are, both for 'integration' and 'choice', of the number of stores in post 1975 buildings located in the second and third quantiles. Globally, over 2/3 of the stores in new buildings are in segments with intermediate accessibility and 40% are in segments with intermediate attraction as travel-through axes. If the difference in percentage corroborates the deduction that new axes are more destinations than distributors, the similarities reveal how the new construction has performed a similar role in the centers in terms of enriching the network, if not fully, at least intermediately.

The greatest correlation, globally, is indeed with the 'yellow' segments, but it should be noted that at the moment when the centers have their maximum weight in the urban perimeter (r= 3.000 to r= 5.000) over 60% of the center stores in post 1975 buildings in Leiria's and Vila Real's centers are indeed in 'integration' segments of the first quantile. For 'choice', for the same interval, this number is around 50%. Although this number eventually drops to 30% in both cases, it is proven that the main new axes of these two centers ('linkages' and 'edge-thoroughfares') have a stronger relation to the close-by peripheral localities ('extensions' and 'main residential areas'), because their correlation with higher values of 'integration' and 'choice' does not occur locally nor globally, but at intermediate distances[389]. It could be supposed that, because new commercial concentrations were rather 'imposed' by new construction, they impact more on the surrounding network than in the whole city. Therefore they are both integrated and 'chosen' to a certain extent, but they are not crucial (hence not 'red'). In Aveiro this mid-distance increase is also perceptible, but occurs to a much lesser extent, and also at

[384] Globally, as it can be seen, one of the buildings (containing 2 stores) is located in a segregated 'choice' street.
[385] 30% for 'choice' and 'integration' close to r = 2.000.
[386] Força Aérea Avenue, for example, becomes 'blue' after r= 3.000.
[387] Globally 30-50% of stores in post 1975 buildings are in segregated lines.
[388] In Vila Real and Aveiro, for r= n, the percentage, for 'choice', of stores in 'blues' is even slightly higher than that in 'yellows', which just attests to the segregation of Aveiro's center and to the fact that Vila Real's high 'choice' axes are at the edges of the center and do not pass through the core, where the stores are.
[389] It is to be supposed that locally, for Vila Real, the weight of the traditional commercial center is responsible for the rise of the 'integration' curve of Figure 119 to occur only at r= 4.000.

lower radii. The evident segregation of new residential neighborhoods and the fact that the old travelling commercial axes still withhold are the causes.

The graphs in Figure 120 also show that in the centers, like in the city-scale analysis, the 'closed' and 'empty' stores are not so much associated with the segregated 'integration' and 'choice' segments ('blues') as could be supposed.

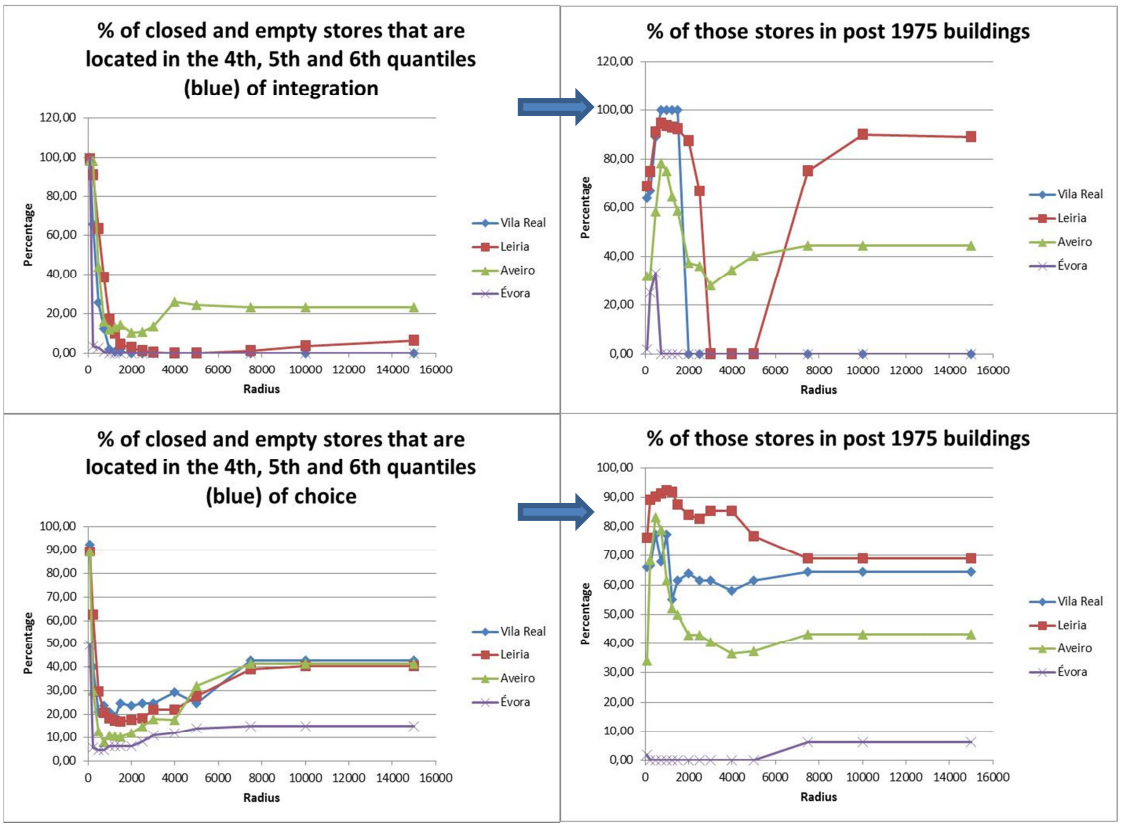


Figure 120 - Percentage of closed and empty stores, in the centers, that are located in segregated lines, both for 'choice' and 'integration', and the respective percentage in post 1975 buildings

For 'integration' with the exception of Aveiro's center, there are hardly any 'closed' and 'empty' stores in segregated segments. Actually, the number is zero for Vila Real's and Évora's center and just 6% for Leiria's. This clearly shows that both the traditional centers (closed) and new thoroughfares (empty) are destinations, even at larger distances, and that center stores favor much more from being in these destinations than in being in travel-through axes. In Leiria, with the exception of the interval between r= 3.000 and r= 5.000 (where the center's 'red' axes are maximized), almost 90% of these stores in 'blue' 'integration' segments are in post 1975 buildings, which reflects the existence of empty commercial spaces in newer residential yet segregated zones. In Aveiro there is a similar drop between the same radii, but the amount of stores in post 1975 buildings before this interval (almost 80%) is twice that which occurs after (40%). This strengthens the above presented hypothesis that in Aveiro's center new construction has an influence mostly at a local scale.

In 'choice' there is a much greater number of stores in the segregated lines, meaning that indeed stores in the center prefer to be located more in destinations than in distributors. Évora still has the lowest percentages (around 15%) because the center is small and most stores are in or around the main axes,

which, as mentioned, are also the main thoroughfares of movement. The other centers show strikingly similar patterns. Locally, they have around 10-20% of non-open stores in segregated 'choice' segments with a very high percentage of those in post 1975 buildings (over 80%). This shows, as it did in 'integration', that new sites constructed in segregated areas (at the edges of the center mainly for residential use), have more trouble in occupying their store space. Globally, these three centers have about 40% of 'closed' and 'empty' stores in 'blues'. The increase can be justified by the introduction of the edge residential/service/commercial thoroughfares of new construction, whose 'choice' influence is larger at greater distances and which also possess non-open stores, mainly 'empty'. Proving this point is the fact that the percentages of these stores in post 1975 buildings is higher (70%) in the centers with more new construction with commerce, that is, Vila Real's and Leiria's.

Lastly, the relationship between to- and through-movement and the type of retail category is analyzed for the centers, using the methodology described in the previous sub-chapter. It can be seen that, for the centers, there are not so many striking similarities as those which could be perceived for other analyses, so an average model is more difficult to obtain.

First it was seen, for each quantile, how was the distribution of retail categories therein (hence always a sum of 100%). The values presented, for the center, for r=n and for the first quantile ('reds'), in Table 29 can be complemented with the graphs of Figure 121, for 'integration', and Figure 122, for 'choice', still for the first quantile, and for the selected radii, as mentioned in the previous sub-chapter. Annex 18 has similar graphs for the 'yellows' and for the 'blues'.

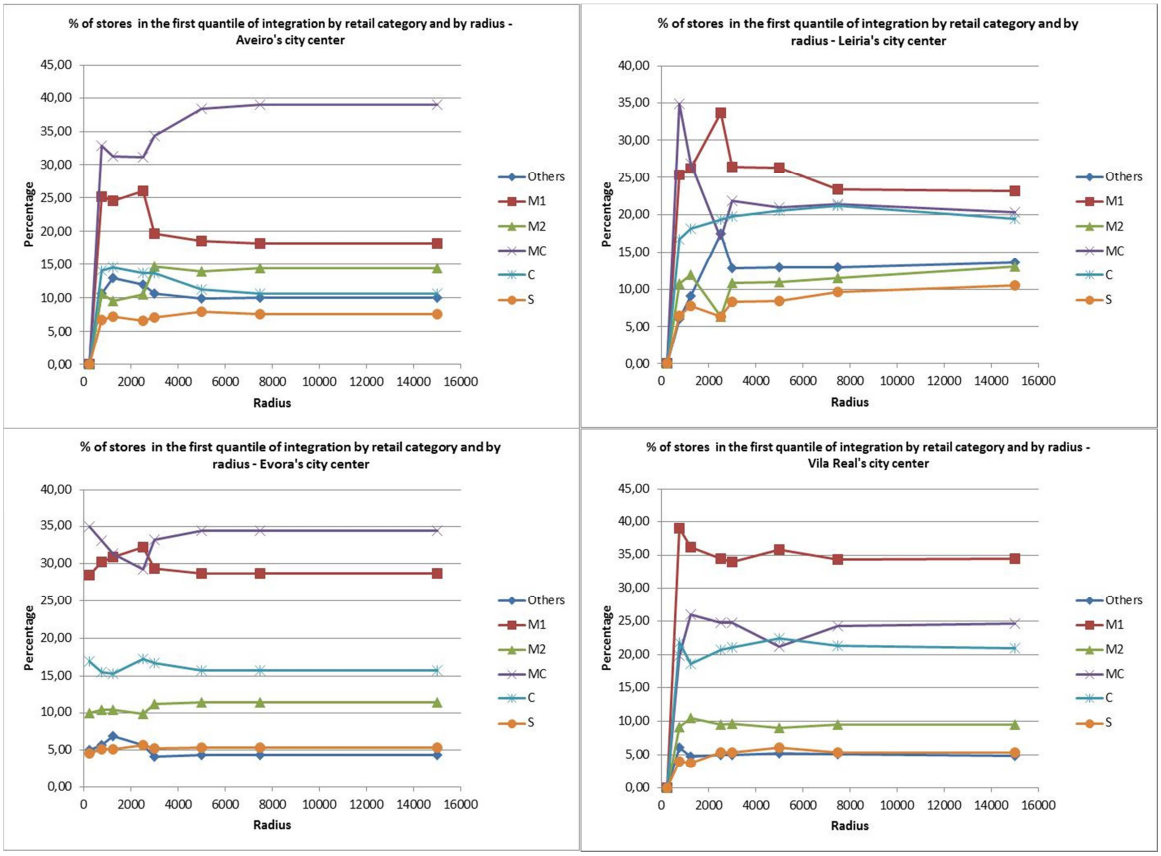


Figure 121 - Percentage of stores in the first quantile of integration by retail category and by radius for each of the four centers

Considering first 'integration' it can be seen in Figure 121 that in Aveiro's and Évora's centers over 1/3 of the stores in the segments with the highest values belong to the MC category. This is indeed, as proved before, one of the principal categories which requires centrality (needs to be in the principal 'destination')[390]. If in Aveiro's center this happens for all radii, in Évora's center, between r= 1.250 and r= 3.000, the first quantile segments serve M1 stores better. It is precisely M1 stores (which also come second in Aveiro's center) that are mostly served by the first quantile segments of Leiria's and Vila Real's centers. This can be because these two centers have more inhabitants and more new areas, that is, more points (local and global) of centrality. The 'traditional' nature of Vila Real, as well as the fact that the center clusters most of the urban perimeter's activities, can justify why in this city M1 stores have the highest representation for all radii (1/3 of the stores). In Leiria's center, this only does not happen at r= 750, where the first quantile serves MC stores better. Actually, with the exception of Vila Real's center, at lower radii all centers' first quantile segments contain more MC than M1 stores. This is because the traditional (pedestrian) commercial axes and their principal extensions, rich with MC stores[391], are highly integrated locally (destinations at short distances in the center).

Most of the category changes occur between r= 2.500 and r= 3.000. This is the moment previously described when the centers cease to consider practically just themselves and start to take into account the main peripheral poles. The immediate consequence is that the percentage of M1 stores associated with the segments of the first quantile declines. This is because these stores are also in segments of second importance, which pass from 'red' to 'yellow', and in those closer to residential areas, which become 'blue'. In Évora, due to this drop, MC stores become the ones with the highest percentage. In the other centers, despite the drop, M1 stores nevertheless keep their place. In Aveiro (although MC stores are still the most represented), at this moment M2 stores become more relevant than C stores. In Leiria, C stores slightly increase after r= 2.500 and have, globally, similar representation as MC stores (20%). In Vila Real, for a brief moment at r= 5.000 'red' 'integration' lines serve more C than MC stores, which reflects the 'Home' cluster in this city and the influence it has on the surrounding periphery[392].

The graphs also show that S stores are always the least represented[393]. They do not need to be in 'destinations' as they probably have attraction enough to locate elsewhere. Sometimes, they also need the space that the main locations cannot provide.

Looking succinctly at the graphs in Annex 18 it can be seen that M1 stores are the ones the second and third quantile segments favor the most, for any radii (30-40%)[394]. This shows that, for Leiria's and Vila Real's centers, M1 stores are indeed the principal category in the 'red' and the 'yellow' segments. This further strengthens the thesis that these commercial centers are the most relevant in serving not only the centers' but also the urban perimeters' population, as they are the most accessible in terms of first necessity goods. The second and third quantile segments have about 20% of both MC and C stores, and below 10% of M2 and S stores. This is valid for all centers but Vila Real's where MC

[390] Fashion' stores not only are in the traditional and main commercial axes of the city centers, they are also hardly anywhere else.
[391] 'Fashion' sub-activities and others like 'travel agencies', 'telecommunications' and 'sporting goods'.
[392] Probably the relationship with the Borbela cluster - Figure 79.
[393] They represent 5% of stores in the 'red' 'integration' segments for Évora's and Vila Real's centers, and 10% for Leiria's and Aveiro's, and these values practically never shift for any radii.
[394] The numbers are close to 30% in Aveiro's and Leiria's centers, and to 40% Vila Real's and Évora's.

stores have a poorer correlation with 'yellow' lines[395]. This is more relevant over r= 3.000, and the drop in MC stores is compensated by an increase in C stores, a prerogative of this city, particularly at a global scale.

If in Leiria's and Vila Real's centers M1 stores are almost always highly accessible, in Aveiro's and Évora's centers these are the stores that the segregated quantile segments ('blues') favor the most, showing that, outside the main axes, the residential neighborhoods (and the first necessity stores) are in less accessible areas[396]. In Vila Real's center it is further shown how C stores only start to matter at higher distances, as locally they are the stores with the highest percentage in 'blue' segments[397]. In Leiria, at intermediate distances, 'Others' are in higher percentage in the segregated segments. At r= 3.000 they are the *only* types served by these, which can obviously justify their lack of success. Most of the other categories have a below 20% representation in the 'blue' segments. S stores are also very poorly represented in these segments, except in Aveiro.

Considering 'choice', it can be seen that there are more dissimilarities (Figure 122). The first quantile is composed, in Aveiro's and Évora's centers, mostly (about 1/3) of MC stores, except, in both cases, at the local level, where M1 stores are more relevant. It can be supposed that locally M1 stores prefer to be in axes that lead to other greater commercial areas of the center. In Évora's center, globally, the percentage of M1 and MC stores will become the same. In Vila Real's center, M1 stores are always in higher percentage in the first quantile axes, and a similar increase in percentage occurs locally. In Leiria's center, however, it is the MC stores that are the most relevant locally. This can be because of the new fashion district in the 'new' linkages[398] which have a high degree of 'choice'. Between r= 1.250 and r= 7.500, not only are MC stores in lower number in the first quantile than M1 stores, they are also lower than C stores. Yet, globally, MC stores will again rise in importance, as they need to be in travelling axes reachable from all points. Nevertheless they have, in these segments, the same significance as C and M1 stores, once again proving Leiria's more equal distribution of store types along its main axes.

On the other hand, C stores either prefer, as seen, the areas near the residential neighborhoods or else more spacious thoroughfares. These thoroughfares obviously have higher 'choice' values, especially if they have a direct connection to the periphery. Therefore, this category will be more perceptible in Leiria's center (especially at mid-distances) and even more so in Vila Real's. Here, except locally (below r= 250) it is the second most representative category (behind M1). Globally, in both these centers, the number of C stores served by first quantile 'choice' segments is practically the same as M1. On the other hand, M2 stores have the least representation in Vila Real, which reflects the deficiencies of services and high-order goods in this city center.

[395] Of the same order of magnitude as M2 and S stores.
[396] In Leiria and Vila Real M1 stores also appear with relative importance, particularly globally, corroborating the segregation of residential and traditional neighborhoods.
[397] It can be seen in the graphs that the percentage of C stores in 'blue' segments continually increases until, between r= 5.000 and r= 7.500, they become the *only* store types served by these segments. This occurs when Vila Real's center peaks in terms of stores in 'red' segments, and there is hardly a segregated line. After this, although C stores are still the ones that have the highest representation in the segregated 'integration' segments (as they locate edge-of-center), their percentage is always declining.
[398] Such as Heróis de Angola Avenue.

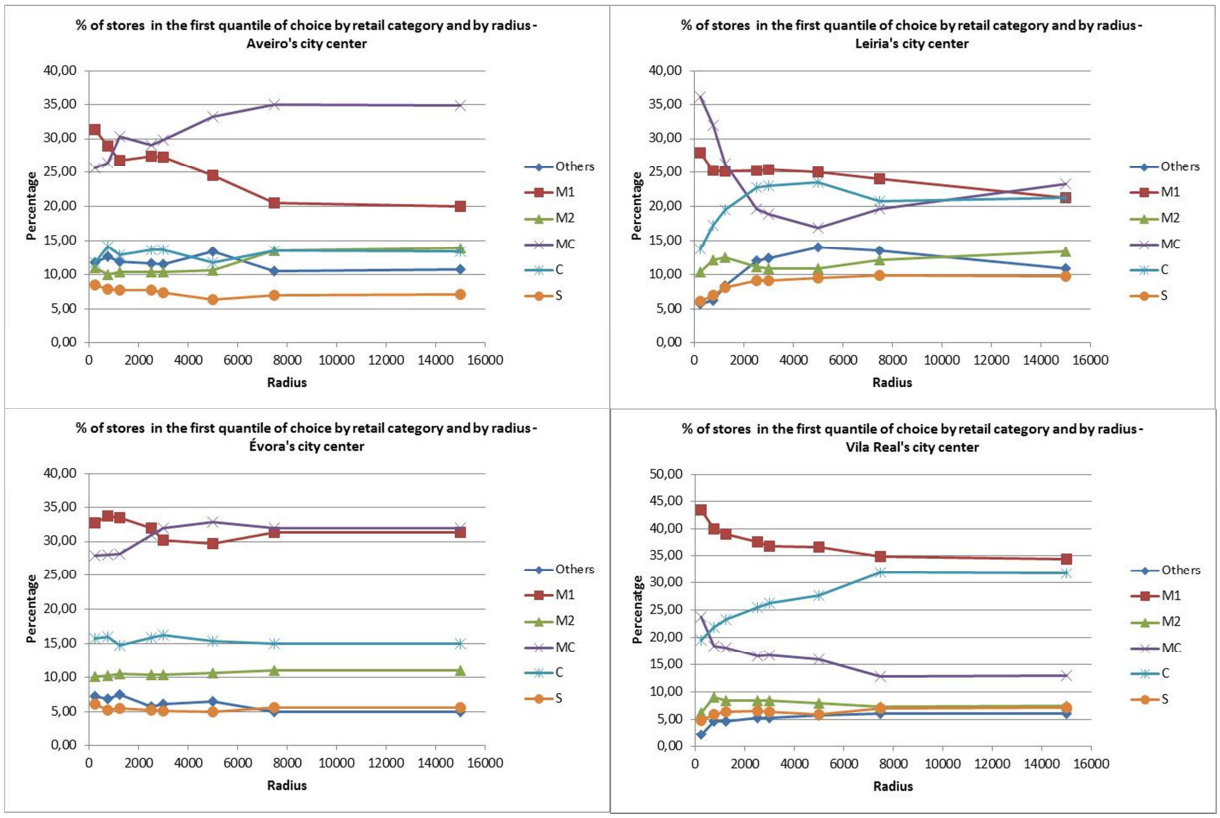


Figure 122 - Percentage of stores in the first quantile of 'choice' by retail category and by radius for the four city centers

In Évora's center there is a great gap between the M1 and MC stores and the rest. In Vila Real, this gap occurs between M1 and C stores and the rest. This should translate the activities inside each of the city centers which are located in routes where exiting costumers from the center, or entering costumers from the periphery have inevitably to pass through. In Évora, the highlight of the center is the 'Fashion' cluster. In Vila Real, it is the 'Home' cluster. In Aveiro this also happens to a certain extent. Because globally practically only Dr. Lourenço Peixinho Avenue is highlighted in 'red', the main category of this axis, MC, stands out. Because of this, and because of the development of the residential localities just outside the center, the percentage of M1 stores is lower here. Nevertheless, all other centers show that M1 is relevant in high 'choice' axes at all distances. On the other hand, S stores once again appear as the activity with the poorest correlation with the 'choice' segments of the first quantile.

Looking once again at the graphs in Annex 18 it can be seen that, like for 'integration', M1 stores have the highest percentage in 'yellow' 'choice' segments (between 30-40%). Locally, all values increase but in Vila Real's center, because here the two distinct local centers have high ('red') betweenness. As M2 and S stores also have practically similar percentages in all centers (less than 10%), the distinctions between them have to be found analyzing the MC and C categories. In this regard, the radius r= 7.500, representing the distance when the main fluxes of traffic cover the length of the diameter of the urban perimeter, seems to be the turning point both for Leiria's and Aveiro's centers. In Leiria's, after this radius, C stores in the segments of the second and third quantile become more than MC stores. In Aveiro's center, the opposite happens. This is because, at this point, the principal travel-through axes in Aveiro are the central avenues, whilst in Leiria these are the edge-thoroughfares. Furthermore, locally, below r= 750 (in Aveiro's center) and r= 2.500 (in Leiria's

center) the shift between these two categories had already happened as well. Both categories are, in their respective cities, important locally and globally, but not at mid-distances. In Vila Real's center MC stores have higher percentage than C stores (because in the first quantile the opposite happened) and in Évora's center the percentages of these two categories are very similar for all radii (20%).

The segregated 'choice' segments ('blues') also contain more M1 stores than any other category. Again, locally, this percentage is higher. These should symbolize the out-of-the-way neighborhoods with only a first necessity commercial structure. Yet it is relevant to note that in Vila Real's center, below r= 7.500, C stores have a higher representation in 'blue' 'choice' segments than M1 stores. Once again it is noted that C stores in this city are only relevant at a global scale, as they are in thoroughfares which have only meaning when serving the entire urban perimeter. Actually, this global decline of C stores in segregated 'choice' segments occurs in all centers but Aveiro's. This should be because at higher radii only Dr. Lourenço Peixinho Avenue and two other less commercially important axes are highlighted in 'red', and both residential and edge 'Home' clusters are more than often segregated. For Aveiro's and Leiria's centers, 'Others', MC and C stores appear behind M1 stores with a weight of about 15-20%, whilst M2 and S stores have a significance below 10%. Actually, S stores only stand out in Évora's city center. For this center and Vila Real's, with the exception of the C stores in the latter case, all categories have a below 15% representation, with close percentages to one another.

To complete the center analysis, these graphs can be produced the other way around, that is, considering the percentage of each type of retail category that is in the segments of each quantile. This way, the affinity of a store type to a given quantile can be found. The values in Table 30, for the first quantile and for r= n, can be complemented with the graphs in Figure 123, for 'integration', and Figure 124, for 'choice', also for the first quantile. The graphs for the 'yellows' and the 'blues' are displayed in Annex 19.

For 'integration' it is found that M2 and MC stores are the ones that most vehemently seek the segments of the first quantile. Although the overall number of these stores, considering all the categories present in this quantile, is small, the truth is that there is here indeed a higher relative percentage of these stores than of any others. Even locally, when only a small portion of the center is 'integrated', the majority of M2 and MC stores already appear in the relevant segments of the second and third quantiles, especially in Vila Real, proving that they choose to be in the places that, as the radii increases, will become fully integrated ('red').

The same happens, to a lesser extent, with S stores. If this occurs for all radii in Leiria's center (showing the higher functions performed by it), in Aveiro's and Vila Real's centers this occurs mostly locally (or at least at the distance when the center has the maximum accessibility). In Évora's center, however, S stores are not in 'red' 'integration' lines, revealing a center with an opposite role than that of Leiria. Furthermore Leiria's graph shows once again how the distribution of activities is more even. Even so, it is perceptible that in this context, M1 stores are the ones who seek less (or have less opportunity to seek) the 'red' 'integration' segments. In Vila Real, on the other hand, these first necessity stores are much more on the 'destinations' of the center. In the other two centers, these stores appear relevantly at a local scale, but not in the global scale. Obviously, the small sub-centers of Leiria's, Aveiro's and Évora's centers, where first necessity stores are located, serve a small radius of the network that is meaningless when the whole urban perimeter is considered. Because in Vila Real

this does not happen, it just helps to prove the center's relative weight. Consequently, M1 stores have one of the highest affinities to segregated 'integration' segments, especially in Évora's and Aveiro's centers. Yet the highest percentages of M1 stores are in the segments of the second and third quantiles. In Aveiro, S stores also have a relatively high (when compared with the other categories) affinity to segregated 'integration' segments. Even so, the percentages of stores in 'blue' segments are very close to zero, especially in Leiria's and Vila Real's centers. This once again shows how the centers are the obvious main destination for the whole urban perimeter.

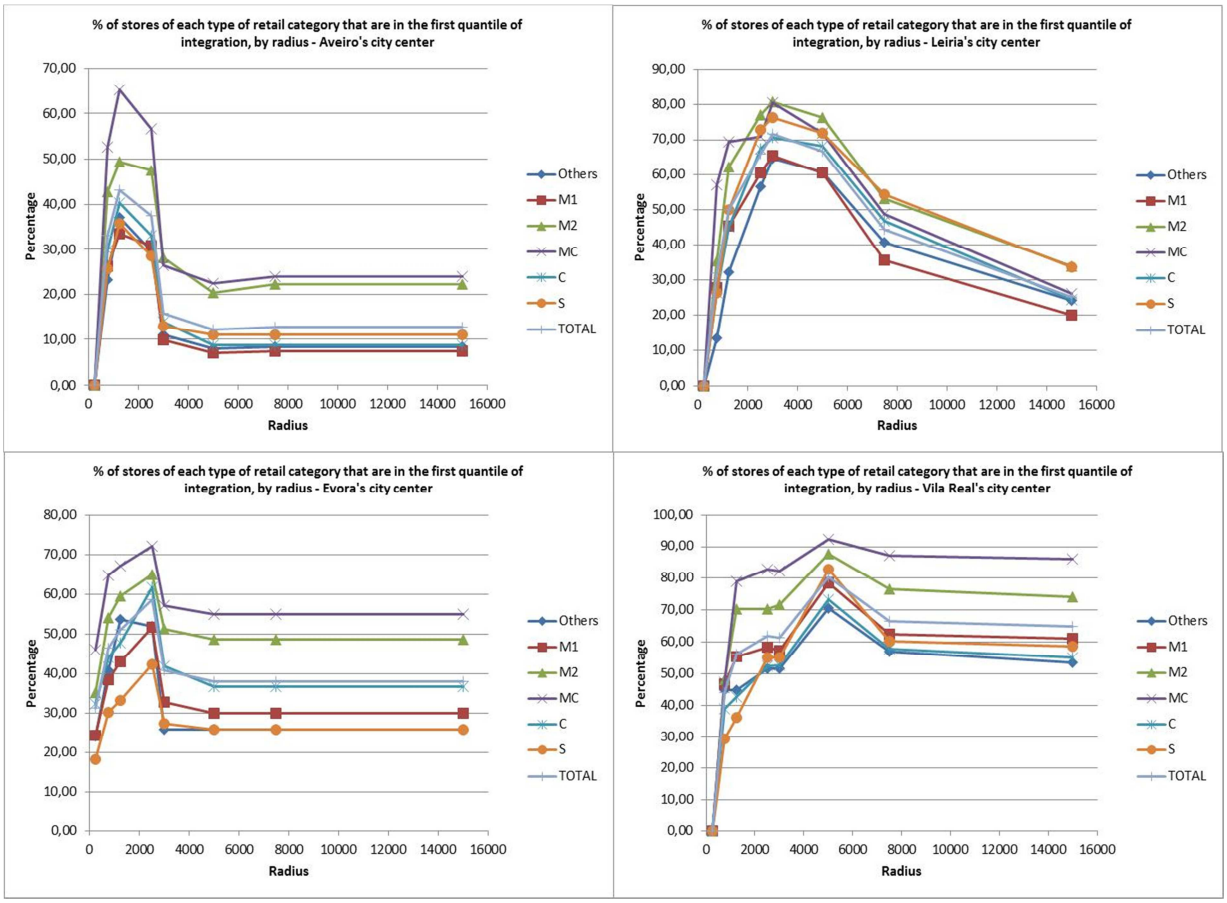


Figure 123 - Percentage of stores of each type of retail category that are in the first quantile of 'integration', by radius, for the four city centers

Yet it can be seen that, in most cities, this accessibility of the center is maximized mainly at lower distances. Therefore the number of stores of each category present in the major 'destinations' is also higher locally. In Leiria's, and especially in Vila Real's center, it can be seen that, like before, the peak occurs at higher distances[399], which reflects the higher degree of attraction the center stores have in the context of their respective urban perimeters. Yet whilst in Leiria's center the axes of the traditional center loose accessibility (to the main 'new' thoroughfares) as the radii increases (hence a declining curve in all categories), Vila Real's most integrated axes withhold, showing either the center's strength, or the evident peripheral segregation. When it is seen that, even globally, almost 90% of the MC stores and 75% of the M2 stores are still in 'red' 'integration' segments, the weight of

[399] Close to r= 5.000.

this city's central commercial axes is clearly defined. To a lesser extent, this also happens in Évora's center.

The affinity of C stores to 'red' 'integration' lines occurs locally. Yet in all cities but Évora, they are the category which most seeks the 'yellow' 'integration' lines, especially globally. 'Other' stores appear here, as well as S stores for Évora and Vila Real, and, as above mentioned, M1 stores.

In 'choice' most of the similarities with 'integration' are found for Aveiro's and Évora's centers. This is because here the most important segments are also the main distributional thoroughfares, so the travel-to and the travel-through axes are mostly similar[400]. That is why, in this case, MC and M2 stores are also the ones which more vehemently seek 'red' 'choice' lines, particularly at a local scale[401].

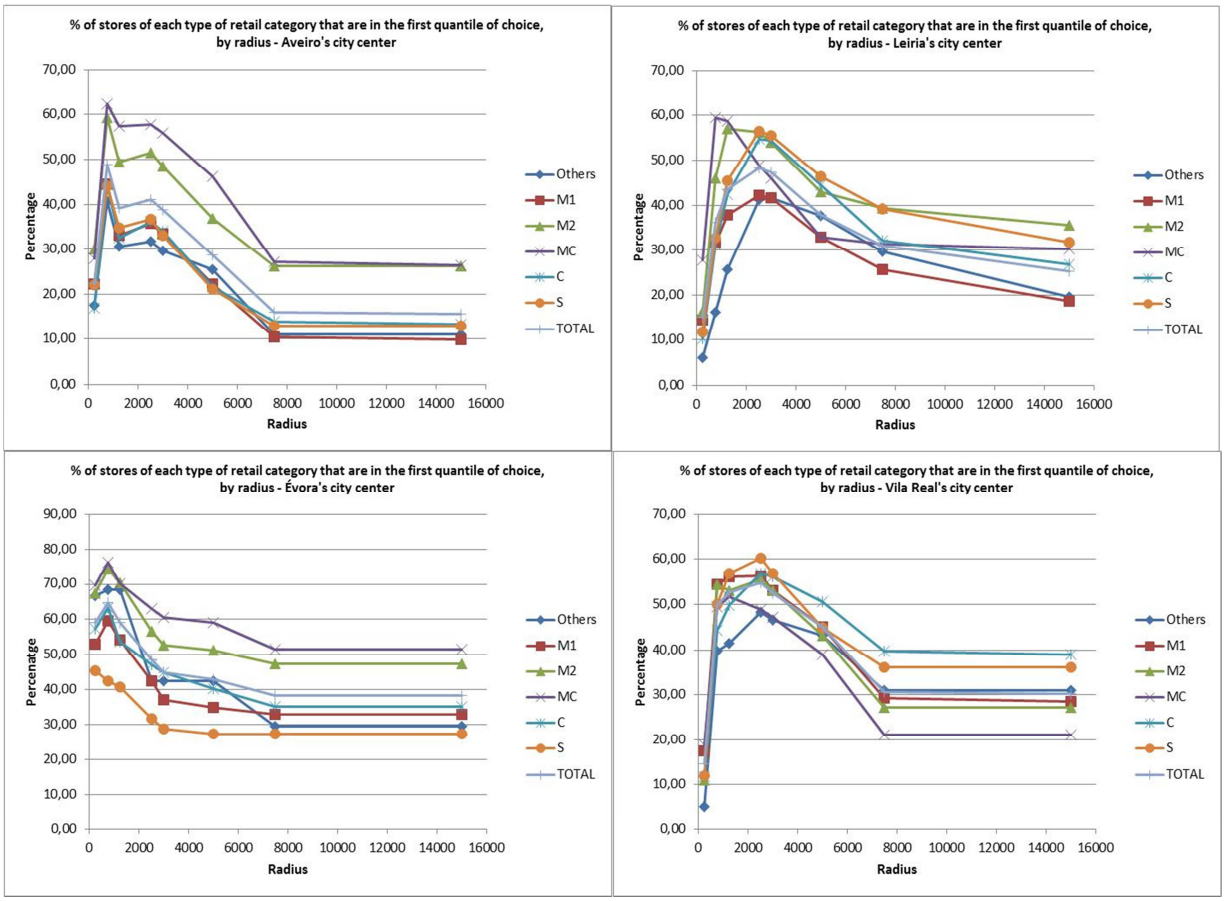


Figure 124 - Percentage of stores of each type of retail category that are in the first quantile of 'choice', by radius, for the four city centers

In Vila Real's and Leiria's centers the central 'core' (the 'traditional center') is much more clearly defined and contained, so the commercial streets therein will not have, as the radii increases, through-movement potential. This is the reason why M2 and MC stores are more important locally (over 60%) and why, for example, M1 stores appear relevantly in Vila Real's local 'choice' axes. Globally the most 'chosen' axes are the 'linkages' and the 'edge-thoroughfares' (granting access to and from the

[400] Like Dr. Lourenço Peixinho Avenue or Cândido dos Reis Street.

[401] Locally, for these two centers, 60-70% of MC and M2 stores are in the segments of the first quantile of 'choice', whilst globally the percentage is around 25% (Aveiro) and 50% (Évora).

center), therefore, consequently, other activity types, which need more space and depend on travel-through traffic, seek more avidly these segments, like C and S stores. If this is clearly perceptible in Vila Real's center, it holds less true for Leiria's. Indeed C and S stores are important at mid-distances, but globally, because the main travel-through axes of the center are also dense residential and service areas[402], M2 and MC stores appear with high affinity with the 'red' segments.

On the other hand, in Vila Real's center, MC stores are the ones which less seek 'red' 'choice' lines, as their affinity is with the integrated traditional center. Yet they are also not in segregated 'choice' axes. They are the category which, in this city, most seeks the second and third quantiles. Globally, over 60% of the center's MC stores are in 'yellow' 'choice' segments because the streets of the traditional center have intermediate 'choice' potential. In this center, with the exception of C stores (25%), all the other categories have 30-40% of their stores in these intermediate 'choice' lines. Looking at the other centers, it is interesting to note, once again with the exception of C stores for Évora's center (55%), that all the categories have, globally, between 40-50% of their stores in the 'choice' segments of the second and third quantiles. This illustrates that the streets with stores in the centers may not be the main travel-through axes, but are, in respect to the whole urban perimeter, still potential distributors. This is an obvious consequence of the fact that stores search main streets, especially those which link the residential areas to the main distributors of movement. That is why, with the exception of MC stores in Vila Real's center, M1 and C stores (home-related) are the ones which have a greater affinity to the 'yellow' segments.

Yet looking at the graphs of the last three quantiles ('blue') this affinity to residential (theoretically more segregated) areas is more difficult to discern, because of the form of the centers and of their commercial roles. 'Other' stores are the ones which show the greatest affinity to 'blue' lines in all center's but Évora's, whose structure favors through-movement in all directions. This can be the reason for these stores' lack of success; stores need to be in areas with affinity to passing movement, that is, costumer traffic. M1 stores also appear relevantly in all cities, as in 'integration', a consequence of their location in more out-of-the-way residential areas. M2 stores in Vila Real and S stores in Aveiro and Évora also appear associated with 'blue' 'choice' segments. The first case can be explained by the segregation, in terms of 'choice', of Vila Real's 'new' center core. The second may help to prove, once again, that the location of S stores is less dependent on the accessibility and betweenness condition of the streets they choose.

As in 'integration', the betweenness capacity of the centers is maximized locally. The peak also occurs at higher distances in Leiria and Vila Real, corroborating the conclusions made above. MC, C and S stores all correlate, in different cities, with 'red' 'choice' segments, which disputes Sarma's (2006) findings.

9.4.3.3. In the peripheries

The very last point of this case-study analysis repeats the same procedures but exclusively for the stores in the periphery. Once again, it can be seen, in the graphs of Figure 125, that stores are mostly located in the segments belonging to the second and third quantiles, that is, in the 'yellow' lines. The

[402] Avenues Marquês de Pombal and Adelino Amaro da Costa (edge-thoroughfares), and Heróis de Angola (linkage).

same reasons as above can be cited to justify this, namely the superior amount of 'yellow' segments in the cities and the natural drifting of the majority of stores to intermediate segments of the network, both for economic and market reasons. To these can be added yet another reason. 'Red' segments in the periphery (especially for 'choice') may symbolize connecting axes of larger dimensions (ring-roads, motorways, new distributional axes yet to urbanize) that do not have, necessarily, a direct building occupation (hence stores) facing them.

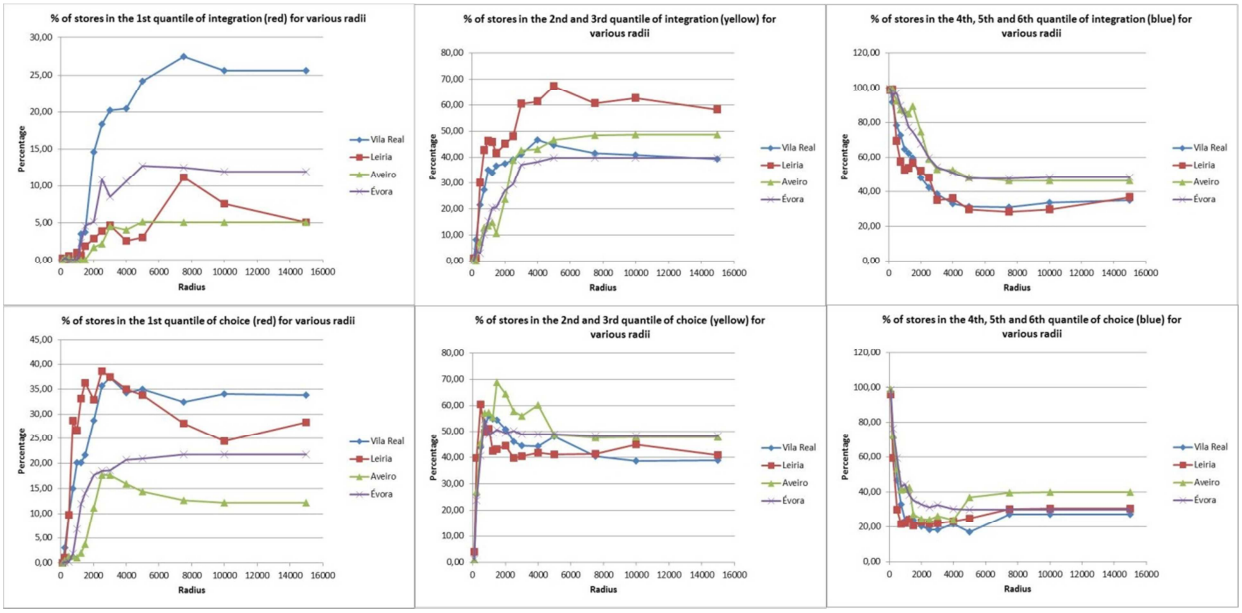


Figure 125 - Percentage of stores located in the different quantiles of 'integration' and 'choice' for various raddi, in the peripheries

Yet, as before, this affinity to the 'yellow' segments does not happen for all radii. But contrary to the center, where the trade-off was between the 'red' and the 'yellow' segments, in the peripheries it is generally between the 'yellow' and the 'blue'. This obviously reflects how segregated the peripheral localities of these medium-sized cities are in comparison with the respective centers. Locally, most stores are in 'blue' segments. In 'integration' this occurs until excessively large radii, namely r= 2.500 for Leiria's and Vila Real's peripheries and r= 7.500 for Aveiro's. In Évora's periphery this does not occur at all, and the majority of stores are always in 'blue' segments. This means that the peripheral centers, and the peripheral commercial centers, are hardly destinations, even locally. And even if they are 'yellow' or even 'red' at lower radii (showing small concentrations), the amount of stores there will always be less than those in 'blue' segments (because the peripheries are being considered as a whole). The number of stores in highly integrated axes only starts to be significant when the main distributional segments are highlighted. Because these are more travel-through than central, it is obvious that the stores therein will appear more prominently in 'choice'. That is the reason why, in 'choice' stores start to favor more 'yellow' than 'blue' segments immediately at r= 500 (750 in Évora's periphery). In these peripheries, contrary to the centers (designed for to-movement), events occur in 'choice' at a much lower radius than 'integration'. Peripheries are therefore designed for through-movement. Consequently, stores prefer to be located in places where they can capture more quickly this passage of clientele, mostly e*n route* from the center to surrounding localities, or vice-

versa. This 'quickness' is translated into less distance through the network and hence lower radius of 'choice'.

In 'integration', locally (bellow r= 2.500), over 40% (in Vila Real's and Leiria's peripheries) and over 50% (in Aveiro's and Évora's) of stores are located in segregated segments. This distinction once again emphasizes the local centrality of the main axes of many localities of Vila Real's and Leiria's peripheries, a consequence of their previous existence as independent small villages. Therefore, 'yellow' and even 'red' 'integration' segments can be perceptible in the main axes of these localities at lower radii. Whilst 'red' 'integration' segments are very few and practically only appear over r= 1.250 (meaning that these centers also exert influence over a vaster dispersed area), as early as r= 500, 20-30% of the stores in Leiria's and Vila Real's peripheries are in the second and third quantiles[403]. The main streets of most 'extensions', 'main residential' and 'residential' localities of these two cities[404] appear well defined (if not in the first, at least in the second and third quantiles), contributing to their local integration (centrality). The less important the locality is, the smaller is the radius when the perception of centrality disappears. For example, in Constantim, for r= 1.500, the central street is as segregated as the others, whilst at r= 750 it was clearly distinct (Figure 126).

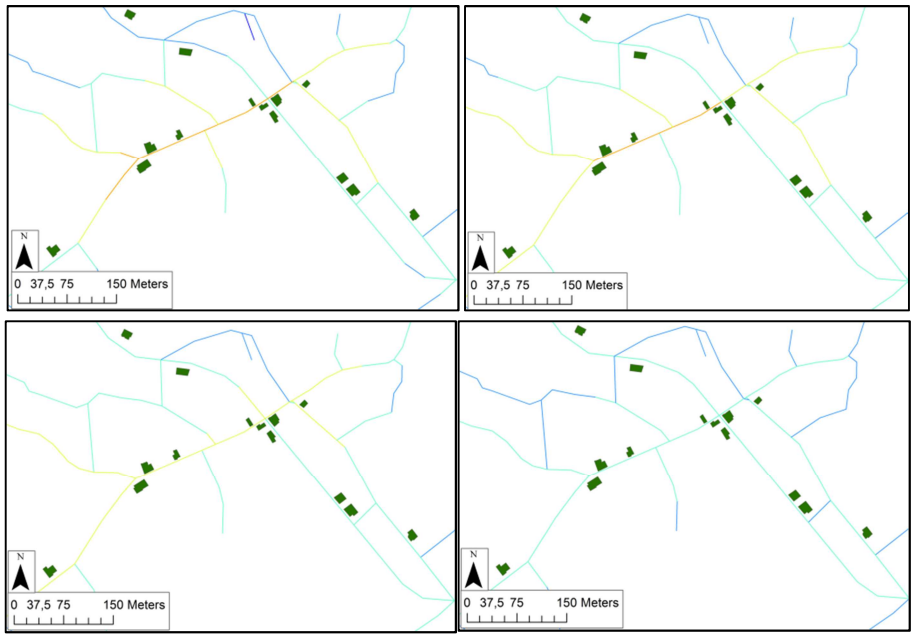


Figure 126 - Evolution of the 'integration' in Constantim's central street in r= 500, r= 750, r= 1.000 and r= 1.500

In Évora's and Aveiro's peripheries, these local centralities are more difficult to discern, because the localities were not conceived as individual urban structures. Therefore centralities only appear in areas with high accessibility, and these are most of the times the expansion and distribution axes (which are only integrated at higher distances) or else some residential street which has, for some reason, a good connection to the network[405]. Yet even locally, most commercial rows and commercial 'islands' are *inside* the residential neighborhoods (hence not facing the main thoroughfares) so they obviously are

[403] This number is less than 10% in Évora's and Aveiro's peripheries.
[404] Namely Parceiros, Marrazes, Marinheiros, Sismarias and Telheiro in Leiria and Borbela, urban Mateus, Avenida da Universidade/Europa, Constantim and Lordelo in Vila Real.
[405] This is the case of the main streets of the Malagueira and the Senhora da Saúde neighborhoods in Évora, because they are well connected to the ring-road that circles the center.

served by segregated streets, as they are only destinations for the residents. In Aveiro much of the same happens. The 'main residential' areas closer to the center can have a local 'centrality' in their main streets (if they are, or are directly connected to, the expansion axes of the center), but all the area East of N109 is all but segregated. In all cities, the 'industrial/commercial' areas are also segregated locally. The main thoroughfares passing through them can become centralities, but only at higher radii.

After r= 2.500 there is a great shift in the 'integration' of the centers, as they, as it was seen above, stop considering just themselves and the few close-by main peripheral localities, to take into account the main thoroughfares of the periphery. Consequently, because they link the centers with the main centralities of the periphery, the most important expansion/connecting axes of these cities also become centralities in their own right, with high 'integration'. Other similar axes, connecting peripheral localities between themselves also become relatively integrated, although the strength of motorway type roads (ring-roads and so on) without urbanization can reduce the relative weight of these thoroughfares from 'red' to 'yellow', as it happens, for example, in Leiria and Aveiro. This is one of the reasons why there seems to be a higher affinity of stores to the 'yellow' segments, as it was discussed above. These thoroughfares are the distributors of development throughout the peripheries (many of post 1975 construction) and consequently it is facing them that the main buildings of residential areas, and therefore the stores, are. This explanation seems to fit Leiria's peripheral scenario, where over 60% of stores globally are in 'yellow' 'integration' segments and less than 10% are in 'red'[406]. It also fits Vila Real's scenario, but only where the 'extension' and the 'main residential' areas are concerned. The other localities of this city are actually too far from the center (and the connections to it are not direct), to become obvious centralities in the urban perimeter at a global scale[407]. Yet this theory fits less in the other two peripheries. In Évora there are indeed a significant number of thoroughfare axes leading directly from the center (the above called 'rays-of-the-sun') which have high 'integration' globally. This is reflected in the number of stores in the first quantile (superior to those in Aveiro's and Leiria's peripheries), yet the number of stores these axes possess is insignificant when compared with those found inside the neighborhoods. Closer to the residential localities (away from the center) the thoroughfares are relative centralities ('yellow') and so are the main residential roads, where commercial clusters can locate. Yet many dormitory neighborhoods[408] and many extensions of the 'industrial/commercial' area[409] are all but segregated. This is why in this periphery there are around 40% of stores both in the 'blue' and the 'yellow' segments. On the other hand, in Aveiro's periphery, the main problem affecting 'integration' seems to be the geographical (and morphological) organization of the localities. The three 'main residential'

[406] The IC2 free-way has a very high integration but the main roads of most localities closer to the center (Sismarias, Telheiro, Marinheiros) are 'only' 'yellow'.

[407] In this case it is striking that outside Borbela/urban Mateus and Europa/Universidade Avenues there are, in the rest of the periphery, no stores in the first quantile for r= n. To contrast, two axes directly connected to the center, the Universidade Avenue and the extension to the North of Aureliano Barrigas Avenue (serving the commercial 'island' North of Continente) are highly integrated ('red') contributing to Borbela/Urban Mateus' (30%) and Europa/Universidade Avenues' (60%) number of stores in first quantile 'integration' axes. It is especially this percentage in the 'extension' that contributes to the higher number of stores in 'red' axes for Vila Real's periphery, seen above distinctly in Figure 125 (25% globally). The Europa and the Universidade Avenues are as important as the city center as a destination for the entire urban perimeter. Actually, this area is even more important than the center's 'new' Northern center.

[408] Like Bacelo.

[409] Like the Industrial and Technological Park.

areas, are actually not connected to each other except through the center[410] or through the peripheral motorway N109, which although highly 'integrated' globally has a very limited number of stores facing it. Therefore the global centrality of these localities becomes dependent of these un-direct connections, so it will never be relatively high. Furthermore, unlike Évora where the thoroughfares flow continuously from the center, in Aveiro the N109 and the railway line are man-made barriers that forbid this to happen. All the localities East of N109, besides having a very intricate structure which hinders the creation of centralities, are also poorly connected to the center by direct access. Therefore, to be relevant, to be a to-movement destination at a global radius, it is necessary a greater distance. That is why in this case stores in 'yellow' segments are only more than those in 'blues' after r= 7.500, and even then the difference is not very striking. But although the areas inside the confuse residential network are segregated and have no destination potential, there are nonetheless three parallel roads[411] that act as the main 'integration' (and also 'choice') thoroughfares, fitting, in this case, in the above presented model for Leiria and Vila Real. Therefore, because most stores in the 'residential' and 'isolated residential' areas are precisely in these thoroughfares (or very close to them) the number of stores in 'yellow' 'integration' segments (50%) in Aveiro is only second to that in Leiria.

Once again, the highest correlation of the peripheral stores with the most integrated segments occurs, for Vila Real and Leiria, at a higher distance (r= 7.500) than for Aveiro and Évora (r= 5.000). At these distances, practically all the urban perimeter is being considered, and the main peripheral thoroughfares can reach the center. Not only is the distance needed to reach the center greater in the first two peripheries, their centralities also appear to serve larger areas than those in the last two.

Looking now at 'choice', it was already mentioned that stores are preferably on 'blue' segments only at very small radii[412]. At these distances the main peripheral axes assume a local importance and after that the main connecting thoroughfares appear as the most important through-movement segments. Unlike the logic of blocks in the center, the peripheries are, as mentioned above, structured in a logic of axes, where commerce is road-side. This type of structure privileges through-movement streets, either ring-roads and expansions axes, but also other residential main streets whose role is to more quickly connect residential neighborhoods to the thoroughfares that will lead to the most important areas inside the urban perimeter. Therefore, whilst the main thoroughfares may be 'red', these distributional residential axes will more than often be 'yellow' at all radii, as the constancy in the graph of Figure 125 demonstrates. Furthermore most store clusters ('islands') face these main residential roads or peripheral distributional thoroughfares, so around 40-50% of stores in all peripheries are served by the segments in the second and third quantiles. Locally, Aveiro's curve shows a clear increase (can go up to 70%). This could be said to occur due to the existence of three main residential areas closely linked to the center but may also be used to justify an earlier deduction concerning the fact that in Aveiro's periphery there is a greater affinity between the distributional main thoroughfares and the streets where the 'new' commercial islands/residential neighborhoods are located. Even though globally the weight of these areas as through-movement axes decreases, locally they feed the main thoroughfares, as they are supposed to do. What seems to exist, however, is a lesser connection between the distributional main thoroughfares and the more traditional residential neighborhoods, inside the intricate peripheral network.

[410] Dr. Lourenço Peixinho Avenue or directly connecting streets.
[411] S. Bernardo Road, Taboeira Road and N230, all connected to the N109.
[412] Below r= 500 for all peripheries except Évora's (r= 750).

At the center's critical moment (around r=2500-3000) not only is the center reachable from the main peripheral poles, but also the peripheral localities are reachable between themselves. Consequently, the through-movement potential of the network is maximized. Therefore, it is at these radii that the number of stores in the segments of the first quantile of 'choice' in all peripheries but Évora's is highest. In Vila Real's and Leiria's this number is higher than in the other two peripheries[413], once again displaying the higher connection between the main poles of these two peripheries and the centers, and the main poles between themselves. If the latter also is seen in Évora's periphery, the former is not, because this periphery was formed as a center extension/'dormitory'. Yet the distributional axes that link center and periphery have an importance in this city that is not found in any other. Although at r= 3.000 the correlation of stores with the first quantile of 'choice' reaches the highest number until then, the correlation will still be slightly strengthened. Because in this city through-movement is highly perceptible and intuitive, with rays-of-the-sun axes fed by a central and then an outer ring which passes through the main localities, the extent of the high 'choice' axes increases as the distance increases (Figure 127)[414].

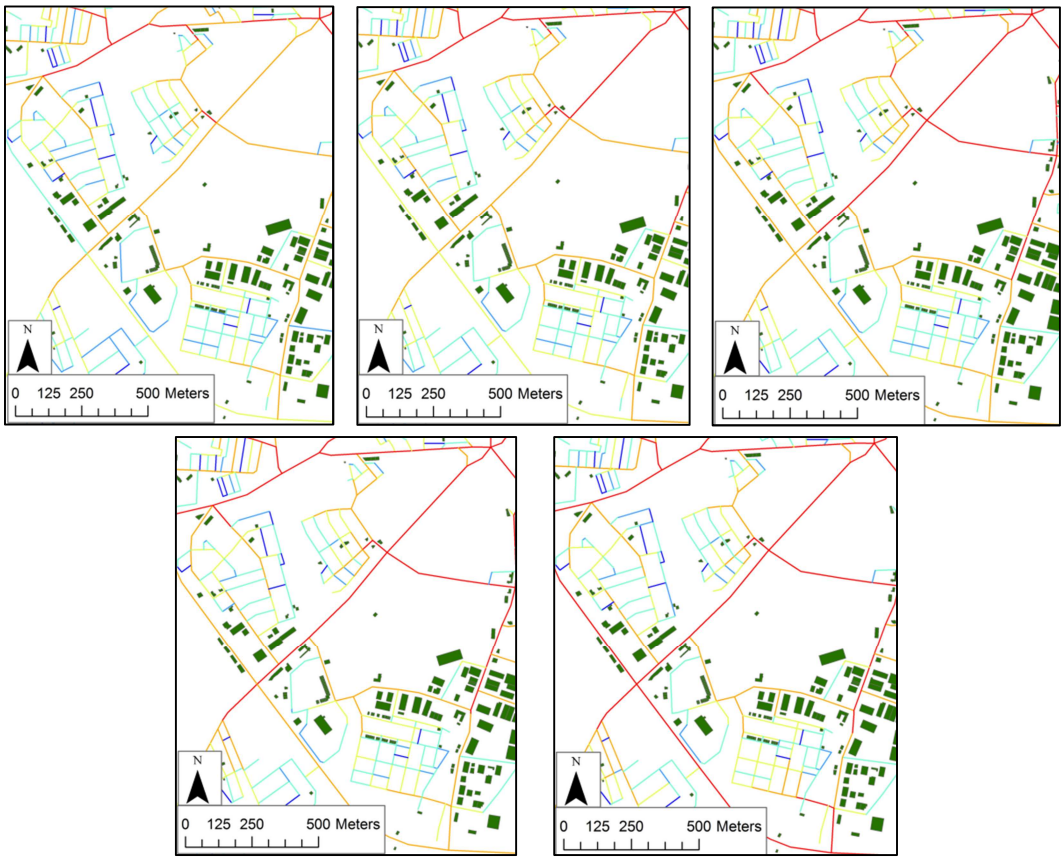


Figure 127 - Evolution of a rays-of-the-sun axis in Évora's periphery, located in Horta das Figueiras, in terms of 'choice', for r= 1.250, r= 1.500, r= 2.000, r= 2.500 and r= 4.000

[413] 35% against about 20% in the other two peripheries.

[414] Today, these axes still possess only a few stores, especially in the outer rings, and that is why the percentage hardly increases from r= 3.000 and does not increase at all over r= 7.500, when the network stabilizes, and also why even with these 'peaks' the stores in 'yellow' 'choice' segments (inside the neighborhoods) are always more. Yet, because there are many empty urban lots in this city, it could be foreseen that these axes may present favorable places for the future location of buildings with stores.

With the exception of this 'growth' in Évora, all the other peripheries see their most important connecting thoroughfares become, after r= 3.000, highly 'chosen' globally, at the expense of local streets whose function is to feed this main network. That is why the percentage of stores in 'red' segments decreases[415]. There is, however, a great difference in the axes that remain highlighted in Vila Real and Leiria, and in Évora and Aveiro[416]. Whilst in the first two peripheries the connections between localities are made through axes directly linked to the main streets of those localities, in Aveiro and Évora this connection is done through indirect means, that is, through a thoroughfare. In Évora, for example, the ring-roads first connect with the rays-of-the-sun thoroughfares and only then is a connection made to the streets serving the neighborhoods, where the commercial 'islands' are located[417]. That is why Aveiro's and Évora's peripheries have fewer stores in first quantile thoroughfares.

Like in the city-scale and central analysis, 'choice' patterns are more constant between cities than 'integration' patterns. In both cases, Vila Real's graph stands out, especially in 'reds', which helps to justify a commercial structure clearly oriented to be close to, and dependent of, the center, something which in the other peripheries is to some extent mitigated by important commercial concentrations. Furthermore, there are more differences between the 'choice' and 'integration' values in this city than in any other. More precisely, Vila Real's peripheral areas may be segregated in terms of 'integration' but they have, most of the times, high betweenness. That is, they are not destinations, but have always a great accessibility to the center. This difference is much smaller in Leiria's periphery and smaller still in Aveiro's and Évora's. In this last city, the main to-movement destinations outside the center are also the main through-movement axes (rays-of-the-sun thoroughfares). Yet in this case, through-movement lines penetrate more into the neighborhoods. The interior of the neighborhoods are not destinations, but the streets therein need to feed the main network for travel-through traffic.

The graphs of Figure 128 show the percentage of stores, for the first three quantiles of 'integration' and 'choice' that are in buildings constructed after 1975. Once again it is seen that, not only has 'new' construction been crucial to the development of the peripheral commercial landscapes[418], it has also been fundamental in the increase of both the accessibility and the betweenness of the peripheral commercial network. As it can be seen in the graphs, between 60-80% of both the stores in the first, and in the second and third quantiles, again both for 'integration' and 'choice', are precisely in post 1975 buildings.

[415] For example in Leiria, there is a clear drop in the number of stores in the first quantile of 'choice' between r= 5.000 and r= 7.500.

[416] These strong distributional axes with great 'choice' values at higher radii include São Bernardo Road and N230 in Aveiro, the central roads of Parceiros, Telheiro, Marinheiros and Sismarias (all of which are directly connected to the center), and those connecting Marrazes with Sismarias and Pinheiros, in Leiria, and all the shortest distance thoroughfares that connect each locality of Vila Real and Évora to the center, as well as some of those which connect localities between themselves (Borbela with Mateus, Almerim with Malagueira, Malagueira with Bacelo).

[417] In another example, in Aveiro, both the São Bernardo Road and N230 are connected by a high 'choice' axis only through the N109. The connections made through the neighborhoods are composed of very segregated streets.

[418] It should be remembered that around 70% of stores in the peripheries are in post 1975 buildings.

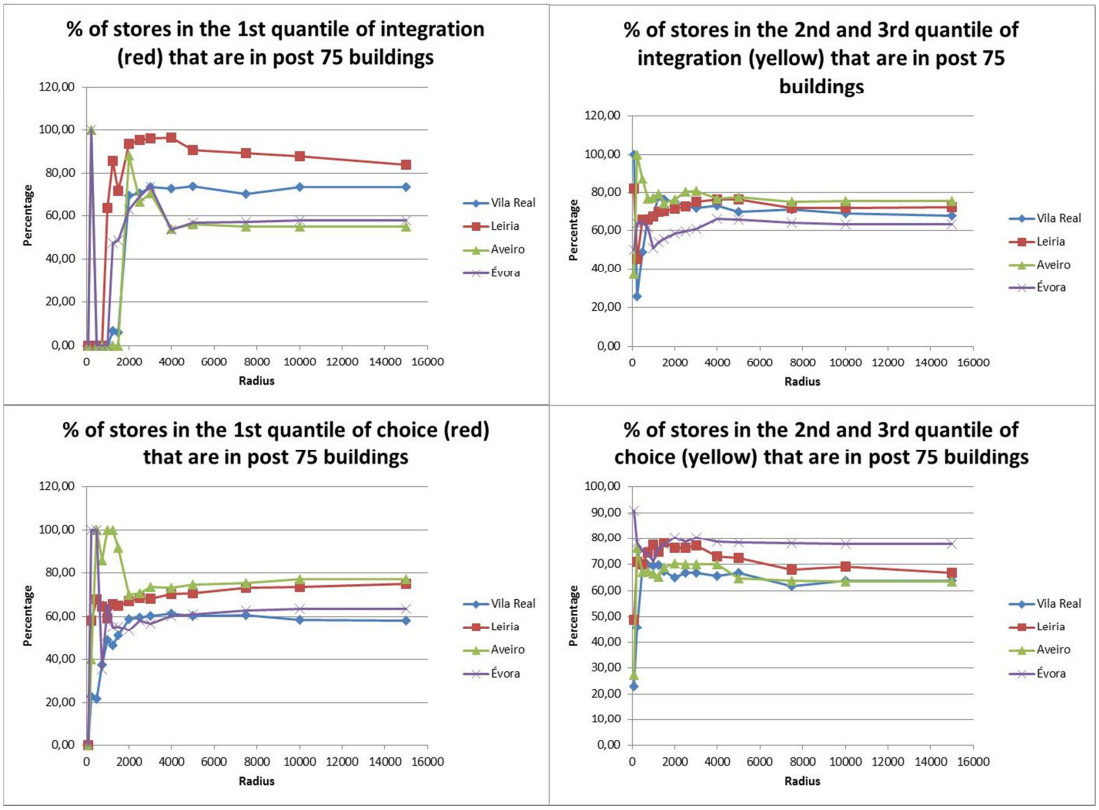


Figure 128 - Percentage of stores, in the peripheries, located in the medium and higher quantiles of 'integration' and 'choice' that are in post 1975 buildings, for all radii

The exception to this value range occurs only for the first quantile of 'integration' and only for Leiria's periphery. Actually, this periphery not only has the highest percentage of post 1975 stores in 'red' 'integration' axes, it has also the highest percentage in 'red' 'choice' axes. In this periphery, despite the former existence of localities with a first necessity commercial structure, 'new' buildings containing stores have revealed to be crucial to the city's growth both globally and locally. Because 'new' construction has filled the gap between the center and the outer localities, both the centrality (integration) and the travel-through potential (choice) of the main axes of these areas are maximized. Not only are they the new commercial destinations of the city, they constitute passageways to the center and also, as the radii increases, from the center to the outer areas. This centrality created by new construction is even more maximized, to its full extent, at mid-distances[419]. Obviously, this can also signify that new construction invariably seeks the greatest 'integration' and 'choice' axes. In Vila Real, as well, new construction either forms or seeks 'red' axes. In Évora's periphery, although there is room in these axes to accommodate new construction, as discussed above, there is yet to be a developing momentum (or necessity) to occupy them, therefore the percentages are lower. On the other hand, in Aveiro's periphery, the way the network is structured conditions the access of buildings to many 'red' segments. Even so, between r= 1.000 and r= 1.500, for 'choice', also close to 100% of stores in the first quantile segments are in post 1975 buildings, meaning that new peripheral construction in this city seeks the thoroughfares that lead to the center.

[419] In Leiria's periphery, between r= 2.000 and r= 5.000, almost 100% of the stores in peripheral 'red' 'integration' segments are in post 1975 buildings. This is due to the influence of the new central areas of Marinheiros, Telheiro and Sismarias.

The similarities between cities in the percentages of post 1975 stores in the segments of the second and third quantiles may be justified by stating that the growth of new residential neighborhoods with stores on the ground floors (commercial 'islands') has followed similar trends in all cities. These locations, although not central nor connecting enough to be the principals of the network, are also not, at the same time, segregated. The evenness of the percentage at all radii symbolizes the fact that their role is the same no matter if the local or the global scale is considered. These segments constitute neighborhoods where mostly residential areas are located, that need to be intrinsically connected to the main distributional and central thoroughfares ('feeders'). The only percentage that stands out of the rest is that of Évora's in 'choice' (80%). Here, the new residential neighborhoods (both closer and farther away from the center) need to be intrinsically connected to the main rays-of-the-sun axes that lead to the city's center.

Considering the problem from the inverse perspective, that is, calculating the percentages of all the stores located in the peripheries' post 1975 buildings that are in each quantile, may help to strengthen these conclusions. The graphs depicting this variable are represented in Figure 129.

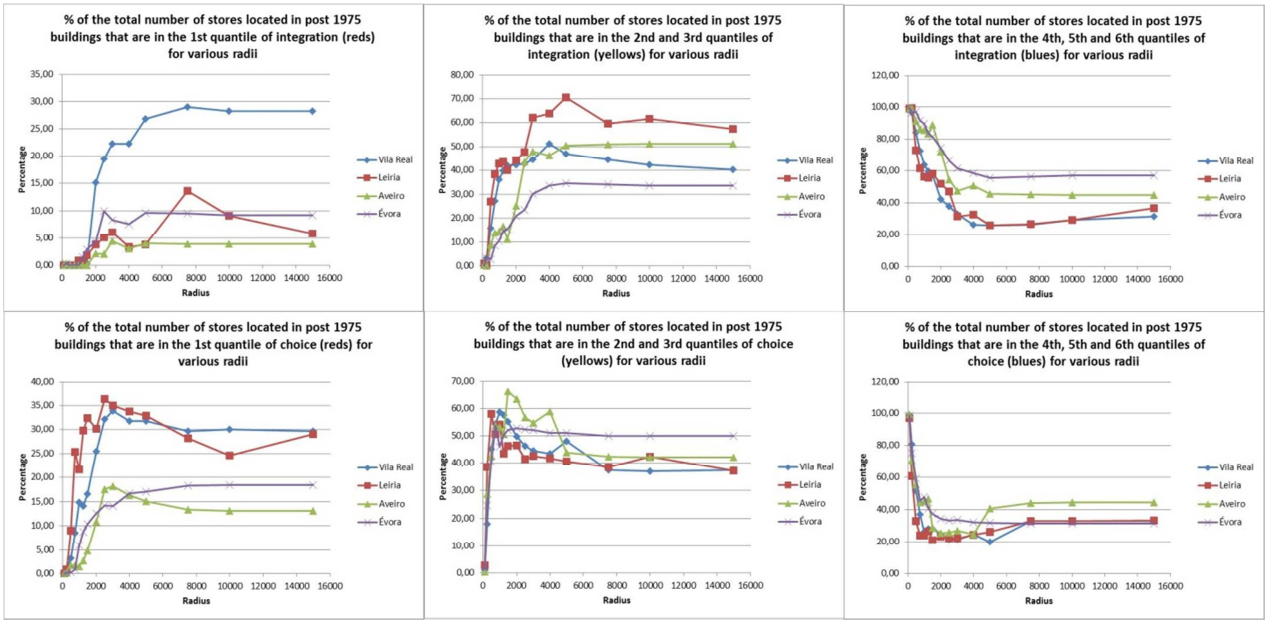


Figure 129 - Percentage of the total number of stores in the peripheries, located in post 1975 buildings, that are in each quantile of 'integration' and 'choice', for all considered radii

These graphs show that the majority of stores in 'new' buildings in the periphery are in 'yellow' or 'blue' segments, both for 'choice' and 'integration'. The affinity to the segregated segments may be in part justified by the weight of the 'commercial/industrial' areas, often in out-of-the-way locations. The main axes of these areas possess, obviously, through-movement potential, and that is why the percentages in 'blue' 'choice' are lower in all cities. Yet they do not need to be 'destinations' as they are places where specific buys, pre-defined, take place. Similar circumstances occur in the 'isolated residential' areas. Stores may be closer to a main street with some through-movement potential, but they are more than often in segregated locations in terms of 'integration'. In Évora's periphery, for 'integration', it can be seen that there are always over 60% of stores in post 1975 buildings in

segregated segments, even globally[420]. But because the affinity to 'choice' is much lower (30%) it is shown what was proposed above that the store clusters in this city are much closer to the through- than to the to-movement axes. It is however in Aveiro's periphery that the lowest affinities to the first quantile segments occur. Both for 'integration' and 'choice' there are around 40-50% of stores in buildings constructed after 1975 either in segregated segments or in the 'yellow' segments, which correspond, respectively, to the stores inside the neighborhoods[421] and the ones closer to the main thoroughfares. The example of this city can also help to explain the medium-size city periphery's overall affinity to 'choice'. Whilst the number of stores in post 1975 buildings in segregated segments is more or less the same both for 'choice' and 'integration' (closer to 40%), the ones in the 'yellow' segments are different (40% in 'choice' and 50% in 'integration'). The difference, obviously, is compensated by the stores in the 'red' segments. That is, in Aveiro's periphery (as well as in all others) there are more stores in 'new' buildings in the first quantile of 'choice' than in the first quantile of 'integration'.

Looking more closely at the first quantile, it can be seen that Vila Real's periphery immediately stands out. For 'integration' and 'choice', almost 30% of the stores in buildings constructed after 1975 are in the first quantile. Yet this can be deceiving because, once again, these stores are practically all in the 'extension'[422]. Leiria's periphery is the other which possesses a high correlation between stores in 'new' buildings and 'red' 'choice' and 'integration' segments. Yet, like in Aveiro, whilst in 'choice' stores are in the first quantile, in 'integration' they mostly belong to the second and third. It is obviously not possible to occupy the ring-roads and the motorways, so the stores choose the next hierarchical segments possible and/or available.

'New' construction seems to contribute to the 'betweenness' of the commercial segments particularly at a local scale. At lower radii, the percentage in the 'red' segments increases in Vila Real's and Leiria's peripheries, and that in the 'yellow' segments increases in Aveiro's periphery. Theoretically this should symbolize the distances needed to feed the main thoroughfares. These segments decrease in importance globally, except in Évora, by the reasons afore mentioned. For 'integration' however, the peaks seem to occur at higher radii. If the centrality of the peripheral areas has a modest local importance, apparently 'new' construction has helped to increase this centrality. For example, in Leiria, for r= 7.500, the 'new' central streets of many of the most important residential areas[423], composed of post 1975 buildings, assume a short-lived 'red' centrality.

Analyzing now the correlation between the segments belonging to the last three quantiles (segregated) and the number of 'closed' and 'empty' stores, it is perceptible (Figure 130) that there is a connection that did not show neither for the city-scale nor for the center analysis, especially in 'integration'.

[420] Both the Bacelo and the Almeirim and Horta das Figueiras neighborhoods contribute strongly to this percentage.
[421] Especially East of N109.
[422] Undoubtedly this is the new center out-of-the-center.
[423] Marrazes, Marinheiros and Telheiro.



Figure 130 - Percentage of closed and empty stores, in the peripheries, that are located in segregated lines, both for 'choice' and 'integration', and the respective percentage in post 1975 buildings

Locally, the correlation is undeniable. For ‘integration’, under r= 2.000, more than 75% of ‘closed’ and ‘empty’ stores in Évora’s and Aveiro’s peripheries are in segregated segments, and this number is never below 50% in the other two peripheries[424]. If in the periphery stores are generally not on overall destinations, if they are not even in local destinations then their predisposition to be unsuccessful is maximized. Furthermore, it is clearly seen that, with the obvious exception of Vila Real, over 80% of these stores are in buildings constructed after 1975, which just shows that the causes for this lack of store success are not on competition from, for example, ‘new formats’, but on a simple lack of good sense concerning location choice by real-estate developers. Globally, the number of non-open stores in segregated ‘integration’ segments is between 40-50% in all peripheries but Évora’s (60%). This shows once again that most of Évora’s commercial ‘islands’ are ‘inside’ the neighborhoods, that is, outside the main to-movement areas. The clear drop perceptible in both Vila Real and Leiria between r= 3.000 and r= 7.500 symbolizes the distances when these two cities have their ‘integration’ peaks. At that moment, in Vila Real, all of the segregated non-open stores are in pre-1975 buildings, that is, in the older residential localities. Because the main new extensions of the city are also the areas outside the center with more ‘centrality’, the correlation of non-open stores with post 1975 buildings will be significantly poorer than in the other peripheries.

For ‘choice’, the correlation is much more reduced at a local scale, showing the quicker betweeness capacity of the main residential axes. All stores types search for the best through-movement traffic, including those in the commercial ‘islands’. Therefore, less than 40% of the non-open stores are in the

[424] For the same radius, the number is 65% for Vila Real’s and 50% for Leiria’s peripheries.

segments of the last three quantiles. Only in Aveiro, globally, the number is superior (50%). This reflects the fact that here there are less through-movement axes making the bridge center-periphery than in any other city. Yet the one thing that the 'choice' graphs show distinctly is that practically all the non-open stores in segregated through-movement axes are in buildings constructed after 1975. With the exception of Vila Real for lower radii (75%), this number is, for all radii and all peripheries, superior to 85%. These should correspond to the developments that failed to realize the periphery's golden rule: stores seek high 'choice' segments. Consequently, it is inevitable that they should have more difficulty in occupying their store space.

Lastly, the relationship between to- and through-movement and the type of retail category is analyzed for the stores in the peripheries, using the same two-point methodology of the previous two sections. The first of the two points consists on seeing how is the distribution of retail categories inside each quantile (hence always a sum of 100% for each graph). The values presented, for r= n and for the first quantile, in Table 29, can be complemented with the graphs of Figure 131, for 'integration', and of Figure 132, for 'choice', still for the first quantile, and only for specific radii. Similar graphs for the 'yellows' and the 'blues' are showed in Annex 20.

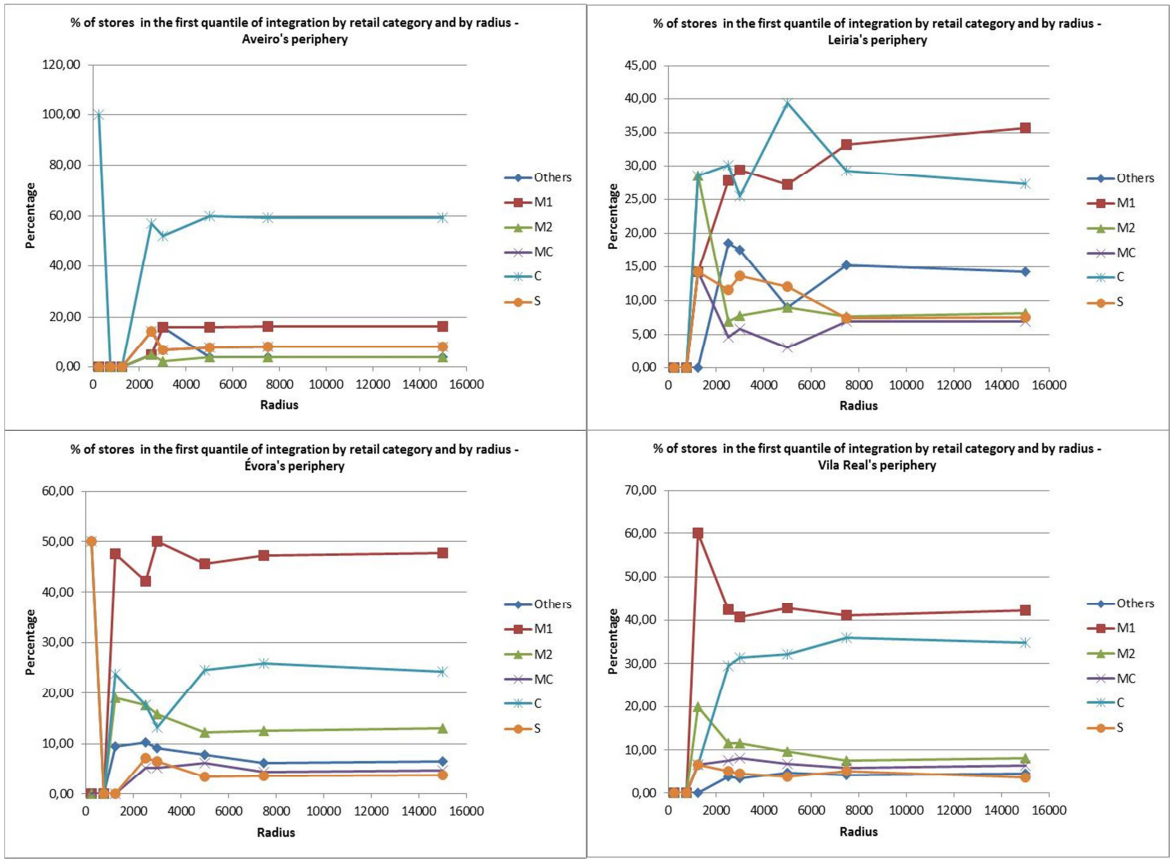


Figure 131 - Percentage of stores in the first quantile of 'integration' by retail category and by radius for each of the four peripheries

The first thing that is perceptible in the graphs for the peripheries' 'integration', in comparison with those of the center, is the lack of MC stores in the most accessible axes. The importance of these stores has been replaced by the C category, especially in Aveiro, where an incredible 60% of the stores in the segments of the first quantile belong to this category. This shows that in this periphery only a few

main thoroughfares[425] are highlighted, globally, in 'red'. C stores, besides being on 'industrial/commercial' areas, are also in these thoroughfares, as they require space and accessibility. Elsewhere, they are also associated with main residential localities. This is the reason why C stores are also relevant in all the other peripheries, representing, globally, between 20-30% of the stores in the segments of the first quantile. In Leiria, there is a peak of C stores around r= 5.000, due to the high accessibility, at this radius, of the principal thoroughfares of the 'main residential' areas, as previously described. In Évora, however, there is a local decline of the percentage of C stores at r= 3.000, because at the moment when the center axes lose importance and peripheral axes gain it, the number of M1 stores served by 'red' 'integration' axes increases.

Actually, with the exception of Aveiro's periphery (where the most integrated axes are never inside the residential neighborhoods), the M1 category is the most relevant, that is, more M1 stores are in the first quantile segments than any others. In Évora, where there are more 'centralities' inside the residential neighborhoods, this is clearly evident, and the M1 stores represent half of those found in the 'red' segments. This is also perceptible locally in Vila Real. This reflects the traditional structure of the peripheral localities of this city, dependent of first necessity commerce, whose centralities are only highlighted locally. In Leiria, this is less perceptible, because the outer localities have a wider range of activities.

All the other categories have less than 20% representation in the axes of the first quantile. Looking at the graphs in Annex 20, it can be seen that M1 and C stores are still in greater number in the segments of the second and third quantiles (30-40% each). With the exception of 'Others' in Aveiro's and Leiria's peripheries (around 15%), all the other stores of each of the remaining categories correspond to less than 10% of those present in the 'yellow' 'integration' segments. The central commercial clusters of the peripheries seem to depend practically on M1 and C stores. The appearance of 'Other' stores in the two most dynamic cities either reflects the tendency for multi-commercial spaces to be in places of relative centrality, or the attempt to produce new commercial 'islands' in these locations, whose store space is yet to occupy.

Yet looking at the graphs of the last three quantiles it is perceptible that exactly the same categories, by the same order, are found. M1 and C stores are so prominent in the peripheries that they are also in greater number in the segregated axes. The percentages are, in average, between 30-35% each, with two exceptions, M1's percentage in Évora (40%) and C's percentage in Vila Real (50%). This reveals each periphery's main functional activity, and that it appears with strong representation regardless of the location in the grid. 'Other' stores correspond to about 15% in all peripheries but Vila Real's.

Because of the strength of the two principal categories (M1 and C stores) the affinity of each category to each quantile can only be perceived when the analysis is inverted, as it will be seen below. But before that, the same overall look is given at 'choice', whose graphs are displayed in Figure 132.

[425] Like the N109.

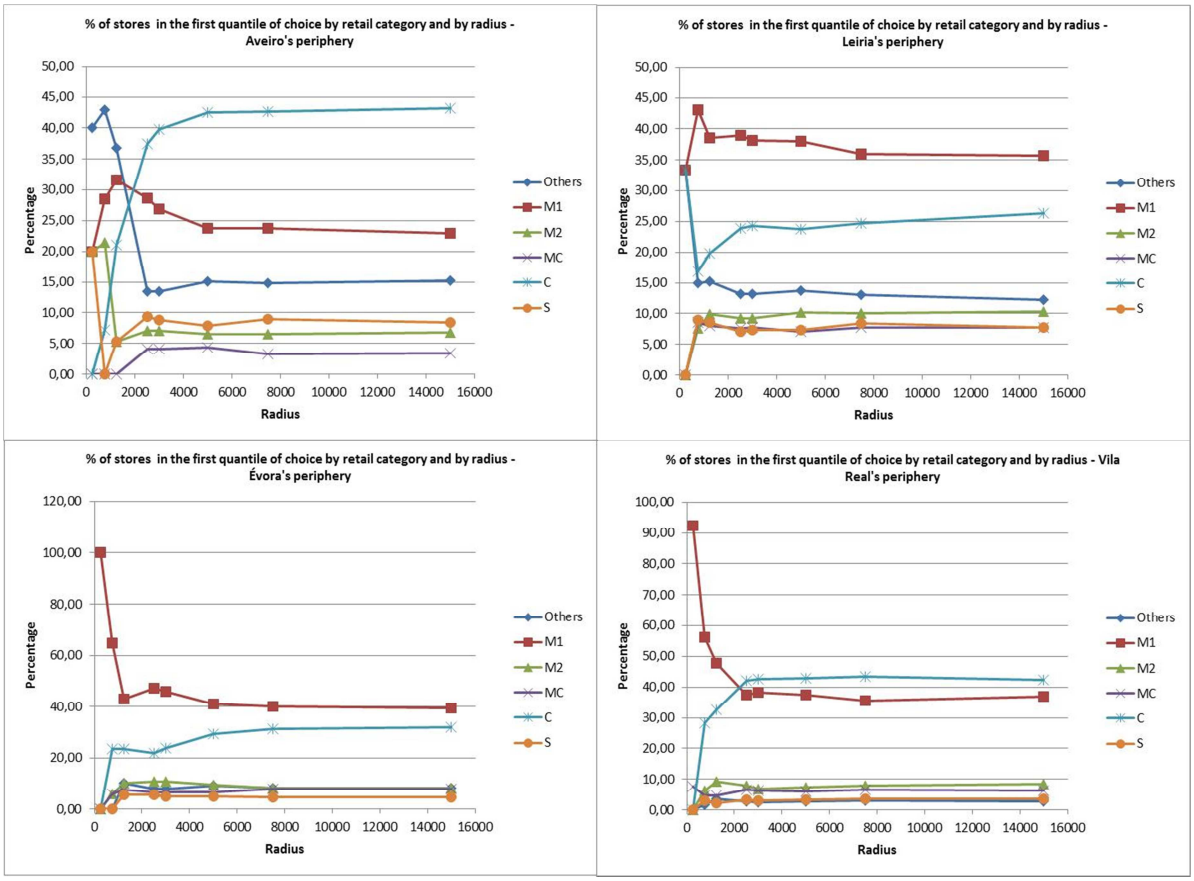


Figure 132 - Percentage of stores in the first quantile of 'choice' by retail category and by radius for each of the four peripheries

In 'choice' practically the same conclusions can be drawn, with the difference that the patterns seem to be more consistent. MC stores also practically disappear from the most 'chosen' axes and C and M1 stores are also, for all peripheries, the ones most found there. Locally, the number of M1 stores in the first quantile segments of 'choice' is greater in all peripheries, symbolizing the importance of the central connecting axes of each locality. Only in Aveiro's and Vila Real's peripheries does the number of C stores in these axes become higher than the number of M1 stores. This is because in these two cities the main expansion thoroughfares are highlighted. It can be argued that this also happens in Évora[426], but whilst in this case the main roads of the neighborhoods also have high 'choice', in Aveiro and Vila Real this hardly happens. The principal 'choice' axes are the main, city-scale, connecting thoroughfares, not the central residential streets. In Leiria's periphery, for global radii, practically all the central roads of all the localities, with the exception of Andrinos, have 'red' 'choice', which explains the preference for M1 store types. Once again, in Leiria's and Aveiro's peripheries, 'Other' stores also appear in third place in terms of number of stores in the first quantile segments. The same conclusions can be drawn. In Aveiro's periphery, at very low radii, the number of 'Other' stores in the 'red' segments can represent 40% of the total number of stores. This can mean that stores do not benefit from local 'choice' segments. That is, stores need to be located in global choice segments, which makes perfect sense, as in this case the number of clients that can 'pass-through' is maximized. All the other categories have a less than 10% representation, especially S stores in all peripheries but Aveiro's.

[426] That is why the percentage of C stores increases in this city.

Looking at the 'yellows' and 'blues' graphs in Annex 20, it can be seen that the same hierarchy of categories is maintained, as it happened in 'integration'. M1 and C stores have the highest percentages (40-50% each), and all the other categories, with the exception of 'Others', have less than a 10% weight. In the segments of the second and third quantiles M1 stores are more relevant locally (when the main axes of the localities are highlighted) and only in Aveiro are they surpassed in weight by C stores. This proves the greater affinity of C stores to areas closer to the main thoroughfares, whilst M1 stores are closer to the residential areas. That is why, for this city, considering the last three quantiles the opposite happens. In this case, both in Leiria's and Vila Real's peripheries, the number of C stores in the segregated segments is greater than the one of M1 stores. The segregation of the 'commercial/industrial' areas helps to justify this. This segregation, however, is mitigated in Évora's and Aveiro's peripheries. In Évora's periphery, this is because not only is the 'industrial/commercial' area crossed by main travel-through axes, it is also surrounded by residential neighborhoods who need accessibility. In Aveiro's periphery, besides the reasons above mentioned, this is also because there is a considerable number of segregated residential neighborhoods, which help to increase the percentage of M1 stores in segregated segments. It should also be noted that there are more 'Other' stores than any of the other remaining categories, except in Vila Real. Once again this seems to indicate that in order to function in the periphery stores need to be in the first half quantiles of 'choice'.

Lastly, the calculations are made considering as the principal element the category and not the quantile. That is, it is seen how each retail category is distributed by the segments of each quantile, therefore discovering affinities. The values presented before, in Table 30, for the first quantile and for r= n, can be complemented with the graphs in Figure 133, for 'integration', and Figure 134, for 'choice', also for the first quantile. The graphs for the 'yellows' and the 'blues' are displayed in Annex 21. If in the center it was clear that the M2 and the MC categories, along, occasionally, with S stores, were the ones which most sought the first quantile segments, in the peripheries the discovery of a pattern is more uncertain. Actually there are very few similarities that can be found between cities, because the number of segments in the first quantile, and the number of stores facing them, also varies considerably.

Therefore, for 'integration', it can be seen that whilst the percentages of stores facing the first quantile segments for Aveiro's periphery are always less than 10%, and for Évora's and Leiria's are below 20%, in Vila Real's periphery these numbers are much higher, because the larger portion of the stores is in the important 'extension' and in the 'main residential' area, places close to the center and with relevant 'integration' (and 'choice'). Because of this over 30% of the peripheries' M2 and MC stores are in the first quantile segments. This is the only case where MC stores appear relevantly in all the peripheries and the obvious weight of the 'extension' is the justification. Yet in Vila Real's periphery there is an even more striking element. 55% of the periphery's 'Other' stores are in the first quantile. As Vila Real's periphery has close to none multi-commercial establishments, it can be said that 'Others' relate mostly to 'closed' and 'empty' stores. This being the case, it is proven the affinity of new developments for places of 'centrality', although it seems that this investment, for the time being, is still unsuitable for the market necessities of this city.

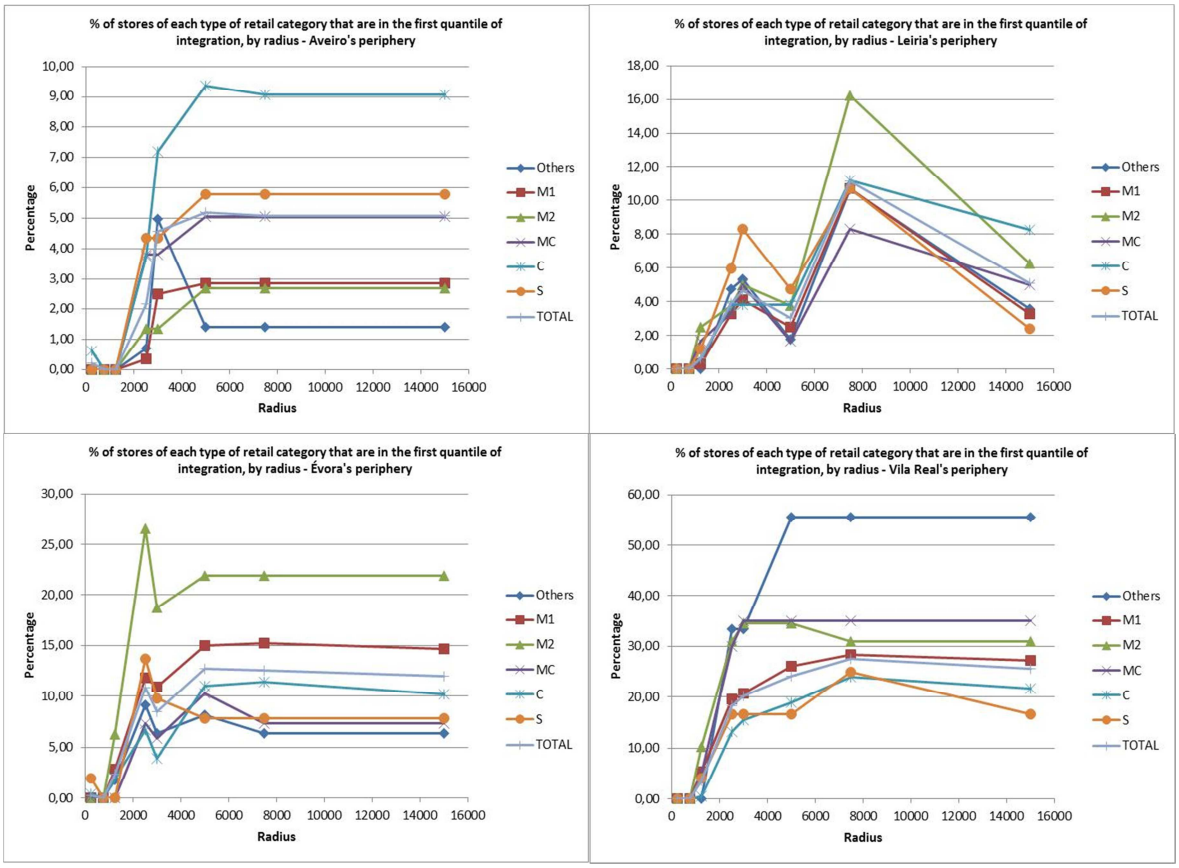


Figure 133 - Percentage of stores of each type of retail category that are in the first quantile of 'integration', by radius, for the four peripheries

In the other peripheries, the affinities of the categories to the segments of the first quantile are easily explained by the functions of their main out-of-center localities and the way these are connected to the center. Évora, Leiria and Aveiro all possess strong residential localities just outside their centers, yet in Aveiro these are more poorly connected, and even locally centralities hardly are defined[427]. Because in this last city the 'red' segments are exclusively the main thoroughfares, naturally C and S stores appear as the categories that most seek them. On the other hand, in Évora's and Leiria's peripheries, the category which reflects centrality, M2, seeks these axes more vehemently. In Évora this happens at all radii, with particular incidence locally[428], reflecting the areas just outside the city center that compensate some activity deficiencies that this center displays. M1 stores also seek these lines of centrality, showing how in this periphery the interior of the residential neighborhoods is more easily accessible. In Leiria's periphery M2 stores are more relevant at mid-distances, when the 'centrality' range of the main streets of these localities is maximized. C stores also seek 'red' 'integration' segments in this periphery globally[429]. Lastly, in these two peripheries, Leiria's and Évora's, S stores also appear to seek, locally, the most central segments. This could mean that S stores are in destinations just outside the center, with a limited range of attraction (for the center inhabitants), but, as it will be seen bellow, globally they also appear relevantly in the segments of the second and third quantiles.

[427] Except in Santiago.
[428] Up to 25% of all M2 stores.
[429] When the thoroughfares are highlighted, including the ones that serve the industrial areas.

In Annex 21 it can then be seen that most retail categories seek the segments of the second and third quantiles. In all peripheries but Leiria's between 40-60% of the stores of each category are in the 'yellow' segments. In Leiria's periphery, these numbers are even higher (50-70%). Stores may not be able to occupy the most central segments, but they are not, however, in segregated areas. Despite their limited overall number, over half of the MC stores are in global 'destinations' of intermediate importance. They seek the most relevant segments of the 'main residential' areas and of the 'extensions' as they need clustering and centrality. These seldom will be 'red' but are more than often 'yellow'. Likewise, M2 stores also seek more these segments, particularly in Évora's and Leiria's peripheries, as it had happened in the first quantile. But the most surprising finding is the appearance of S stores, globally, in a relevant position in all peripheries but Leiria's. If in the centers they did not need (or where not able to get) a central position, in the peripheries they appear locally in the most integrated segments and globally in the second and third quantiles. Even so, looking at the graphs for the last three quantiles, it is seen that 40% of S stores, in all cities, are still in segregated segments, which could prove the point made earlier that some of these stores are able to make their own centrality. C stores also appear to seek more the 'yellow' segments in Aveiro's periphery and 'Other' stores appear more than relevantly, at a local scale, in Vila Real's. This makes sense, as new developments may appear, especially in smaller localities, in places of relative local centrality. Yet once again, this centrality appears not to be enough. Probably through-movement potential is needed.

Looking at the graphs of the segregated quantiles it can be seen that M1 stores are in 'blue' segments in all peripheries, as it would be expected due to their need to be near residential areas. In Vila Real's and Leiria's peripheries, 40% of the C stores are also in these segments (stronger yet more segregated 'industrial/commercial' areas). In Évora's periphery it is clearly perceptible that most of the 'Other' stores (70%) are in segregated segments, which should explain their lack of success. In Vila Real's periphery, on the other hand, this number is close to zero. New developments with excessive store space are hardly in the out-of-the-way traditional localities, yet their occupation rate is as faulty as in the other cities.

At long last, the same observations are made for 'choice'. In the first quantile (Figure 134) there is a much higher number of stores than there was for 'integration', especially in Leiria's and Vila Real's peripheries. Locally, once again, the percentages are even higher, revealing the connecting segments that have relative local importance when feeding the main thoroughfares. There are not, however, relevant category changes from the local to the global scale. In Aveiro's periphery, because only main thoroughfares have high 'choice' value, they are sought preferably by the C and S category. On the other peripheries, however, most MC and M2 stores appear, with higher percentages than in 'integration'. This means that these two elements of centrality, when existing in the peripheries, prefer high 'integration' but better still high 'choice' segments. In Leiria, M1 stores also seek 'red' 'choice' especially locally, showing how the main streets of the peripheral localities have good local through-movement potential. In Évora's periphery the same happens, yet globally the number of activities that seeks the high 'choice' thoroughfares is much wider, showing that the through-movement potential is much more maximized when the entire city is considered, a probable consequence of its form. Over 45% of 'Other' stores also seek the first quantile segments in Vila Real's periphery, confirming the predisposition of new developments to be in the main thoroughfares leading to the center (and also to be in the 'extension').

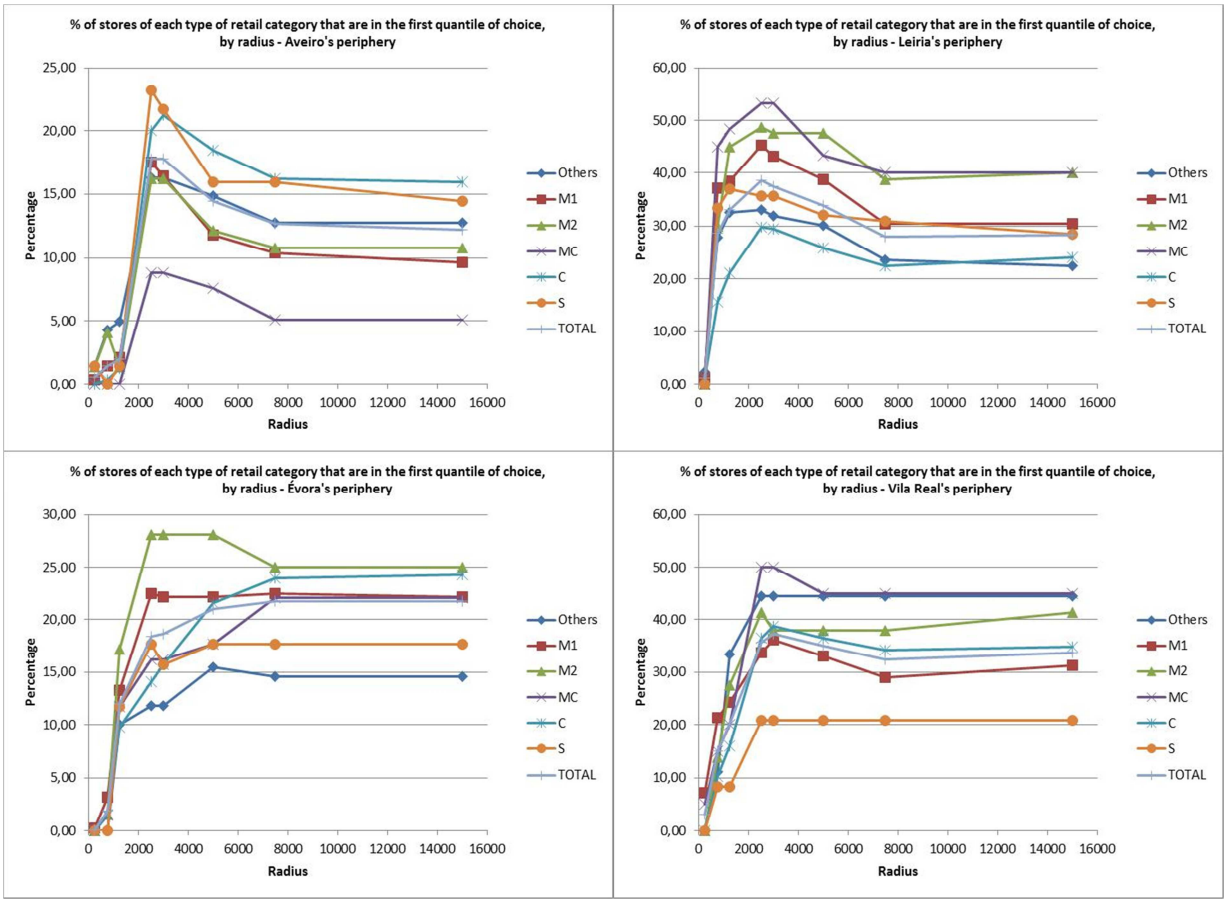


Figure 134 - Percentage of stores of each type of retail category that are in the first quantile of 'choice', by radius, for the four peripheries

If less than 30% of S stores seek the first quantile segments, it can be seen in Annex 21 that over 40% seek the segments of the second and third quantiles. Locally, both for Aveiro's and Vila Real's peripheries, the numbers surpass 60%. These are precisely the two peripheries that do not have a high affinity of S stores with local 'integration'. This may be because main out-of-center locations suitable for S stores coincide in Leiria and Évora[430] with main local central roads, whilst in Vila Real and Aveiro they coincide with main expansion through-movement axes[431].

Like for 'integration' MC stores also seek majorly the 'yellow' 'choice' segments, despite their limited number, in the peripheries of Évora and Aveiro. This is because the most relevant segments of the 'main residential' areas and of the 'extensions', where these stores cluster, are also, in these two cities, travel-through axes. Obviously, M1 stores also appear with relative significance in the segments of the second and third quantiles in all cities. In Aveiro's and Leiria's peripheries C and M2 stores also have higher percentages in these axes.

Lastly, between 30-40% of S stores are located in the segments of the last three quantiles, representing, in the case of Évora's and Vila Real's peripheries, the category that most seeks them. At lower radii however, in all cities, there is a drop in the percentage, symbolizing the local importance of this activity. In the case of Évora's periphery, the percentage of 'Other' stores that seek these segregated segments is the same as that of S stores. Actually, in all peripheries but Vila Real's, 'Other'

[430] Where peripheral localities are stronger and closer to the center.
[431] Where the center if off-center and the connecting points center-periphery are less.

stores are the ones which most seek the segregated segments, which can only mean that peripheral stores, to be successful, need to be in places of great through-movement potential. In all peripheries, over 30% of C stores are also located in these segments, an obvious consequence of the lack of through-movement capacity of all the axes of the 'industrial/commercial' areas, with the exception of the main distributional one. M2 stores also appear with some relative importance in Vila Real's peripheral segregated segments, symbolizing the segregation of main commercial 'islands'. Worthy of note is the fact that M1 stores, although they have between 20-30% representation in segregated 'choice' segments, are not, relatively, the ones that most seek these lines. This corroborates the conclusions made above that 'choice' penetrates more into the neighborhoods than 'integration' and that commercial clusters in the periphery, even those of first necessity, try to locate in segments with travel-through potential.

Summary Box nº 4

Regardless of the strength of the regions these four cities are in, of each city's role in the respective region and of each center's function in the respective urban perimeter, the truth is that the commercial landscape, the activity distribution and, more importantly, the direct morphological variables associated to commercial buildings, blocks and streets, and the distribution of stores within each of these elements, are practically similar in all the case studies. The exception is constantly Évora, mostly due to the reduced building heights and the constrained area. The other cities possess, for example, commercial spaces in buildings with similar average height (3/4), similar areas and volumes per store (both for the centers and the peripheries) and the same overall number of stores per block (6). These findings could be assumed as natural predispositions of commercial spaces and as thresholds for medium-sized cities. The fluctuations of these variables, however, seem to depend more on the location inside the urban perimeter than on the activity performed in that location.

In the centers, because commercial evolution has followed land-development, the morphological realm of commerce has changed accordingly. In traditional centers (which possess the greatest local accessibility and betweenness) commerce occupies a low-rise closed network (full blocks), formed around main traditional landmarks and older buildings, composed of 1-way narrow streets with narrow (or no) sidewalks, increasingly pedestrian or with a single parking row (close to residential neighborhoods). Although commerce can occupy all sides of the blocks (in sporadic commercially dense zones) or the shorter edge (near residential areas) it is mostly in the larger edge, as the blocks develop parallel to the main streets. Main squares are the exception, with larger heights and with commerce facing them regardless of the block edge. In these conditions, 'Restaurants & Cafés' (M1), 'Fashion' (MC) and 'Hygiene and personal care' stores are mostly found. The entire extent of Évora's city center follows this logic. In the other centers, from here commerce expands in commercial axes/linkages until it reaches edge-thoroughfares. Blocks, streets and heights increase in size. Blocks become semi-hollow (with commerce still on the larger side) and the number of stories is between 4-6/7. Linkages are complementing 1-way streets (2 lanes), with average or larger sidewalks, depending on building occupation and relative importance. Edge-thoroughfares are 2-way streets (2-lanes in each direction) with larger sidewalks, as most buildings (and stores) are farther from the street. 'Services and other activities', S stores and 'Home appliances and electronics' favor these locations. But, because of the dual central occupation, besides the activities which are clearly 'traditional' or

'modern', all others have more or less a 50-50 distribution between one area and another, for example, between low-rise and medium-rise developments. Higher heights occur in isolated locations (in Vila Real and Aveiro) or, with more continuity, in the edge-exes of Leiria.

In the peripheries the morphological characteristics also vary according to the type of function of the hierarchical area (hence distance to the center) and, to a lesser extent, to the type of commercial occupation (hence with the existence of commercial 'islands' in new multi-family residential buildings). Building heights, road-size and road complementarity decrease and block area increases with the distance to the center. Excluding isolated monolithic high-rise 'islands' (more frequent in Vila Real), building heights decrease steadily from the 'extensions' and 'main residential' areas (4-6), according to how much 'traditional' and 'residential' each locality is, until they become 1-2 in 'isolated residential' areas and 'industrial/commercial' areas. Because the periphery is structured in a logic of 'axes', the 'street' is a crucial morphological element. Expansion center axes, thoroughfares, main local roads passing through the center of localities and regional roads, possess most of the commercial spaces and are usually 2-way streets (1 lane each direction) with declining width and sidewalk size. Near roundabouts, intersections, 'islands' and main axes these streets widen and may have parking rows. Only residential areas away from main streets possess 1-way, not necessarily complementing, roads, but more rarely (except in 'islands') commerce is here. Commerce is on the larger side of hollow and semi-hollow medium-sized blocks oriented to face these main streets. The blocks lose their geometry and increase in size in pre-existing less developed and more isolated areas. Inevitably commerce becomes 'road-side' and there are no blocks. M1 stores are constant throughout, C stores prefer the industrial areas and MC, 'Hygiene and personal care', 'Home appliances and electronics', 'Food & Beverages' (supermarkets) and some services need clustering, that is, to be in 'islands' or closer to the center.

The relationship between the area and the volume of buildings containing stores is represented by various linear distributions, which can be quantified. Multi-commercial spaces (shopping centers and arcades), 'Services and other activities', 'Home' and 'Food & Beverage' (associated to single standing stores or not) are usually the outliers, that is, the ones located in buildings with more area, more volume, or both. Yet what was found is that most stores locate in either high or low cubic content buildings, depending on the area they are in. Usually, 'Services and other activities' represent the greatest commercial area, although this is not the case in some residential areas and in Évora's center.

Commerce usually seeks larger blocks (except in Vila Real). The same happens in all centers and in all peripheries (including Vila Real's), except in areas that contain larger extensions of unoccupied space (such as 'isolated residential' areas). The numerical relationship between the average area of the blocks containing stores in the whole city and that same area in the center and in the periphery is exactly proportional, and similar, for all cities (1/3 and 1,5 respectively). Blocks are, for the most part, geometrical, with the clear exceptions of Leiria's, and to a lesser extent, Vila Real's centers. As both have a more irregular topography it can be argued that terrain conditions can influence the geometry of commercial blocks. The hollowness of blocks is also dependent on the type and size of the existing multi-family buildings. This is why, as seen above, hollowness is more prominent in the peripheries.

Only main commercial streets are crossed by the public bus lines. In the centers these include the main 'new' commercial axes, namely the 'linkages' and the 'edge-thoroughfares'. The off-center centers in general (like Aveiro's) and the traditional centers in particular are poorly served, as the form of the

center and the location of the major residential neighborhoods without stores influence more strongly this correlation. In the peripheries, this service varies with the distance to the center. Where main streets are stronger and more buildings face them ('extensions', 'main residential areas') more stores have a direct connection to the bus lines. The same happens in road-side areas where both stores and bus lines cannot be anywhere else (like in Vila Real). In 'residential' areas and 'industrial areas' there are stops in the main axes but in 'isolated residential' areas there are none at all. It could be argued that outside main axes the commercial occupation consists mostly of M1 stores, therefore of pedestrian accessibility, so there is lesser need for public transport service, at least commercially speaking.

'New' buildings, in this case those constructed after 1975, not only contain half of the city's stores, they have also been fundamental, to a certain extent, in increasing the accessibility and betweeness of the commercial network. This has happened particularly at mid-distances, and particularly in the center (where practically no stores in new buildings are in segregated 'integration' segments) and in the 'extensions'/ 'main residential areas' (especially in Leiria). This has also occurred more in 'integration' than in 'choice', that is, stores in post 1975 buildings create, or seek, more central than travel-through locations. And this also happens more at a local than at the global scale. The most important global axes have, for the most part, a pre-established definition, and the introduction of new construction has not hindered their importance, especially as a destination. Because for Évora, and also for the first quantile at r= n both in Leiria's and Aveiro's centers, the patterns of 'choice' and 'integration' are also similar, the success and importance of these ancient main axes as both travel-through and travel-to commercial ribbons can be explained. In the peripheries, most stores in post 1975 buildings are not in first quantile axes. They seem to seek the most central and 'chosen' axes possible, but that may not always be viable (for example due to non-urbanized ring-roads). This is truer in Leiria and Vila Real. For integration there are higher peaks, as new construction appears to increase the influence radius of a given centrality. On the other hand, new construction has contributed to the betweenness of commercial spaces mainly at a local scale (until the distance needed to feed the main thoroughfares is reached). Both in the centers and in the peripheries (except in Évora's center) the number of stores in post 1975 buildings in the second and third quantiles is the same for all cities (and remains almost constant for all radii). This could mean that these axes (mostly symbolizing residential neighborhoods with stores) have similar roles, as destinations (in the center) or as connections to central and distributional thoroughfares (in the peripheries). Post 1975 buildings with stores are, particularly in the center, higher, as they are associated to the newer areas. In the periphery, however, they are not significantly higher than pre-1975 buildings (even though there are sporadic high-rise commercial 'islands'), because, overall, they have complemented the pre-existing axes and, truthfully, there was no need. Yet this lack of need seems not to have been perceived in terms of commercial spaces. The consequence is that these buildings have more trouble in occupying their store space, particularly if they are in segregated segments.

Whilst the centers have been designed to be clear destinations (locally and globally), the peripheries have been designed for through-movement. In the peripheries, there are much more stores in the first three quantiles of 'choice' than in the first three of 'integration'. Furthermore, events occur at lower radii than in 'integration', and many segregated areas in terms of 'integration' have high 'choice' values. The 'choice' patterns are more constant between cities, proving that the expansion through through-movement axes has followed similar trends. Another cause for this can be that their formation seems to be, as said above, less dependent on new construction. Yet the activities that seek these

'choice' axes are not as similar between cities as they are in 'integration'. In this case, they depend on the rest of the city's organization.

Most stores are not located in the segments belonging to the first quantiles but rather to those of the second and third quantiles ('yellows') both for 'integration' and 'choice'. This means that size of the city (as it decreases the relative number of 'red' axes) and form (for example the existence of non-urbanized ring roads belonging to the first quantile) are important variables, but it can also mean that stores do not have the economic capacity to choose the best locations, or else that they do not want to, preferring corners or perpendiculars to main streets, and to be near residential neighborhoods (in 'feeders' of the main distributors).

The centers act as 'destinations' for the entire urban perimeter. They are hardly segregated in terms of 'integration' (only S stores in Aveiro are perceptibly in segregated segments), although they are slightly segregated in terms of 'choice'. They are more 'central', that is, the greatest number of their stores are in principal ('red') 'destination' segments (to-movement), between local and intermediate distances, when they are just considering themselves and a few close-by peripheral localities (until r= 3.000). Here the 'new' axes are highlighted in 'red' and the traditional shopping streets are on the brink of losing their importance (which is maximized locally). The influence of main 'choice' axes (albeit fewer) reaches larger distances, so the centers have their betweeness capacity maximized (through-movement) until r= 7.500 m, when the expansion axes are able to serve, in a direct line, the limits of the urban perimeter. The traditional centers only have through-movement importance locally.

The peripheries are more segregated, especially locally, and especially inside the residential neighborhoods (concerning M1 stores). The peripheral commercial centers are hardly destinations, even at a local scale. Especially in Leiria and Vila Real, smaller centers are perceptible, but the smaller the locality, the quicker the perception of local centrality decreases. Yet in 'integration', as in 'choice', the influence of these segments seems to affect larger distances (peak at r= 3.000 for 'choice'), that is, they need to serve larger areas to be relevant. Only after r= 2.500 (Leiria, Vila Real) and r= 7.500 (Aveiro) for 'integration' and r= 500 (750 for Évora) for 'choice', stores correlate more with the streets in the second and third quantiles ('yellow') than with the segregated segments. Although the changing radius for 'choice' is considerably lower, stores benefit much less from local than from global 'choice'. Locally, stores seek the 'feeding' axes (those which serve the global thoroughfares connecting the center and the peripheral localities between themselves) and globally the best possible through-movement traffic (rays-of-the-sun, ring-roads, axes leading to the center). The importance of the intermediate 'feeding' axes (where the 'islands' are) seems to be constant at all 'radii' (constant number of stores in 'yellows').

The segments of the first quantile, both for 'choice' and 'integration', serve preferably M1, MC and C stores. For 'choice' the percentage of MC stores decreases in all cities. This is an activity which prefers central locations. That is why it is, along with M2, the category that most seeks the segments of the first quantile, particularly in 'integration', both in the centers and in the peripheries. In the centers, the centrality of MC is more local, and its betweenness attraction more global (in both cases except in Vila Real). In the peripheries, its importance decreases drastically (it is substituted by C stores), yet the few existing stores still seek 'yellow' segments (particularly in 'integration'), that is, they are located in the peripheral centralities. M1 stores also appear in these centralities, but their reach is much wider. They are the ones most served globally by first quantile 'integration' axes

(except in Aveiro), and their importance rises locally (both revealing a location in small centralities and in travel-through 'feeding' segments). Yet because they are inside the neighborhoods they have a strong affinity to the last three quantiles' axes. This is less evident in 'choice', as 'choice' (feeding) segments penetrate more inside the neighborhoods. Actually, it is M1 stores, along with C, the ones that are most found in residential neighborhoods, and the only ones practically found in 'isolated residential' areas. These are the categories mostly served in all the periphery segment types, have higher representation in 'integration' locally (small centralities) and, if in main axes, greater representation in global 'choice'. Yet C stores, unlike M1, have a much clear tendency for thoroughfares and industrial/commercial areas. That is why in the centers they appear only globally for 'integration', when the outer expansion axes have more meaning. If they seek 'red' axes locally near residential neighborhoods, they seek 'yellow' ones globally. Yet in the peripheries, due to the weight of the segregated warehouses, they are mostly in 'blue' segments. At first glance, S stores also appear relevantly in segregated segments, which could mean that they have attraction enough to locate where they please. Yet locally, there is a revealed tendency for these stores to be in high 'integration' segments. They appear to somewhat seek 'red' central segments in the centers of Leiria and Évora, 'red' 'choice' segments in the centers of Leiria and Vila Real, and in the peripheries, local 'red' 'integration' segments in all cities, whilst they are in 'yellow' 'integration' segments in all peripheries but Leiria's. This appears to translate a preference for destinations just outside the city centers ('extensions' and 'main residential' areas) with a limited attraction range. As they are also (40%) in 'blue' 'integration' segments in all peripheries, it could be assumed that the increase in the range of attraction can be supplied by the store itself and not by the location it is in. 'Other' stores are also mostly located in segregated 'choice' segments in all cities but Vila Real and in all center's but Évora's – stores, especially peripheral ones, need high 'choice'.

Considering the entire urban perimeters, a less than expected correlation between the segregated segments and the 'closed' and 'empty' stores was found (20-30%). This is because most stores (and therefore most non-open stores) are in the centers, places where the principal axes of commerce have always a high 'choice' and especially a high 'integration'. This is truer in Évora's city center, because of its size and because most stores face the main thoroughfares. In Aveiro, due to the segregation of most of the city center, the only palpable connection exists. In the peripheries, locally and for 'integration', the connection of non-open stores to segregated segments is undeniable, particularly in Évora (because it has more stores inside the residential neighborhoods, which are not destinations). Stores in the periphery are not generally on global destinations, but if they are not even on local destinations then they are more than often unsuccessful. Globally however, there are only significant decreases in this percentage in Vila Real's periphery and furthermore, with this exception, over 80% of these stores are in post 1975 buildings, which reflects poor location decision choices. Because the peripheral commercial concentrations seek 'choice' segments, the percentage of non-open stores in segregated through-movement axes is less both locally (proving the local feeding capacity of main residential axes) and globally (buildings and stores favor the city-scale distributional axes). Almost all 'closed' and 'empty' stores in segregated lines are in post 1975 buildings, especially in the periphery. In the centers, obviously, the correlation is more acute in 'choice'. The exception, as mentioned, is Vila Real, showing both the city's reticence in new construction and also the affinity of this new construction to high 'integration' and especially 'choice' axes. 'Other' stores have, in this city's periphery, a very high percentage in 'red' segments. As there are few or none multi-commercial establishment in the periphery, it can be said that 'others' relates to 'closed' and 'empty' stores. In this

case, their lack of success was not a consequence of their location in the network, but probably of the lack of commercial need.

Looking at the case studies there are overall similarities. Aveiro and Leiria, the most developed and commercially intense cities have obviously more overall commercial area, more commercial area per store, and consequently, because building heights are similar between case studies, more overall commercial building volume and more building volume per store parcel. Yet their form is different. Leiria's center is central in the context of the urban perimeter and the expansion follows a 'locality' logic. Aveiro's center is off-center and the expansion follows an 'axes' logic. Both cities have structuring ring-roads but because they are not local roads (that is, they are like motorways), they possess little urbanization, and consequently very few stores. Furthermore, their weight helps to decrease the global importance of center roads and thoroughfares (peripheral local centralities). Because the 'choice' potential of these axes is relatively greater than other thoroughfares, these two peripheries have a poor correlation with 'red' segments. That can be the reason why S stores appear in the 'red' global 'choice' axes of these two cities, that is, in less obvious places for commercial location. It can also explain why C stores, for example, are not connected to 'choice' at mid-distances (only globally). In both cases to-movement axes (especially those connecting to the center) have been obvious choices for new construction. In both peripheries, C and M2 stores seek the second and third quantile 'choice' segments, and 'Others' the second and third quantile 'integration' segments.

On the other hand Évora and Vila Real have fewer stores and smaller building areas and volumes, whilst their peripheries have the same number of stores per block. Their low-rise central areas have more MC stores, and first quantile segments have a higher percentage of M1 stores, particularly in the periphery, and particularly at a local scale (both a trait of 'traditional' locations). In some of their residential peripheral areas 'Restaurants & Cafés' occupy more commercial area than 'Services and other activities'. There is also an evenness, for 'choice', of the stores that seek 'red' segments, that is, the thoroughfares of both cities are richer in terms of commercial spaces and their importance is maintained at most radii.

Aveiro's and Vila Real's peripheries have more C stores in global through-movement segments, unlike the other cities which have more M1 stores. Because of the off-center traditional centers and of the smaller number of direct connecting points (expansion axes) between the center and the periphery the peak of center 'choice' (distance needed for more stores to be in through-movement relevant axes) occurs at higher distances and more residential areas are segregated. This can explain the greater affinity with stores that seek thoroughfares, like C and, to some extent S, which can locate in main through-movement expansion axes. Although S stores seek 'red' 'integration' segments, locally, in these two centers, the same does not occur (unlike in the other cities) in the peripheries. Instead, S stores prefer higher 'choice' axes.

In Leiria and Évora, in the center and in the periphery, there is an exactly similar number of blocks containing stores (that are more than in the other cities). It should be reminded that Évora has half of the area but twice the number of stores per inhabitant and per area of Leiria, which could explain the similarities. Both traditional centers occupy a central position and both centers are more circular and more organized, that is, there is a clear commercial and syntactic hierarchy from the core to the outer rim. Hence, in the centers, 'choice' values are higher locally than in the other cities. The values of 'integration' as well, both for the centers and for the main peripheral localities, are maximized at mid-

distances, symbolizing an above normal centrality range of each locality. The affinity of M2 stores to higher 'integration' axes at mid-distances is a consequence of this. The different localities are stronger and closer together, and that can be seen in the presence of S stores in the main local roads (they seek 'red' integration locally – destinations outside the center – and 'yellow' globally). C stores also seek these thoroughfares of high 'integration' which unite localities and the center. In Évora, M1 stores also appear here. Both categories do so more locally, as they try to compensate the deficiencies of the city center. More similarities, however, appear considering Leiria/Vila Real and Évora/Aveiro.

Vila Real and Leiria have stronger and accessible centers (destinations), which serve both the local scale and larger areas (the maximum store correlation with 'red' segments occurs at higher radii). This is also true, to a lesser extent, in the smaller centers of the pre-existing communities in the peripheries, whose main axes are highlighted in 'integration' and 'choice' locally and then lose their relative importance in the global scale. That is why there are more points, local and global, of centrality (hence more M1 stores locally), and why, in both peripheries, the correlation with 'red' segments even surpasses the one with 'blue' segments, at some radii. 'Choice' peaks at higher distances and there are good connections with the 'red' segments. The number of stores in the thoroughfares is relevant, forming links to the center and between localities. An advantage in these cities is that the connecting thoroughfares are directly linked to the main local streets, yet most of the 'feeders' disappear in global 'choice'. This aptitude for thoroughfares may explain why C and S stores seek 'red' choice in both centers, and why M1 stores are in segregated 'integration' lines (also S). Yet, in the periphery, C stores are mostly in 'blue' segments (more segregated industrial areas). Although the traditional centers (both of the 'center' and of the smaller ancient localities) are more compact and contained (smaller heights), these two cities possess larger blocks and larger block volumes containing commerce. This is because their expansion (stores in post 1975 buildings) has been the greatest, especially in the center. This causes for the difference between the areas of average blocks and that of blocks containing commerce to be higher in these two cities, especially in Leiria. This new construction seems to have been crucial, again especially in Leiria, in increasing the accessibility and more so the betweenness of the commercial network (more stores in 'red' segments that are in post 1975 buildings). This number peaks at intermediate distances (close relation of the 'new centers' and 'main residential areas') and the impact of the new construction is more local than global. Therefore, globally, the number of stores in post 1975 buildings in segregated segments is also similar in these two cities, which can mean similar overall expansion and function of the 'islands'.

In Vila Real an important element is that the traditional center is still the most integrated area, both locally and globally, so most stores therein are preferably served by first quantile segments, at any radii. This area is clearly the 'destination' for the entire urban perimeter, and that can explain why it has not modernized and why it has been able to survive and surpass any other commercial area in the city. Yet, because this area is very much sought, it also reflects the relative overall segregation of the remaining city spaces, especially those belonging to the periphery, in terms of buildings, stores and services (90% of stores in 'blue' peripheral segments are M1 and C). The peripheral localities are actually too far away from the center (and the connections are not direct) to become less segregated (there are no stores in first quantile segments for r= n in the localities outside Borbela/Mateus and Europa/Universidade Avenues) and this could somewhat explain their lack of development. Even so, these localities may not be centralities but present (at least in the main street) high 'choice' values, which can also contribute to explain their center-dependency, as the travel-through connections are always visible. This affinity to high 'choice' values also explains why more C stores are in, and seek,

'red' segments, which is also a consequence of the 'Home' cluster that exists in this city. In the center this only happens globally, because the 'choice' axes do not pass through where most stores are (traditional center), and the thoroughfares only have meaning when the periphery is being considered. Yet as there are similar indicators to the other cities (stores per block in the city, area per store in the periphery), the commercial sustainability of Vila Real's periphery may be somewhat justified, even though it has much less stores, less inhabitants, and less commercial centralities. The city's deficiency of services and high-order goods is reflected in the fact that both to- and through-movement segments serve preferably M1 stores, locally and globally. Recently, the 'extension' has tried to compensate Vila Real's center's deficiencies and to balance the 'periphery'. It has most peripheral stores and the only peripheral multi-commercial establishments, and it is as important as the city center (and more so than the 'new center') in terms of being a destination. Because it has, globally, a very high accessibility and betweenness, it has, along with the center, contributed to the fact that above r= 1.250 more stores in the city are served by 'red' integration segments than any others. This has also both increased, in the periphery, the correlations of stores to the first quantile segments, and of stores in post 1975 buildings to first quantile segments, something which can be deceiving and hide the above mentioned segregation of the other areas. The containment of the city's commerce in particular areas explains why it has the less overall number of blocks containing stores and why the commerce is very much served by public transport lines (also because it is practically all road-side). This is particularly true in the center, where there are more stores per block than in the other centers. Once again, these values can be deceiving of the city's true commercial nature. This concentration also explains why all categories seek high 'integration' segments, particularly in the center, and why M2 and MC stores appear to seek 'red' segments throughout, even though M2 are definitely also associated to segregated segments in the periphery. 'Other' stores also seek local integrated ('yellow') segments (which can mean that local centrality is not enough to provide clientele) and 'chosen' ('red') segments (as new construction is in thoroughfares and in the 'extension').

Leiria has, on the other hand, a wider range of functions. Globally, both to- and through-movement segments serve distinctively three kinds of categories (M1, MC and C) showing the commercial richness of its main axes. C, M2 and MC stores all chose to be preferably in 'red' segments with equal avidness. In the peripheries the first two do so globally for to-movement, and the last two do so for through-movement. S stores also seek local destinations, as above discussed. This wide range of activities can be explained first because the main 'new' axes of the center (the linkages and the edge-thoroughfares) are also dense residential and service areas, which have both to- and through-movement potential. Furthermore, the main areas close to the center are important destinations, and are connected directly to each other by urbanized thoroughfares. This causes a more gradual reduction of the importance of first quantile axes, so the correlations hold longer. The stores in new buildings have offered increased assistance to this 'integration' and 'choice' potential. Stores in post 1975 buildings seek 'red' 'choice' and 'yellow' 'integration' (because the centrality of post 1975 locations – main residential areas – is maximized locally). This local good 'choice' potential in the periphery explains why M1 stores are so well represented in first quantile axes. The same for 'integration' explains the local appearance of C stores. This accessibility contrasts, however, with the lack of proper public bus lines in the periphery.

Évora's and Aveiro's cities work for short distances in terms of to-movement (stores correlate more with 'red' segments at lower radii), showing that they possess less strong centralities. In Évora the city center is small and has some activity deficiencies (like services) and in Aveiro this center is segregated

due to the city's form. Both peripheries are structured in the form of rays-of-the sun axes, something which contributes much more to their through-movement potential (highly perceptible and intuitive). In the centers of both cities the old main thoroughfares still withhold, that is, the main axes have not been a consequence of new construction. If these are central, they possess, at the same time, considerable 'choice' values (that are hardly high anywhere else in the centers). That is why in the centers there are very close similarities between the activities that seek first quantile segments in 'choice' and 'integration' (the segments are the same). In the peripheries the main thoroughfares are also the main to-movement destinations (especially globally). Main residential roads only highlight very briefly locally, so centralities are difficult to find (M1 stores are in segregated segments except at a local scale) and most commercial 'islands' are not in destinations. But the through-movement potential of these segments holds longer, enough to feed the main 'choice' rays-of-the-sun thoroughfares. This is more perceptible in Évora, where there are better connecting segments crossing the neighborhoods (better correlation with 'red' at a local scale) although in Aveiro the correlation with 'yellow' is the greatest, as most new commercial concentrations face the main thoroughfares (unlike in Évora where they are inside the neighborhoods). Yet in these cities the connection between the main roads of the peripheral localities is not direct, like in Vila Real and Leiria. The connection has to pass necessarily through the distributional thoroughfare, something which increases the segregation of the neighborhoods (fewer stores in peripheral 'red' 'choice'). Because both peripheries have more diffuse expansions, they do not possess clear hierarchical structures – zones are multipurpose. This influences, for example, building heights (higher in 'isolated residential localities' than in the other two cities) or the pedestrian accessibility of the industrial/commercial areas. The traditional inheritance of these cities is translated by the fact that more 'Food & Beverage' establishments are seen in the two low-rise centers. MC stores are closer to high 'choice' axes (also M1 in Évora), whilst S stores appear with more percentage in segregated 'choice' segments.

Évora is more constant in terms of construction and density. The smaller city and the smaller blocks (which lead to fewer stores per block) seem nonetheless to aid the structural accessibility relationships between elements. The city is more organized (more complementarity between streets), and there is more proximity of stores (and neighborhoods) to public transport lines. The city's regular and symmetrical geography permits the greatest similarities between 'choice' and 'integration', that is, the main axes serve dual roles. In the centers, because stores mostly face these axes, the passage from the local to the global scale affects less the stores' connectability to 'red' axes. In the periphery, this allows for 'choice' axes to maintain high betweenness capacity at all distances, yet this focus on rays-of-the-sun thoroughfares helps to segregate other areas, such as the residential neighborhoods, where stores (including those in new buildings) are served by 'blue' segments, especially those of 'integration' (as there is a need to 'feed' the through-movement). That can be the reason why Évora's first quantile segments are sought primarily by M2 stores, especially locally (important to- and through- movement axes bridge the gap between the center and residential areas). It is also the reason why 'new' construction has a poor connection to 'red' 'choice' (it prefers the second and third quantiles). Even though in the peripheries most categories seek the first quantile segments of 'choice', the number of stores served by the distributional thoroughfares is inevitably less than that of the stores inside the neighborhoods. But as there are many empty urban lots, that may change if there is need for new commercial construction. Once again S stores seek local destinations but not global (even in the center, where there are hardly any segregated lines, they do not seek 'red').

Lastly, in Aveiro the morphological constitution of the city creates a problem of store access. The center is off-center, there is not an urbanized ring road and the expansion axes flow, parallel, just East, although not in a direct line to the suburbs (unlike Évora), because of the influence of the railroad track, the motorway and the 3 main residential localities, which are not connected to each other except through the center or the motorway. This denies the city a large number of high 'integration' and 'choice' axes, and also of points of connection between the center and the periphery. Most of the center is cornered, which affects considerably more the through- than the to-movement potential of the area. This is also why there is a lesser connection to public transport lines. In the periphery, outside the main thoroughfares, the accessibility is much hindered, the network is confusing and the streets are not directly complementing. This makes more difficult the creation of centralities and any relevant affinity to integration (that is why 'red' 'integration' serves mostly C stores). To be relevant, to be a destination, greater distance is needed, that is why peripheral stores only are in majority in the second and third quantiles of 'integration' (rather than in the segregated segments) just after r= 7.500, and even then the value of shops in 'yellow' and 'blue' segments is almost similar. Even so the majority of stores face the main axes, and there is an affinity between the major commercial axes (thoroughfares) and the new residential neighborhoods, which can also explain why there is a globally good correlation between segregated 'choice' and non-open stores. Traditional neighborhoods, however, either in the cornered center or in the diffuse peripheral network, possess a much worse affinity to the thoroughfares. Here M1 stores appear (segregated segments). Because the network is based on pre-existing axes, only locally (also in the center) does new construction contribute to the accessibility and betweeness of the commercial network. Globally, the stores in post 1975 buildings are more than often in 'blues' and 'yellows'. Because C and S stores seek the first quantile 'integration' and 'choice' segments, and MC stores are hardly served by these, it is shown that this city is focused on large thoroughfares, not on residential streets.

10
CONCLUSIONS AND RECOMMENDATIONS

In another Kubrick masterpiece, 'A Clockwork Orange' (1971), the opening shot reveals the image of a face. As the camera slowly pans back in a single tracking shot, the face becomes part of a body. The body, in turn, becomes part of a group of bodies. The group of bodies becomes part of a room, the room becomes part of a corridor and, lastly, the corridor becomes part of a bar. Throughout, the face is still the centerpiece of all the frames. Without the face, with its two intent staring unblinking eyes, the body, the group of bodies, the room, the corridor and the bar, that is, all the elements that form the whole, could not exist, or would be meaningless. This could be a metaphor for many things, and it also seems to suit perfectly in the universe of commercial studies. The face is the product on the shelf. The shelf is located in an aisle, which is in a store, which is in a building, which is facing a street, which is in a block, which is in a neighborhood, which is in a locality, which is in a city. The question is, can the product also be the centerpiece of the city? Can there be a direct influencing link between the store and the product it sells, and the morphological composition of all the elements that form, layer by layer, the urban spaces? Again, Nelson's (1958) question comes to mind: '*But can stores or shopping centers be as important to the emotional aspects of location?*'. Fifty years have passed but the answer to his question is still uncertain. Yet, even if uncertain, the element to retain is that this research can *indeed* provide an answer, it exists, and it is substantiated by palpable, even if meager, evidence.

Revisiting the literature review

When Nelson wrote this question it was merely as an afterthought of an earlier statement which stressed that location was a functional aspect crucial to the store's success. Commerce was considered to be a dependent variable, whose performance fluctuations and activity dispersion was justified by the value of the 'locations' it was in. This of course makes perfect sense and it is obviously true, to a certain extent. The problem was that the proofs that substantiated this knowledge followed a narrow dogmatic vision, so what was considered to be a 'known truth' was actually just a 'half-truth'. This vision assumed without question two elements: first that the value of the 'location' was solely an economic value, which arose from the ability to 'catch' consumers in a competitive market, and second that commerce was just an instrument for wealth-generation, with no capacity of its own. Commerce had come a long way. Its reputation, dignity and importance as one of the city's main economic activities increased through the centuries and it finally came of age in the 20th Century. Its role was so well established in current practical and theoretical thought that it was hardly worth

praising it. The number of studies of various fields other than Economy, from Geography, to Sociology, and even to Planning multiplied in the last 30 years. Even so, the two dogmatic statements presented above seemed to accompany all of these researches. This resulted in an obvious lack of knowledge that can justify the inadequacy, even if well intended, of many commerce-related decisions and the inexistence of proper public policies.

Suddenly, in the last 10 years, when commercial studies, like the ones written by Axenov *et al* (1997), van Nes (2005), Sarma (2006) or Villain (2011), called attention to the fact that the 'morphology' component of urban 'form and structure'[432] had been constantly absent in commercial studies, they were not generating a breakthrough in the literature. They were merely stating the obvious. They were merely trying to uncover the other half of the truth. If form and structure is, according to Karaman (2001), composed of 'topology', 'typology' and 'morphology', then why were only the first two being considered in commercial studies? Location is not just an address in a map, to which an 'activity', a 'sales sheet' or the 'catchment area consumer information' can be added to. These elements are all important, for sure, but they are not all of those that exist. A location has, as well, a *morphological sense*, because blocks, buildings and streets are an intrinsic part of any urban place. At the same time, authors like Whitehand (2007) were stressing that a 'typology' component was missing from urban morphology studies. A link between these two fields, therefore, seemed inevitable. Even so, it has rarely occurred. Commerce is looked upon by so many fields that the possibilities and combinations of research seem almost endless. Inside the field of morphology, the same vastness of researches appeared, but as well, these were seldom integrated and seldom co-related to other fields. Paradoxically, the knowledge on the *morphological sense* seemed not to increase because researchers were trying to prove the correlation of commerce to one single variable in one single city and using one single method of analysis. Furthermore, the researches only very rarely zoomed on the micro-scale (Moudon, 2002; van Nes, 2005), and the lack of integration meant a lack of data. Therefore most researches had to start, once again, at the 'stage zero' supplied by 'typology': store location data collection, something which can exhaust resources and hinder the feasibility of subsequent detailed work. If all this meant that the first dogma was definitely put into question, the second dogma was also being challenged, and this time it was not just as an afterthought. If the pre-conditions of a location (including the morphological ones) influence store behavior (reactive nature), then a store, because it has morphological characteristics *of its own*, along with other attractive and wealth-generating features, can positively impact on surrounding urban spaces (active nature). If this has been proved in larger projects it has failed to be perceived in the city's ordinary commercial landscape. Again, the micro-scale was lacking and again, a look beyond the economical scope was hard to find. Consequently, and unlike the challenge to the first dogma, there were yet no research proofs that could substantiate this hypothesis and provide an answer to Nelson's second question.

The research path

When the problem is looked upon from this perspective (something that actually is not evident at first glance) then the path that this investigation has followed becomes apparent. The first step was to devise a way to organize the almost endless possibilities of commercial research, not only within the morphological realm, but also between Morphology and all other fields. Could this be achieved? If form and structure is measured by the elements present in Figure 2 and commercial spaces by the

[432] As shown in Figure 2.

elements in Figure 14, was there a way to link them using the path already trodden by the existing fields of research? The scheme in Figure 21 shows that, theoretically, this link is possible. It is a link created directly by the understanding of the literature review and its undeniable occurrence constitutes the first conclusion of this research project. Actually, the connection is stronger than a link. It is a *symbiosis*, because the fluxes flow both ways and most elements are, one way or another, directly or indirectly, connected. Obviously, what this scheme presents is an utopia, a theoretical utopia. Nowadays, not only is the coordination of all these fields almost virtually impossible in the planning, execution and normal functioning of commercial spaces and commercial urbanism projects, but also any research that tried to use all of these elements in order or unravel the mysteries of such a symbiosis would inevitably encounter innumerous logistic problems in the data treatment, and would consequently loose specificity and focus. How then to answer the first research question and discover the measure of influence of each element that forms the organism? The solution, presented by this research, was to start with a first link, namely the one between geographical pattern comparison, the origin of all commercial researches (‘*location, location, location’*), and the field of morphology, the one which has received less attention in the literature and the one which has had integration problems within itself. If the symbiotic mechanism of this first step is uncovered, then the path is cleared for future researches to add subsequent steps.

But even here, in this first link, logistic problems occur. All the elements that constitute the form and structure of cities that influence Geography and Morphology needed to converge into a single, yet to be devised, model, as the second research question stressed. Because of the lack of available data, the field work indeed started, once again, at ‘stage zero’. This field work was not substantially different, in conception, from any performed since the early 1970s. This research has followed the same field procedures has the ones adopted, for example, by Guy’s team, when they collected the address, the name, the activity and the opening date of all stores in Reading in 1976. The difference is that now, enlightened by the symbiotic importance of morphology, the data collection was much more ambitious. But the effort, the resources and the time spent were very much rewarding. The model devised, as explained in Chapter 5, constitutes the second contribution of this research project. Because four medium-sized cities were modeled, this immediately overcame a gap in the literature, namely the fact that existing studies always focused on one single city of large dimensions. Furthermore, because of the amount and type of data inserted into each of the models, the store spaces became practically four-dimensional, enriched with commercial, morphological and even some temporal variables. These models constitute original documents in Portuguese commercial literature in general and in the study of medium-sized cities in particular, contain databases with a detail level that, as far as it could be ascertained, no Portuguese institution (public or private) possesses and have, furthermore, once again as far as it is known, the first appearance of the Space Syntax maps of these cities in a research publication. For all these reasons, the models proved to be successful in serving the interests of this investigation and consequently, the second research question is positively answered.

When compared with the usual results of geographical studies, at first glance these models do not seem to produce any new findings, or rather, they corroborate existing research. Indeed, in the case-study cities, like in other studies interpreted in Chapter 3, first necessity and convenience stores (M1[433]) have a wider spatial representation, clustering in small groups in easily accessible locations or interception spots. C stores are also found in most residential locations, but they are also present in

[433] The separation of stores into category types is explained in Section 5.2.3, more precisely in Figure 25.

thoroughfares and industrial areas. These, like shopping and higher order goods (M2 and MC) tend to cluster, a consequence of complementarity and cumulative attraction. M2 and MC stores are much more relevant in central locations. Specialty goods and single isolated purchases (S) appear to be able to generate their own business, so for them location is less important. Whilst the centers possess most of the fashion, service agencies, food/restaurants, touristic and entertainment sub-activities, the peripheries have different functions, containing other types of services, as well as industrial, home/residence and first necessity food sub-activities. The commercial centralities in the centers have shifted from older to newer areas, whilst clusters and number of stores decrease with the distance to the center and neighborhood concentrations (islands) possess a wide but limited range of goods. All this had been known before. Overall this is indeed what occurs. But the authors were the first to admit that this spatial observation was able to explain some, maybe even most, but not all of the commercial location patterns. It was at this junction that this research introduced three crucial elements. The first is the introduction of morphological variables, as it is proposed that they are the ones that are able to explain the behaviors that RLT, Sociology or Geography have not been able to. For example, Space Syntax analysis gives a meaning to the spatial necessities of stores in general and store types in particular. It proves that stores in the centers seek centrality ('integration'), especially that with a medium-range influence in the urban perimeter, and that stores in the peripheries seek through-movement ('choice'), benefiting much more from global than from local 'choice'. Likewise, it is proven the affinity of M2 and MC stores to first quantile 'integration' segments, the local importance of M1 stores and their evident affinity to segregated (residential) neighborhoods, C stores' tendency for 'choice' thoroughfares and segregated out-of-the-way areas, and S stores' preference for locations just outside the center with a limited range of attraction, that can be compensated, in any location, by the store itself. These findings constitute much more than spatial observations, they are unbreakable mathematical correlations that this thesis helps to make evident. This is the third contribution of this research project: the undisputable justification for known, but seldom proved, phenomena. The second element was the introduction of the micro-scale analysis. The research went, for example, beyond the activity to the sub-activity, and beyond the block to the building. The third was the innovative (just because it had never been done before) comparison between case studies. It was with the introduction of these three elements that the dissimilarities to existing literature started to appear, that is, unsubstantiated myths were broken and other findings were at least disputed because the richness of the database and the possibility of obtaining four confirmations of a given phenomenon gave strength to new possibilities. Actually, what was initially surprising was the incredible similarities that were found between so, to some extent, dissimilar case studies.

Research results

Already in Chapter 6, when the overall commercial indicators of each city were introduced, it was proven that the four case studies have similar values when the differences in study area and in the number of inhabitants are taken into account. Whilst they possess different geographical locations, different backgrounds, different permeability to new formats, and different number of stores, inhabitants and buildings, it was seen, for example, that the cities have practically the same number of inhabitants per store. Also, for example, Vila Real and Leiria have exactly the same number of stores per area, and this number is half of that present in Évora and Aveiro, which have, in turn, precisely half of the overall area of the first two cities. This could be a coincidence but the truth is that throughout the analysis it was seen that these 'coincidences' were maintained. In Chapter 7 it was discovered that the physical distribution of stores can be quantified through a power function, and that

this function is, for the largest concentrations (around 1.000 stores) almost coincidental in all cities. In Chapter 8 it was seen that not only are the patterns of location of each activity similar, the percentages of these in each city are also more or less coincidental. Many similarities in overall percentages are also perceived when analyzing other variables such as 'store type', 'store structure' and even 'store status'. In Chapter 9 these similarities are further strengthened. The direct commercial variables associated to commercial buildings, blocks and streets, and the distribution of stores within these elements, are practically similar in all case studies. For example commercial spaces are in buildings with similar average heights, there are similar areas and volumes per store, and the same overall number of stores per block. Furthermore, cities possess similar hierarchical commercial structures, (which contain similar commercial location patterns), similar hierarchical commercial street networks, and there are even similarities in the behavior of stores that are in buildings constructed after 1975[434]. Their percentage is, for example, practically the same in all peripheries, and the percentage of these in the segments of the second and third quantiles is also almost coincidental in all cities. What this means is that regardless of the strength of the regions these four cities are in, of each city's role in the respective region and of each center's function in the respective urban perimeter, they actually behave similarly in an overall commercial/morphological sense. This finding constitutes the fourth contribution of this research project. Of course, it is impossible to be sure that this is not an incredible coincidence that arose from the selection of precisely these four cities. There is, however, a reasonable possibility that each of these similar values may represent the commercial behaviors and the commercial needs of a larger amount of cities, especially if they are Portuguese, and especially if they are of a medium-sized nature. For other cities, of larger or smaller dimension and outside the country, these thresholds and indicators may not hold true. But what this thesis has provided is a modeled pattern that indeed holds true for at least four different cities in Portugal and therefore can be used, with a reasonable security, as a comparison term or a leveler, in other scenarios.

Of course that not all patterns are similar in all of these four cities. There are obviously exceptions concerning some variables which are a consequence of the particularities different cities present. For example, Évora never has similar indicators to the other cities whenever 'building height' is a variable, because due to the world heritage nature of the city center, the number of floors is much more constrained. The number of stores in Vila Real's periphery is also much more reduced than that on the other three cities, which also influences some (not all) indicators. Nevertheless what is observed is that these exceptions usually occur in only one city, which means that there are still three case studies with similar indicators, something which strengthens their validity. Furthermore, most of the indicators and variables that are not similar, or at least not in the same order of magnitude, in all four or in three of these case studies, are similar in pairs. And it was further discovered that these pairings are much less dependent on economic and even commercial variables (such as purchasing power, degree of development and overall number of stores), and more on the morphological variables of the cities. Leiria and Aveiro, for example, have more stores, more commercial area and volume, more varied types of stores, more services, more web-connected stores and more S stores, showing that they are the most developed cities. The opposite similarities occur between Évora and Vila Real, which appears to corroborate Barke's (1997) proposal that commercial modernization and development is dependent of the number of inhabitants in a global (regional) scale. Yet in terms of densities and indicators arising from the interpretation of micro-scale commercial/morphological variables, Barke seems to be proved

[434] As discussed in Chapter 5, because no other temporal data common to the four case studies could be found, the variables pre- and post-1975 buildings were used throughout the research.

wrong, as the similarities within these two pairs are much less. Although other pairings are found according to specific variables, the similarities are rather maximized between Leiria and Vila Real, and between Aveiro and Évora, simply because in each pair the cities have much more in common in terms of form and structure. This constitutes the fifth contribution of this research project: cities with more morphological similarities will have, on the micro-scale, more commercial similarities. This just helps to strengthen the importance of the morphological sense in commercial studies. These differences between three case studies and an outlier, or between pairs, help to reveal the true nature of the case study cities, their evolution tendencies, their differences in function and the flaws that they might present. These comparative analyses had therefore a threefold purpose: first reveal the similarities that allow for the definition of thresholds and help to model a common pattern for these medium-sized cities; second explain the behavior of a particular city in a particular circumstance by the mere difference in relation to the other three cities; and third, reveal the measure of influence of each element so that the first research question could be answered.

Therefore, looking at these similar and dissimilar patterns, several considerations can be made. The first, which is often neglected in commercial studies, is that it is virtually impossible to dissociate the 'store' from the building it is in. Only one in every five stores (and one in ten in Aveiro) is in a 'single standing' building with no other use, that is, in a purposely built structure for accommodating exclusively commercial spaces. This means that all other stores are in buildings which possess other uses in the upper floors (more than often exclusively residential) and it is safe to assume that in most cases these buildings were erected bearing in mind the specificities of these *other* uses, and not those of the commercial spaces. The morphological variables associated to the store are more than often not its own, but are related to the building it is in, and to the street and the block in which that *building* is located. If this establishes the building as the most important morphological element that influences commerce it also gives strength to the hypothesis that commerce is a mere consequence of land development. But again this constitutes a half-truth. Residential neighborhoods without stores are not crossed by principal streets, are usually in segregated areas of the network, have closed street and block structures, sometimes of reduced dimensions (especially in the centers), and only seem to influence the structure of the public transport network (due to the weight of the resident population). They have neither contributed to increase the centrality or betweenness of the network, nor possess any other function other than being a 'dormitory'. Residential buildings with stores, however, assume an entirely new meaning in the network. In the centers major traditional commercial streets and axes have been maintained in all the cities, despite the proliferation of commerce in 'new centers' and in ever-growing 'extensions' and 'main residential' localities. The weight of activities such as MC, M1 and M2 in these locations has actually been crucial in the conservation of their livability (which breaks the myth of the 'death' of in-city commercial areas composed of family-owned stores), but this is not the only reason. The formation of these corridors of buildings with stores has constituted many (or most) of the central or travel-through locations in the city centers, so actually commercial construction has influenced *centrality* instead of being a mere consequence of it. The pinnacle of this example is Vila Real's *Rua Direita*, whose position in the network makes it a destination for the entire urban perimeter. This position, created instinctively and before any of the new poles of commerce had been established, helps to strengthen the validity of this new hypothesis. Obviously, this position of centrality also explains the continuity of the success of this area's commercial structure, so it can also be said that position ('location') also influences performance. That is, the fluxes of influence point

both ways, which can also mean that Nelson's two questions may have exactly the same answer as 'who came first, the chicken or the egg?'.

This is further proved by the analysis of the influence of new commercial construction, or rather, new construction that contains commercial spaces. On one hand it has been discovered that these new buildings (and stores) seek preferably the most central lines possible ('integration'), but also the lines with the greatest travel-through potential ('choice') when in the periphery, which symbolizes that their location is to some extent dependent on the pre-existing network structure of each locality. But on the other hand, the appearance of these new buildings, which have formed new axes, along with the stores they possess, has indeed helped to change, in their own right, the centrality, accessibility and betweenness of the network. This influence has been more felt in the local scale. The stores these buildings contain have increased the influence radius of a given commercial centrality and they have boosted the 'feeding' capacity of certain peripheral axes, so that the connections between commercial poles inside the neighborhoods ('islands') and the main axes leading to the center can be maximized. New construction has obviously been able to accommodate new commercial types, although the commercial offer it presents is on the whole balanced. In the centers, 'linkages' and 'edge-axes' possess specific types of commerce like services, and in the peripheries, the new poles have been crucial to accommodate a variety of commercial offer not found in older centers of first necessity.

To these new buildings, which form new blocks and streets, specific morphological characteristics are associated. These characteristics however, seem to depend more on the location inside the urban perimeter than actually on the type of commerce they contain. The number of commercial poles of recent formation, as well as building heights, road-size and road complementarity decrease and block area increases with the distance from the center, which can mean that all these elements are connected. On one hand, this contradicts the works of Yoshida and Omae (2003) or Joosten and van Nes (2005) which allocate commercial spaces to specific morphological features, in this case, high cubic content buildings and full block typologies, respectively[435]. With the exception of particular 'traditional' or 'modern' store types which tend towards specific locations (like more restaurants than services in residential/traditional areas or services generally seeking buildings with other services), most commercial variables, particularly in the centers, have even distributions between the various types of buildings and the various types of blocks. A common element, however, seems to be the continuous positioning of commercial spaces in the larger side of blocks. On the other hand it is perceived that the areas which present obvious commercial modernization signs are of post 1975 construction. Therefore, it is assumed that commercial development is dependent on 'new' construction. Stores in these buildings are more, closer together ('door to door') and more spatially organized, which increases the chances of success because this research also establishes (albeit without economic data) that commerce performs better in proximity. The number of 'modern' stores also depends almost exclusively on the number of post 1975 buildings (it also depends on the amount of multi-commercial spaces) and 'web-connection' is, in turn, directly proportional to the number of 'modern' stores. 'New' buildings are usually located in larger blocks (an average tendency for commercial spaces), the

[435] It should be noted nonetheless that the geographical contexts are different. As discussed in Chapter 9, both the works of Yoshida and Omae (2003) and Joosten and van Nes (2005) relate to the central portion of very large cities (Tokyo and Berlin respectively), which are very different, obviously, from the medium-sized cities analyzed in this research. If some connections to the results of these studies can be found in the main new streets of these medium-sized cities, outside the centers and of the main commercial cores the dissimilarities are all too evident.

stores in these buildings use more the public space in front of them ('esplanades') and as they usually are farther from the street they also influence the size and type of the sidewalks. This means that blocks, sidewalks and streets are also conditioned by commercial buildings, which constitutes another answer to Nelson's second question.

On the other hand, multi-commercial buildings and 'single standing' stores of new construction also impact on the landscape, either urban or commercial. Commercial arcades, shopping centers and warehouses (either in 'industrial/commercial' areas or not) usually have the greatest areas and volumes, and the lack of penetration of the first two in the commercial landscapes of these cities have influenced the continuity and the restructuration of the main commercial 'in street' poles. And it is erroneous to assume that the appearance of these multi-commercial formats is prejudicial to street commerce. Actually, what occurs is precisely the inverse. In-city shopping centers and commercial arcades need to be articulated with commercial streets, in order to be successful, that is, they need to be close to the main shopping axes, with a continuity/complementary commercial structure, regardless of overall accessibility, and to have a limited number of store spaces. The same happens with commercial 'islands' in the center, but not in the periphery, where they can appear in isolation, as long as they are, as mentioned, close to the main 'feeders' of travel-through axes. Large shopping centers also influence their surrounding locations because even if they are built in less occupied areas, they do not stay commercially alone for long, whilst also promoting residential development close-by. On the other hand, they seem to appear more frequently in peripheries without clearly defined centralities. Looking at Aveiro's example, it could be speculated whether the lack of defined commercial centers (in a block structure rather than a long axis) cannot influence the appearance of multi-commercial spaces.

Other than the type, age and nature of 'buildings', commercial variables seem to be more affected by (and to affect) the form and organization of the city. This structure obviously conditions the characteristics of the segments that form the network, that is, it affects their 'choice' and 'integration' values, which are intrinsically linked with the distribution of commercial spaces. This is because most store types depend more on the position in the network (centrality, through-movement potential, closeness to a given element) than on the other morphological characteristics of that position, whatever they may be. But at the same time a city's structure also conditions the morphological characteristics of the elements, because these change from the center to the periphery, and from the main local road to segregated neighborhoods, and it also conditions how localities are connected between themselves and how hierarchies are formed, something which is also linked to the behavior of commercial spaces.

For one, 'streets' are the second greatest morphological element, especially in the periphery where most commercial clusters favor through-movement, and where urbanized ring roads, expansion thoroughfares, and local or regional roads passing through the center of localities are the distributors of development, as most localities develop around/facing them. Greatest connection means more commercial strength, not only of the ribbons *per se*, but also of the poles these ribbons connect. Connection means continuity, and in these concentrations the number of stores reachable is proportional to the distance travelled. When continuity is broken, the development and type of the commercial poles in the extremities change. In Vila Real's center, for example, there are no commercial ribbons connecting the older and newer commercial centers. This may be one of the reasons why the second has still not been able to surpass the first. A link is a natural element for

change, rather than a complete and abrupt shift in position. Likewise, the lack of urban and commercial ribbons connecting the peripheral localities of this city makes them segregated and hinders their urban and commercial development. Other non-urbanized and non-commercial connecting axes can also be prejudicial for development. Ring-roads in Aveiro and Leiria, for example, decrease the accessibility of the main streets, that is, they decrease the accessibility of the main commercial areas. In Vila Real and Aveiro the lack of connection points between the center and the periphery, and particularly in Aveiro the impossibility of a continuous expansion of the 'connections', also segregates innumerous commercial poles inside residential neighborhoods, and makes it more difficult to access the center. This causes the creation of competing stronger poles outside the center, in the 'extensions' or 'main residential' areas, obviously changing these areas' morphological landscapes and their development capacity. On the other hand, in Vila Real and Leiria the thoroughfares that unite different localities are transformed, at the extremities, in the main local streets. Because the axis is the same, this considerably improves both the through-movement potential and the centrality of these localities, which helps to maintain their commercial structures, at the same time as it stimulates continuous development. The same does not happen in Aveiro and Évora, where, due to the 'rays-of-the-sun', rather than the 'in-localities', expansion, the links between main local roads are not direct. This hinders the creation of centralities, and allows for older traditional axes to be substituted by stronger commercial poles in multi-family buildings located in 'feeders' of, or in, main through-movement axes. This peripheral store necessity (to be near 'choice' axes) clearly influences the location of the building, and consequently it influences, as well, the location of all the other uses in the building.

Therefore, the form of the city can also influence commercial behavior. Leiria and Évora have central centers inside the urban perimeter, and central traditional commercial areas inside the center, unlike Aveiro and Vila Real, so naturally they have a clearer hierarchical and commercial structure from the core to the periphery, which increases the centrality range and the local 'choice', attracting specific activities accordingly. Because of this the closest peripheral localities are more connected to the center, which should explain why these two cities have more developed communities, overall, in the periphery. In Aveiro's and Évora's peripheries, the expansion in 'axes' and the lack of closed hierarchical communities is negative in a sense that it produces less strong commercial centralities but positive in a sense that zones gain multiple hierarchical purposes, something which can influence variables like 'building height' and 'pedestrian accessibility'. Despite the similarity in the overall physical location patterns of stores in the same hierarchical zones of different cities, the morphological composition of these zones may be different due to these nuances, which are caused by residential areas, commercial buildings and accessibility. These are then three crucial elements affecting the 'emotional aspects of location'. On the other hand, symmetry, like the one found in Évora, also contributes to the creation of similar 'integration' and 'choice' patterns, that is, stronger axes that are attractive to stores. This, in turn, influences the 'emotional aspects of stores/buildings with stores', so it is rather difficult to ascertain where the cycle begins and ends. Other physical constraints, like the slope of the terrain, have also been proved to affect morphological characteristics of commercial blocks.

Consequently, these physical variables also affect a store's performance. In a general sense, the overall expansion of the city's commercial landscape is the main cause for the appearance of 'closed' and 'empty' stores. The first are generally in older areas which have lost their vitality and, comparatively, their attraction, whilst the second are in 'new' developments. The number of these is sometimes so

excessive in commercial 'islands' and in other spaces of new construction that it has to necessarily mean that these stores' lack of success is not a consequence of location or competition, but simply of a lack of market need for more store space that was not taken into account in the project phase. As the centers are the greatest commercial destinations, stores therein are hardly in segregated segments, so conclusions are hard to draw. But in the peripheries it is seen that, although stores are generally not on global centralities, if they are not even in local centralities/destinations then their chances for success are much reduced. Even so, as it is seen in Vila Real, local centrality may not necessarily be a guarantee of success, because what stores need in the periphery is to be in axes of high 'choice' potential, or at least at the distance when they can reach them easily. Over 80% of these non-open stores are in buildings constructed after 1975, which helps to understand why older axes still withhold and why the construction of buildings containing commercial spaces cannot occur in any given location inside the urban perimeter. Stores not on the ground floors are comprehensibly unpopular and perform worse.

From the knowledge obtained in the above paragraphs it can definitely be disputed the hypothesis presented by most Space Syntax researchers that stores are preferably in first quantile ('red') segments, and also Jingman's (2009) findings that stressed that the city's various centers correspond to the various syntax centers[436]. But what can immediately be seen is that these researches generally are made in very large and important cities, and preferably in the dense and busy centers of these. The case studies presented in this thesis help to prove that the commercial landscape in smaller cities has a different behavior, especially outside of the centers. Stores don't want (for market reasons), can't (for financial reasons) or are unable (for structural reasons) to be in first quantile segments. Likewise, when Sarma (2006) reveals that MC, C and S categories do not correlate with 'choice', he bases this statement on the analysis of a central location. In peripheries, for example, C stores are, logically, in travel-through thoroughfares.

Answering the research questions

Considering all these findings it can be proposed, as an answer to the first research question, that the location, characterization and performance of commercial spaces is in no small degree connected to the six following aspects: (i) the amount, type and age of buildings and their distribution; (ii) the location of residential areas and whether they have commercial rows or not; (iii) the way urban hierarchies are structured; (iv) the configuration/form of the localities, that is, the structure of their blocks and of their street networks; (v) the relative position of the centers inside the localities; and (vi) the way localities/areas are connected through urban ribbons. This of course constitutes the sixth contribution of this research project.

This being said, it can be stated that this research has supplied the following contributions to planning literature:

- The prove that a link between the form and structure of cities, and the commercial landscape they possess exists, can been established, and includes contributions from various fields of research;
- The methodology for the creation, and the final outcome, of 4-D city/commercial models in an ArcGIS platform, original files in Portuguese commercial research;

[436] Jingman's work, as presented in Section 3.2.2.2, was performed in Wuhan, China.

- The justifications for known, but seldom proved phenomena, and the contradiction of various 'commercial myths', both substantiated by (morphological) research evidence;
- A series of indicators concerning commercial/morphological behaviors and needs, based on the similarities between case studies, that can constitute values of reference or comparison for other studies or commercial policies;
- The evidence that cities with more morphological (rather than statistical) similarities will have, on the micro-scale, more commercial similarities;
- Six overall aspects that constitute the bridge between the location, characterization and performance of commercial spaces, and the form and structure of cities, of which all other variables seem mostly to depend on.

These contributions show that the hypothesis that has been formulated in Chapter 1 was justified. Indeed the creation of the GIS database and the compilation of existing research methods of different fields did provide the necessary tools to understand in what conditions the link between commerce and form and structure occurs. But if that connection is firmly established, the knowledge of the direction of the influencing flux is still, as mentioned at the beginning of this concluding Chapter, uncertain. Who follows who? Are commercial spaces totally dependent of form and structure or can they command changes in the morphological realm? Are researchers any closer to finding out which of Nelson's statements is more valid? The answer is in the word *symbiosis*. Neither statement is totally correct and neither is wrong. This research project has provided the necessary data to safely state that store location, characterization and performance is first, conditioned by pre-existing morphological characteristics of cities (rather than just economic and social aspects), but second, *not* exclusively dependent upon them. At the same time, it is more reticent in stating the opposite. Because the store is intrinsically connected to the building it is in, it is almost virtually impossible to state without a shadow of a doubt that the proven influence on a given area's development, residential growth or degree of centrality is caused exclusively by the *store* and not by, for example, any of the other uses a given commercial building accommodates, or even by the mere existence of the building (or the street) itself. But the truth is that the store is indeed there, it is open to the public and it is more directly entwined with the economic, social and morphological realm of the area it is in than any other residential or service use the building might contain. So indeed, it is proposed that the *store* can be not only an economic motor, a wealth-generator, but also a city maker. It can be a maker of centralities, of amiable public spaces and can command the location of new neighborhoods and of new streets. Consequently, it can influence, among others, demographic indicators. That is, commerce can indeed be an instrument of urban planning.

In 1998 Borchert asked whether planning was ready for 21st Century commerce. It would seem then, and even now, that it was not. Considering the Portuguese scenario and the answer to the first part of the third research question of this investigation, it was seen in Chapter 4 that planning, even if well intended, lacks an informed knowledge on the commercial sector's new post millennium trends, patterns and dynamics, and has, at the same time, poor or no awareness of the morphological dependency found in this research. Commercial regulations focus mainly on three aspects: controlling opening hours, conditioning commercial area of larger stores and licensing large scale formats. Small stores are therefore positively discriminated, but at the same time they are not regulated, as they can locate where they please and sell any product as long as commercial use is allowed. Planning regulations add little to this. In the PDMs of the four studied medium-sized cities only brief allusions

are made to commercial spaces, namely in terms of public and parking space that should exist according to a given number of commercial square meters, of the definition of built or to-built areas that can contain commercial use, and of restrictions like storage area or exclusivity of location in the first two floors of a building. Itinerant commerce (fairs, trailers), for example, seems to be much more controlled and regulated than ordinary commerce, which is viewed as a part, or a consequence, once again, of the building. At the same time commercial urbanism projects are European-fund or private-fund dependent, and are therefore mostly individual and not integrated enterprises. This results in a disperse application of the funds and no long term economic or commercial planning is devised.

Facing this scenario, it was found that the second part of the third research question can be answered positively. This research can *indeed* supply knowledge, or at least theoretical basis, that can, in the future, increase the capacity and probability of success of planning regulations concerning the commercial spaces and ultimately, the optimization of the benefits they can offer to cities. Planning practitioners and City Hall officials should be able to make *informed* decisions, not only when writing laws but also when executing projects. First they should be aware of the true commercial and morphological nature of their municipalities or regions. The creation of a Letter for the Zoning of Commercial Activities, so that the sector could be coordinated, has already been proposed by UACS (2002), but it has never been materialized. The licensing of commercial spaces supplies crucial information but is lost in unorganized documents that municipalities possess, that have never been transformed into a spatial database. This research proves that such a database is possible. Here it has been created from scratch, through an unaided field research process, but if the models were enriched with the information present in the licensing documents store owners have to submit to municipalities, they would be always up to date and could become an even more powerful tool. Therefore, it is recommended that such databases are created, so that the first step of the research never has to be repeated, only updated. Second, planning practitioners should be made aware of the relevance and implications of the *morphological sense* of commerce. If decision makers *know* that the street network or building variables, such as volume or height, can condition commercial performance and even the pattern of activities, and that, on the other hand, commercial location and activity can influence certain aspects of the urban realm, then the permissiveness of construction in general and of licensing of commercial establishments in particular could be substituted by a more constrained vision that would ultimately be much more beneficial to urban spaces. Furthermore, this increase in knowledge can only be supplied by communication, and this communication has also to include the various actors that shape the commercial landscape; promoters, builders, and obviously the individual store owners themselves.

Another element that this research provides for planning practitioners is the modeled pattern, composed of morphological/commercial indicators, based on the more than evident similarities between the four case studies. These indicators can be used as comparison terms to others calculated in other cities in similar circumstances, and may prove to be crucial in determining the reasons why some city areas appear not to be working. Ultimately, when these thresholds are further compared with the indicators of other cities, planning legislators can, hopefully, be able to set a series of reference commercial limits for cities. These could, for example, safeguard the construction of unnecessary store space (and hence avoid the scenario of empty stores), show excesses or deficiencies of a particular activity in a particular area, or regulate the construction of peripheral commercial ‘islands’ (placing them close to a ‘choice’ thoroughfare to maximize the influence range of the stores therein). These

reference values will be as efficient as the amount of positive similarities found between cities, so this constitutes another advantage of having a country-wide commercial spatial model.

Recommendations

Lowe (2004) once argued that 'place building' is now very much associated to 'retail planning policy'. With the conclusions presented by this research this statement gains more sense than ever. But what has been presented here is, as mentioned, just the beginning. Looking at Figure 21 it is understood that the perfect integration needed to 'build places' reaches much farther than bridging the gap between Geography and Morphology. The 'retail planning policy' should indeed be heretofore enriched by the added knowledge this research divulges, but this knowledge is not enough.

Therefore, it is recommended that future research should include, first and foremost, the economic and social fields. Economic data is more difficult to obtain, but it is indispensable, especially when planning commercial urbanism projects. Social data, on the other hand, entails making extensive surveys. There is yet another variable that was (almost) ostensively missing in this research, and that is the temporal variable. True that the division of buildings in those constructed before and after 1975 has generated interesting results, but temporal data of the commercial spaces themselves is needed. Commerce is a volatile activity. Stores close and open with a known regularity. The re-localization patterns of given activities could only be theorized in this research, not proven. Once again, licensing documents in municipal archives could eventually supply this information. Extensive surveys could be another solution, but if a store has closed but not changed its location, that is, if it has closed for good, the knowledge of it will be lost. Commerce's volatile nature also calls for a continuous update of the four developed databases. This update could also include information concerning other types of commerce not considered in this research, such as e-tailing distribution networks. But before enriching the database with other types of variables, two things should be noted. First that the database may not be 100% reliable, because it was based on visual observation and field research carried out by a single researcher. Municipal data concerning the licensing of commercial spaces is once again called for. Second that the database has not yet been explored to its fullest potential. Not all data has been interpreted and not all the possible correlations have been experimented. Furthermore, most of the analyses made in this research were interpretations of *percentages*. Because the research had to start from 'stage zero', and because over a year and a half was spent in collecting the massive amount of data and in uploading it into the model, little time was left to pursue more complex research techniques. The advantage is that this preliminary, almost geographical, work had to be made and, at least for these cities, needs not to be repeated. The disadvantage is that the analysis performed constitutes only a portion, the tip of the iceberg so to speak, of what the database created can offer. Yet very easily this can be turned into a series of other advantages in future research. Consequently, it is recommended that future research should use, for example, multivariate analysis, in an attempt to achieve mathematical correlations between the various variables the model possesses. Likewise, the option to use segment maps converted from road-center lines instead of axial maps was purely based on available time. Eventually, axial maps could be produced, although it is to be expected that the overall trends that this research has uncovered will not be put into question.

If this has been an original work in terms of modeling Portuguese medium-sized cities in these terms, it would be unthinkable if this work was not continued, because of the perceptible advantages it can offer to all the actors involved in planning in general and commercial activity in particular. If more

cities are modeled in the same way, then something close to a country-scale commercial map of the main cities could be achieved in a course of a few years. This, again somewhat utopian vision, could be crucial for various motives. A model such as this, to which economic and social variables are added to, could take RLT to a new level. RLT would cease to be a prerogative of economically empowered private companies, and it would cease to be solely based on market economic/social studies. Therefore, it could considerably improve decision-making at various levels, from the individual store owner wishing to establish himself in a given neighborhood, to a large scale company wishing to create an in-city shopping center. But it could also assist planners concerned with the 'regeneration thesis'. The usual planning solutions for commercial urbanism, often discussed in the literature, include mix-uses, integrated policies, allocation of structural funds, increases of functionality and attractiveness of given areas, public transport planning, and promotion, marketing and management. But could not they also include changes in form and structure, particularly in the *morphological sense* of cities? Furthermore, should not planners, in these times of economic crisis in which many store-owners are seeing their sales drop or stores close, potentiate the growth that commerce can provide, a growth that goes beyond the economic scope? A question remains if planning should interfere with market logic. In a grand economic sense it should not. But if commercial activity is indeed symbiotically linked with urban form and structure, planners cannot pretend, like they have mostly done until recently, that the regulation of commercial activity is out of the range of their competences. If the evidence present in this research is sufficient for planners to belief that Nelson's second statement is valid, then the growth that commerce can provide also occurs at a morphological level, which can be influenced by proper planning measures. Working with promoters and other commercial actors, planners can begin to understand how commerce can be used as a true instrument of urban planning. They can assist commercial spaces to select the best possible positions in the city so that their profits are maximized, they can construct proper environments so that stores can reform themselves (paraphrasing Fuller), but in return planners (and the city) can receive all the added benefits that the proper presence of commercial spaces can provide. A symbiotic relationship in a symbiotic city. A city we all like to live in.

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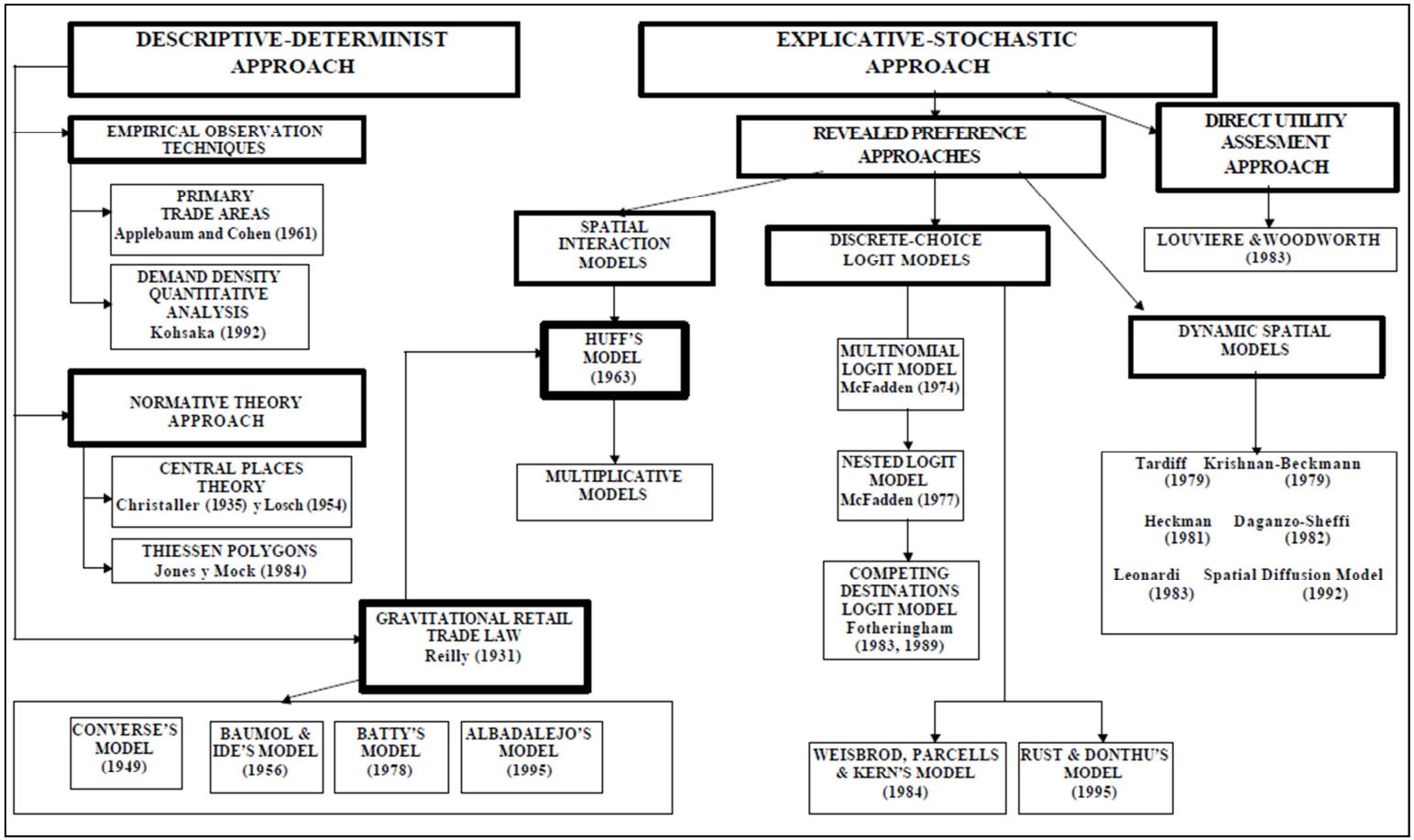
ANNEXES

Annex 1 – RLT Models

Type of Model	Model	Disciplinary background	Date	Instruments used	Inputs	Outputs	Notes	Articles
Analogue-based	Rules of Thumb	heuristic and common sense argument	-	checklists; surveys; trial and error	experience and empirical observations	isolate key factors of store location or customer preference	simplistic and subjective methods	Lilien, Kotler (1983)
	Analogue based forecast models	Empirical Observation Techniques	1932 onward	observation and quantification of market areas; customer spotting surveys	information derived from the observatory work	geographical pattern of trade areas; sales forecast interval	simple and inexpensive; does not use much data; Applebaum's model was the first systematic retail forecasting system founded on empirical data; modern market changes have no prior background so this method becomes obsolete; large data hard to handle and becomes subjective	Applebaum, Cohen (1961) Yrigoyen, Otero (1998) Thrall (2002)
	Site Ranking	Empirical Observation Techniques	-	GIS packages; extensive databases	identify key variables and analogue areas	potential business oportunity areas	compares existing number of stores and total floor space with potential of analogue areas to see if there is a possibility to install new stores	Mendes, Themido (2004)
	Nelson's Principle of Compatibility	Empirical Observation Techniques	1958	tables of compatibility	type of store	compatibility with pre-existing stores	-	Nelson (1958)
Gravitational	Law of Retail Gravitation (Reilly)	Newton's law	1931	mathematical formula	size (or population) of centers; distance between centers	breaking point (gravitational pull)	model not prepared for changes in mobility, and only allowed for 2 locations	Reilley (1931) Yrigoyen, Otero (1998)
	Spatial Interaction Models (Huff and others)	Newton's law Reilly	1964	mathematical formula	center mass (square foot of center space); distance to center (or travel time)	market capture rate (probability of a consumer at a given origin to travel to a given shopping center)	alowed for unlimited number of competing centers and varying distance decay parameter; focused on 'utility', rather than 'atractiveness'	Huff (1964) Yrigoyen, Otero (1998)
	Lakshmanan and Hansen	Huff	1965	mathematical formula	size of shopping centers measured in floor space; distance to consumer and to competing facilities; total retail expenditure in the trade area; friction parameters	agregate retail sales (Rij) in retail market i for shopping center j	allowed for variations in retail size; other Spatial Interaction models inserted new dimensions, such as temporal; MODEL software was used in recent gravitational models	Lakshmanan, Hansen (1965) Eppli, Shilling (1996)
	Multiplicative Competitive Interaction Models (MCI) (Nakanishi and Cooper)	Huff and other gravitational theories	1974	mathematical formula	characteristic variables of outlet j for a consumer located in a place i	market capture rate (probability of a consumer at a given origin to travel to a given shopping center)	inclusion of additional variables lacking in prior models, defining more precisely the coefficient of attractiveness	Yrigoyen, Otero (1998)
Analogue-based regression	Store location assessment model through revenue forecast (regression or multiple regression analysis)	regression analysis	1970s onward	linear statistic equation (now cheaply available in software packages for personal computers)	variables measured for existing stores (independent variables); measurement for new sites (X factor)	store turnover or market share (dependent variable)	demographic as well as competitive variables can be defined in one or more zones; it can be tested by using known stores in the model and calculating the residual between the prediction of the model and the real outcomes; dependent of a good data-collection	Simkin (1989) Thrall (2002) Rogers (1992)
	Discrete Choice models	mathematics; transport modeling	1970s	logit function (specialized software such as ALOGIT)	observation of choices (real or simulated)	The probability of an individual making a particular choice given particular levels of variables; Elasticities indicating the percent change in the variable being predicted (i.e., probability of choosing a mode) for a given change in one of the independent variables, holding the other variables constant; Total number/percent of people expected to change behavior, if results of the model are aggregated over a population	These techniques apply when there is the ability to choose between distinct (discrete) courses of action, as a function of any number of variables	Ben-Akiva and Lerman (1985) Horowitz et al (1986) Yrigoyen, Otero (1998)
	Competing destination models (Fotheringham)	transport modeling	1983	mathematical equations	known outflow from origin i; Mass size of destination j; distance between origin i and destination j	number of interactions between origin i and destination j or acessibility of destination j to all other destinations available to origin i	tries to remove the spatial structure effect by adding an accessibility variable into the conventional gravity models	Hu, Pooler (2002) Yrigoyen, Otero (1998)
	data-mining (Support Vector Regression - SRV)	profiling practices	-	automated pattern; recognition methods; mathematical algorithms	sales data from existing stores; large variety of spatially aggregated geographical, socio-demographical and economical features describing the trading area and competitor characteristics	probable turnovers (or other probabilistic variables)	extraction of implicit, yet unknown and potentially useful information from data by using methods from statistics, artificial intelligence, machine learning and pattern recognition; iterative and more inductive model	Krause-Traudes et al (2008) Reed, Berry(1999)
	Dynamic spatial models	economic geography (diffusion theory, for example)	1970s onward	information integration; logit techniques; graphic users interfaces	data and evaluations of hypothetical scenarios	spatial pattern or functions (eg. consumer utility, travelling pattern)	does not use past choice data therefore it is helpful in the estimate of market shares of innovative retail institutions	Yrigoyen, Otero (1998)

Descriminant analysis	site screening tools (decision system)	statistic	-	multiple discriminant analysis; linear equations	existing store performance in order to identify the variables that best explain the difference between pre-selected groups of stores	allocate new site in the appropriate store turnover group and sales range used in the prevision	highly sensitive to poor data collection; one function is developed for each store group, including the variables that best explain the difference between groups and function weights that reflect the importance of each variable	Rogers (1992)
	Automatic Iteration Detecting	statistic; variance analysis	1960s	mathematical algorithms	retail related data	probabilities and clusters	It can be used to determine the characteristics that differentiate buyers from nonbuyers. It involves a successive series of analytical steps that gradually focus on the critical determinants of behavior, creating clusters of people with similar demographic characteristics and buying behavior; ideal as an initial screening device	Morgan, Sonquist (1969)
	Tree-building methods	statistic	1960s	algorithms for classification and discriminant trees	retail related data	set of strata and a rule of individuals in the strata, which will jointly explain the criterion variable	high data exigence; complexity of necessary calculations	Mendes, Themido (2004)
Multi-criteria decision analysis	analogue forecast models	decision theory techniques and trade-offs	late 1980s	multi-objective analysis techniques; surveys; aggregation functions; mathematical programming formulation; vector optimization; penalty functions approach; convex combinations; specific algorith design	location-related factors	rank group of sites and/or potential locations, comparing them with existing databases	forecast store turnover inside relatively wide intervals	Mendes, Themido (2004)
	Analytic Network Process (Saaty)	decision-making	1996	Super Decison Software (for example)	criterea related to the store (retailers, acessibility, environment) grouped into clusters (judgements and measures)	constructs a pairwise relationship matrix and then an analytic network model (ratio scale priorities for the distribution of influence among the factors and groups of factors in the decision)	most comprehensive framework for the analysis of social, governmental and corporate decisions that is available today to the decision-maker. It is a process that allows the inclusion of all the factors and criteria, tangible and intangible that have a bearing on making the best decision; replaces hierarchies with networks	Burnaz, Topcu (2006)
Genetic algorithms		Darwin's theory of evolution other models of sales forecast and spatial interaction	1950s	search algorithm	a genetic representation of the solution domain; a fitness function to evaluate the solution domain	suitable solution	is a search technique used in computing to find exact or approximate solutions for optimization and search problems; algorithm repeated until some condition is veryfied	Mendes, Themido (2004)
Voronoi Diagrams (Thiessen Polygons)		used as early at 1644 by René Descartes and by Dirichlet (1850) in the investigation of positive quadratic forms. They were also studied by Voronoi (1907)	1984	Voronoi Diagrams and poligons equations	location information	forecast of sales considering the distribution of the population in the polygon as well as the mean expense per customer in each store	creates polygons that represent areas of attractiveness. For a given store it calculates all space that is more atracted to it than to any other point.	Mendes, Themido (2004)
GIS modeling		geography	1960s onward	GIS-based inventory mapping and analysis; ArcGis, CLEO, Iris Explorer Visualization, HYPERparalell	demographic variables, store sales data, costumer transaction and loyalty data, land-use planning data, competition store data	customer spotting, trade area analysis, customer profiling, competitor analysis, hot-spotting, sales forecasting, consumer behaviour modelling	data organization engine and vehicle for visualizing results of previous methods on the map; characterize change over time and space is difficult in a conventional GIS framework	Hernandez (2007) Reed, Berry (1999) Clarke (1998)



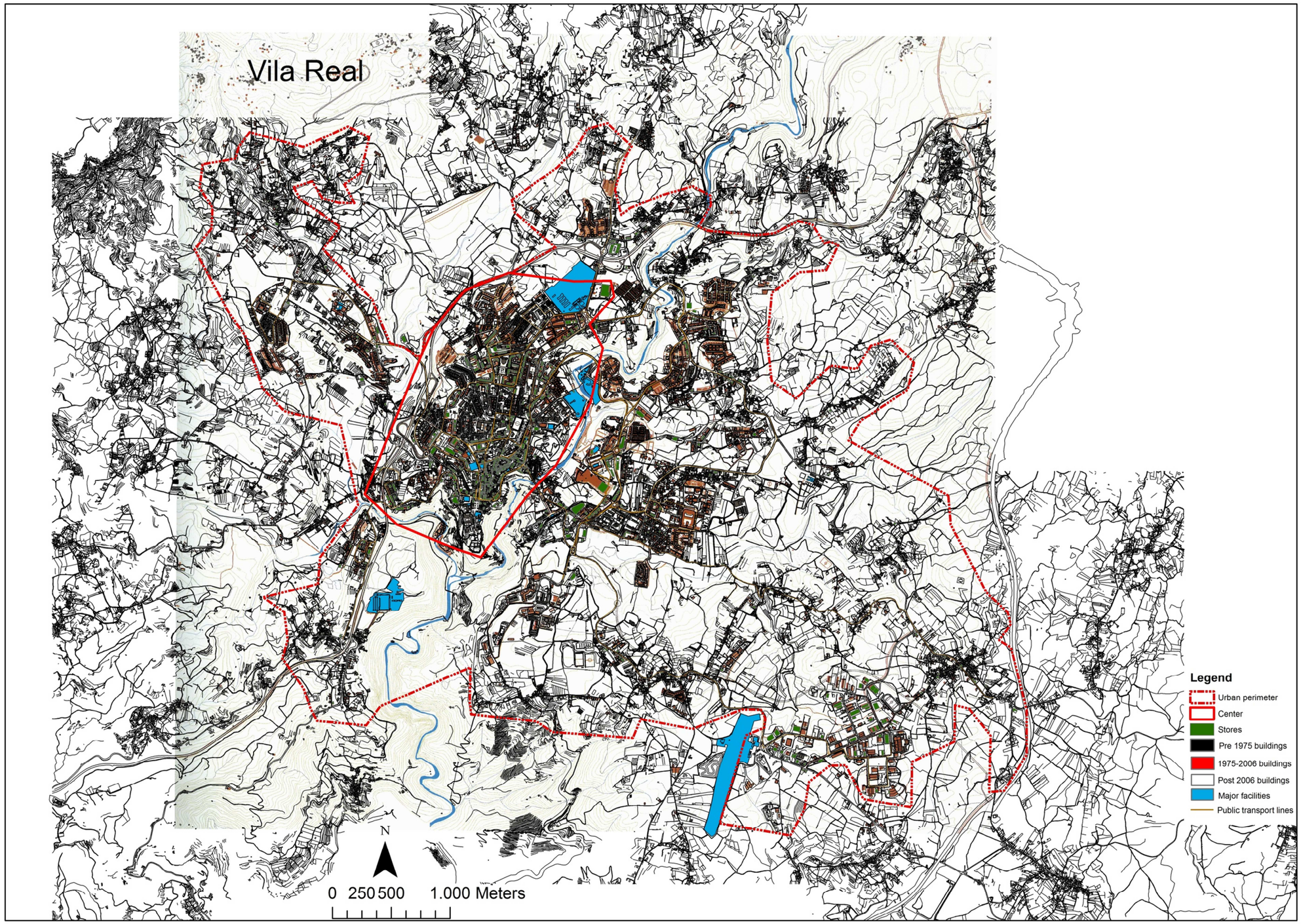
Spatial models and methods applied to the design of commercial trade areas (source: Chasco, 1997 *cit in* Yrigoyen, Otero; 1998)

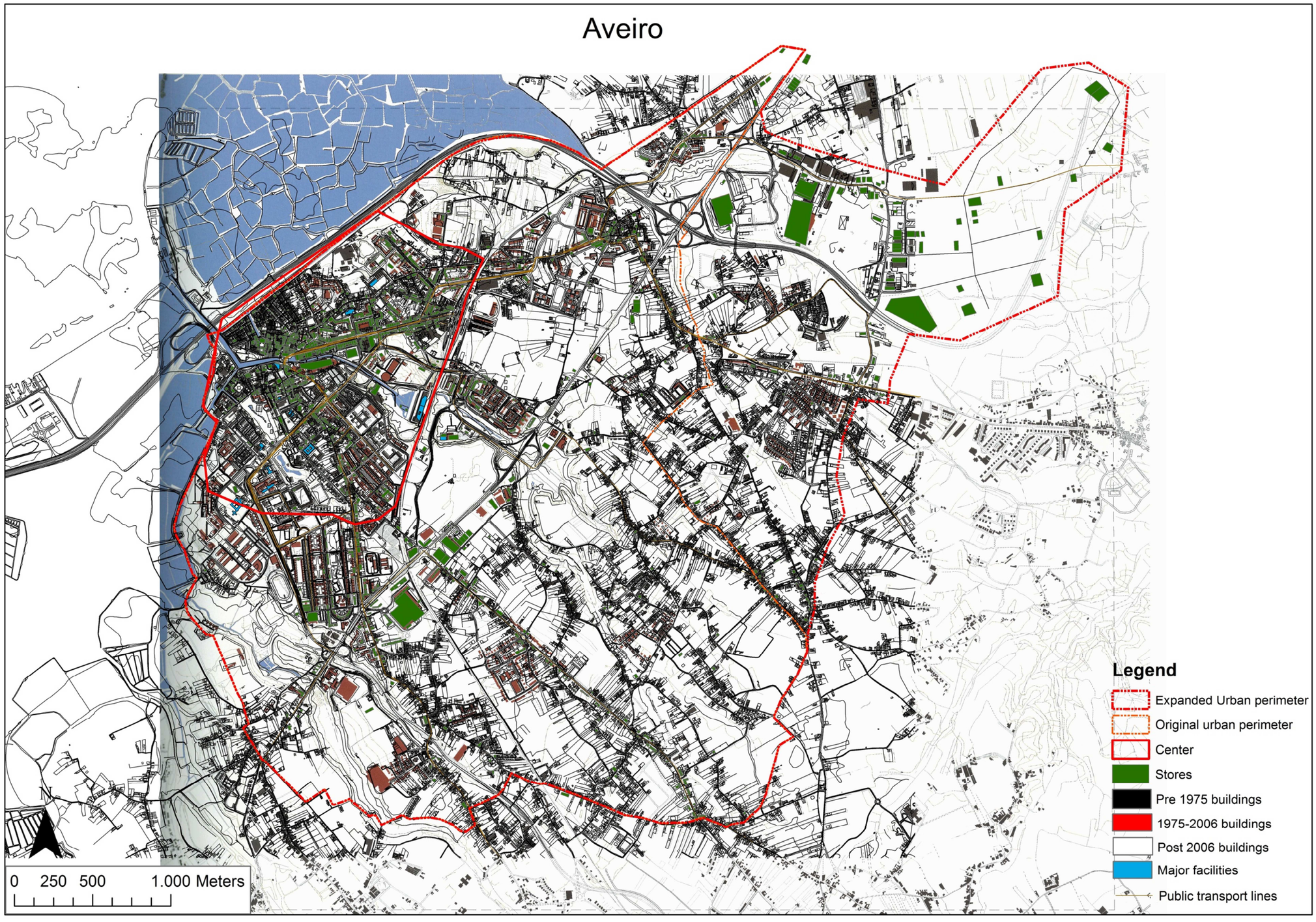
Annex 2 – Pre-selection of case-studies

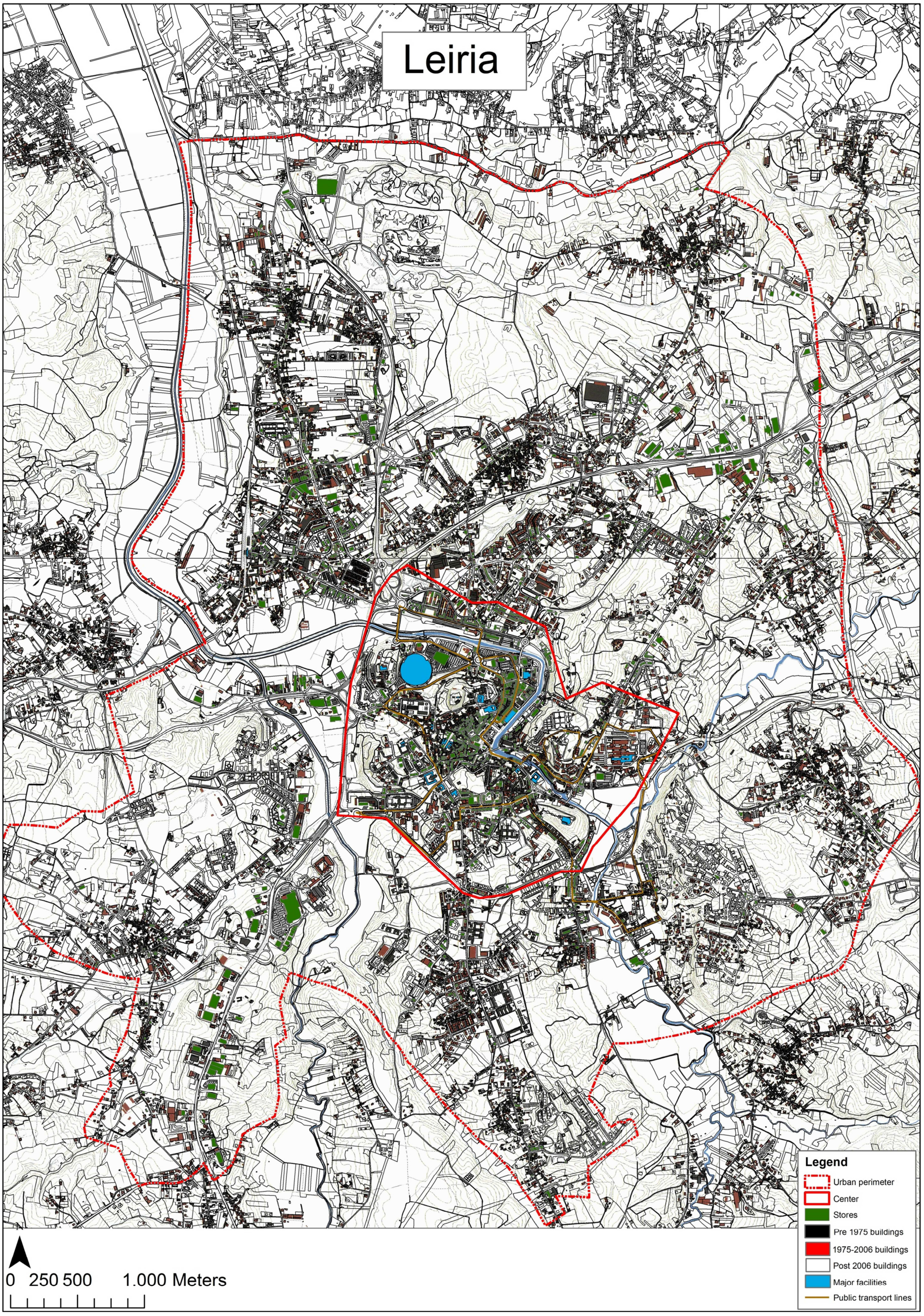
City	Region	Inhabitants (2001)	Regional Plan (PROT) framework	Shopping centres *not part of the portuguese association of shopping centres (APCC)	Prosiurb - 1st year	ProCom	Urbcom - Global Projects	Urbcom - individual projects	MODCOM (promoters)	MERCA	POLIS XXI (RUCI)	CIUMED	Growth (according to Carvalho and Sequeira, 1999)
Aveiro	Center	55 291	level 1 pole	Aveiro Retail Park CC Continente Aveiro Forum Aveiro CC Pingo Doce Glicinias Shopping* CC Oita*		X		x	X			X	strong growth
Barcelos	North	20 625	regional city	CC castro* CC terco* CC senhor da cruz* CC Barcelence* Vivaci barcelos (proposal)* E.LECLERC de Barcelos*		X		x	X		X		
Beja	Alentejo	21 658	regional urban centre	VIVACI Beja (project abandoned)*	X	X		x	X		X	X	
Bragança	North	20 309	regional city	Bragança shopping*		X		x	X		X		slow or stagnated growth
Caldas da Rainha	West and Tejo Valley	25 316	regional urban centre	Centro Bordalo (under construction) Vivaci Caldas da Rainha			X		X				
Castelo Branco	Center	30 649	level 2 pole	CC Alegro Castelo Branco Forum Castelo Branco	X	X		x	X		X	X (in 2009 but not now)	slow or stagnated growth
Covilhã	Center	34 772	level 2 pole	Serra Shopping				x	X		X		
Évora	Alentejo	41 159	regional urban centre	Eborim (closed) Evorashopping (under construction)	X	X		x	X		X		slow or stagnated growth
Faro	Algarve	41 934	concelho capital	Forum Algarve		X		x	X		X	X	strong growth
Figueira da Foz	Center	27 742	level 2 pole	Foz Plaza*		X		x	X			X (after 2009)	
Guarda	Center	26 061	level 2 pole	Vivaci Guarda In Guarda Retal Park* Guardashopping (under construction)*	X	X		x	X		X		slow or stagnated growth
Guimarães	North	52 181	regional city	Espaço Guimarães Guimarães Shopping Guimarães Plazza (under construction)		X	X	x	X		X	X	
Leiria	Center	42 745	level 1 pole	CC Continente de Leiria (which turned into LeiriaShopping in 2010) Retail Park Leiria*		X		x	X		X	X (after 2009)	strong growth
Olhão	Algarve	24 876	concelho capital	Ria Shopping*		X		x	X		X	X	
Portimão	Algarve	32 433	concelho capital	Aqua Portimão CC Continente Portimão Portimão Retail Centre Portimão retail Park				x	X				
Santarém	West and Tejo Valley	28 760	regional urban centre	CC Feira Nova Santarém Galaxy Shopping (proposal) Santarém Retail Park W Shopping*		X		x	X			X	slow or stagnated growth

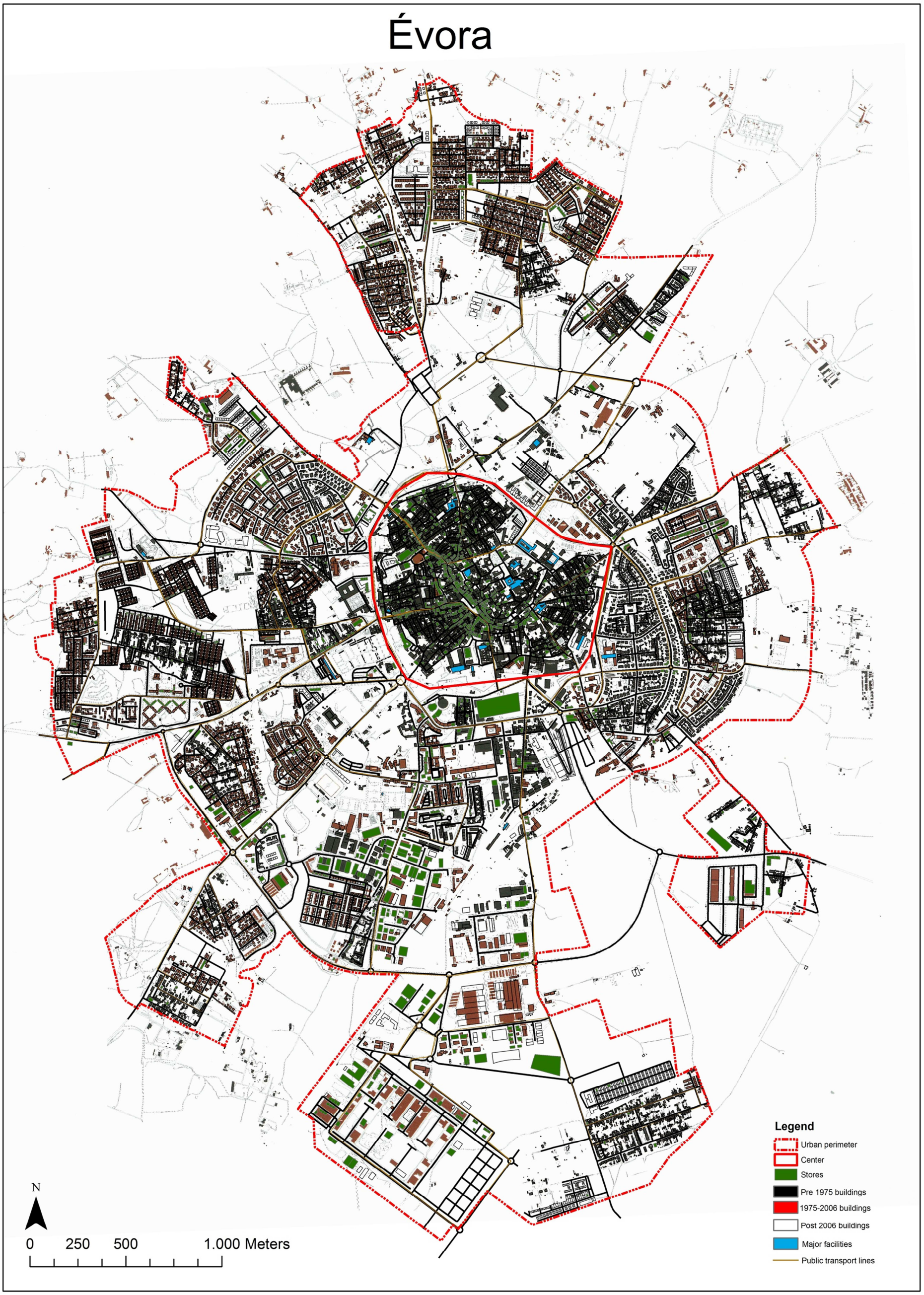
Viana do Castelo	North	36 148	regional city	Estação Viana Shopping Lima Retail Park Viana Retail Center		X		x	X				slow or stagnated growth
Vila Nova da Famalicão	North	27 900	regional city	CC Jumbo Famalicão Famalicaoshopping (under construction)		X		x	X		X		
Vila Real	North	24 481	city of regional equilibrium	Dolce Vita Douro	X	X		x	X		X	X (after 2009)	slow or stagnated growth
Viseu	Center	47 250	level 1 pole	Forum Viseu Palácio do Gelo Shopping Soima Multiusos* ViseuShopping* Viseu Retail Park*		X		x	X				strong growth
Braga	North	109 460	city of regional equilibrium	Braga Parque Braga Retail Centre Dolce Vita Braga Espaço Braga Minho Center Bragashopping* CC Gold center* CC Rechicho* CC Granjinhos* CC Cruz de Pedra* CC lafayette Braga* CC santa barbara* CC santa cruz*		X	X	x	X		X		strong growth
Coimbra	Center	101 069	level 1 pole	Coimbra Retail Park CoimbraShopping Dolce Vita Coimbra Forum Coimbra	X	X	X	x	X			X (after 2009)	slow or stagnated growth
Elvas	Alentejo	15 115	regional urban centre	CC Revoltilho* CC da Boa-Fé* CC Lugar do Paraiso* CC Superelvas* CC PagaPouco* CC Lena* CC Lojas Alentejo - Grupo Nabeiro* CC Modelo* Chinês Shopping* Espaço Santa Luzia Shopping (under construction)*		X		x	X		X		
Portalegre	Alentejo	15 238	regional urban centre	City Shopping Portalegre (under construction)*		X		x	X			X (after 2009)	
Chaves	North	17 535	regional city	City Park Chaves		X		x	X		X		
Ovar	Center	16 849	level 3 pole	Dolce Vita Ovar		X		x	X				
Torres vedras	West and Tejo Valley	16 461	regional urban centre	Arena Shopping					X		X		
Tomar	Center	15 764	level 3 pole	Forum Tomar (project)	X	X		X	X				

Annex 3 – City Models


Vila Real
Legend
Urban perimeter
Center
Stores
Pre 1975 buildings
1975-2006 buildings
Post 2006 buildings
Major facilities
Public transport lines
N
0 250 500 1.000 Meters


Aveiro
Legend
Expanded Urban perimeter
Original urban perimeter
Center
Stores
Pre 1975 buildings
1975-2006 buildings
Post 2006 buildings
Major facilities
Public transport lines
0 250 500 1.000 Meters

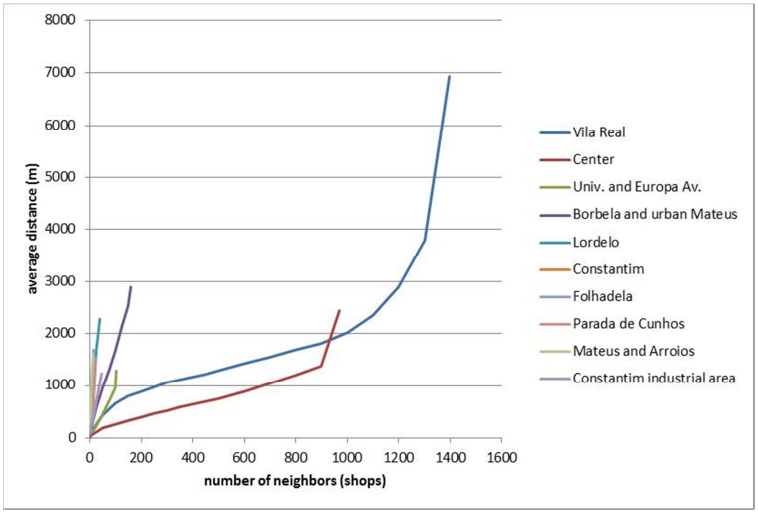

Leiria
Legend
Urban perimeter
Center
Stores
Pre 1975 buildings
1975-2006 buildings
Post 2006 buildings
Major facilities
Public transport lines
0 250 500 1.000 Meters

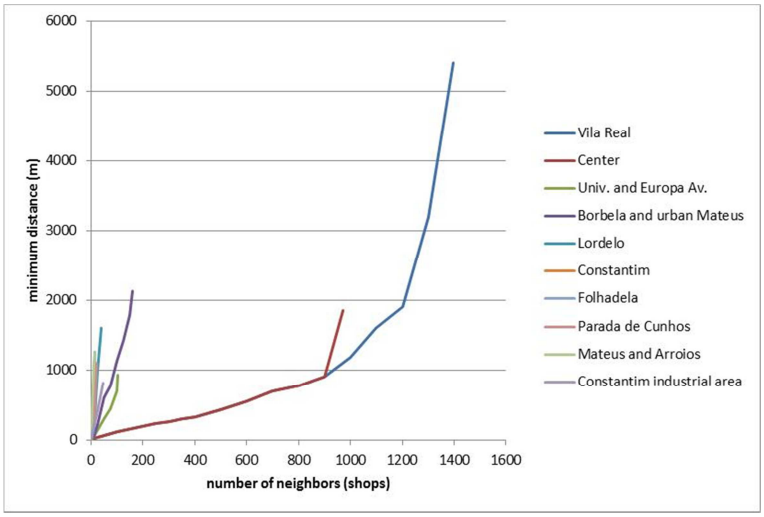

Évora
N
0 250 500 1.000 Meters
Legend
Urban perimeter
Center
Stores
Pre 1975 buildings
1975-2006 buildings
Post 2006 buildings
Major facilities
Public transport lines

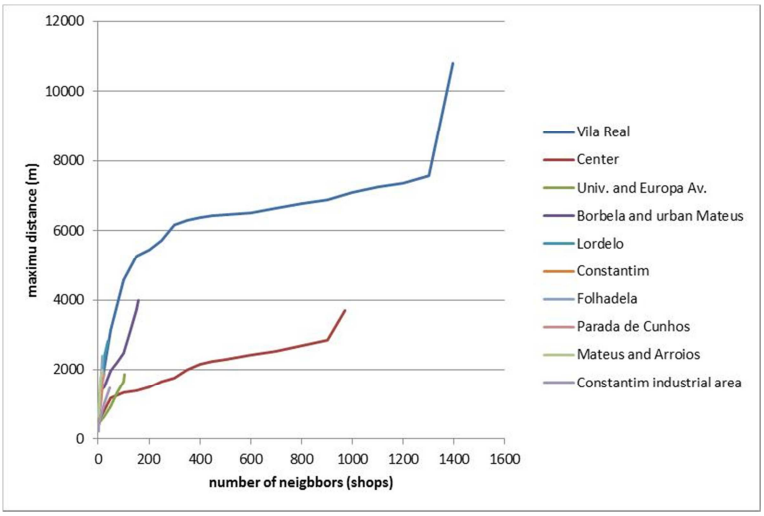
Annex 4 – Main summary of the study variables for all cities and all city areas

City / Variable	Vila Real	Leiria	Évora	Aveiro	Relationships	Évora's center	Sra. Saúde	Malagueira	Bacelo	Horta das Figueiras /Almeirim	Aveiro's center	Santiago	Forca	Esgueira	S Bernardo/St. Joana/Esgueira/ Arades	Esgueira Industrial	Vila Real's center	Europa and Universidade	Borbela, Mateus	Lordelo	Constantim	Folhadela	Parada de Cunhos	Mateus and Arroios	Constantim Industrial	Leiria's center	Sismarias	Marinheiros	Telheiro	Marrazes	Parceiros	Pousos	Gândara de Olivais	Andrinos	Pinheiros	Parceiros Industrial	Vale Sepal Industrial
Study area (m2)	23662406	36259245	13474660	17856603	L>V>A>E	1065516	1912922	2141252	2426806	5590163	2375412	1191792	365852	1404336	8397760	2656282	3112403	695444	4589731	2843790	902211	2478204	1315362	3081797	1247921	3851337	2876168	2285939	3034723	1646583	2148942	4128596	2549236	931037	1981703	3015595	1381832
% of total study area	100	100	100	100		7,91	14,20	15,89	18,01	41,49	13,30	6,67	2,05	7,86	47,03	14,88	13,15	2,94	19,40	12,02	3,81	10,47	5,56	13,02	5,27	10,62	7,93	6,30	8,37	4,54	5,93	11,39	7,03	2,57	5,47	8,32	3,81
Resident population (2011)	30207	50455	41846	40860	L>E>A>V	4738	7281	11396	8638	9793	11872	5375	1736	6800	14475	602	12003	1953	8195	3262	790	1376	1443	1026	157	12707	7489	7044	6669	3518	2282	5351	2158	844	764	1290	315
Present population (2011)	31808	49749	41469	43579	L>E>A>V	5418	7280	10888	8240	9643	13131	7988	1631	6381	13881	567	12842	2829	8046	3454	751	1335	1392	1005	152	13933	7097	6522	6484	3323	2174	5001	2036	789	728	1345	294
Number of stores' catalogued	1423	2517	1735	2223	LA>VE	840	150	224	128	393	1255	259	127	145	358	77	971	105	160	39	17	17	24	17	47	1409	296	223	137	89	51	94	52	13	18	79	44
Number of empty stores	44	358	159	336	LA>E>V	51	23	42	19	22	191	64	21	23	34	1	36	2	5	0	0	0	0	0	0	185	45	61	14	15	4	19	5	0	0	4	0
Number of closed stores	88	163	110	71	L>E>VA	56	9	20	11	12	42	10	2	5	13	0	69	2	9	2	3	0	0	1	0	95	22	14	8	8	1	3	2	1	1	2	1
Number of open stores	1292	1986	1466	1816	LA>VE	733	118	162	98	359	1022	185	104	117	311	76	866	101	146	37	14	17	24	16	47	1329	229	148	115	66	46	72	45	12	15	73	43
Total commercial area (m2)	260643	615126	353152	573659	L>A>E>V	85066	18477	28296	20873	200441	184021	90401	17164	23476	64196	194401	136038	34906	30277	8354	3191	3790	4050	2379	37657	202807	76204	37518	25977	17319	8195	24790	30536	3233	6005	115600	66942
Average area per store (m2)	183	244	204	258	LA>VE	101	123	126	163	510	147	349	135	162	179	2525	140	332	189	214	188	223	169	140	801	144	257	168	190	195	161	264	587	249	334	1463	1521
Activity with the greatest area (percentage)	Services and other activities (32%)	Services and other activities (35%)	Services and other activities (28%)	Services and other activities (26%)		Restaurants & Cafés (27%)	Services and other activities (27%)	Services and other activities (29%)	Restaurants & Cafés (35%)	Services and other activities (33%)	Services and other activities (22%)	Services and other activities (31%)	Services and other activities (55%)	Services and other activities (26%)	Services and other activities (39%)	Services and other activities (20%)	Services and other activities (26%)	Services and other activities (24%)	Services and other activities (29%)	Services and other activities (39%)	Restaurants & Cafés (43%)	Restaurants & Cafés (75%)	Home (38%)	Restaurants & Cafés (56%)	Services and other activities (63%)	Services and other activities (29%)	Services and other activities (23%)	Services and other activities (31%)	Services and other activities (31%)	Services and other activities (32%)	Services and other activities (37%)	Services and other activities (36%)	Services and other activities (17%)	Services and other activities (46%)	Services and other activities (73%)	Services and other activities (41%)	Services and other activities (62%)
% of the total commercial area concerning multi-commercial spaces	9,82	8,94	5,17	24,80	A>VL>E	3,58	0,00	0,00	0,00	7,59	9,25	27,93	0,00	10,25	0,00	50,20	11,24	28,57	1,09	0,00	0,00	0,00	0,00	0,00	0,00	6,02	5,91	0,00	0,00	0,00	0,00	0,00	57,11	0,00	0,00	18,04	0,00
Buildings (2011, INE)	7430	10017	13708	8569	E>L>A>V	3138	2423	3188	2369	2590	2519	520	194	791	4333	212	2245	368	1936	1033	417	510	338	528	53	1823	1214	1015	1079	929	704	1424	788	305	347	268	113
Homes (2011, INE)	16052	28031	21397	23968	L>A>E>V	4364	3982	4973	3701	4377	8585	3759	965	3492	6889	278	6907	1313	3936	1473	439	715	660	548	59	8722	3924	3840	3565	1591	1062	2622	1018	341	352	842	142
Families (2011, INE)	13314	20654	17156	17568	L>E>A>V	2499	3266	4394	3222	3775	5712	2426	715	2800	5693	222	4693	820	2981	1102	277	497	508	383	50	5779	2982	2852	2769	1320	843	2045	812	284	282	562	115
Main activity	Services and other activities (Restaurants & Cafés in the same order of magnitude)	Services and other activities	Restaurants & Cafés (just 7 stores more than Services and other activities)	Services and other activities		Restaurants & Cafés	Restaurants & Cafés	Services and other activities (just 2 store more than Restaurants & Cafés)	Restaurants & Cafés	Restaurants & Cafés (just 3 stores more than Services and other activities)	Services and other activities	Services and other activities	Services and other activities	Services and other activities	Services and other activities	Services and other activities	Services and other activities	Services and other activities	Services and other activities	Restaurants	Restaurants & Cafés (just 1 store more than Services and other activities)	Restaurants & Cafés	Services and other activities	Restaurants & Cafés	Services and other activities	Services and other activities	Services and other activities	Restaurants & Cafés (just 3 stores more than Services and other activities)	Services and other activities	Services and other activities (just 1 store more than Restaurants & Cafés)	Services and other activities(just 2 stores more than Restaurants & Cafés)	Food & Beverages (just 1 more store than both Services and Restaurants)	Services and other activities	Services and other activities	Services and other activities
Main activity only considering open stores	same	same	Services and other activities (Restaurants & Cafés in the same order of magnitude)	same		same	same	Services and other activities (just 2 store more than Restaurants & Cafés)	same	same	same	same	same	same	same	same	same	same	same	same	Services and other activities (just 1 store more than Restaurants & Cafés)	same	same	same	same	same	same	same	same	same	Food & Beverages, Restaurants & Cafés and Services and other activities	same	same	same
Main sub-activity	Cafés	Cafés	Cafés	Cafés		Cafés (Restaurants and Fashion in the same order of magnitude)	Cafés	Cafés	Cafés	Cafés	Cafés	Cafés	Real-estate agency	Cafés	Cafés	Car acessories	Cafés	Cafés	Cafés	Cafés	Cafés	Restaurants (1 more store than Cafés)	Cafés and car stand	Cafés (1 more store than Restaurants)	Car stand (2 more stores than Construction Materials)	Cafés (2 more stores than Clothing)	Cafés	Cafés	Cafés	Cafés	Cafés (1 more store than Restaurants)	Cafés	Cafés	Cafés (1 more store than Beverages)	Car acessories (1 more sotre than Restaurants)	Car stand and car acessories	Car stand
Main store type	Modern	Modern	Modern	Modern		Modern	Modern	Modern	Modern	Modern	Modern	Modern	Modern	Modern	Modern	Modern	Modern	Modern	Modern	Tradicional	Tradicional	Tradicional	Modern	Tradicional	Modern	Modern	Modern	Modern	Modern	Modern	Modern	Tradicional (2 stores more than Modern)	Tradicional	Tradicional	Modern	Modern
Main store structure	Individual	Individual	Individual	Individual		Individual	Individual	Individual	Individual	Individual	Individual	Individual	Individual	Individual	Individual	Chain (2 more stores than Individual)	Individual	Individual	Individual	Individual	Individual	Individual	Individual	Individual	Individual	Individual	Individual	Individual	Individual	Individual	Individual	Individual	Individual	Individual (1 store more than Chain)	Individual
Main store integration	D_t_d_res	D_t_d_res	D_t_d_res	D_t_d_res		D_t_d_res	D_t_d_res	D_t_d_res	D_t_d_res and Single Standing	Single Standing	D_t_d_res	D_t_d_res and es	D_t_d_serv_r and es	D_t_d_res	D_t_d_res	Single Standing	D_t_d_res	D_t_d_res	Single Standing	D_t_d_res	Single Standing	SS_res (1 more store than Single Standing)	Single Standing	Single Standing	Single Standing	D_t_d_res	D_t_d_res	D_t_d_res	D_t_d_res	D_t_d_res	Single Standing (1 more store than d_t_d_serv_res)	D_t_d_res	Single Standing	Single Standing	Single Standing	Single	Single	Single
Main number of stories	2	4	2	3	L>A>VE	2	2	1	2	1	3	4	4	2 (just 1 store more than 3)	1	1	2	4	2	2	2	2	1 e 2	2	1	3	3	5	5	3 (just 1 more store than 2)	1 e 2	3	1	1 (just 1 more store than 2)	1	1	1
Main number of stories considering just open stores	same	3 (just 4 stores more than 4 stories)	same	same		same	same	same	same	same	same	same	same	2 e 3	same	same	3	same	same	same	same	same	same	same	same	same	same	same	same	same	2	same	same	same	same	same	same
Highest number of stories	13	10	5	14	VA>L>E	4	4	5	4	5	14	12	14	9	7	3	13	8	11	4	3	3	6	3	3	10	8	8	8	5	4	5	4	2	3	5	2
Average number of stories	3,71	3,77	2,23	3,76	VLA>E	2,45	2,11	2,40	2,01	1,79	3,97	4,52	5,43	3,74	2,42	1,24	4,10	3,45	3,44	1,90	2,06	2,00	2,38	1,94	1,15	4,26	3,76	4,05	3,82	2,56	2,29	2,53	1,77	1,46	1,39	1,62	1,16
Number of shopping centers´arcades	2_13	6_8	1 (+2)_1	5_17	A>VL>E	(1)_1	0	0	0	1(+1)	1_14	1_0	0	0_3	0	3_0	1_8	1_1	0_4	0	0	0	0	0	0	3_7	1_1	0	0	0	0	0	1_0	0	0	1_0	0
Stores per inhabitant	0,047	0,050	0,041	0,054	A>L>V>E	0,177	0,021	0,020	0,015	0,040	0,106	0,048	0,073	0,021	0,025	0,128	0,081	0,054	0,020	0,012	0,022	0,012	0,017	0,017	0,299	0,111	0,040	0,032	0,021	0,025	0,022	0,018	0,024	0,015	0,024	0,061	0,140
Open stores per inhabitant	0,043	0,040	0,035	0,044	VA>L>E	0,155	0,016	0,014	0,011	0,037	0,086	0,034	0,060	0,017	0,021	0,126	0,072	0,052	0,018	0,011	0,018	0,012	0,017	0,016	0,299	0,089	0,031	0,021	0,017	0,019	0,020	0,013	0,021	0,014	0,020	0,057	0,137
Stores per area (km2)	60	69	129	124	EA>VL	788	78	105	53	70	528	217	347	103	43	29	312	151	35	14	19	7	18	6	38	366	103	98	45	54	24	23	20	14	9	26	32
Open stores per area (km2)	55	55	109	102	EA>VL	688	62	76	40	64	430	155	284	83	37	29	278	145	32	13	16	7	18	5	38	293	80	65	38	40	21	17	18	13	8	24	31
Population density (inh/km2)	1277	1392	3106	2288	E>A>L>V	4447	3806	5322	3559	1752	4998	4510	4745	4842	1724	227	3857	2808	1786	1147	876	555	1097	333	126	3299	2604	3081	2198	2137	1062	1296	847	907	386	428	228
Commercial area per inhabitant (m2/inh)	8,63	12,19	8,44	14,04	A>L>VE	17,95	2,54	2,48	2,42	20,47	15,50	16,82	9,89	3,45	4,43	322,93	11,33	17,87	3,69	2,56	4,04	2,75	2,81	2,32	239,86	15,96	10,18	5,33	3,90	4,92	3,59	4,63	14,15	3,83	7,86	89,61	212,51
% of commercial area in total study area	1,10	1,70	2,62	3,21	A>E>L>V	7,98	0,97	1,32	0,86	3,59	7,75	7,59	4,69	1,67	0,76	7,32	4,37	5,02	0,66	0,29	0,35	0,15	0,31	0,08	3,02	5,27	2,65	1,64	0,86	1,05	0,38	0,60	1,20	0,35	0,30	3,83	4,84
Stores per building	0,19	0,25	0,13	0,26	LA>V>E	0,27	0,06	0,07	0,05	0,15	0,50	0,50	0,65	0,18	0,08	0,36	0,43	0,29	0,08	0,04	0,04	0,03	0,07	0,03	0,89	0,77	0,24	0,22	0,13	0,10	0,07	0,07	0,07	0,04	0,05	0,29	0,39
Average distance to closest store (m)	30,72	27,73	27,37	25,65	V>L>E>A	14,95	36,59	26,43	49,85	43,47	15,66	23,05	18,18	27,92	51,40	89,69	16,44	31,10	43,26	114,60	88,50	134,70	81,88	219,18	77,99	15,59	26,32	26,44	36,62	43,84	67,87	48,90	58,86	111,84	149,14	83,68	78,10
Average distance to all stores in the area (m)	6936,70	6893,05	4591,64	6622,23	VL>A>E	1174,94	1760,08	2119,03	1941,21	3306,71	2025,69	1440,22	759,14	1685,14	4794,35	2472,34	2433,90	1287,93	2894,91	2286,70	1062,58	1694,19	1524,22	1621,06	1238,20	2234,41	1805,28	2032,89	2428,35	2098,79	1639,86	2308,62	1675,12	756,46	1157,50	3365,98	1535,00
Number of stores in post 1975 buildings	724	1593	683	1031	L>A>V>E	10	84	182	117	290	340	234	123	88	200	46	441	82	110	19	1	5	16	5	45	792	218	201	102	57	35	63	20	4	11	49	41
% of stores in post 1975 buildings	50,88	63,29	39,37	46,38	L>V>A>E	1,19	56,00	81,25	91,41	73,79	27,09	90,35	96,85	60,69	55,87	59,74	45,42	78,10	68,75	48,72	5,88	29,41	66,67	29,41	95,74	56,21	73,65	90,13	74,45	64,04	68,63	67,02	38,46	30,77	61,11	62,03	93,18
% of stores in post 1975 buildings in the first quantile of integration for r= n	31,49	18,02	9,08	3,69	V>L>E>A	0,00	16,67	12,09	0,85	8,62	3,24	2,99	4,88	2,27	6,00	0,00	33,56	50	34,45	0	0	0	0	0	0	30,3	1,83	18,41	1,96	0	0	0	0	0	0	2,04	7,32
% of stores in post 1975 buildings in the first quantile of choice for r= n	25,83	29,44	18,16	12,61	L>V>E>A	0,00	23,81	15,93	7,69	22,76	11,47	18,38	4,07	0,00	21,50	0,00	23,36	21,95	46,36	10,53	0	60	50	40	0	29,8	21,1	34,83	38,24	45,61	51,43	25,4	15	0	0	2,04	34,15
Stores in the first quantile of integration for r= n	738	410	424	208	V>L>E>A	317	31	34	2	40	159	7	8	6	22	6	629	60	49	0	0	0	0	0	0	354	4	43	3	0	0	0	0	0	0	3	3
% of stores in the first quantile of integration for r= n	51,86	16,29	24,44	9,36	V>E>L>A	37,74	20,67	15,18	1,56	10,18	12,67	2,70	6,30	4,14	6,15	7,79	64,78	57,14	30,63	0,00	0,00	0,00	0,00	0,00	0,00	25,12	1,35	19,28	2,19	0,00	0,00	0,00	0,00	0,00	0,00	3,80	6,82
% of those stores in post 1975 buildings	30,89	70,00	14,62	18,27	L>V>A>E	0,00	45,16	64,71	50,00	62,50	6,92	100,00	75,00	33,33	54,55	0	23,53	68,33	79,59	0	0	0	0	0	0	67,8	100	86,05	66,67	0	0	0	0	0	0	33,33	100
Stores in the first quantile of choice for r= n	437	668	514	313	L>E>V>A	319	43	55	11	86	195	50	7	0	61	0	293	33	74	4	4	9	11	9	0	357	62	78	53	39	26	32	5	0	1	1	14
% of stores in the first quantile of choice for r= n	30,71	26,54	29,63	14,08	VE>L>A	37,98	28,67	24,55	8,59	21,88	15,54	19,31	5,51	0,00	17,04	0,00	30,18	31,43	46,25	10,26	23,53	52,94	45,83	52,94	0,00	25,34	20,95	34,98	38,69	43,82	50,98	34,04	9,62	0,00	5,56	1,27	31,82
% of those stores in post 1975 buildings	42,79	70,21	24,12	41,53	L>VA>E	0	46,51	52,73	81,82	76,74	20	86	71,43	0	70,49	0	35,15	54,55	68,92	50	0	33,33	72,73	22,22	0	66,11	74,19	89,74	73,58	66,67	69,23	50	60	0	0	100	100
Number of closed and empty stores in post 1975 buildings	80	376	137	206	L>A>E>V	2	20	60	29	26	73	68	22	18	25	0	67	2	11	0	0	0	0	0	0	193	49	69	15	18	3	21	1	0	1	5	1
Percentage of closed and empty stores in post 1975 buildings	60,61	72,17	50,93	50,61	L>V>EA	1,87	62,50	96,77	96,67	76,47	31,33	91,89	95,65	64,29	53,19	0,00	63,81	50,00	78,57	0,00	0,00	#DIV/0!	#DIV/0!	0,00	#DIV/0!	68,93	73,13	92,00	68,18	78,26	60,00	95,45	14,29	0,00	33,33	83,33	100,00
Number of non-open stores in the last three quantiles of integration for r= n	8	116	99	139	A>L>E>V	0	13	38	30	18	54	37	9	8	31	0	0	0	2	2	3	0	0	1	0	18	36	15	6	9	0	22	2	1	3	4	0
Percentage of non-open stores in the last three quantiles of integration for r= n	6,06	22,26	36,80	34,15	EA>L>V	0,00	40,63	61,29	100,00	52,94	23,18	50,00	39,13	28,57	65,96	0,00	0,00	0,00	14,29	100,00	100,00	#DIV/0!	#DIV/0!	100,00	#DIV/0!	6,43	53,73	20,00	27,27	39,13	0,00	100,00	28,57	100,00	100,00	66,67	0,00
% of those stores in post 1975 buildings	25,00	84,48	93,94	64,03	E>L>A>V	0,00	84,62	100,00	96,67	83,33	44,44	94,59	88,89	87,50	48,39	0,00	0	0	100	0	0	0	0	0	0	88,89	83,33	86,67	100	88,89	0	95,45	0	0	33,33	75	0
Number of non-open stores in the last three quantiles of choice for r= n	51	205	71	183	L>A>E>V	16	7	18	14	16	97	47	11	12	16	0	45	0	5	1	0	0	0	0	0	113	33	30	6	8	0	6	1	0	2	6	0
Percentage of non-open stores in the last three quantiles of choice for r= n	38,64	39,35	26,39	44,96	A>VL>E	14,95	21,88	29,03	46,67	47,06	41,63	63,51	47,83	42,86	34,04	0,00	42,86	0,00	35,71	50,00	0,00	#DIV/0!	#DIV/0!	0,00	#DIV/0!	40,36	49,25	40,00	27,27	34,78	0,00	27,27	14,29	0,00	66,67	100,00	0,00
% of those stores in post 1975 buildings	66,67	77,56	67,61	63,39	L>VE>A	6,25	57,14	100,00	100,00	68,75	43,30	93,62	90,91	66,67	75,00	0,00	64,44	0	100	0	0	0	0	0	0	69,03	87,88	96,67	50	100	0	100	0	0	50	83,33	0
Average block area (m2)	78416,86	52106,96	12719,42	34885,41	V>L>A>E	4675,74	14825,24	9082,90	14016,04	22927,59	11200,31	24981,97	27099,14	39293,90	49656,07	270337,22	20128,09	53930,87	42101,46	82456,93	95575,71	250564,34	201560,05	177753,52	261153,33	18016,45	41631,75	43166,75	47879,95	39010,17	119264,03	49987,44	127736,69	85354,49	91849,37	166993,37	144446,18
Number of blocks with stores	233	442	441	358	LE>A>V	172	52	60	56	101	154	43	21	32	96	12	99	21	46	18	11	10	10	10	8	173	44	43	40	30	16	35	19	6	11	14	11
Stores per block	6	6	4	6	VLA>E	5	3	4	2	4	8	6	6	5	4	6	10	5	3	2	2	2	2	2	6	8	7	5	3	3	3	3	3	2	2	6	4
Average block area (for blocks containing stores)	63156,85	59496,05	14528,79	41064,49	V>L>A>E	4849,28	17872,67	11284,93	18999,53	28739,33	11402,69	27075,21	33967,28	35191,86	69763,95	270337,22	24059,90	68017,87	43895,43	88511,02	86571,68	200556,68	51175,62	173401,48	261153,33	19667,76	53706,38	43045,44	66752,98	48005,99	145824,28	53819,99	189817,05	89465,32	90421,27	238372,69	170758,47
Estimated average volume for blocks containing stores (m3)	703089	672982	97198	463466	V>L>A>E	35642	113134	81251	114567	154330	135955	366927	552838	394634	505691	1008285	296152	703499	453495	503832	534708	1203340	364626	1009808	900145	251465	606374	523494	765954	368945	1003614	408803	1007491	392271	376755	1158672	593774
Total volume of buildings with stores (m3)	2690841	5046006	1874631	4568721	L>A>V>E	618369	118104	214104	113190	810864	2181627	796152	232347	294702	421668	642225	1716708	373572	360657	40008	19899	19155	29469	13209	118164	2409621	660678	414585	276423	122523	50208	157659	109284	13326	22188	577647	231864
Building volume per store parcel	1891	2005	1080	2055	A>L>V>E	736	787	956	884	2063	1738	3074	1830	2032	1178	8341	1768	3558	2254	1026	1171	1127	1228	777	2514	1710	2232	1859	2018	1377	984	1677	2102	1025	1233	7312	5270

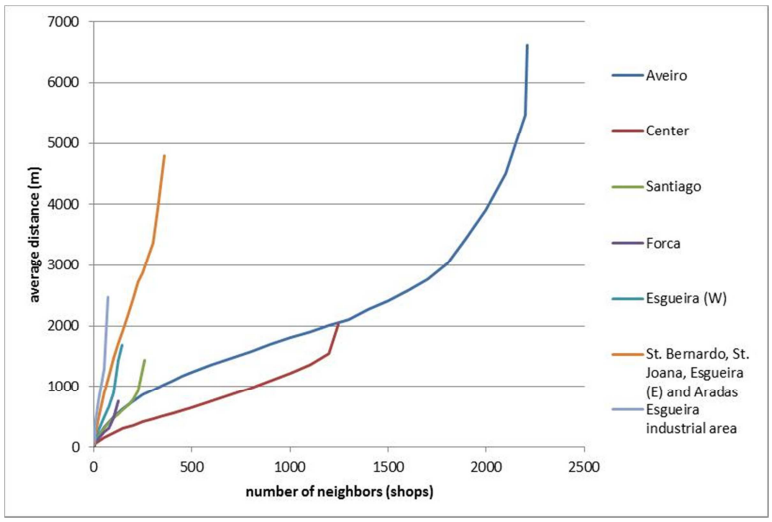
Annex 5 – Nearest neighbor analysis

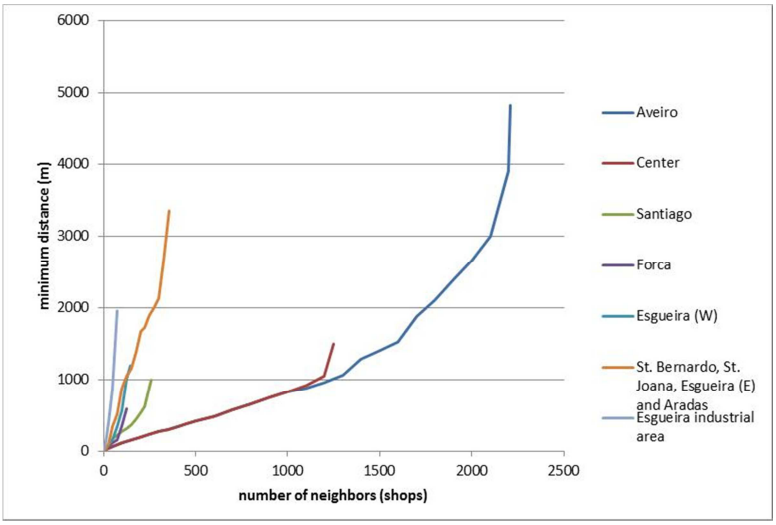


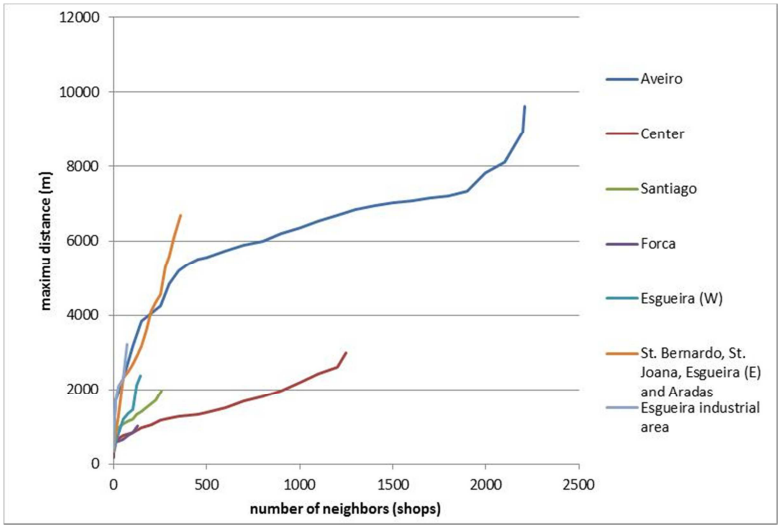




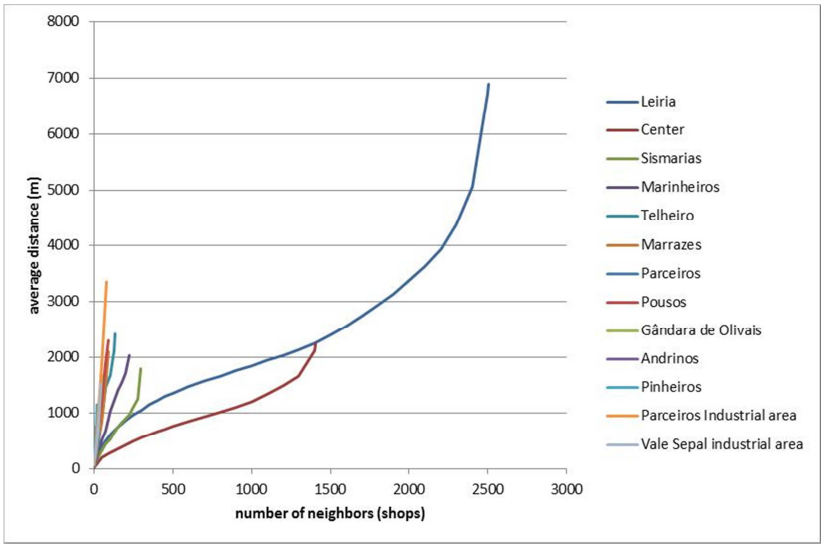
Nearest neighbor analysis comparison between Vila Real's hierarchical areas

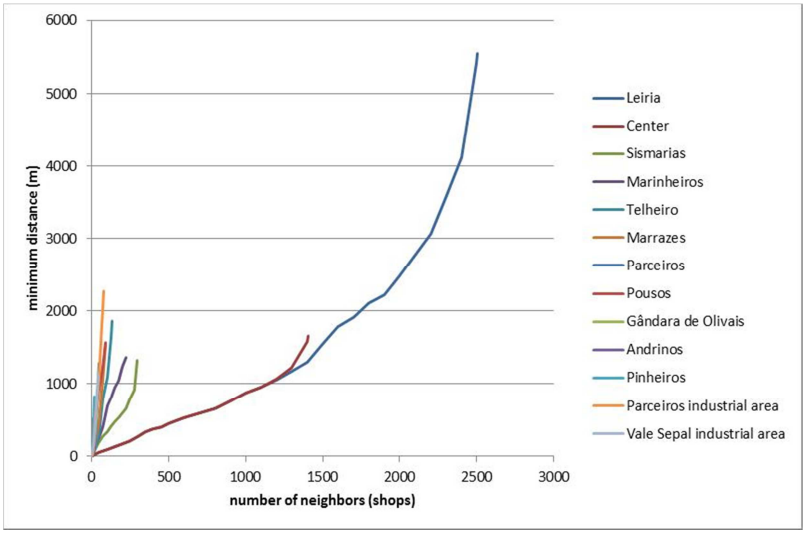


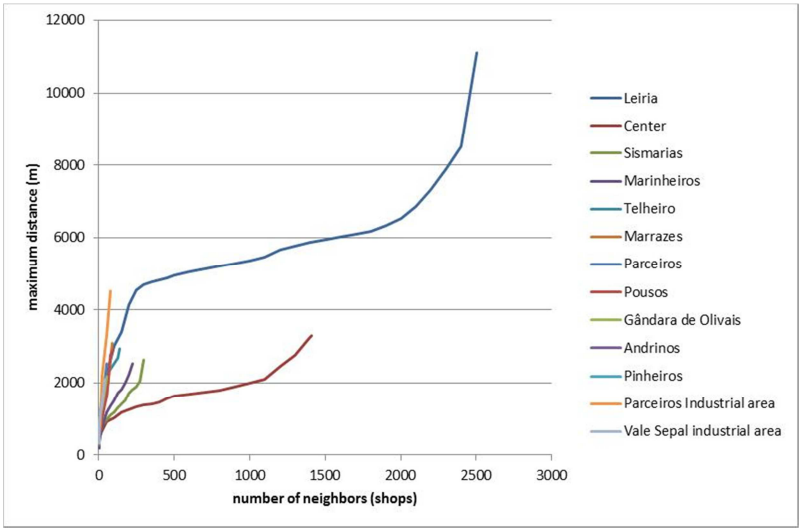




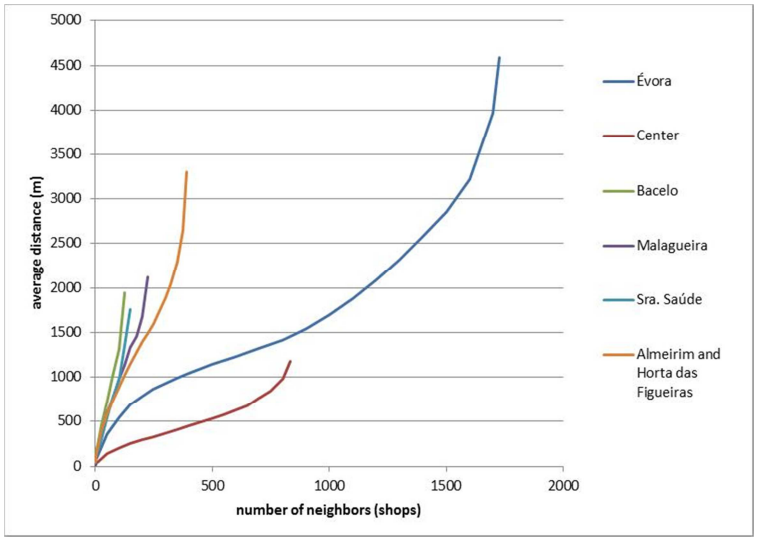
Nearest neighbor analysis comparison between Aveiro's hierarchical areas

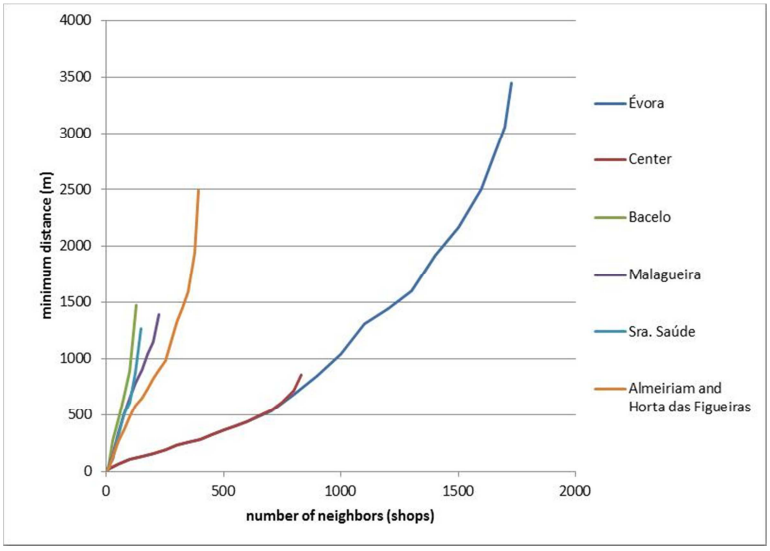


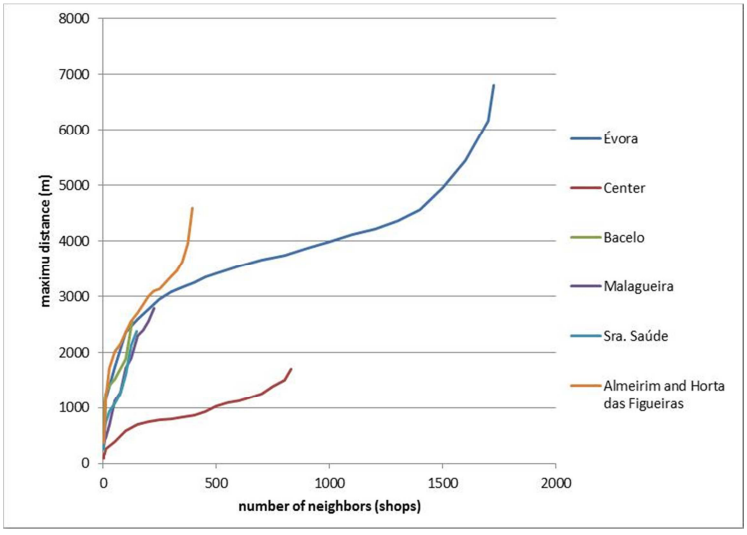




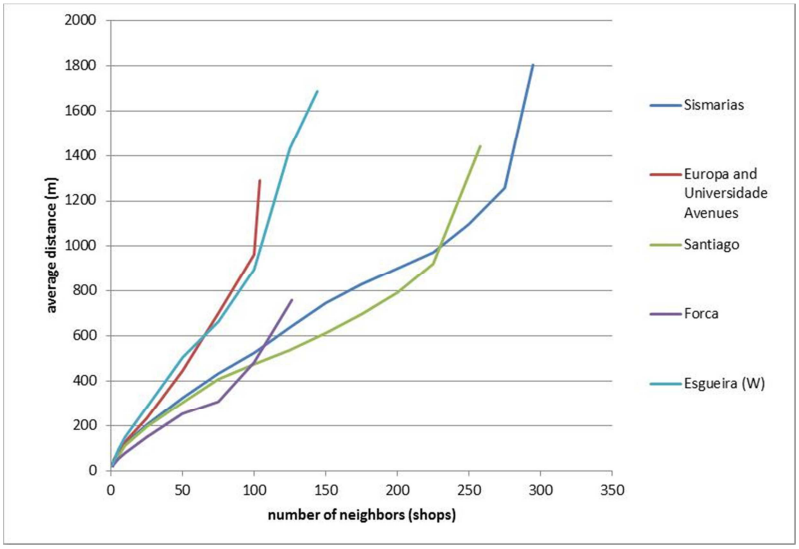
Nearest neighbor analysis comparison between Leiria's hierarchical areas

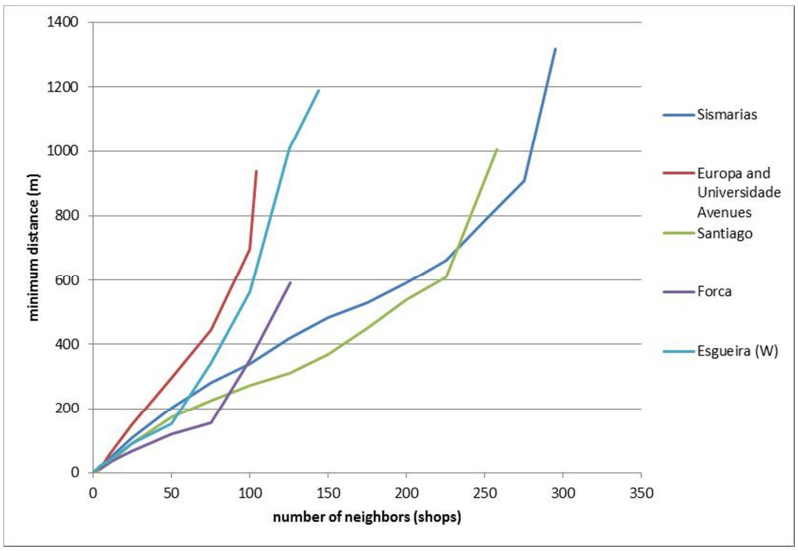


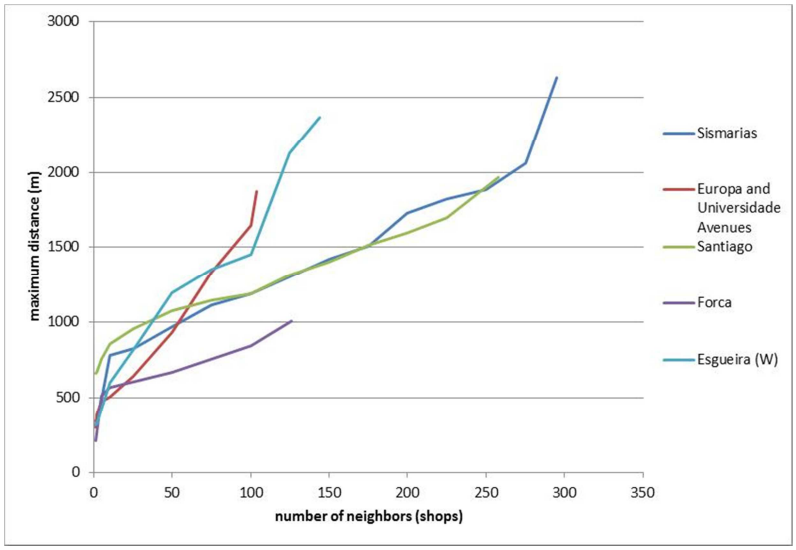




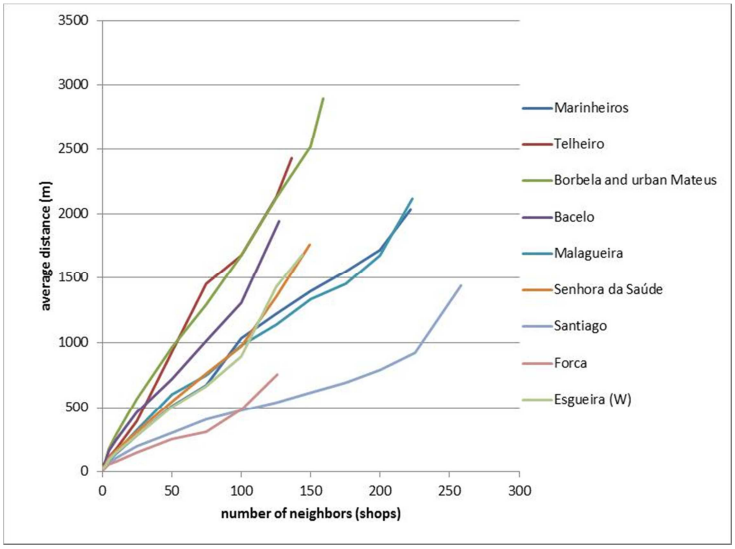
Nearest neighbor analysis comparison between Évora's hierarchical areas

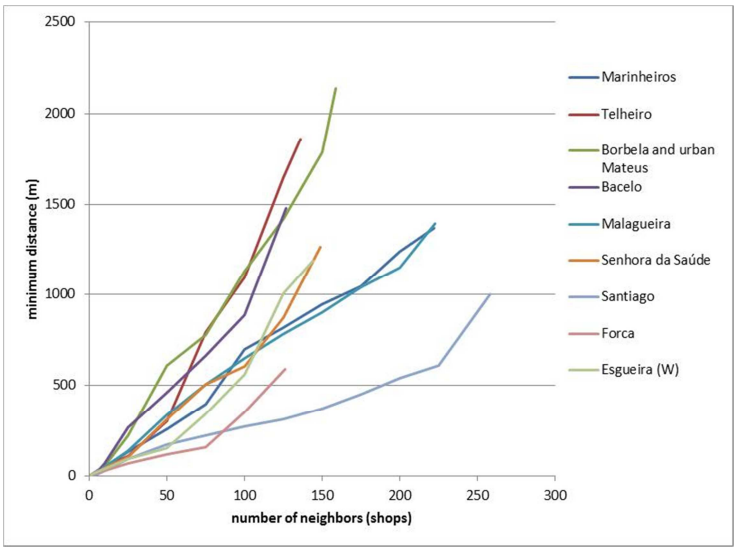


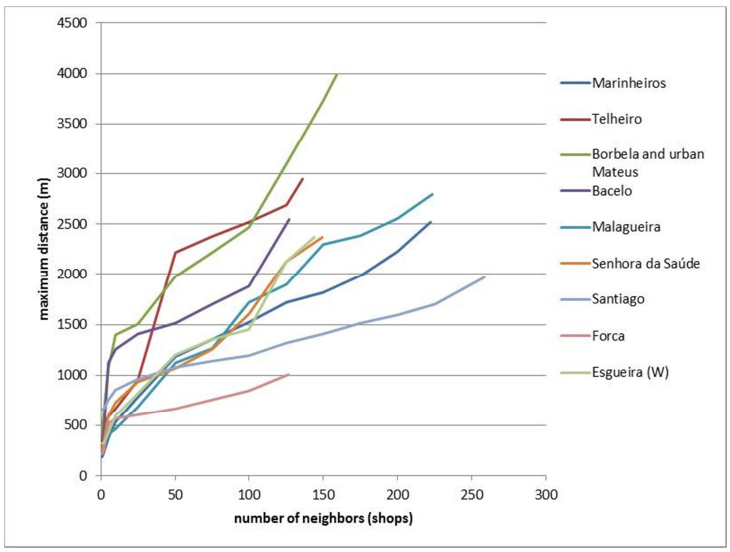




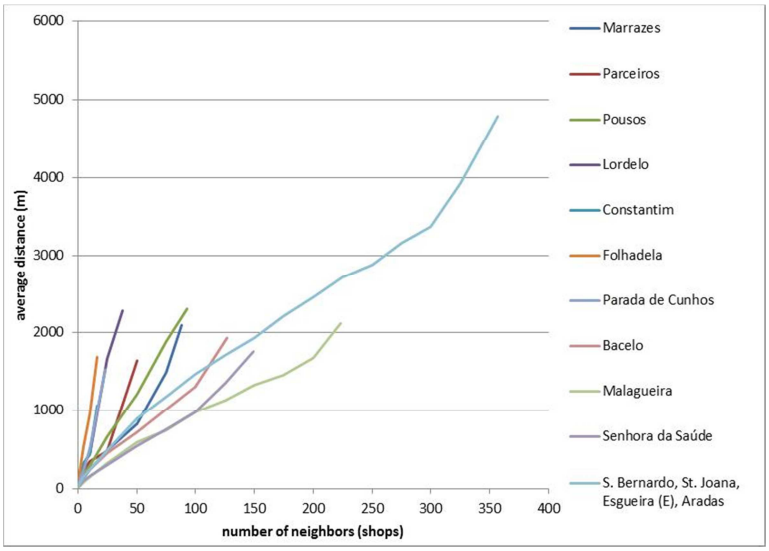
Minimum, maximum and average distance between each store and n neighbors in the extensions of the city center

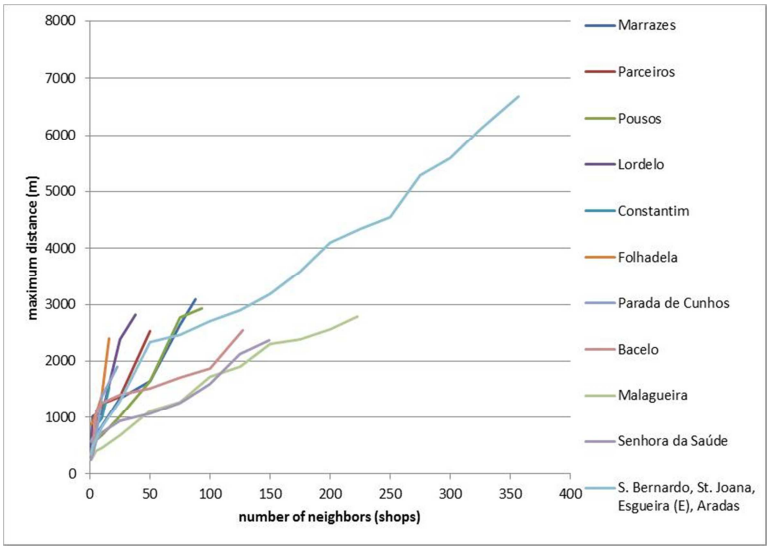


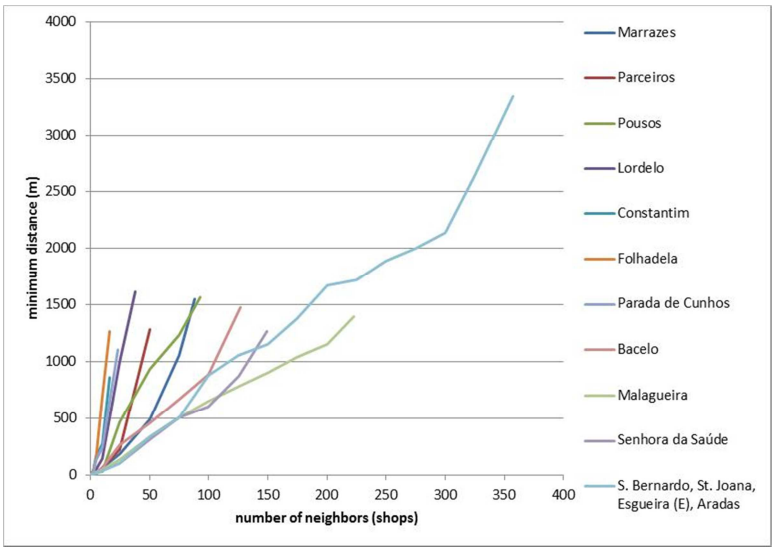




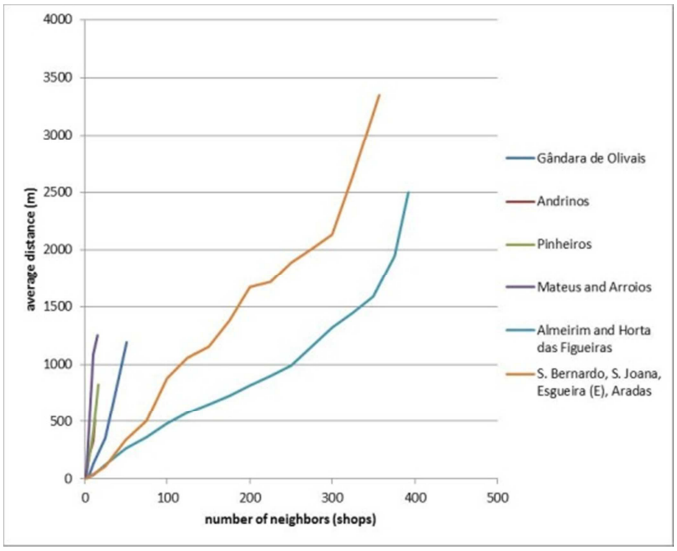
Minimum, maximum and average distance between each store and n neighbors in the main residential areas

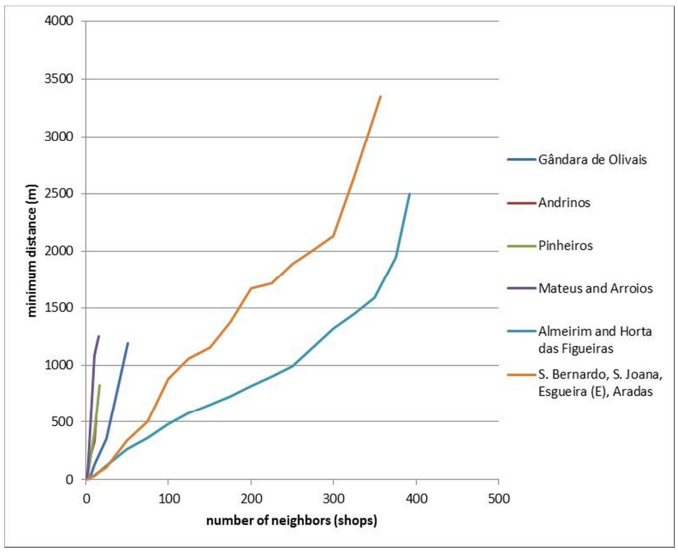


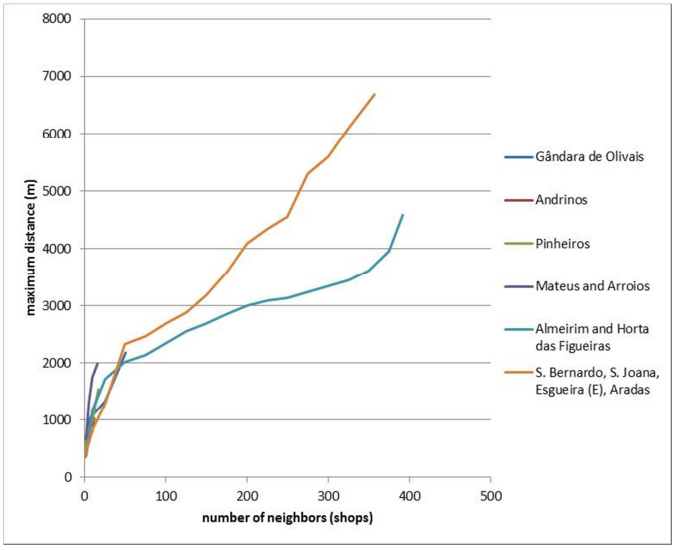




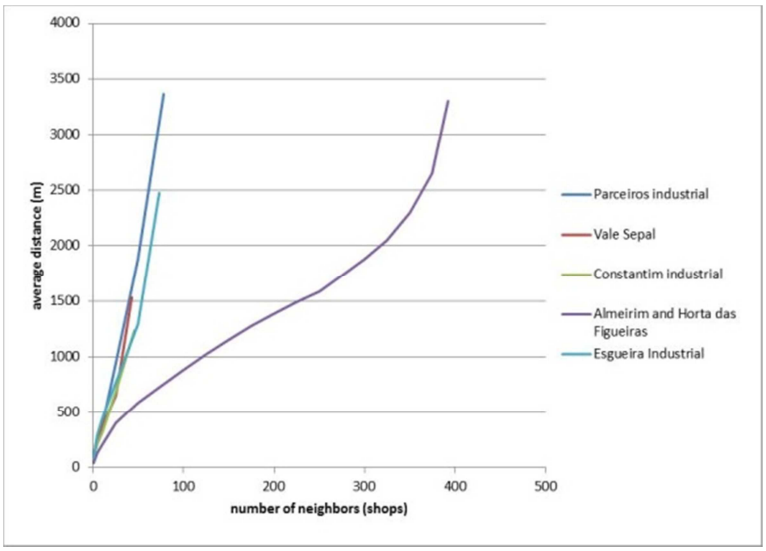
Minimum, maximum and average distance between each store and n neighbors in the residential areas

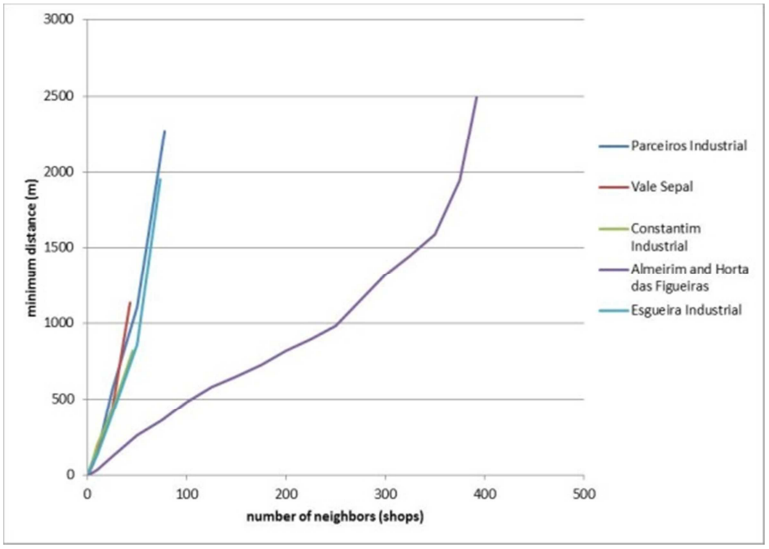


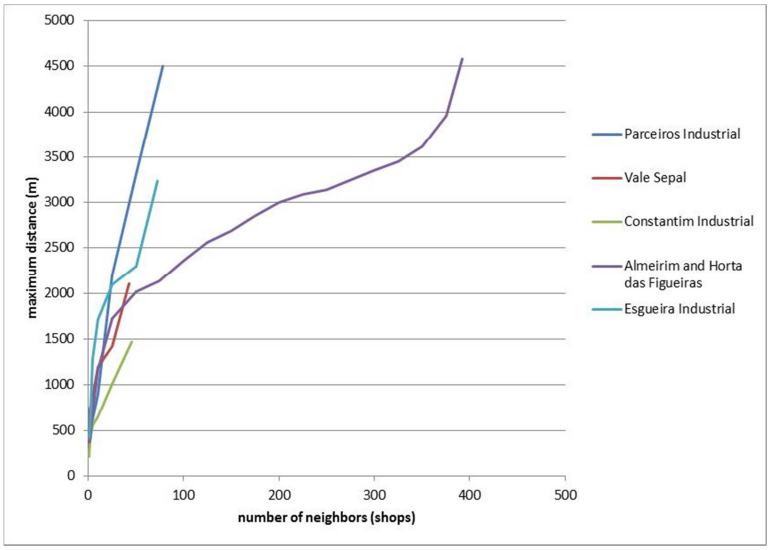




Minimum, maximum and average distance between each store and n neighbors in the isolated residential areas

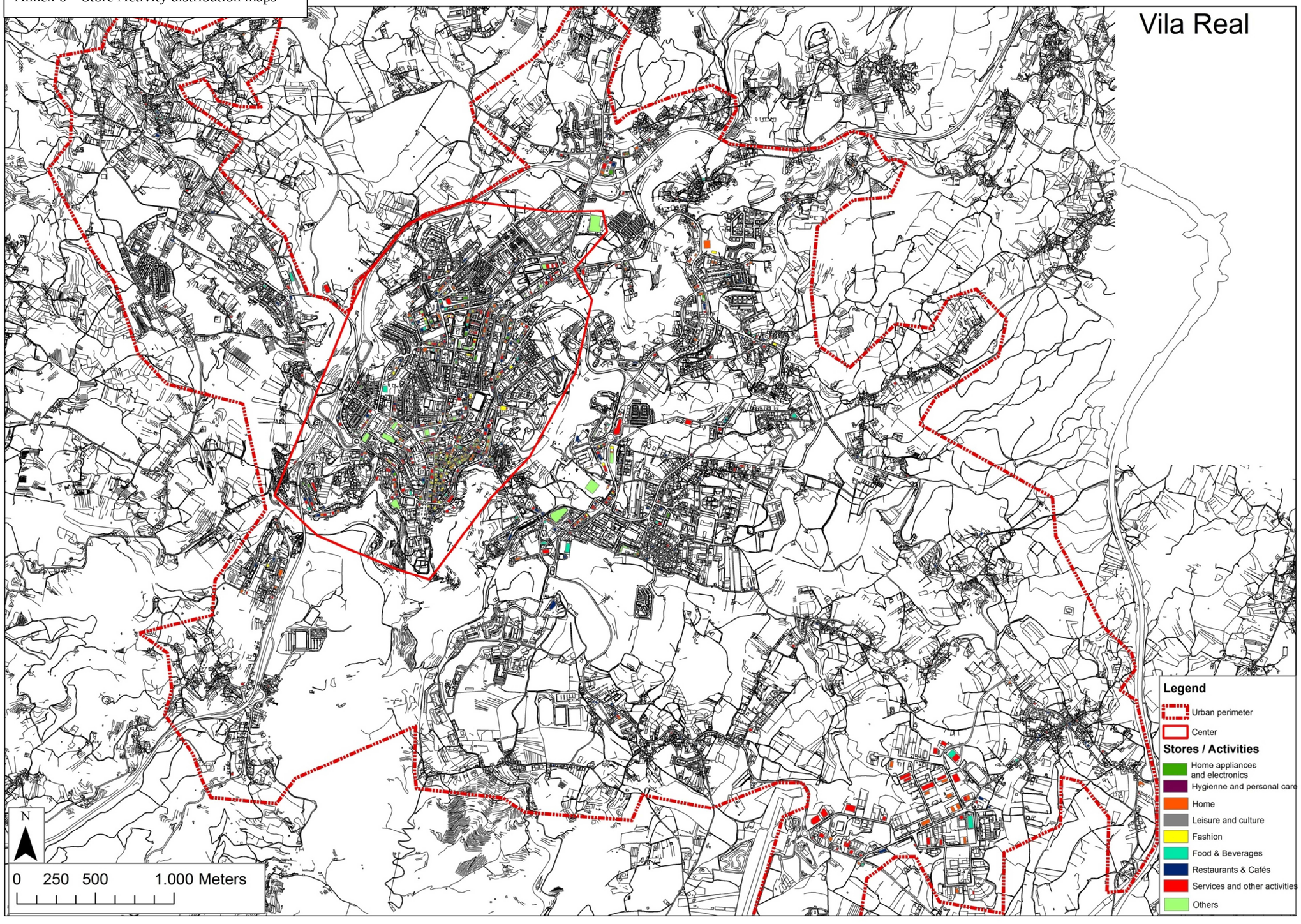


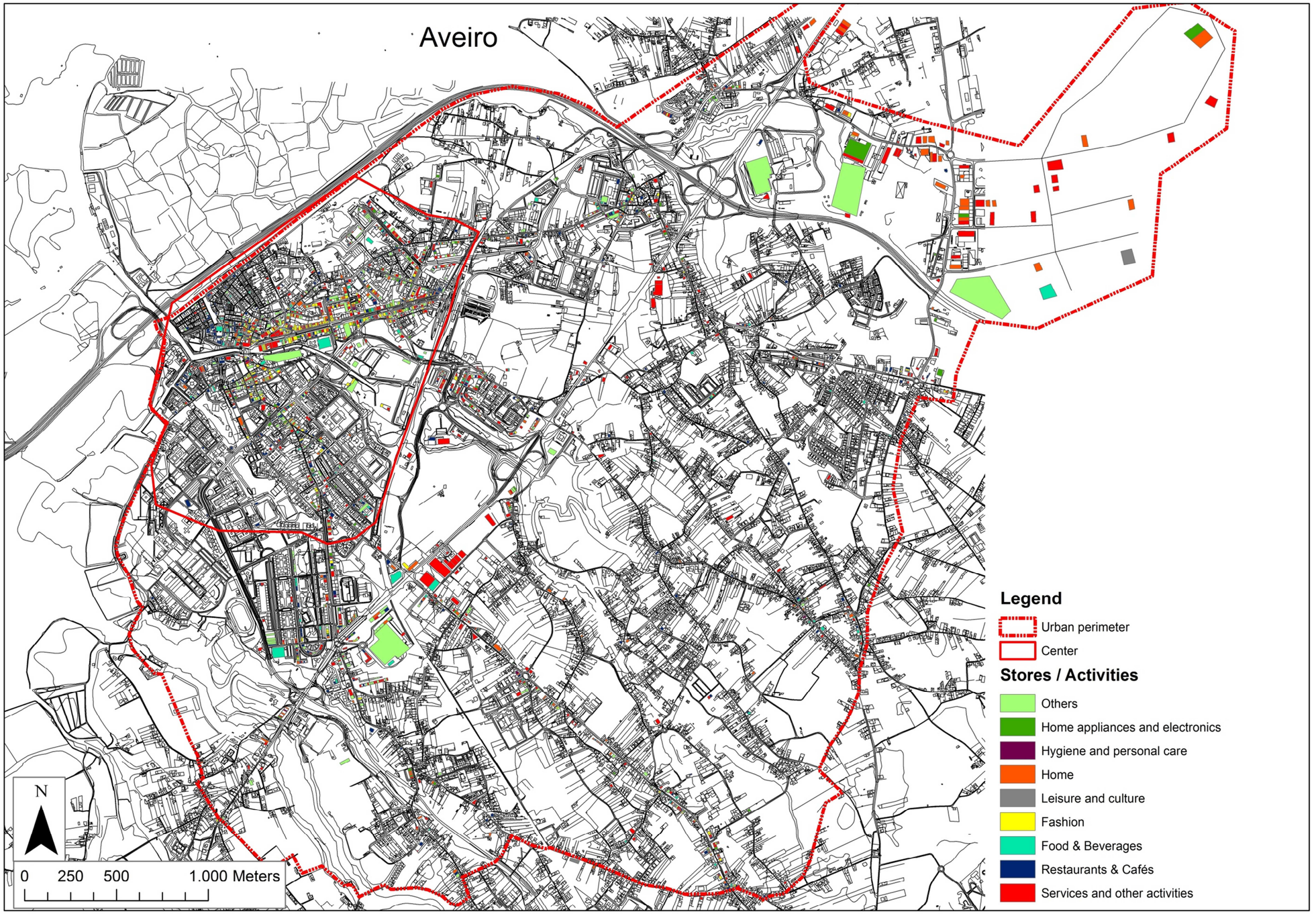


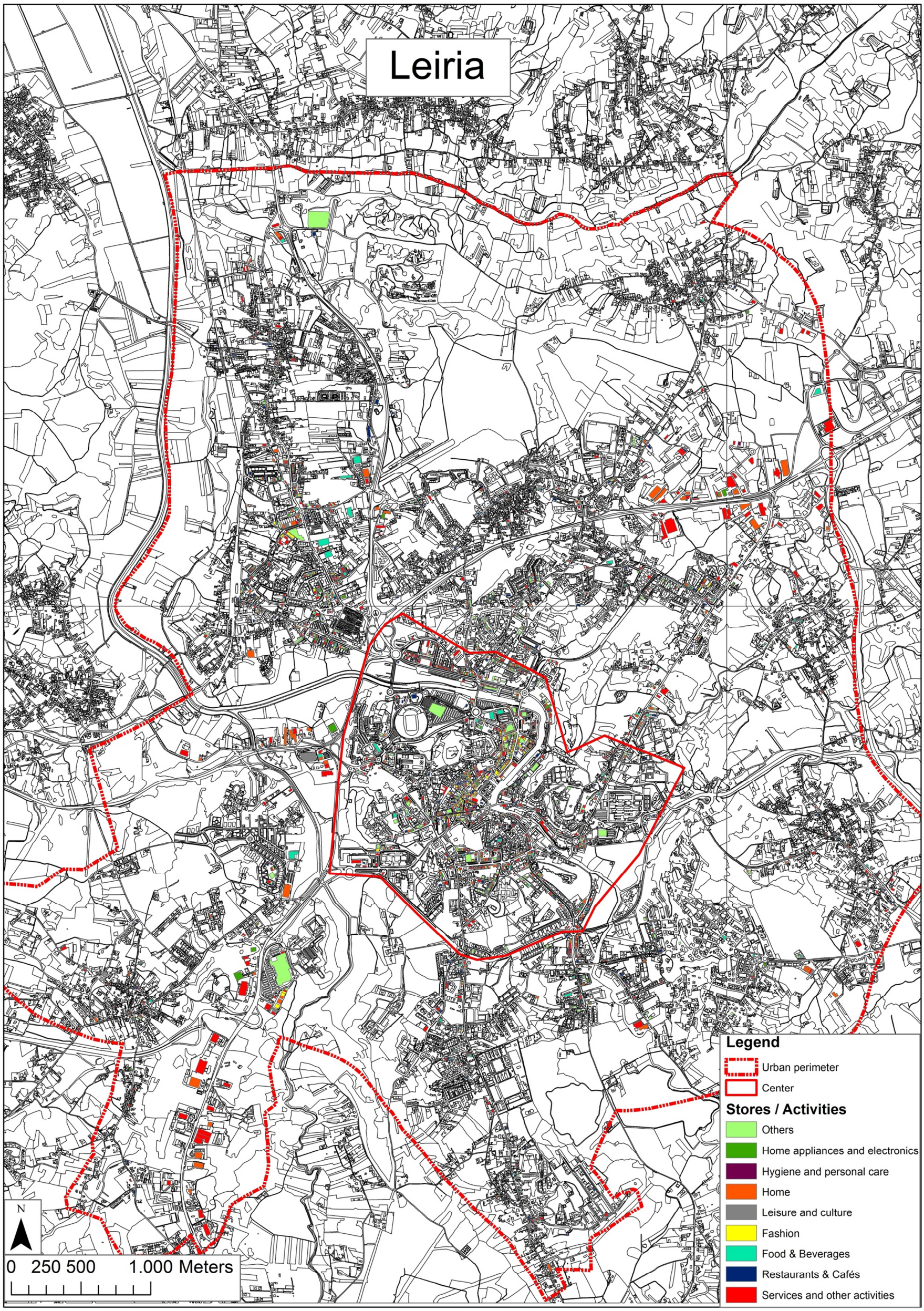


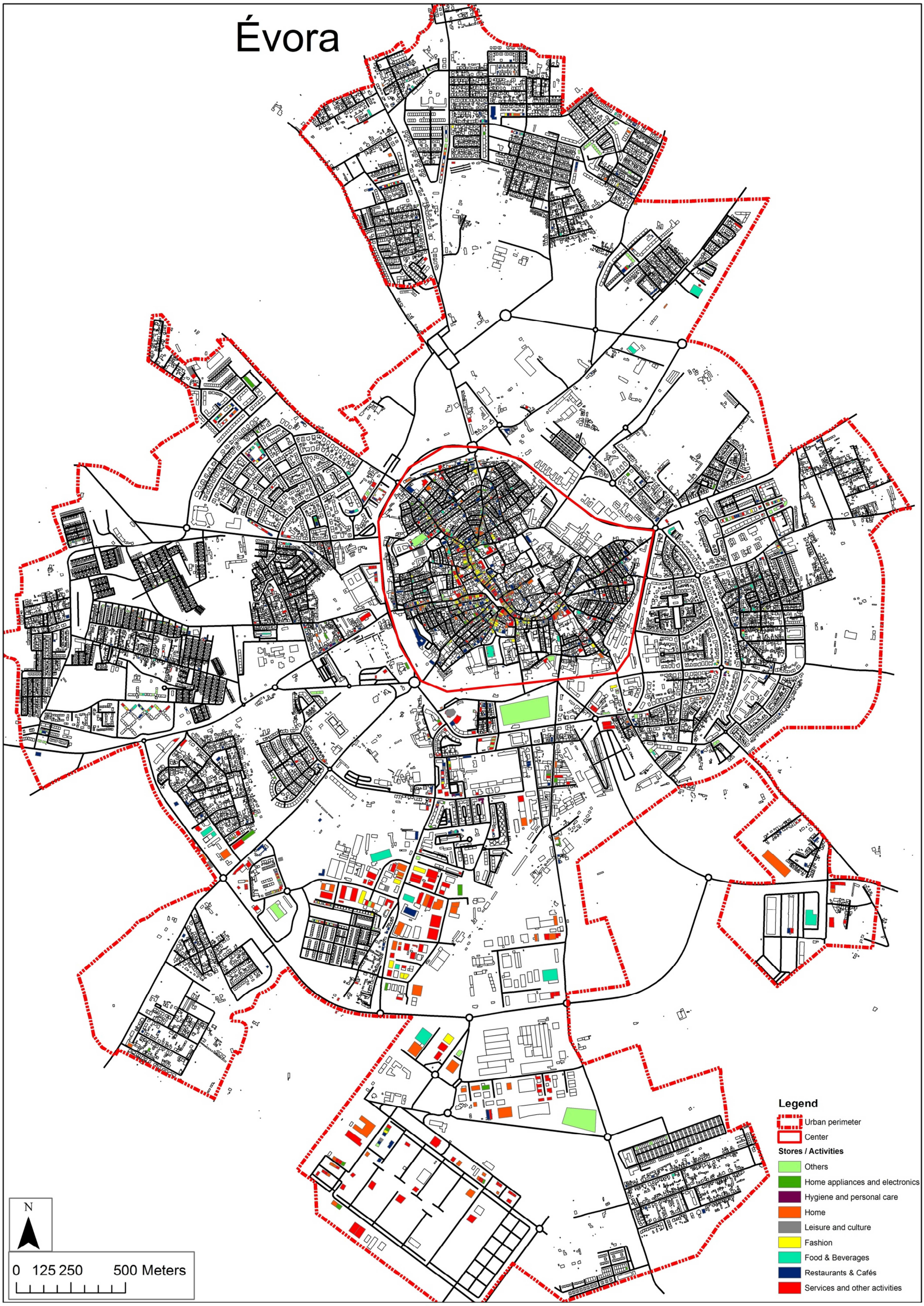
Minimum, maximum and average distance between each store and n neighbors in the industrial areas

Annex 6 – Store Activity distribution maps

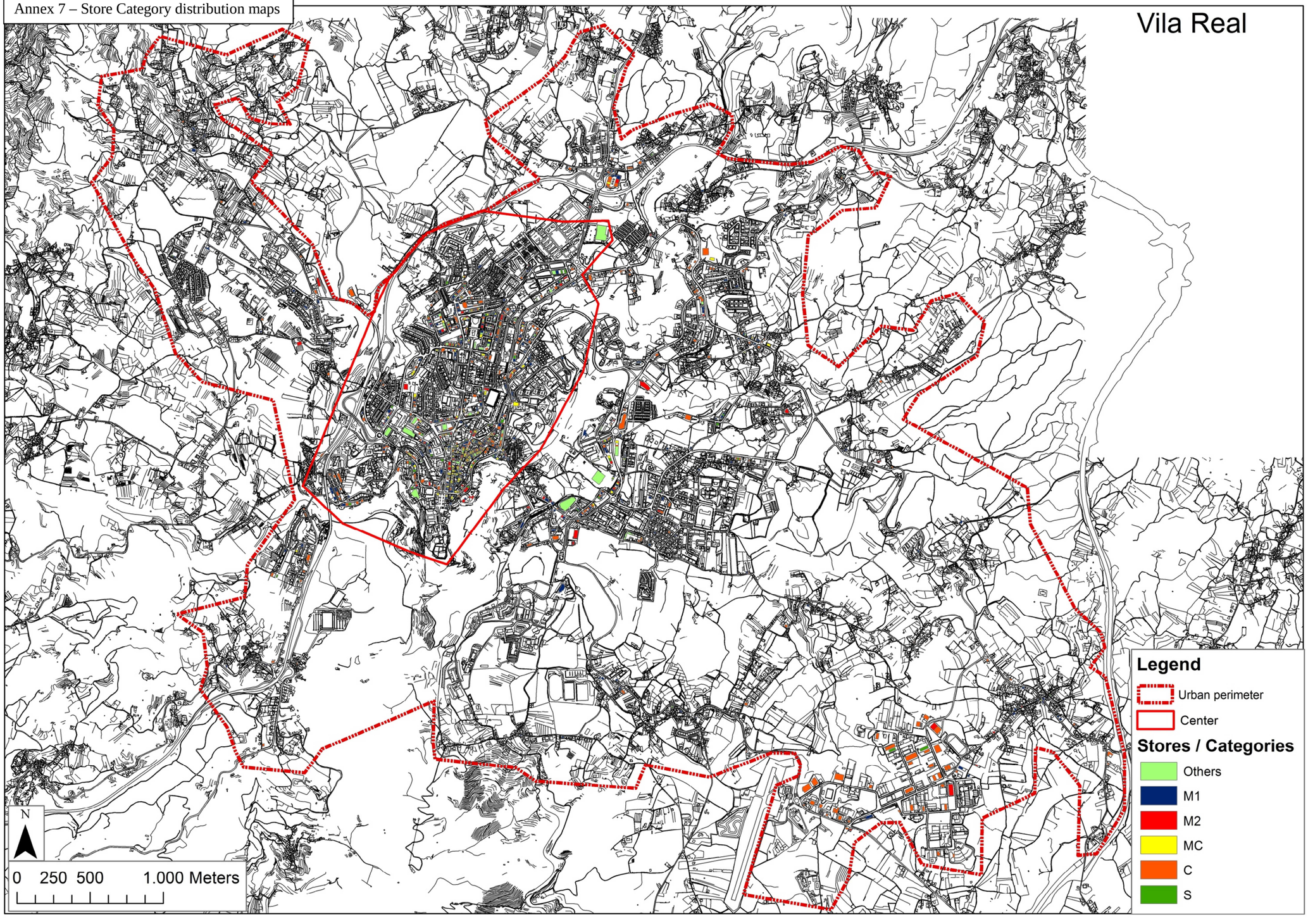


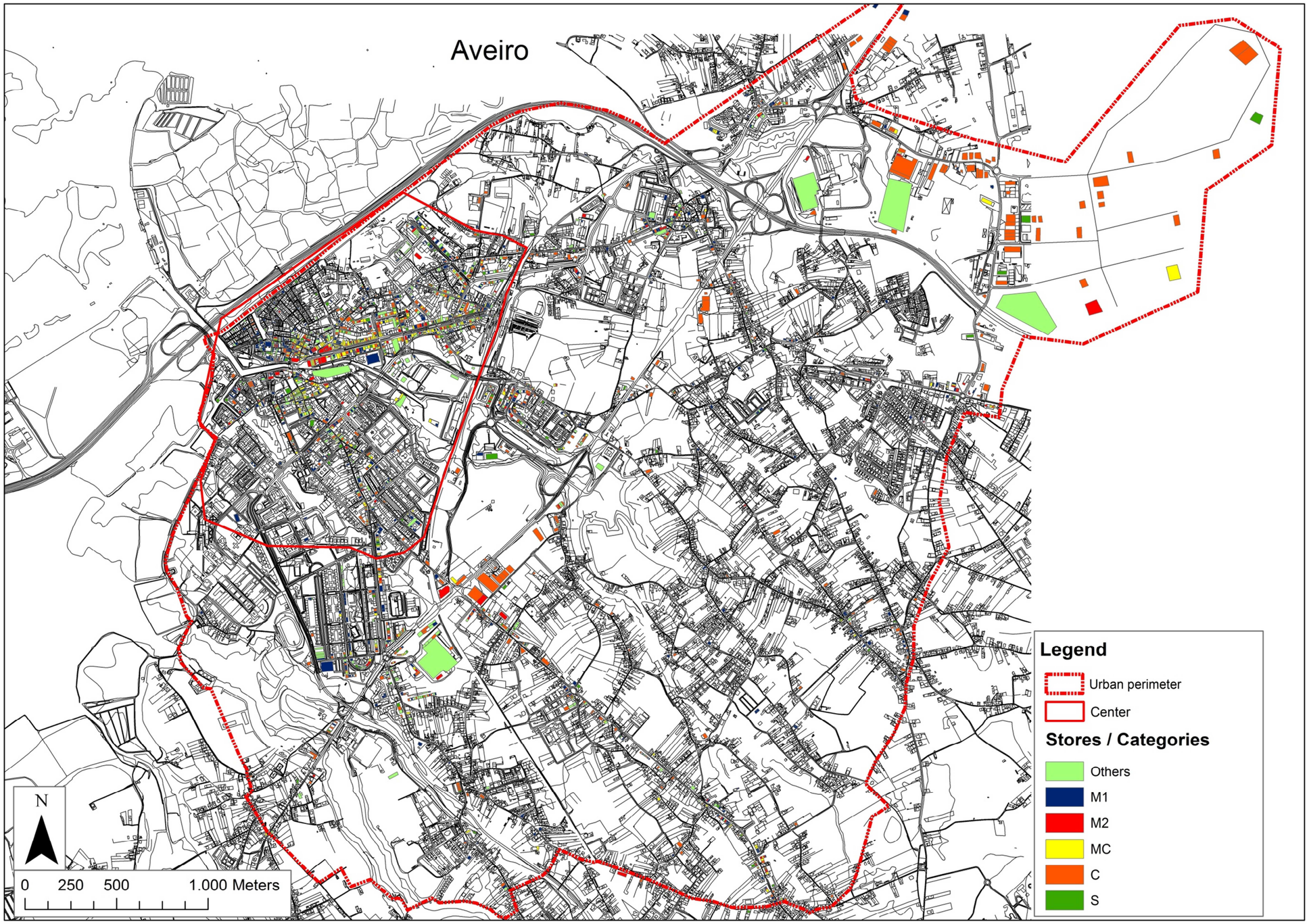

Aveiro
N
0 250 500 1.000 Meters
Legend
Urban perimeter
Center
Stores / Activities
Others
Home appliances and electronics
Hygiene and personal care
Home
Leisure and culture
Fashion
Food & Beverages
Restaurants & Cafés
Services and other activities

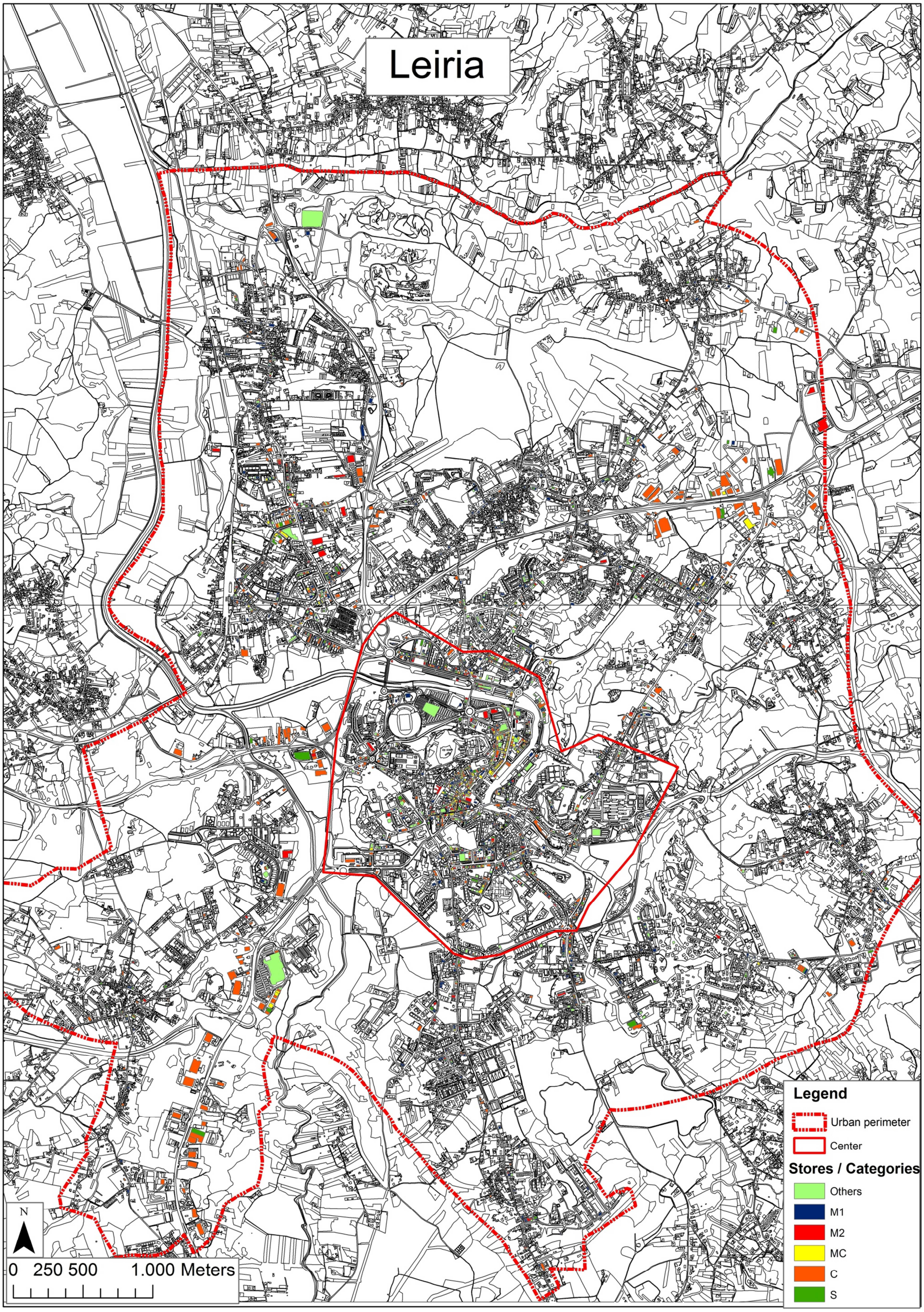

Leiria
Legend
Urban perimeter
Center
Stores / Activities
Others
Home appliances and electronics
Hygiene and personal care
Home
Leisure and culture
Fashion
Food & Beverages
Restaurants & Cafés
Services and other activities
N
0 250 500 1.000 Meters

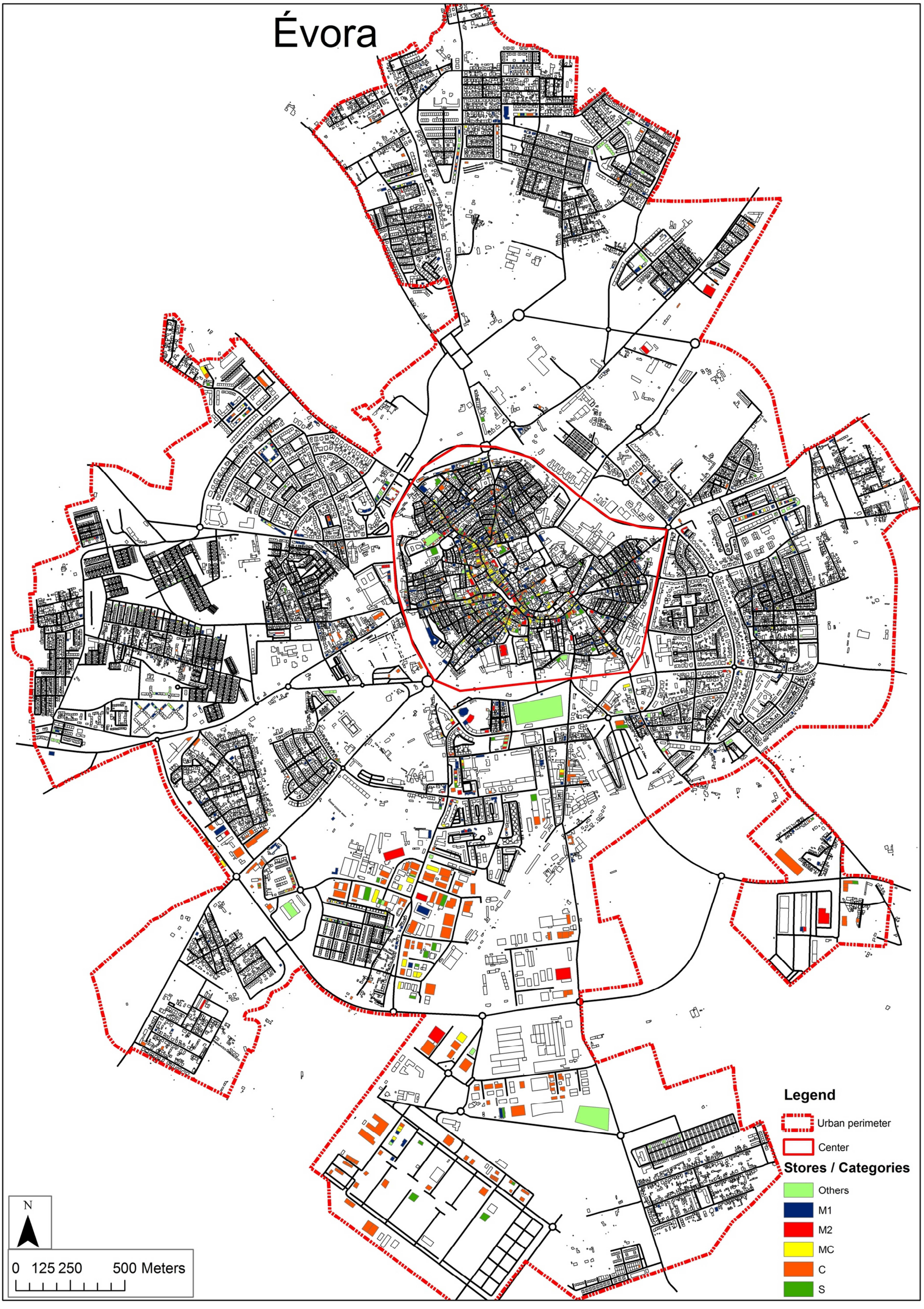

Évora
N
0 125 250 500 Meters
Legend
Urban perimeter
Center
Stores / Activities
Others
Home appliances and electronics
Hygiene and personal care
Home
Leisure and culture
Fashion
Food & Beverages
Restaurants & Cafés
Services and other activities

Annex 7 – Store Category distribution maps

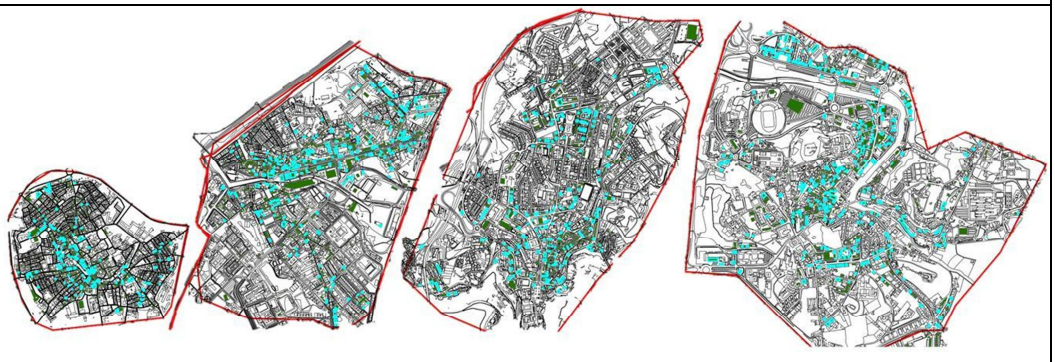


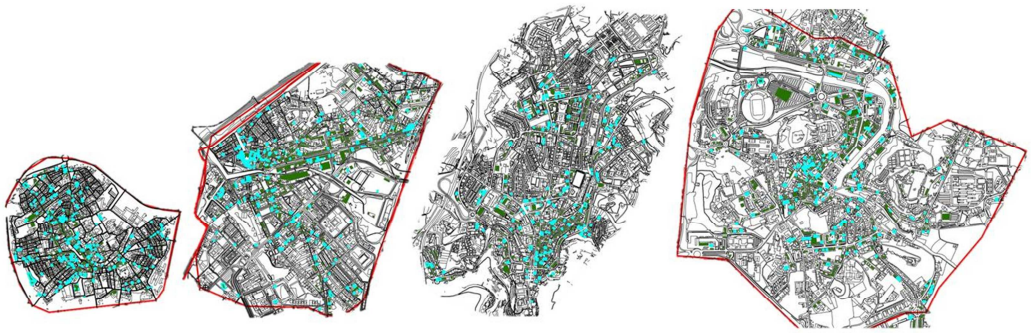

Aveiro
N
0 250 500 1.000 Meters
Legend
Urban perimeter
Center
Stores / Categories
Others
M1
M2
MC
C
S


Leiria
Legend
Urban perimeter
Center
Stores / Categories
Others
M1
M2
MC
C
S
N
0 250 500 1.000 Meters


Évora
Legend
Urban perimeter
Center
Stores / Categories
Others
M1
M2
MC
C
S
N
0 125 250 500 Meters

Annex 8 – Detailed description of the activity and category distribution in the centers

Activity	Services and other activities
Percentage of center stores	29% (L) / 24% (VR, A) / 18% (E)
Description	The distribution of 'Services and other activities' is practically similar in all city centers, with the obvious exception of the absence of a 'new center' of services in Évora. In all city centers, 'Services and other activities' usually avoid the traditional, narrower blocks (where 'Restaurants & Cafés' are more prominent), although they appear in traditional main squares such as the Giraldo Square in Évora and in front of Vila Real's City Hall. Even so, their preference is mostly on larger, two-way, commercial axes, more than often modern ones which appear at the edges of the center, such as the Marquês de Pombal and Adelino Amaro da Costa Avenues in Leiria; the Santa Iria Street and the Aureliano Barrigas Avenue in Vila Real; and the Força Aérea Avenue and portion of the Lorenço Peixinho Avenue in Aveiro. It is this lack of residential/commercial/service axes that drastically decreases the amount of services in Évora's center. 'Services and other activities' also favor intersections, squares and roundabouts. It can be seen that they have a high connection with public transport lines and to the city's landmarks, precisely because they represent a kind of activity that can afford the best locations. 'Banks', 'insurance agencies', 'real estate agencies' and 'travel agencies' are some of the most relevant sub-activities that appear in these locations. And in this case, Leiria's center has almost twice as much banks and real estate agencies than any of the other centers, proving how much service-prone this center is. Nevertheless 'Services and other activities' can also appear both in residential areas and in near-edge-of-center locations. First because this activity contains a series of personal service sub-activities that require proximity to residential neighborhoods. The most important of these is 'Hairdressers', that has and incredible representation in these cities. Actually, one in every five 'Services and other activities' shops in each of these city centers is a 'hairdresser'. 'Beauty parlors' are also common to all city centers, as well as 'laundries', 'health clubs', 'post offices' and traditional stores of 'shoe repair' and 'sewing and tailoring'. All of these appear closer to the residential areas. Second because some sub-activities, namely the car-related ones ('garages', 'gas stations', 'car stands' and 'automobile accessory' stores), require space and accessibility. In Vila Real these automobile related activities have a much greater importance than in the other centers, although none of these stores is in the main axes. In closely defined centers, such as Évora's, it is more difficult to accommodate these activities. Évora's, for example, is the only center that does not possess a gas station. In cities where the center's boundaries are vaster and contain a wider, less dense area at the edges, in closer contact with the periphery, this type of sub-activity becomes more common. This being so, although they present a clustered pattern in all cities, 'Services and other activities' are slightly less clustered in Évora. This is a consequence of a lack of clear service linkage axes.
Location maps (to scale)	

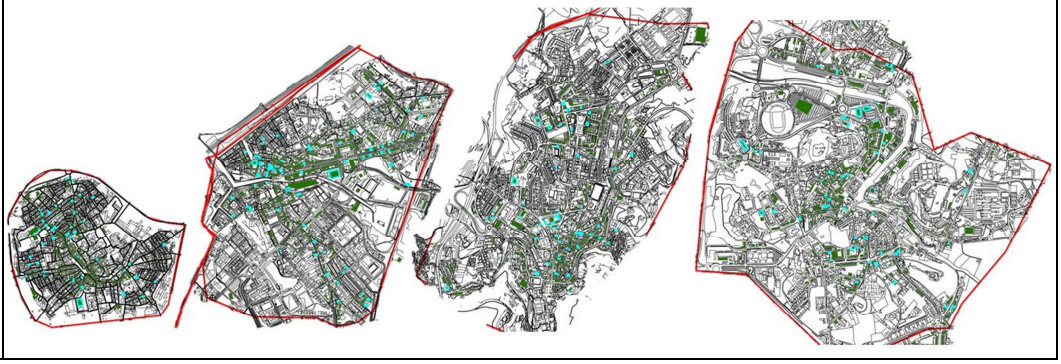
Activity	Restaurants & Cafés
Percentage of center stores	27% (E) / 20% (VR, A) / 17% (L)
Description	'Restaurants & Cafés' have a clear clustered pattern in all city centers. The concentration of this type of store practically occurs at the opposite end of 'Services and other activities'. Older existing axes and the narrower blocks of the traditional center always possess defining rows of 'Restaurants & Cafés'. These also favor main squares and axes, although they usually are not in the main facade, that is, they are not in the most central and visible places. Instead, they are usually one or two turns away. For example, it can be seen that there are only four 'Restaurants & Cafés' directly facing Évora's Giraldo Square, although there are four times as much of these stores in the perpendicular and in the first parallel streets to this square. One fact that remains evident is that 'Restaurants & Cafés' almost never appear alone. Although their concentration is much greater in the traditional centers, when they appear in the linkages, in the new centers and in the residential areas, they generally appear paired. This is why, when viewing how many of these establishments are in post 1975 buildings, the values don't show a clear preference for older buildings, except obviously in Évora. In Leiria's and Aveiro's centers, although lower, these values are not very far from the reference values considering all the stores. Only in Vila Real's center there is a slight increase from the reference value. The amount of new residential areas inside the center may be the justification. In terms of sub-activities, there is a perceptible difference between Évora and Vila Real, and Leiria and Aveiro. The first two city centers have a very similar number of 'Cafés' and 'Restaurants' (about 46% each), whilst Leiria's and Aveiro's have much more 'Cafés' (55%) than 'Restaurants' (30%). Observing that the ratio between the present and the resident population is greater in Leiria's and Aveiro's centers than in Vila Real's and Évora's, this difference may be justified. Likewise, 'Bars' constitute 4% of the 'Restaurant & Cafés' sub-activities in all cities but Aveiro, where they amount to 11%. This is no doubt a consequence of the student population. Although all cities present university poles, Aveiro's is the largest, and the one that has most positively influenced the city.
Location maps (to scale)	

Activity	Fashion
Percentage of center stores	15% (19% E)
Description	The case study city centers possess between 80 to 90% of the urban perimeter's 'Fashion' stores. And even here they are the most densely concentrated activity. A cluster analysis proves that all cities present a very clustered pattern (higher than 'Restaurant & Cafés'), that is even higher in Vila Real's city center. Their presence is restricted almost solely to one or two very strong commercial axes (usually the *Rua Direita* and, to a lesser extent, an important new thoroughfare), and respective perpendicular streets. In Évora the concentration is strongest in João de Deus Street and around Giraldo Square. In Vila Real it occurs around *Rua Direita* and António Azevedo Street, both in the traditional center. In Leiria it lies around Rodrigues Lobo Square, João de Deus Street (perpendicular to *Rua Direita* and Comandante João Belo Street) and Heróis de Angola Avenue. In Aveiro the greatest concentrations are in *Rua Direita* and in Dr. Lourenço Peixinho Avenue, in the portion closest to the traditional center. These concentrations are therefore much stronger in traditional areas, and that is why these stores are majorly in pre-1975 buildings. Newer commercial areas also have a perceptible amount of fashion stores, yet these are more spaced from one another and represent high value multi-national chains, unlike the stores in the traditional axes, which are often family-owned. One of the reasons for the lack of 'Fashion' stores 'in the street' elsewhere can be their overt presence inside shopping centers and commercial arcades. As it is known, the majority of stores inside multi-commercial establishments relates to fashion and food. The small number of 'Fashion' stores outside the traditional center may help to prove that they indeed favor these large scale establishments. And that may be also the reason why the two city centers which have been less permeable to large scale commercial enterprises, namely Évora's and Leiria's, are precisely the ones which have more 'Fashion' stores in their centers. Both have gained modern chain fashion stores in their traditional shopping streets, precisely because these could not go elsewhere. In Leiria, this phenomenon has even been greater. The larger potential of the city, and the fact that Leiriashopping has only opened in 2010 has catapulted the presence of the most famous fashion stores around 5 de Outubro Square. Zara's store is a notable example (Figure 73). The rehabilitation of a derelict traditional building is one of the landmarks of this square. In the commercial concentrations of residential areas, 'Fashion' stores are very rarely found. 'Fashion' is the preferable activity of traditional centers and of 'traditional stores'. It has been the activity that has best survived in these centers. Perhaps, it has also been crucial in helping these centers to survive. The main 'Fashion' sub-activity is 'Clothing'. This sub-activity corresponds to 55% of all 'Fashion' stores in Vila Real's and Évora's city centers and 65% in Leiria's and Aveiro's. 'Shoe stores' represent 12%, 'Eyewear' and 'Jewels' 8% each and 'Fashion accessories' about 5% of the stores in each center.
Location maps (to scale)	

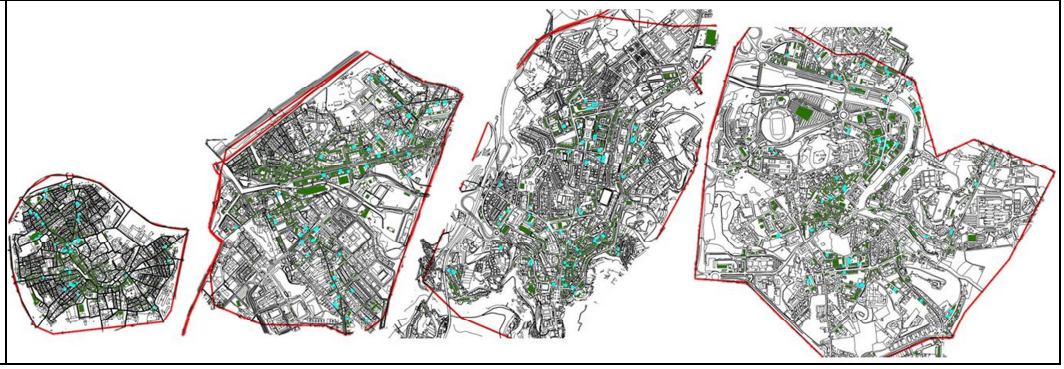
Activity	Home
Percentage of center stores	14% (VR, E) / 9% (L, A)
Description	'Home' stores are mostly located, not so in main axes, but in perpendicular streets to these. Here they appear mostly in pairs. Therefore, actually, these stores usually follow the flow of commerce in these city centers. The small family 'have-everything' or the home-decoration stores also have some significance in traditional centers, but modern takes on the concept are much more common in the intersections which signal the transition between the main axes and the residential areas. Because of this distribution their clustering is more uncertain. Vila Real's and Leiria's centers present weaker clustered patterns and in Évora's and Aveiro's centers there is a chance that they may be random. For the same reasons, the percentages of these stores in buildings constructed after 1975 are very similar to the reference values considering all types of stores. There is only a slight increase in Vila Real, a consequence of the concentration in St. Iria Street, in the new center. In Évora no 'Home' store is in a post 1975 building. In Aveiro and Leiria, 'Home' stores are much more common in the suburbs, in industrial areas and inside shopping centers. These are more modern and usually require larger store areas. It is true that this type of 'Home' store also exists in Évora and Vila Real but there is a much more common type in these two traditional centers, namely small decoration and home article stores, which appear to be much less in Leiria and Aveiro. It is this type of traditional 'Home' store that boosts the percentages of this activity in the more 'traditional' centers. In Évora, the touristic shop selling hand-made products is also an asset to the city's commercial landscape. The articles-for-the-home stores such as 'home decoration' or more traditional ones such as 'have-everything' are the most common 'Home' stores to appear in city centers, and totalize 40% of these stores. 'Furniture' stores are about 20% in all centers except Évora's, in which they only account for 4%. The above mentioned reasons and the lack of large store space inside Évora's city center may justify this decline. On the other hand, 'Construction materials' constitute a large chunk of Vila Real's center 'Home' stores (17% against 9% in the other three centers). Analyzing these types of stores more carefully it can be seen that Vila Real has a higher representation of traditional and technical stores, selling, for example, tools and construction materials, but a much less representation of more refined home stores. A clear example is the sub-activity 'textiles for home', which in Vila Real's center correspond to only 3% of the 'Home' stores, but in Leiria's and Aveiro's centers amounts to 15%. Vila Real's greater connection to surrounding rural areas may be the reason for these differences.
Location maps (to scale)	

Activity	Leisure and Culture
Percentage of center stores	7%
Description	'Leisure and culture' establishments present a tendency to concentrate in particular areas usually not far from the main axes. This is clearly perceptible in Évora, where they concentrate East of Giraldo Square, and in Vila Real, where they are around *Rua Direita*. Otherwise they are mostly represented by one or two establishments in practically all residential areas, especially in terms of 'news-stand' establishments. Because of this 'Leisure and culture' establishments present a random pattern that can only be clustered in the above mentioned areas. The pattern of these stores is only clearly clustered in Aveiro, but this may be explained by the fact that these establishments orbit the almost continuous line made by *Rua Direita*, Dr. Lourenço Peixinho Avenue and Força Aérea Avenue. Consequently, considering just buildings constructed after 1975, the percentage of 'Leisure and Culture' remains similar to the reference values, except in Vila Real. Here, because these establishments are clearly around *Rua Direita*, the percentage is lower. The most relevant 'Leisure and culture' sub-activity is the 'Stationary/news stand' store, representing about 30% in each city center. These appear both in main commercial axes and in the residential areas, and have the advantage of being able to fit in vary small locations, and even in provisory out-of-building locations (kiosks). Other 'Leisure and culture' sub-activities include 'Sports goods', 'Flowers and Plants' (both around 10% of 'Leisure and culture' stores) 'Photo shops', 'Art Galleries' and, to a lesser extent, 'Toy' stores' and 'Libraries'. It is proved that there are more, and more specific types of store ('fishing', 'musical instruments') in Leiria's and Aveiro's centers than in Vila Real's and Évora's.
Location maps (to scale)	

Activity	Food & Beverages
Percentage of center stores	6%
Description	'Food and Beverages' stores assume a paramount importance, because they are almost exclusively associated to first necessity (M1) products. Consequently, these stores do not follow the line of the main

	central axes, but are rather near the main intersections of those axes, and closer to residential and traditional areas. In these, there are particular squares which are often food-related, such as the Peixe Square in Aveiro[437], and that in Vila Real's Santa Sofia Street (where the city's market is located). These establishments also like competition and complementarity, as they often appear in pairs. When located in the main axes, they are farther from the central portions (favored by services) and are as close as possible to the residential spaces, but without losing their centrality. The concentration on the East portion of Dr. Lourenço Peixinho Avenue in Aveiro is an example of this phenomenon. Near main landmarks, there is always at least one of these stores. If family owned food stores are a prerogative of traditional areas, chain supermarkets have the tendency to drift towards newer residential areas. Vila Real is the most 'traditional' locality in terms of 'Food & Beverages' supply stores. There are only 2 hypermarkets in the entire urban perimeter, both inside multi-commercial facilities (Continente and the 'Jumbo' store inside Dolce Vita Douro), and both at the edge of the city center[438]. Consequently, inside Vila Real's center there are 60% of all the city's grocery stores, 53% of all minimarkets and 78% of all the supermarkets. These are eight: two 'Pingo Doce', one 'Minipreço', two 'Viva Aqui', one 'Frescos & Companhia' and one traditional. If 'Minimarkets', 'Grocery stores' and 'Supermarkets' represent each between 10-15% of the center's 'Food & Beverages' stores, 'Butcher' alone represents 30%. Aveiro is also a strong 'Food & Beverages' locality, and it has been much more permeable to newer formats. It has only one grocery store, but is possesses almost half (17) of the urban perimeter's minimarkets (which account for 22% of the 'Food & Beverage' establishments in the center) and 11 (of 19) supermarkets (which account for 15%). These are two 'Minipreço', two 'Spar', two 'Pingo Doce', one 'Merco Bairro', one 'Sclecker', one 'Bio Bom' and one 'SuperCor'. On the other hand, Évora and Leiria, both with strong residential poles outside their city centers, have a poorer representation of 'Food & Beverage' stores inside. In Évora only 2 of the 13 supermarkets of the city are in the center (one traditional and one 'Frescos e Companhia'). Grocery stores are also poorly represented. To balance, most of the 'Food & Beverage' stores in the center are 'Minimarkets' (20, representing 40%). As the other 'Food & Beverages' sub-activities all possess less than a 10% representation, it is proved that the food supply structure in this city center is based on these small minimarkets. As for Leiria, 36 of the 53 hypermarkets and minimarkets, as well as all 3 hypermarkets the city possesses are outside the city center. In the center there are only 8 supermarkets (five 'Ponto Fresco', one 'Pingo Doce', one 'Spar' and one 'Lidl'). Supermarkets and minimarkets account each for 15% of the sub-activities, whilst butchers account for 17%. Even so, in Leiria, these stores are more spatially organized, because the commercial concentrations of the residential areas inside the center are also more spatially organized. That is the reason why Leiria's 'Food and Beverages' have a clustered pattern, whilst in Vila Real and Aveiro this pattern can be either clustered or random and in Évora it is random or dispersed. The strength of the patterns seems to be entirely connected to the amount and distribution of residential neighborhoods inside the center. Other representative sub-activities of 'Food and Beverages' are 'Dietetic products', 'Sweets' 'Drinks' and 'Fruits and Vegetables'. It should be noted that traditional single product activities such as 'Fishmongers', 'Bakers' or 'Herbs and Teas' (with the exception of butchers), have very little significance (1 or 2 shops each per city center). This means that today most centers practically depend solely on multi-product food establishments.
Location maps (to scale)	

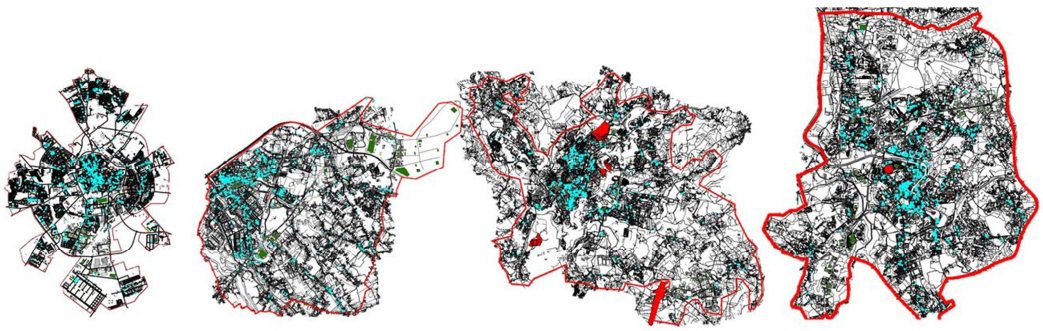
[437] Literally, the Fish Square, where the Fish Market and other 'Food & Beverages' stores are located.
[438] Continente was, as mentioned earlier, considered as part of the city center.

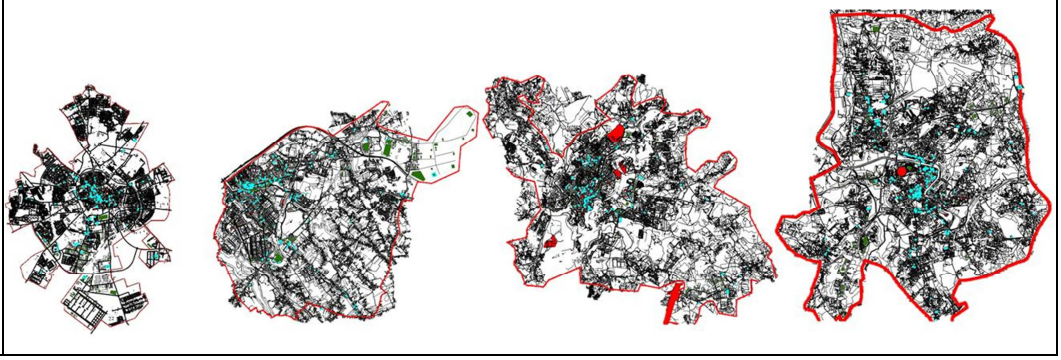
Activity	Home appliances and electronics
Percentage of center stores	4%
Description	'Home appliances and electronics' stores, like 'Home' and 'Food & Beverage' stores, are located in main axes but way from their core, that is, closer to the transitions to residential areas. Examples are the Cândido dos Reis and the Raimundo[439] Streets in Évora; the Almirante Cândido dos Reis and the S. Sebastião Streets in Aveiro; the Heróis de Angola and the Combatentes da Grande Guerra Avenues in Leiria, and the Boavista Street[440] in Vila Real. Yet these stores are few and farther apart. Hence the analysis shows a clustered/random pattern in Vila Real, Aveiro and Leiria, and a random/dispersed pattern in Évora, where, once again, the lack of strong commercial poles in residential areas may be the cause. This is proven by the fact that the percentages of these stores in buildings constructed after 1975 is higher than the reference values, meaning that they prefer newer areas. 'Home appliances' and 'Computers' correspond each to about 20-25% of all 'Home appliances and electronics' sub-activities. 'Telecommunications' are also important, especially in Vila Real' center, as well as 'Electronic articles and materials', especially in Leiria's and Aveiro's centers. Vila Real's and Évora's centers have, on the other hand, more 'have-everything' stores. By realizing that the most important sub-activities of 'Home appliances and electronics' correspond to products sold in the great commercial surfaces (TVs, fridges, computers) it may be understood why 'in the street' these stores have a very small percentage, and why in Évora and Vila Real there is a greater amount of traditional family stores that still retain this activity.
Location maps (to scale)	

[439] This street is parallel to both the Romão Carvalho and the Serpa Pinto streets signaled in Figure 57, and connects the Giraldo Square to a ring road roundabout Southwest of the city center.
[440] A perpendicular to Cândido dos Reis Street.

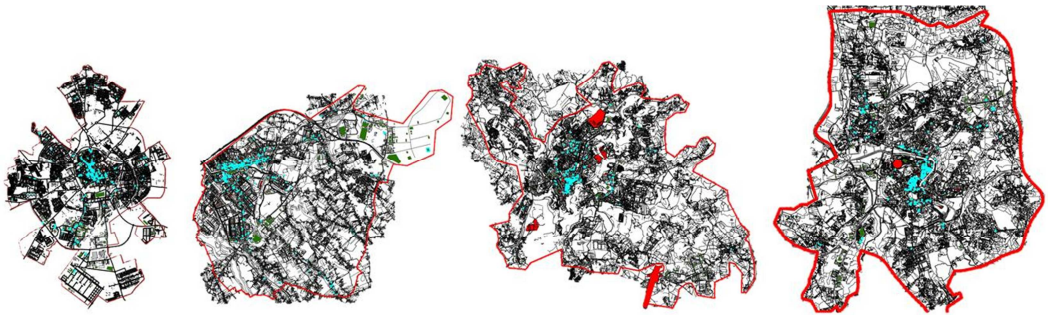
Activity	Hygiene and personal care
Percentage of center stores	2%
Description	'Hygiene and personal care' stores are very few and present a dispersed or random pattern in all city centers. Nevertheless a visual analysis reveals a sort of linearity in their distribution. The truth is that they appear to cover all the strategic points along or around the main commercial axes. Only occasionally there are small clusters of three or four stores, such as in Cândido dos Reis Street in Vila Real or in José Estevão Street[441] in Aveiro. 'Pharmacies' account for most of 'Hygiene and personal care' stores. They correspond to 40% of these stores in Leiria's and Aveiro's centers, and almost 60% in the other two cities. 'Perfume and Cosmetic' stores, as well as 'articles for hairdressers' account for most of the other sub-activities.
Location maps (to scale)	

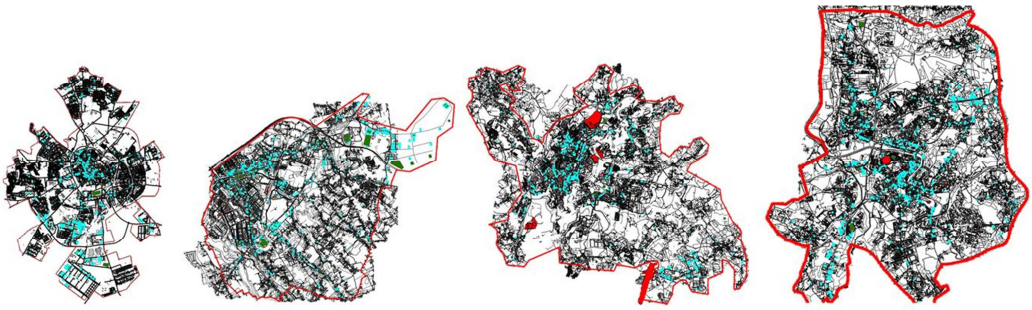
[441] The paralell street, to the East, of Mercadores Street.

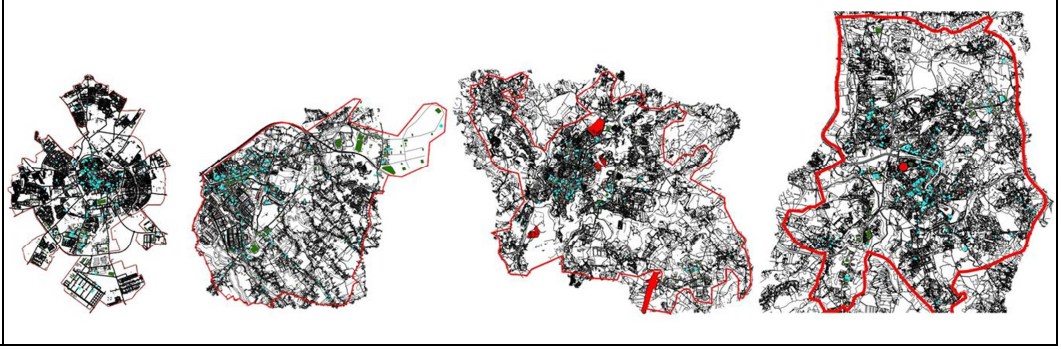
Activity	M1
Percentage of center stores	30% (A, L) / 37% (E, VR)
Description	M1, the establishments related to first necessity goods of local accessibility are, obviously, the most common in the four city centers. In Aveiro's and Leiria's city centers they represent 30% of all stores, whilst in Vila Real's and Évora's they represent 37%. This difference is once again a remainder of the distinct roles these two sets of groups (littoral and interior) perform. These percentages hardly change considering just buildings constructed after 1975, which means that these stores appear regardless, with the same proportion. This is an activity which is perfectly clustered in all cities, primarily because it has an all-around occupation. It is primarily located in main axes, intersections and squares, both of first and second importance. Yet it is also in the traditional city center, in thoroughfares exiting the center and in commercial axes or single concentrations of residential areas. The place where they clearly are not is in the central portions of the main, newer, edge service/residential thoroughfares. This is because here the primacy is 'Fashion' and service agencies, and M1 stores represent mostly 'Restaurants & Cafés' and a specific kind of 'Services and other activities', mostly home- and beauty-related, such as 'hairdressers', 'beauty centers' and 'laundries'. Actually, 'cafés', 'restaurants' and 'hairdressers' add up to 70% of all M1 stores in the city centers. Relevant M1 stores are also those belonging to 'Food & Beverages' (minimarkets and butchers) and 'Leisure and culture' (mostly news-stands).
Location maps (to scale)	

Activity	M2
Percentage of center stores	9%
Description	M2 stores account for about 9% of all stores in the four centers, and the proportions change little when considering buildings constructed after 1975, once again meaning and even dispersion between older and newer buildings. M2 stores are more concentrated than M1 stores. They cluster around main squares (for example the Giraldo Square and the Joaquim António de Aguiar Square[442] in Évora) or in specific axes of the traditional center (as José Estevão Street in Aveiro). In the rest of the traditional center they are rarely found. In the commercial concentrations of newer residential areas, however, they are almost always present, even if by just one or two stores. This fact may be enough to make the pattern less clustered. Actually, they only present a clearly clustered pattern in Leiria, where the old center and the new commercial rows are perfectly linked by ribbons. In Évora and Vila Real the pattern is also clustered but to a lesser extent. In Aveiro, the pattern may either be clustered or random, and this may be because the main commercial axes are clearly defined and the complementing residential outposts are farther apart and often not commercially linked. The main M2 activity is 'Services and other activities', especially in Leiria. This is mostly due to the importance of the 'Bank' sub-activity, which accounts for 40% of M2 stores in Leiria's center, and 30% in the others. 'Leisure and culture' is also important (more so in Évora's and Vila Real's centers) mostly because shops like 'Flowers and plants', 'Photography' and 'Toys' appear in most neighborhoods. 'Library', on the other hand, has a much smaller representation in Vila Real. The lower percentages in Aveiro's center of the two above mentioned activities are balanced by the 'Food & Beverage' stores. These represent 37% of Aveiro's center M2 stores, against less than 25% in the other centers. This is because Aveiro's center has a great amount of 'Supermarkets' while 'Drinks' (in Évora), 'Sweets' (in Vila Real and Aveiro) and 'Dietetic food products' (in Aveiro) are also relevant. 'Shoe repair' accounts for about 5% of M2 stores and many activities which serve residential areas have about 1 or 2 stores in each city, such as 'Video rental', 'Pet shop' or 'Musical instruments'.
Location maps (to scale)	

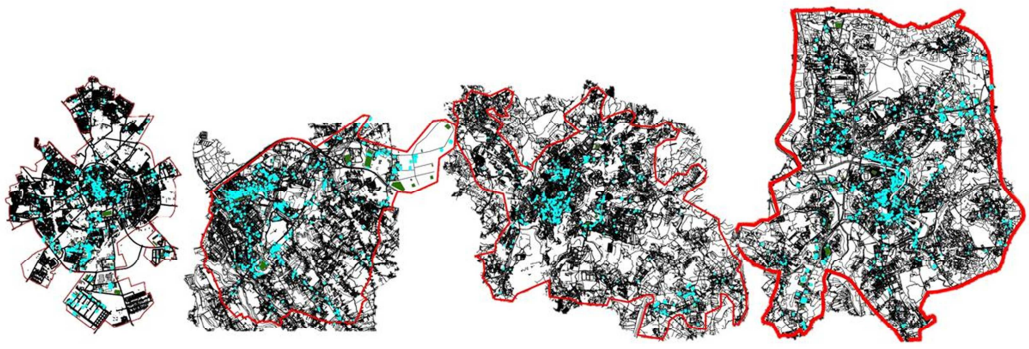
[442] Facing José Elias Garcia Street.

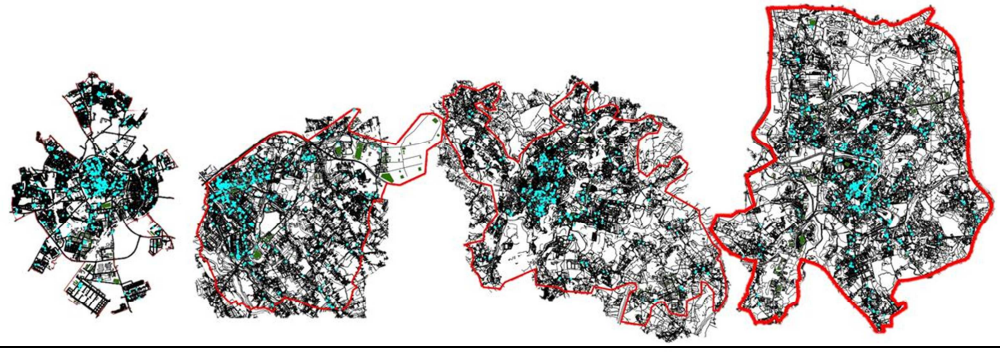
Activity	MC
Percentage of center stores	10% (24% E)
Description	MC stores amount to 20% of all the stores in these city centers except in Évora's (20%). Almost 80% of MC stores are 'Fashion' stores, mostly of the following sub-activities: 'Clothing', 'Shoe Stores', 'Eyewear', 'Fashion accessories' and 'Jewelry'. Consequently, MC stores have a pattern very similar to 'Fashion'. They are obviously situated in older buildings, namely on the main central axes (including *Rua Direita*) and they lack in main thoroughfares (a place which is occupied by C stores). In residential areas, these stores clearly are not in the main commercial axes, which are filled with services and restaurants, and they more than often fail to be in commercial residential clusters. Obviously, their presence here is not due to 'Fashion' stores but by those of 'Services and other activities' (mostly 'travel agency'), 'Leisure and Culture' (mostly 'sporting goods') and 'Home appliances and electronics' (mostly 'telecommunication' stores). Due to this diversity, MC stores manage to present clustered patterns. In Vila Real these are less strong, which no doubt is a consequence of the divided centers.
Location maps (to scale)	

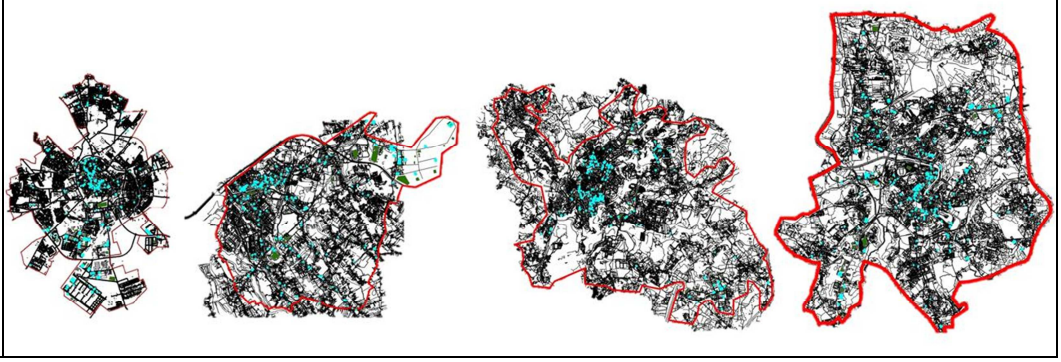
Activity	C
Percentage of center stores	16% (E, A) / 20% (L) / 25% (VR)
Description	C stores correspond to 16% of all stores in Évora's and Aveiro's centers, 20% in Leiria's and 25% in Vila Real's. They have a slightly larger tendency to be located in post 1975 buildings, especially in Leiria, because they are more common in residential areas than in the central places. They generally occupy residential main streets and squares (such as the intersection between the Mártires Street and the 25 de Abril Avenue in Leiria) and the principal residential connections to the suburbs or 'last axes' of the center (such as Dona Glória Barata Rodrigues Street in Leiria). Closer to the center's center, C stores are usually in perpendicular and parallel streets to the main axes. Although they can also appear in these, the concentrations are generally one turn away, such as in Cândido dos Reis and Santa Iria Streets in Vila Real; or Eng. Von Haffe Street in Aveiro. The pattern of C stores is clearly clustered, except in Évora, where it may be random. This is because this center has very few new residential buildings with stores where concentrations could occur. Actually the greatest concentration of C stores in this city center is in 5 de Outubro Street, a pedestrian street uniting the Giraldo Square with Évora's Cathederal. Here the stores are touristic-oriented, selling hand-made traditional products. This is why in Évora 70% of C establishments belong to the 'Home' activity, against about 50% in the other city centers. The most relevant sub-activities of this nature are traditional 'have-everything' stores (particularly in Vila Real and Évora), 'Home decoration' (except in Vila Real) and 'Furniture' (except in Évora). In Vila Real, the percentage of 'construction materials' is almost twice as much as in the other city centers. On the other hand 'Services and other activities' account for 40% of C stores in Leiria's city center, 26% in Aveiro's and Vila Real's and only 11% in Évora's. In Leiria and Aveiro, for example, 'real estate agencies' have three times the percentage as in the other two centers. In Vila Real and Leiria there are more car related sub-activities. Despite some residual 'Hygiene and personal care stores' in Vila Real and Aveiro the rest of the C stores are represented by 'Home appliances and electronics', mostly because of 'Home appliances' shops and 'Computers'.
Location maps (to scale)	

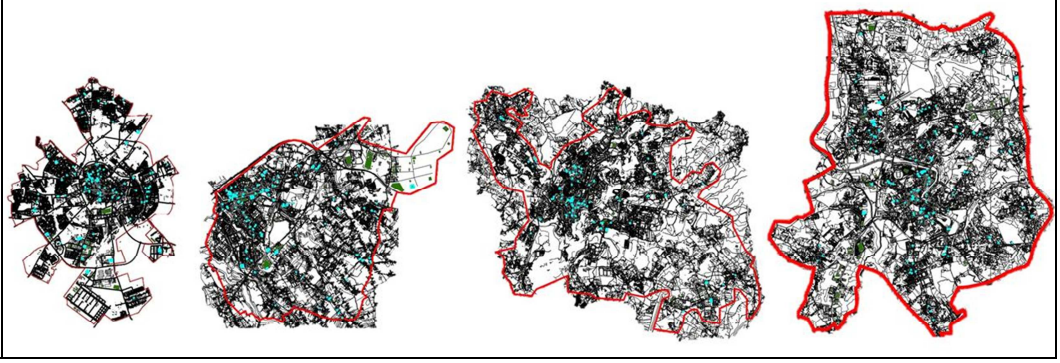
Activity	S
Percentage of center stores	8% (6% VR)
Description	Lastly, S stores correspond to about 8% of the center's stores, except in Vila Real (6%). These have a slightly greater tendency to be in buildings constructed after 1975. S stores dot the main commercial areas, more spaced than other activities. Yet there are very few of these stores in main axes, intersections or roundabouts. Instead, they appear in perpendicular and parallel streets to the main axes, and in residential thoroughfares, namely those which also possess miscellaneous services (such as Dr. Adelino Amaro da Costa Avenue in Leiria). Nevertheless, there are concentrations of S stores in the traditional center, concerning the arts, entertainment or night district (around Peixe Square in Aveiro for example). In outer residential localities, the number of S stores is small and they appear sporadically, mostly isolated, although they practically don't miss a neighborhood, at least in the center. This is the reason why their pattern is the most uncertain. Aveiro is the only city where the pattern is consistently clustered (although it is not very strong), probably due to the weight of the nightlife district and the gravitational pull of the two main axes. In Leiria the clustered pattern may be random, in Évora the random pattern may be dispersed, and in Vila Real the pattern is probably random. S stores represent 3 activities, 'Services and other activities', 'Leisure and Cultures' and 'Restaurants & Cafés'. The first accounts for 80% of the S stores in Vila Real's and Leiria's center, 73% in Évora's and only 63% in Aveiro's. This does not mean that Aveiro's center has less services. It is just that the weight of 'Restaurants & Cafés' is heavier due to the concentration of 'Bars' (24% in Aveiro against 10% in the other cities). 'Insurance Agency' is the most common sub-activity, as well as 'Other' services, not specified. 'Rent-a-car' and 'Health Club' are more relevant in Leiria's and Aveiro's centers, and 'Copy Centers' and 'Funeral Homes' appear in all cities, except this last sub-activity in Aveiro. There are 4 post offices in Leiria and Aveiro's city centers, and two in the other two cities. The number of 'Leisure and Culture' establishments categorized as S stores is about the same in all cities, but the comparative percentage is largest in Évora. 'Art galleries' account for one third of these stores and 'Cinemas', 'Theaters', 'Games' and 'Night clubs' account for the rest, although their numbers are reduced, with only one or two per center.
Location maps (to scale)	

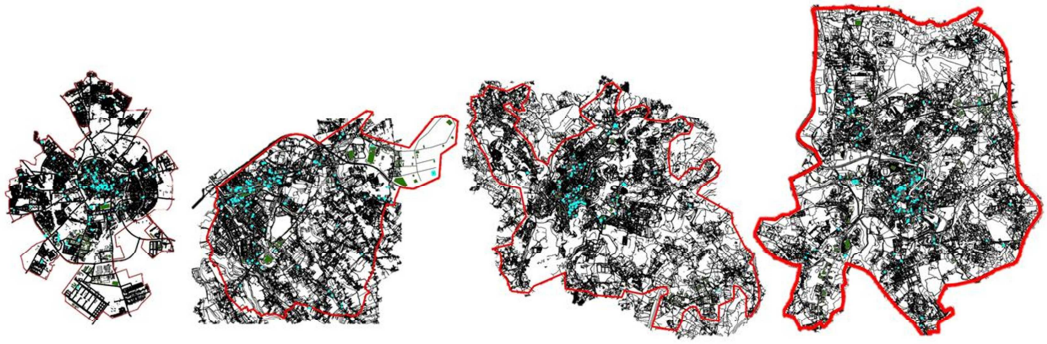
Annex 9 – Detailed description of the activity and category distribution in the peripheries

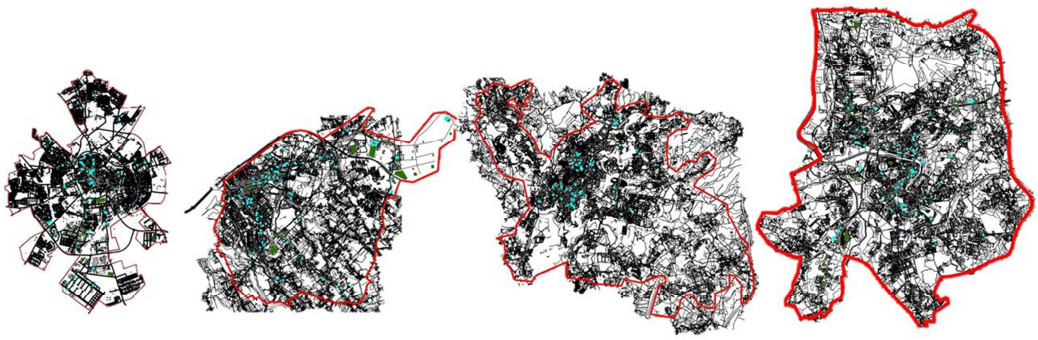
Activity	Services and other activities
Percentage of stores	32%
Description	Services and other activities' not only have once again the greatest overall significance (over 1/3 of all peripheral stores) and occupy the greatest commercial area, they also have an increase in weight, especially in the more 'traditional cities'. This is a consequence not only of the amount of car-related sub-activities and of industrial/commercial warehouses, both of which require space, but also of the personal services inherent to dense residential areas, such as hairdressers, banks, and real estate agencies. It is precisely these three types of sub-activities; car-related (accessories, stands and garages), 'hairdressers' and service agencies (banks, insurance and real-estate) that constitute the most important sub-activities of 'Service and other activities' in the peripheries. Because of the lack of these services in Évora's city center, and of the large amount of residential population in this city's periphery, the percentage increase of 'Service and other activities' is greater in this city than in any of the others. 'Services and other activities' have their highest density in two distinct locations. The first is in the main peripheral thoroughfares leading away from the city center. Examples of these are the Station Road in Sismarias, the EN1 in Marinheiros, the Europa Avenue in Vila Real and the Dr. Mário Sacramento Street in Santiago. These streets were former commercial ribbons that were slowly occupied by construction similar to that of the city center. That is the reason why they have the dual occupation of medium-sized commercial warehouses in free-standing locations and also of high-rise multi-family residential buildings with strong commercial clusters in the ground floors. It is not surprising that these axes are all in the extensions of the city centers or, in the case of Marinheiros and Santiago, in the main residential areas. These are the densest residential areas and mimic the center in terms of distribution and amount of activities. Actually, this is not only true for services, but for most of the other activities as well. The second location 'Services and other activities' cluster in are the industrial area thoroughfares, where large individual warehouses (mostly of car-related sub-activities) exist. Yet the presence of 'Services and other activities' is not restricted to these two locations. In residential localities, they always concentrate in main intersections or squares, and in main distribution roads, such as S. Bernardo Road in Aveiro (Figure 78). Whenever there is a commercial concentration, either in these intersections, main axes or in the commercial rows of residential buildings, even if isolated, there is always a considerable representation of this activity. These services are practically only absent in out-of-the-way residential localities, such as Andrinos or the Almeirim neighborhood, where there is not enough momentum to justify an M1 or M2 service store. This distribution makes the pattern of 'Services and other activities' clustered in all cities, and with similar post 1975 distributions as the reference values, considering all stores in the periphery.
Location maps (to scale)	

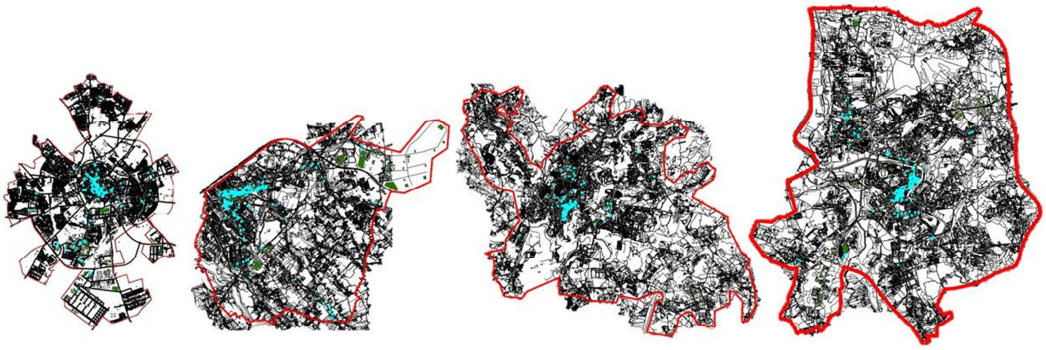
Activity	Restaurants & Cafés
Percentage of stores	27% (E, VR) / 20% (L) / 15% (A)
Description	'Restaurants & Cafés', in the periphery, are likewise clustered, because they also appear in most commercial axes and concentrations, although more spaced and in a lesser number than 'Services and other activities'. Obviously, the 'street café' is an undisputable presence in most commercial concentrations, and is usually the store type with most 'tradition' in outer peripheral localities. That is why, unlike 'Services and other activities', 'Restaurants & Cafés' also appear in out-of the way residential localities and have a tendency to exist in buildings constructed before 1975. On the other hand, also obviously, they have very little significance in industrial areas. 'Restaurants & Cafés' usually dot the most important travel-through axes, inside a given peripheral locality, and the most important connecting thoroughfares (either between localities, and between these localities and the city center). It appears that their major goal is to capture traffic 'along-the-way' so there is not an effort to locate exactly on, for example, main intersections and roundabouts, places where commerce clusters in outer peripheral localities. Instead, although they are close to these places, the priority seems to be always facing the thoroughfare, the travelling axis. Inside smaller communities, 'Restaurants & Cafés' take a more central position, concentrating near a landmark, such as a train station or a main square. On the other hand, in residential commercial concentrations, their presence is more constrained, usually with single representation. Nevertheless, in all the above mentioned places, they seldom appear alone. At first glance, the more traditional/residential the locality is, the more seems to be the presence of 'Restaurants & Cafés'. Évora's and Vila Real's periphery, as mentioned, have, relatively, more of these stores (27%), against 20% in Leiria and 15% in Aveiro (localities with more services). This translates into the fact that in the 'main residential areas' of Évora and Vila Real there are more 'Restaurants & Cafés' than 'Services and other activities', and the same happens, for all cities except Aveiro, for 'residential areas'. Yet, in 'isolated residential areas', restaurants only surpass services in Vila Real. This means that the variable 'inhabitants' is also fundamental for the significant presence of 'Restaurants & Cafés'. In 'isolated residential areas' there is insufficient population momentum to produce more than one or two central street 'cafés' and 'restaurants'. Furthermore, because 'isolated residential areas' are closer to 'industrial areas' and possess more unoccupied space, this can impact on the amount of 'Services and other activities' these areas may contain.
Location maps (to scale)	

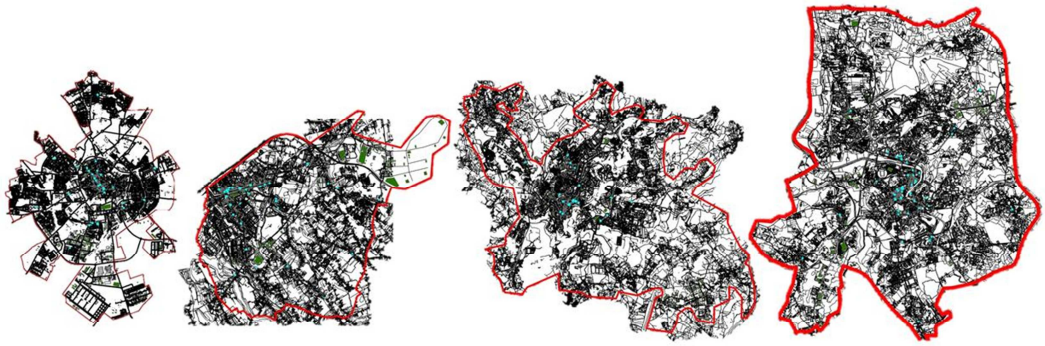
Activity	Home
Percentage of stores	14% (10% E)
Description	'Home' stores are the third most important activity type in the peripheries. They pair with 'Services and other activities' because their main concentrations are both in the industrial areas and in the main peripheral thoroughfares. They also appear alongside 'Restaurants & Cafés' in more isolated traditional localities, although not in the same place. Here, like in areas closer to the center and in main residential localities, they are usually not in the main axes. Although some specific concentrations can occur in peripheral main roads (such as in Gaspar Sameiro Street in Vila Real, Figure 79), 'Home' stores lose hierarchical power (but gain in area) as they drift from the center to the periphery. Near the center (in peripheral thoroughfares), they can be in main axes but farther from their commercial core. Then they are not in these, nor in intersections, but in perpendicular roads, more akin to residential areas. Here they can also appear in commercial concentrations in residential buildings, sometimes in pairs. Then, in isolated localities, they are in outer areas, where they find space. Lastly, they occupy, with considerable relevance, industrial areas. The type of 'Home' store also changes geographically, from 'Decoration' and 'Home' stores near residential areas, to 'have-everythings' in traditional localities to 'Bricolage', 'Tools' and 'Construction materials' nearer industrial areas. 'Bricomarché', a hypermarket, part of Intermarché, specialized in bricolage and other home products, exists in urban Mateus, Horta das Figueiras and Sismarias, strengthening the 'Home' representation of these localities. Vila Real's periphery still has the greatest 'Home' representation, but this is not as distinct as it was in the center. This may be a consequence of the large dispersion of Vila Real's suburbs and of the vast amount of unoccupied areas and of isolated residential areas with residual stores. There are indeed 'Home' clusters, such as in the already mentioned Gaspar Sameiro Street, but the remaining stores are very much dispersed. This can be the reason why 'Home' presents a clustered pattern in all cities but Vila Real, where there is a probability that it can be random. On the other hand, this clustering, mostly in newer buildings, in urban Mateus, in the residential areas of Europa and Universidade Avenues, and in the post 1975 industrial area of Constantim give 'Home' an above average representation in post 1975 buildings. The opposite happens in Aveiro and Leiria. This can be a consequence of Aveiro's older industrial area and of the fact that the commercial ribbons leading from the center, in both cities, are not of new construction.
Location maps (to scale)	

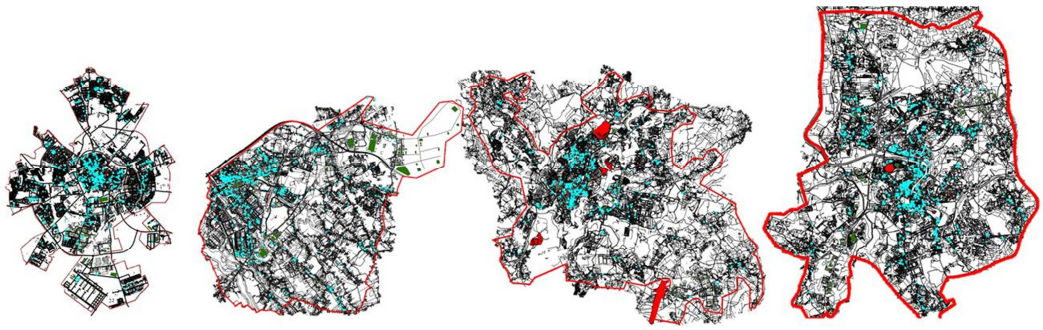
Activity	Food & Beverages
Percentage of stores	7%
Description	'Food & Beverage' establishments clearly seek residential localities, especially those of more recent construction. In traditional residential localities (mostly the 'isolated residential localities') the number of these stores is very much reduced, amounting to one or two traditional 'minimarkets' in the main streets, built to serve precarious first necessity needs of a small segment of the population. These are obviously being overcome by modern formats in accessible places and with parking lots. Therefore, in larger, more important, residential localities, these stores are in main axes, mostly in pairs. In some 'residential areas', especially of Leiria and Vila Real (like Marrazes, Lordelo and Constantim), where there was a pre-existing first necessity commercial independence, 'Food & Beverage' stores can appear with significant percentages, defining the main streets. Yet their greatest concentration is not here, but rather near high-rise multi-family buildings of recent construction, even if these buildings are not facing the main residential thoroughfare. For example, in Santiago, the food stores are in Espinho Street, inside the neighborhood, and not in Dr. Mário Sacramento Street. Neighborhoods whose commercial landscape is mostly constituted by a succession of these multi-family residential clusters (Telheiro, Malagueira) can have a high representation (over 10%) of 'Food & Beverages'. 'Butchers' and 'grocery stores' tend to these concentrations of population and so do the large scale food-establishments like 'supermarkets' and 'hypermarkets'. These are in larger number in Évora and Leiria's peripheries, yet in Évora these stores are often dispersed through the residential localities (each isolated from the next), hence the pattern is more random. In Leiria the urban continuity between the localities and the large amount of large food-establishments (particularly in Sismarias, Figure 80) assures a strongly clustered pattern. It should also be noted that the existence of shopping centers and hypermarkets in all the peripheries increases the amount of 'Food & Beverage' offer available. These are mainly either on the 'extensions of the city centers' or on the 'industrial/commercial areas'.
Location maps (to scale)	

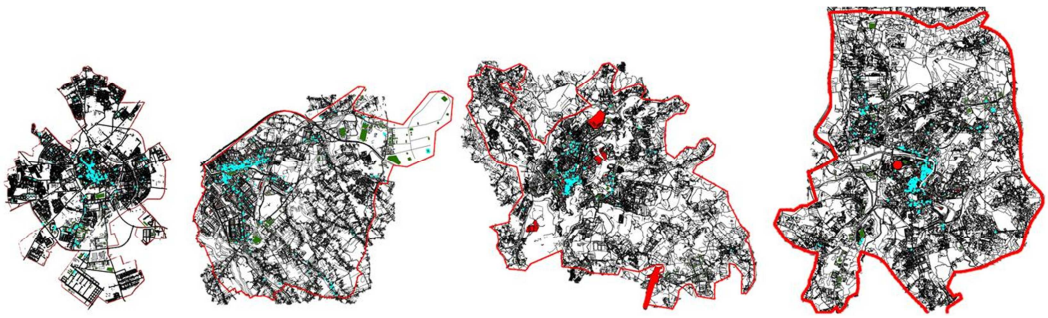
Activity	Leisure and culture
Percentage of stores	5%
Description	'Leisure and culture' appears in the most important and strategic commercial locations of the periphery, usually with no more than two stores. One of them is often the 'stationary-news-stand', which appears near most residential areas. Therefore 'Leisure and culture' stores occupy the main axes and intersections of the residential peripheral areas, as well as the commercial clusters in residential buildings. Only occasionally do they appear in the travel-through main thoroughfares or roundabouts. They depend much more on pedestrian accessibility ('flowers and plants', 'video club') than car traffic. Because they follow the residential areas their pattern is only clustered in Leiria. In Vila Real, there is a probability that this pattern is even dispersed.
Location maps (to scale)	

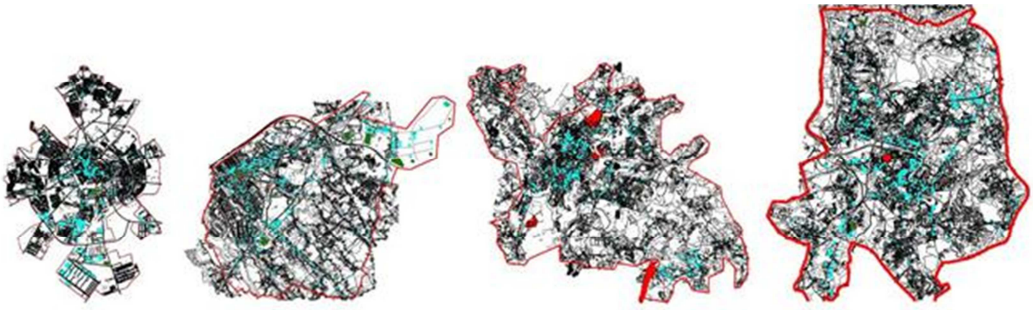
Activity	Home appliances and electronics
Percentage of stores	5%
Description	'Home appliances and electronics' relevance in residential areas is reduced. Although they are all but absent in traditional localities, they actually do locate in commercial concentrations near the most important residential neighborhoods ('computers' and 'telecommunications' stores). Even so, their strength 'on their own' is limited, and they rather complement others that are located inside multi-commercial facilities. Likewise they locate (in small numbers) in the main peripheral thoroughfares, especially those leading to the industrial/commercial areas in which they are also located ('electronic articles and materials', 'Home appliances'). Here they complement the stores inside the shopping centers, where they are much more common, and are, in turn, complemented by warehouses 'lost' in the peripheries of isolated localities, where more space, at a cheaper price, is available. Because of this preference for thoroughfares, industrial areas and commercial residential clusters, there is a tendency for these establishments to be in post 1975 buildings and for their pattern to be random. In Vila Real, like the specific 'Home' stores, 'Home appliances and electronics' stores are also significant in the residential areas of Borbela and Mateus.
Location maps (to scale)	

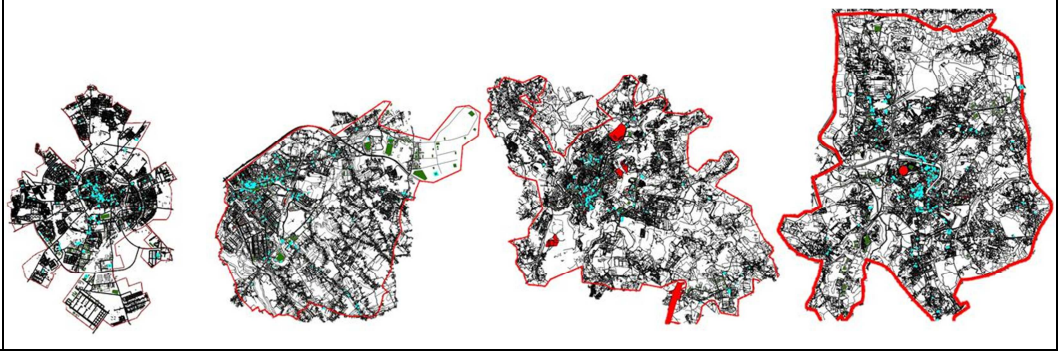
Activity	Fashion
Percentage of stores	5% (E, A) / 3% (L, VR)
Description	'Fashion' (mostly 'clothing', 'shoe stores', 'optics' and 'fashion accessories') has a very small representation outside city centers. Less than 20% of all 'Fashion' stores are in the peripheries, and those that are, are mostly close to the center, in the 'extensions' (Sismarias, Europa and Universidade Avenues) or in the thoroughfares that lead directly to it (Dr. Mário Sacramento Street in Aveiro). This is usually a high-value type of 'Fashion' store, serving the newer residential areas. Older main residential communities, like S. Bernardo or Esgueira, can have small clusters of traditional, family-owned fashion stores, mimicking the traditional city centers. These are very sporadic, appearing around specific axes in main peripheral/residential thoroughfares (for example the south end of S. Bernardo Road or the Vicente Almeida Eça Street) or around intersections/roundabouts. The rest of the 'in-street' 'Fashion' stores appear dispersed and alone, either in commercial concentrations in newer residential buildings or, to a lesser extent, in traditional shopping streets of traditional localities, most of the times facing main travel axes or intersections. The bulk of the 'Fashion' stores in the outer peripheries is in the commercial/industrial areas. The enormous variety of 'Fashion' stores inside the shopping centers is complemented by a small number of outlets and large scale warehouses, usually representing 'chain' stores. Because of this balance between older and newer areas, only in Vila Real (where Europa and Universidade Avenues contain 60% of the 'Fashion' stores) there is a tendency for these to be located in post 1975 buildings. This periphery also displays a dispersed pattern of 'Fashion' stores because, excluding the above mentioned concentration, the rest of the stores are very few and dispersed throughout the residential areas.
Location maps (to scale)	

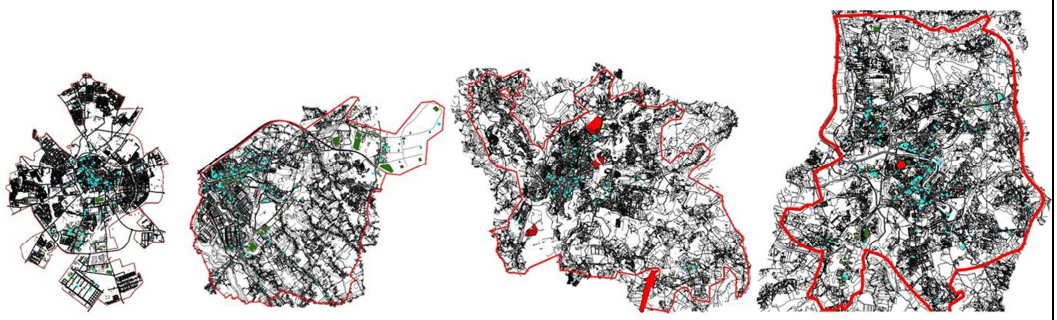
Activity	Hygiene and personal care
Percentage of stores	1%
Description	Lastly, 'Hygiene and personal care' stores, a mere 1% of all peripheral stores (about 10 stores per city), have a completely dispersed pattern. This is because they have a small representation of 1 or 2 stores ('pharmacy' or 'perfumes and cosmetics') in some (not all) of the peripheral localities, and they only concentrate (although never with more than 3 stores) in the extensions (like Forca or the Europa Avenue). In these places, 'Hygiene and personal care' stores are situated near the commercial center, facing the main thoroughfare, or on a commercial concentration in a residential building. They are practically absent in more traditional residential areas. It is to be supposed that this activity, although considered of first necessity (M1) was actually nonexistent in these localities until the urban expansion. This may be the reason why there is a clearer tendency for these stores to be in post 1975 buildings only in Évora's and Vila Real's peripheries, whose outer communities were much less developed. These stores, especially those relating to 'perfumes and cosmetics', usually belong to multi-national or international chains that prefer to locate in multi-commercial spaces. This can also be the reason for the small amount of 'in street' 'Hygiene and personal care' stores in these peripheries.
Location maps (to scale)	

Activity	M1
Percentage of stores	31% (A, L) / 39% (E, VR)
Description	M1 is, with no surprise, the highest represented category. Almost 1/3 of all the stores in Aveiro's and Leiria's peripheries belong to this category. In Évora's and Vila Real's periphery, this number is almost 40%, which can reflect the lack of some other category types in these localities and, consequently, their lesser development, or at least their more limited commercial offer. Because the main sub-activities M1 stores represent are 'Cafés', 'Restaurants', 'Hairdressers' and 'Minimarkets', their presence is constant in all commercial clusters of residential agglomerations. Although these stores also appear in most main peripheral commercial thoroughfares, both of first and second importance, they prefer intersections and roundabouts, and locations either near landmarks and the centers of localities, or else in the commercial cores of residential neighborhoods. Because they correspond to pre-existing commercial centers, M1 stores are those which are clearly below average in terms of post 1975 building location, that is, they are preferably in older buildings. And because both these concentrations, either older or newer (residential islands) usually encapsulate a series of M1 stores (as Figure 82 shows), the pattern of these stores is clearly clustered.
Location maps (to scale)	

Activity	MC
Percentage of stores	8% (E, A) / 5% (VR, L)
Description	MC stores have a stronger weight in Évora's and Aveiro's periphery (8%) than in Vila Real's and Leiria's (5%). Multi-comparison sub-activities, most notably fashion sub-activities, 'sports goods', 'telecommunications' and 'travel agencies' represent stores which obviously need busier and central places, and this justifies their large decrease in weigh in the peripheries (they were ¼ of the center's stores). It can also justify why in the two peripheries which have main residential localities closer, and more strongly linked to the center (Évora and Aveiro), there are more MC stores. Even though both Vila Real and Leiria have 'extensions of the city center', the majority of their outer localities were not devised merely as residential servers of the center, and in these, MC stores don't find enough momentum. That is why the majority of MC stores is in 'extensions of the city center' or in 'main residential areas' close (but not necessarily in) main travelling axes. They are not on these axes because they prefer the residential commercial concentrations, where they can cluster (hence multi-comparison), and where they can access a wider, close-by, residential clientele. For the same reasons, when in main axes, they are not along their extension, choosing instead to be near main intersections or roundabouts, although once again they are not necessarily facing them. The same happens inside residential localities. Yet in 'isolated residential' localities, and even in the commercial islands of newer but isolated residential neighborhoods (away from main axes) they have a very poor representation. There can be one MC store per each of these pockets, but often there is none at all. In industrial areas, MC stores once again cluster, in the form of outlets or large warehouse establishments, mostly related to 'Fashion'. Because they appear always closer to each other, a consequence of their definition, MC stores have a clustered pattern in all cities, except in Vila Real. This is because there is a concentration in the 'extension' and in the industrial area, but then in the other localities these stores have a much more dispersed pattern, a consequence of the peripheries' own urban dispersion. Because the poles of commerce in residential areas and in the 'extensions' are of newer construction both in Vila Real and Évora, in these two cities MC stores have a preference for post 1975 buildings.
Location maps (to scale)	

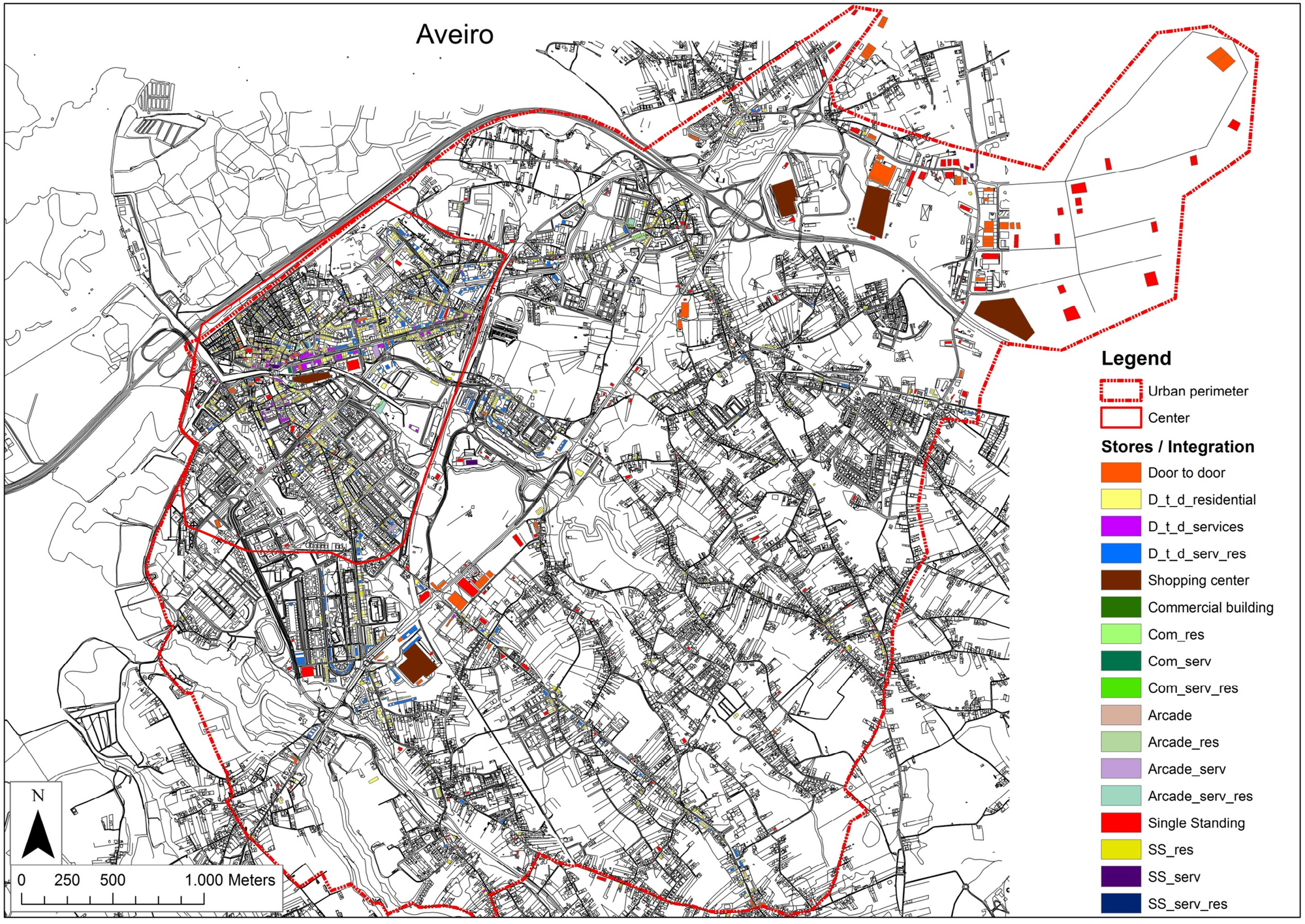
Activity	C
Percentage of stores	30% (41% VR)
Description	C stores have about the same average as M1 stores in Leira's, Aveiro's and Vila Real's peripheries (30%, 30% and 40% respectively), but they have a ten percentage points drop (from 40 to 30%) in Évora's periphery. Obviously, the percentage is larger in Vila Real due to the affinity to 'Home' stores, but most C stores are not associated to this activity. About half of the C stores are associated to 'Services and other activities', most notably in terms of car-related sub-activities. Because of this dual preference, C stores are mainly in two principal locations. The first is in Industrial areas where large warehouses are situated, both concerning 'Home' outlets or chain stores and large automobile-related facilities. This type of occupations overflows from the industrial areas and can appear in close-by out-of-the-way areas belonging to isolated traditional localities. The second are the principal thoroughfares leading from the center to the suburbs. These commercial ribbons are the places *par excellence* for the locations of activities that need to be close to the center but that require space. For this reasons they also appear in the main thoroughfares connecting the several peripheral localities or, in the case of more central activities ('real estate agency', 'furniture', 'home decoration', 'computers'), in the main roads passing through the center of the localities. In this case, they cluster close to the main intersections, but not necessarily facing them. These sub-activities also appear dispersed, often alone, in commercial concentrations of residential buildings. C stores can also be in other, out-of-the-way streets in the case of traditional and smaller shops that don't have the capacity to locate in the larger warehouses of the industrial areas. With M1 stores, this is the only retail category which significantly occupies traditional residential localities, and like M1 stores it is the only clearly clustered category in the four peripheries. Only in Vila Real do the numbers show a preference for newer buildings. The same reasons (a new industrial area, a new extension of the city center, mostly new residential clusters) can be cited.
Location maps (to scale)	

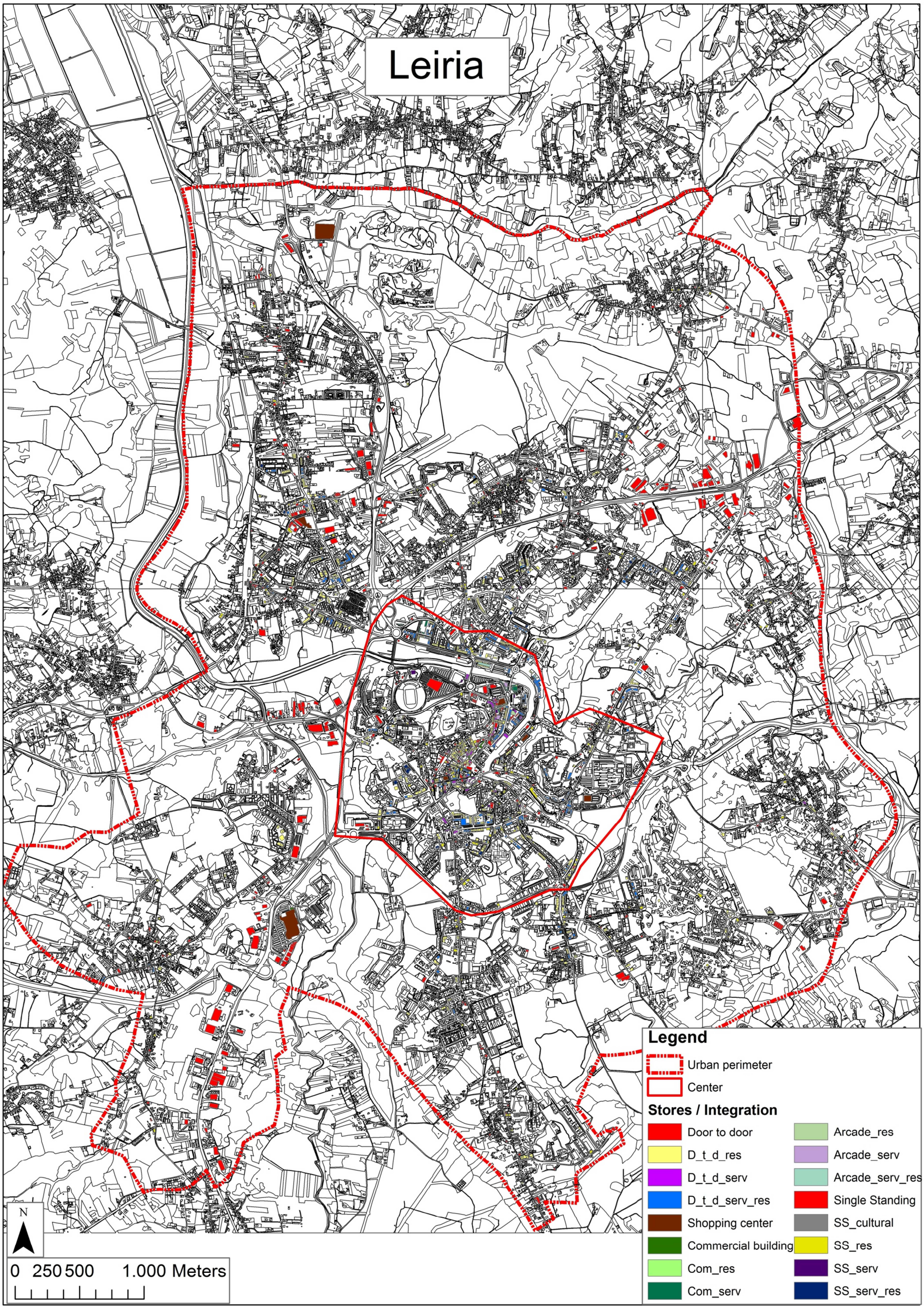
Activity	M2
Percentage of stores	7%
Description	Like MC stores, M2 stores are also more focused in the 'extensions' and in the 'main residential' areas, and are practically never seen in more traditional residential localities. This is because they need a large customer base and quick accessibility ('supermarkets', 'banks'). Therefore they locate in the main commercial axes in the extensions of the city center or else in the main intersections or in the commercial concentrations of residential buildings in the main suburban localities. In the rest of the periphery, they are in much lesser number and when they do appear, they usually join other categories in the commercial 'islands' of newly constructed residential buildings. This is the reason why M2 stores prefer newer buildings. Only in Leiria this does not happen and the pre-existence of the peripheral localities can be the cause.
Location maps (to scale)	

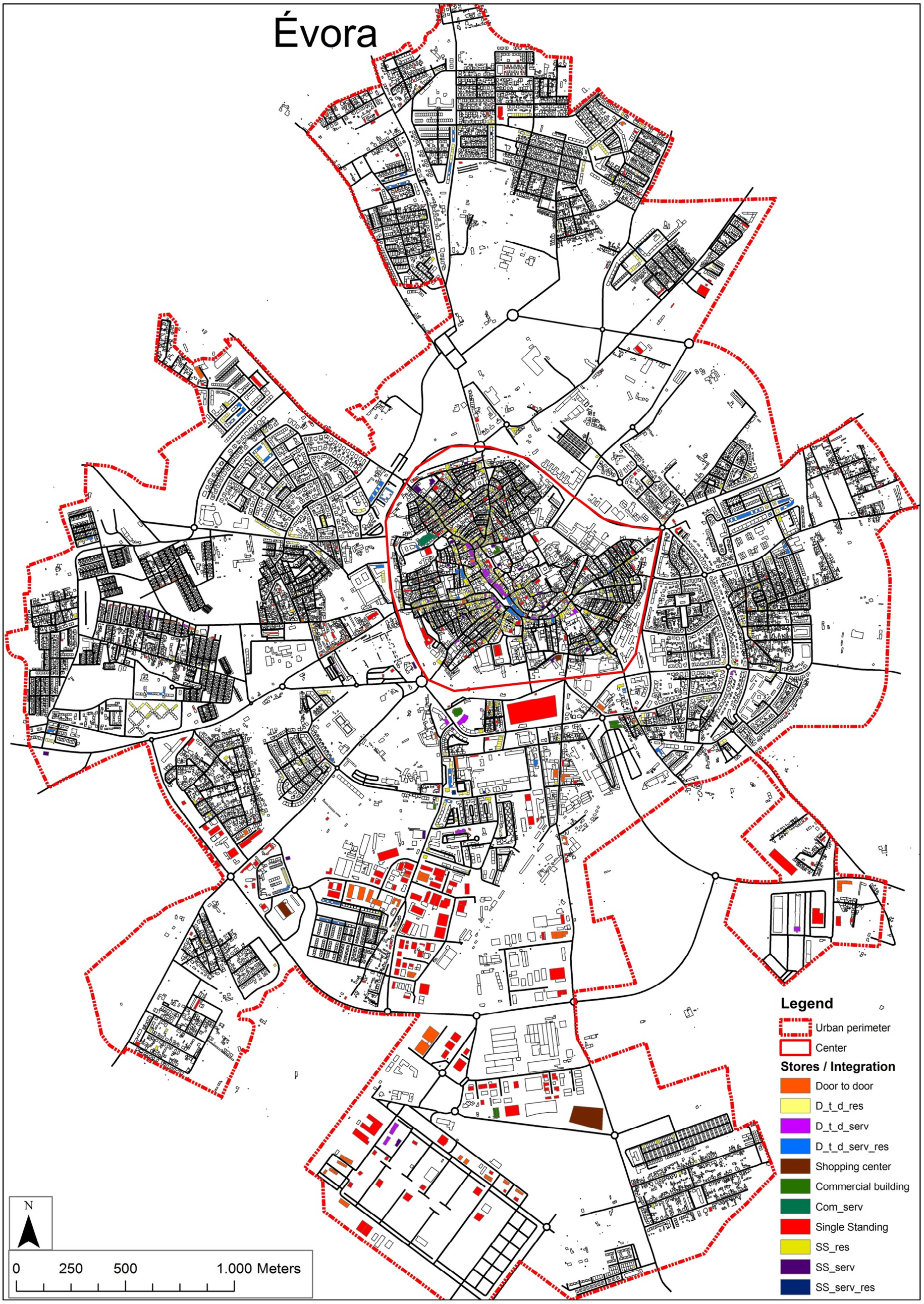
Activity	S
Percentage of stores	7%
Description	S stores usually are distributed along the main commercial areas, although always in lesser number and always more spaced from one another. In main thoroughfares coming from the center these stores appear at somewhat regular intervals, which get larger as the distance from the center increases. In the peripheral localities they are either in or close to the main central street, near its central core. Their occupation of residential commercial pockets is similar to that of the city center: each (with practically no exceptions) contains one or two S stores, mostly isolated. Because this type of new neighborhoods with commercial clusters seldom appears in Vila Real, this translates into more random patterns. S stores seldom appear in traditional and out-of-the-way residential neighborhoods. Only in Aveiro, a city where the peripheral main thoroughfares have a more ancient existence, do these stores prefer pre-1975 buildings.
Location maps (to scale)	

Annex 10 – Store integration distribution maps

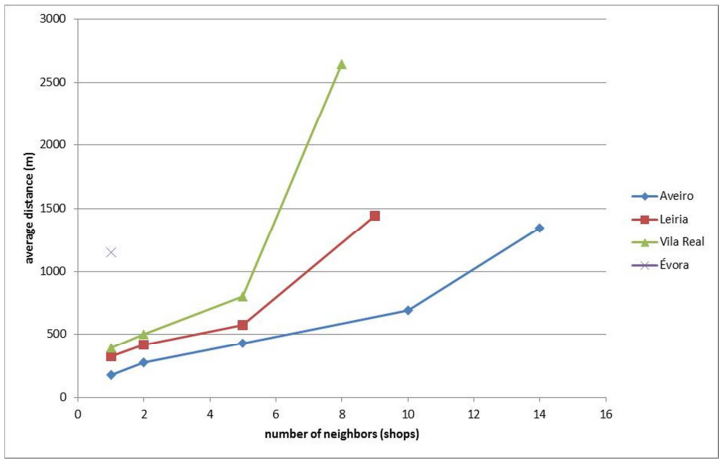


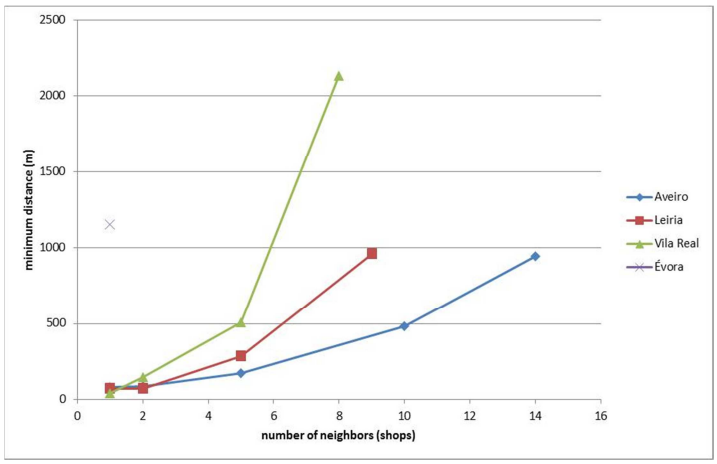

Aveiro
Legend
Urban perimeter
Center
Stores / Integration
Door to door
D_t_d_residential
D_t_d_services
D_t_d_serv_res
Shopping center
Commercial building
Com_res
Com_serv
Com_serv_res
Arcade
Arcade_res
Arcade_serv
Arcade_serv_res
Single Standing
SS_res
SS_serv
SS_serv_res
N
0 250 500 1.000 Meters

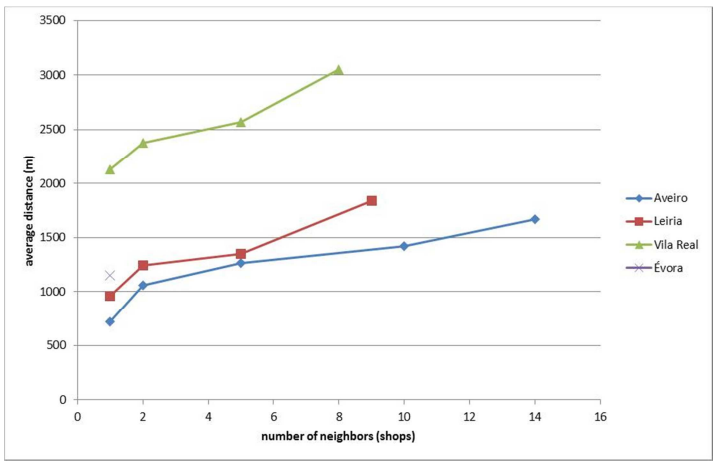

Leiria
Legend
Urban perimeter
Center
Stores / Integration
Door to door
D_t_d_res
D_t_d_serv
D_t_d_serv_res
Shopping center
Commercial building
Com_res
Com_serv
Arcade_res
Arcade_serv
Arcade_serv_res
Single Standing
SS_cultural
SS_res
SS_serv
SS_serv_res
N
0 250 500 1.000 Meters


Évora
Legend
Urban perimeter
Center
Stores / Integration
Door to door
D_t_d_res
D_t_d_serv
D_t_d_serv_res
Shopping center
Commercial building
Com_serv
Single Standing
SS_res
SS_serv
SS_serv_res
N
0
250
500
1.000 Meters

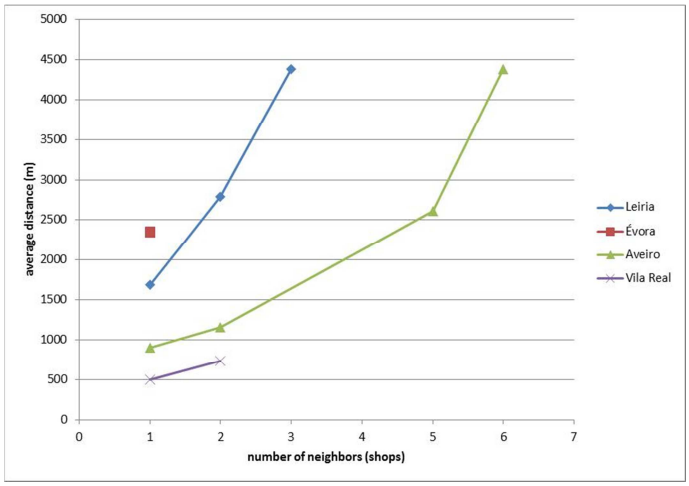
Annex 11 – Nearest neighbor analysis of multi-commercial spaces in the centers and in the peripheries

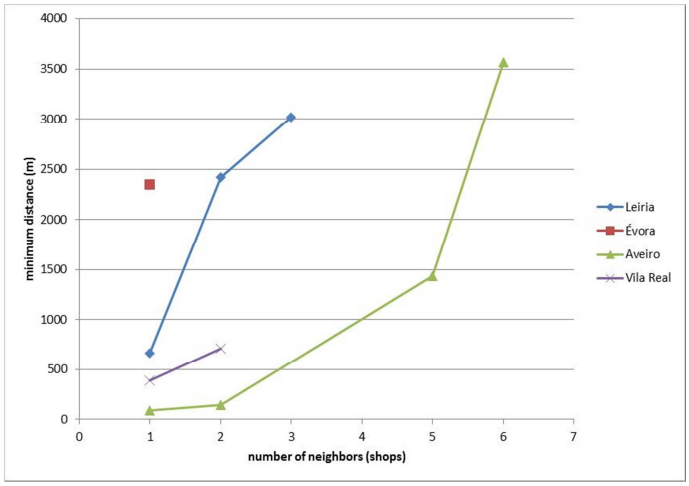


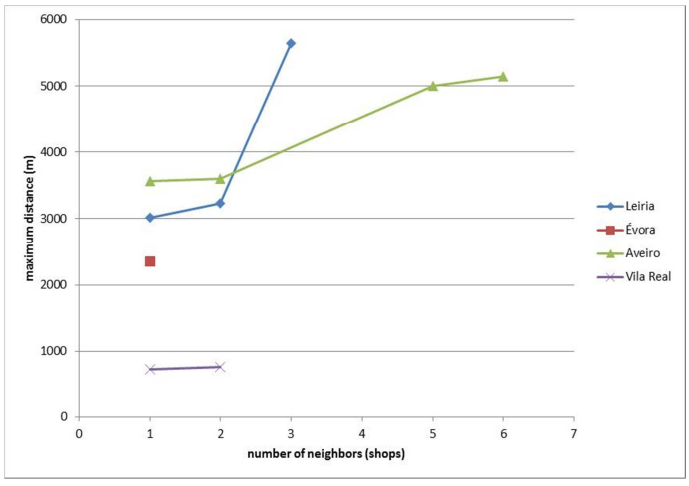




Minimum, maximum and average distance between each store and n neighbors in terms of multi-commercial spaces in the center

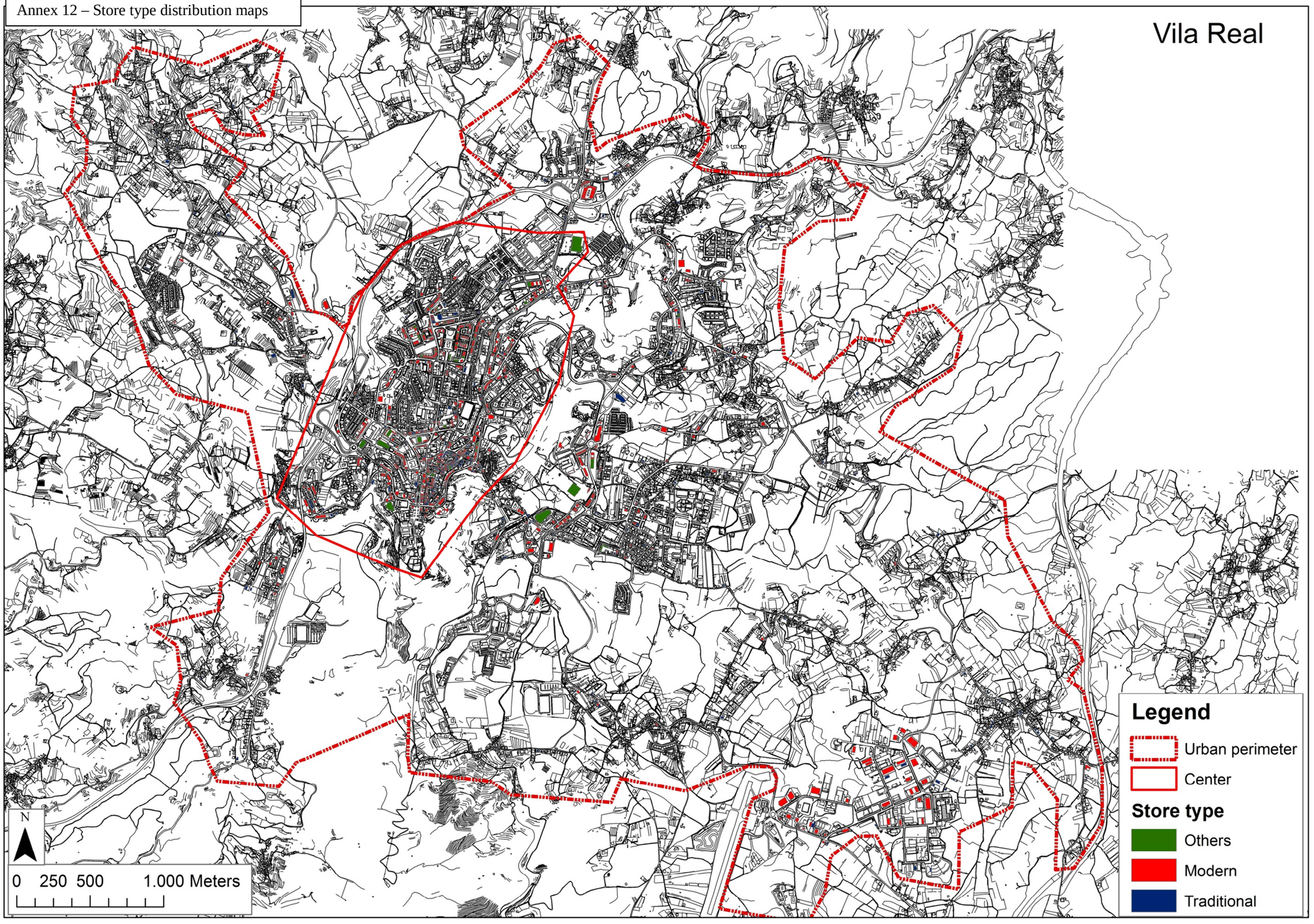


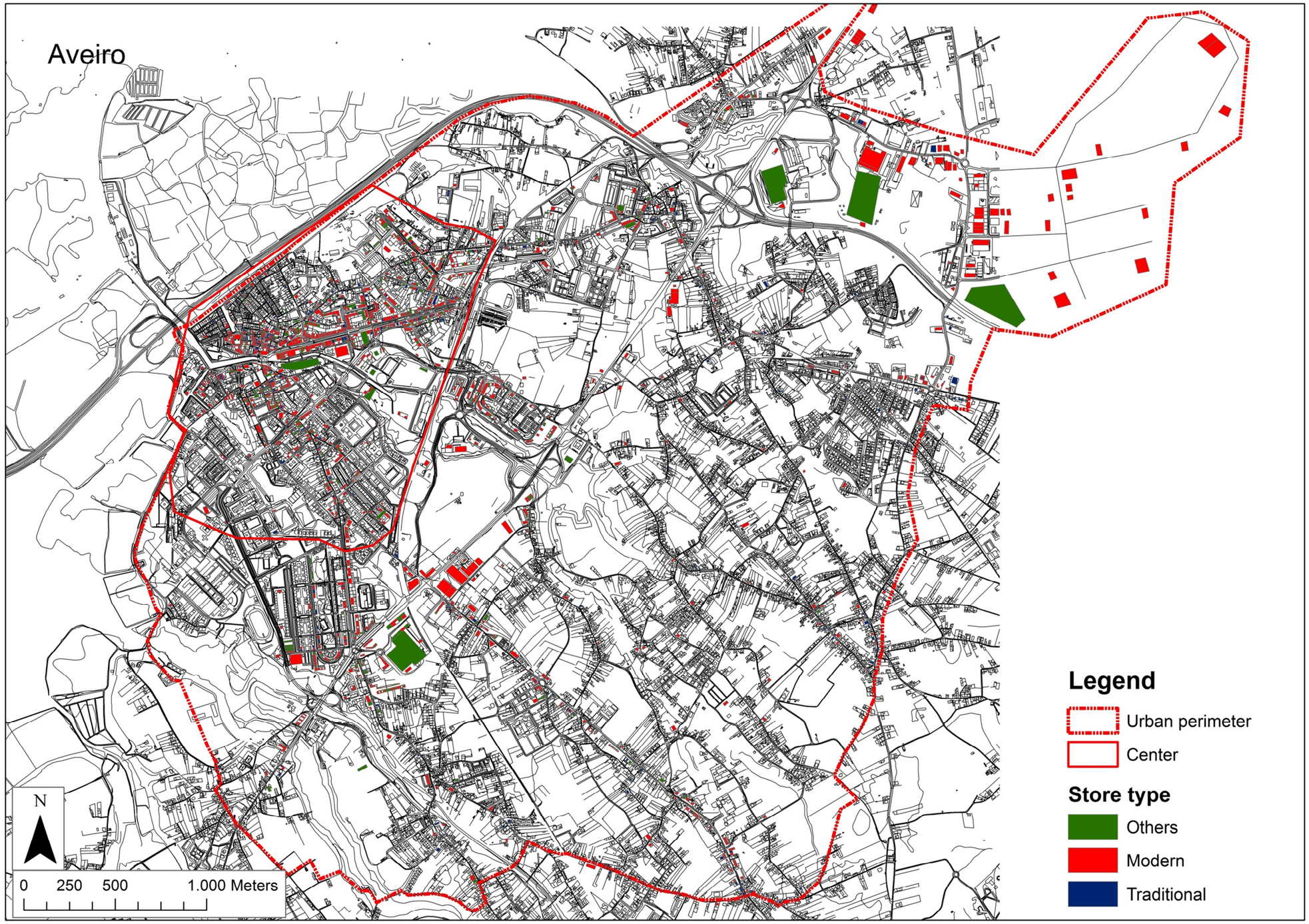




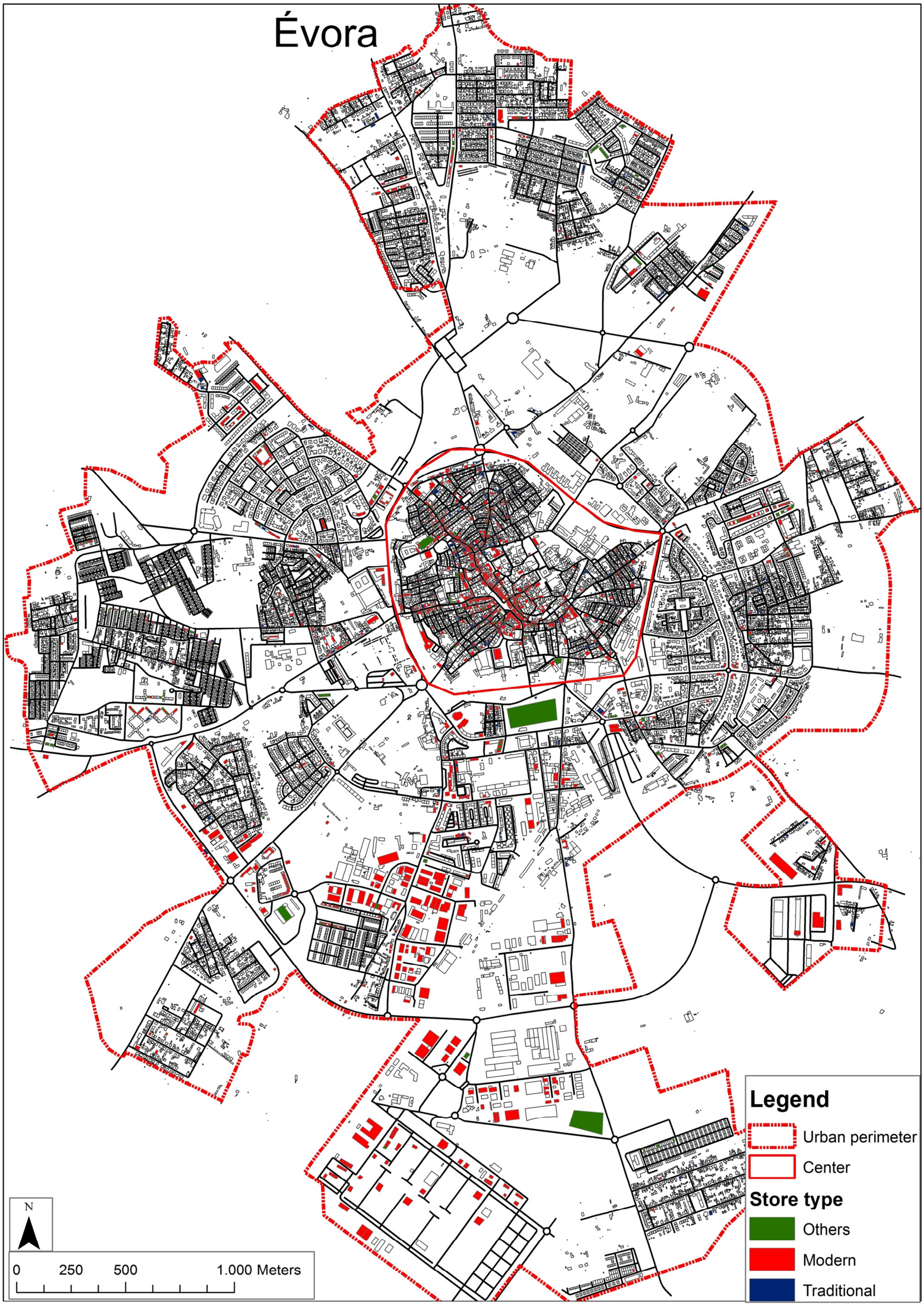
Minimum, maximum and average distance between each store and n neighbors in terms of multi-commercial spaces in the peripheries

Annex 12 – Store type distribution maps

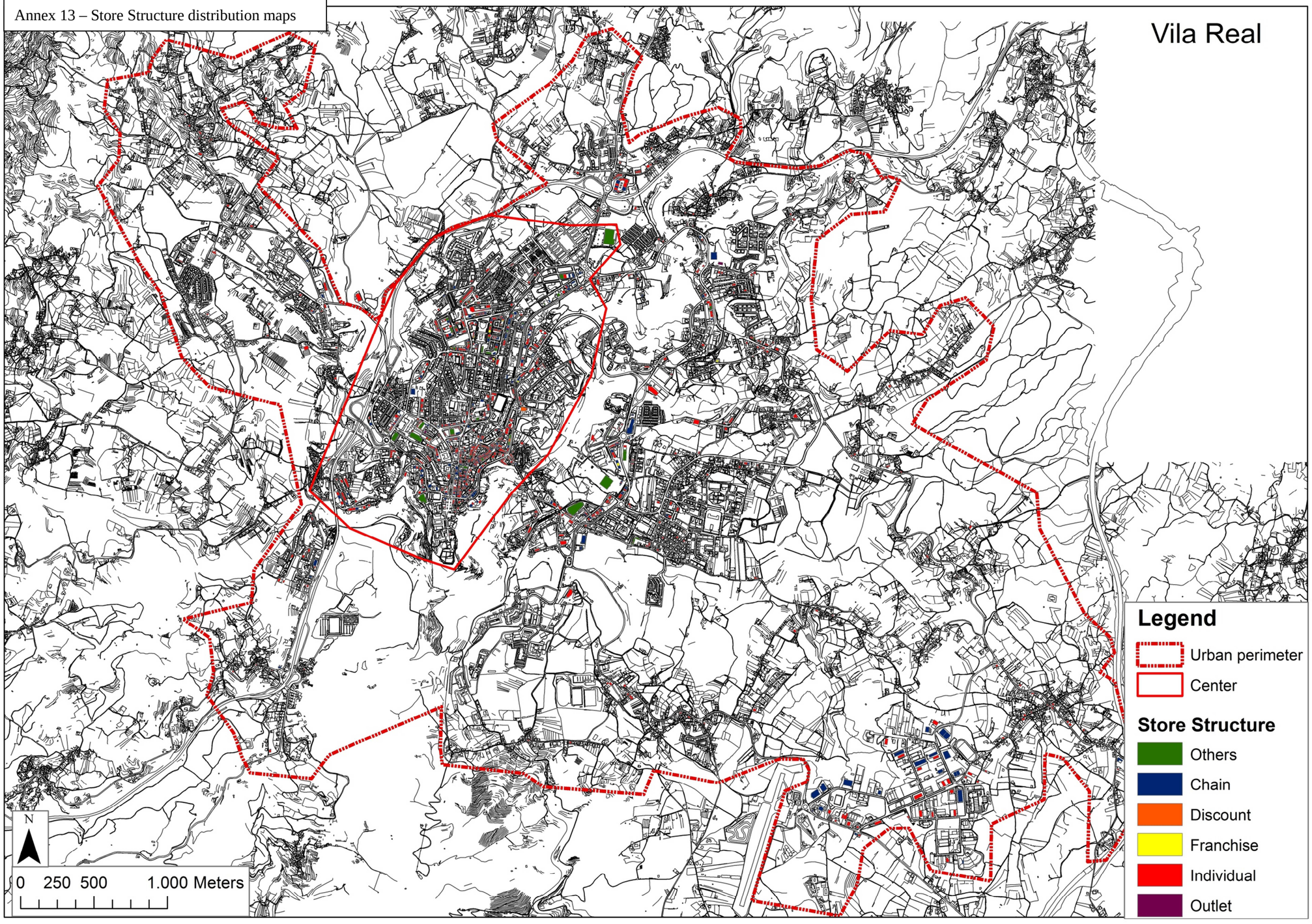


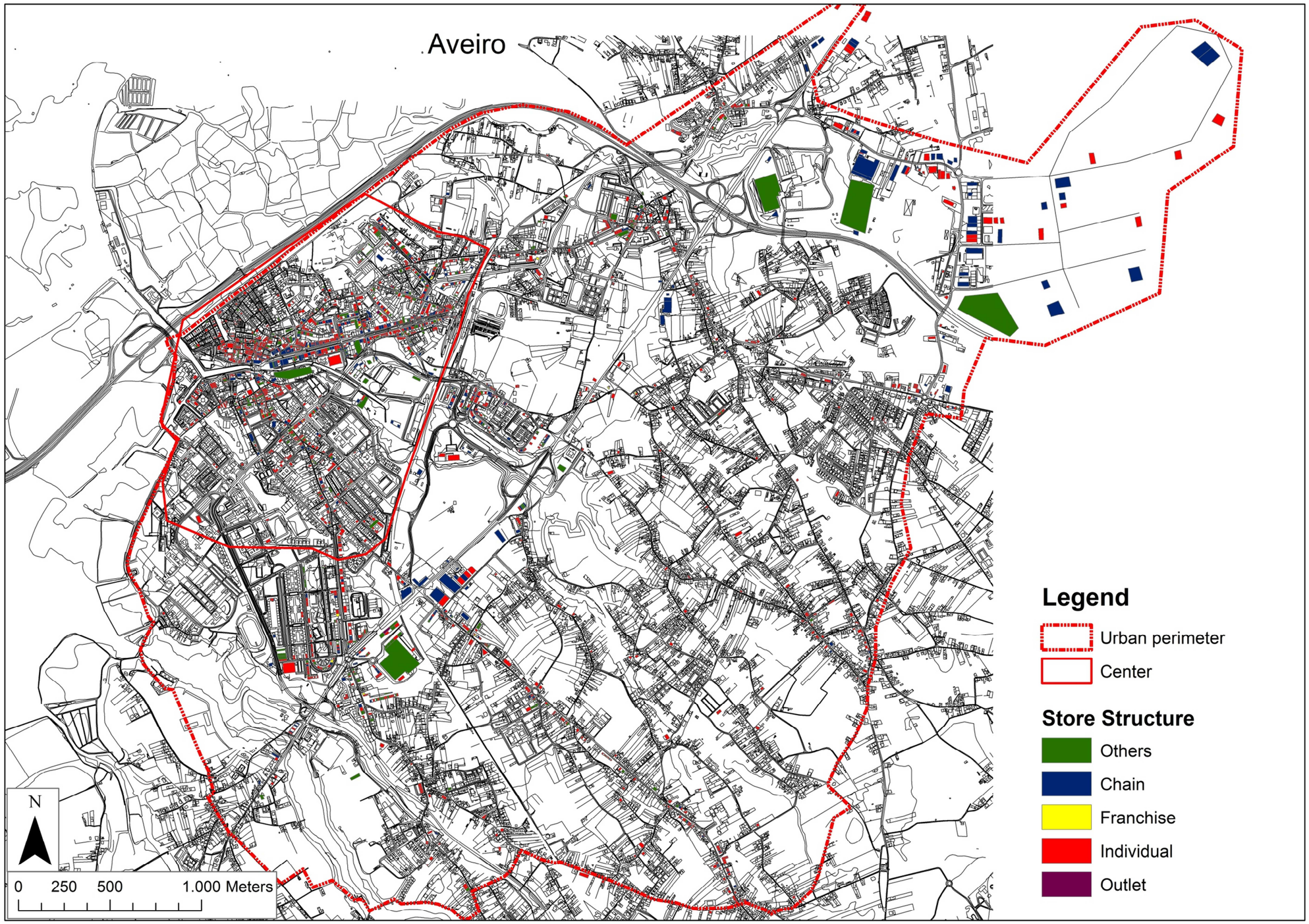

Aveiro
N
0 250 500 1.000 Meters
Legend
Urban perimeter
Center
Store type
Others
Modern
Traditional

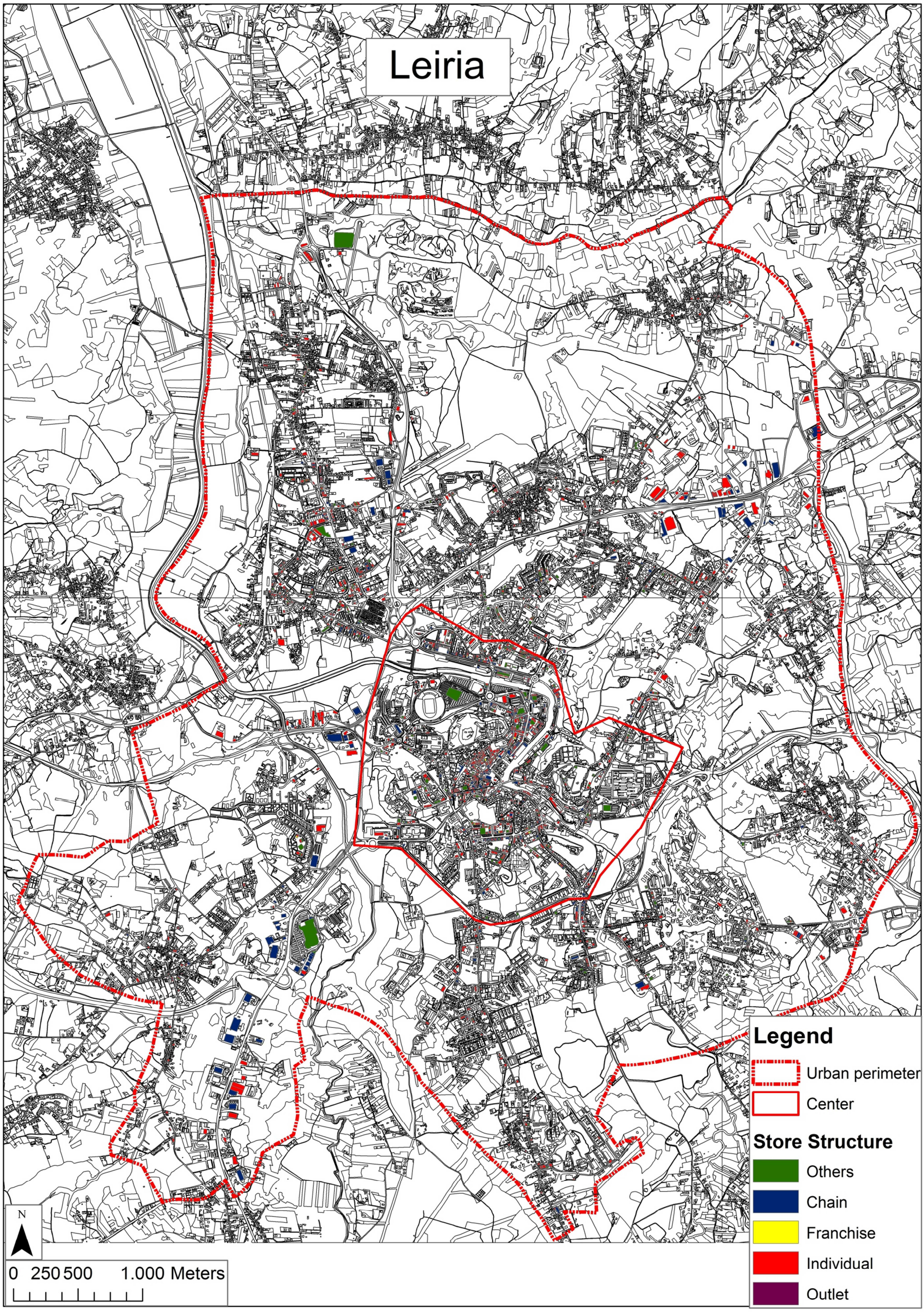

Leiria
Legend
Urban perimeter
Center
Store Type
Others
Modern
Traditional
N
0 250 500 1.000 Meters

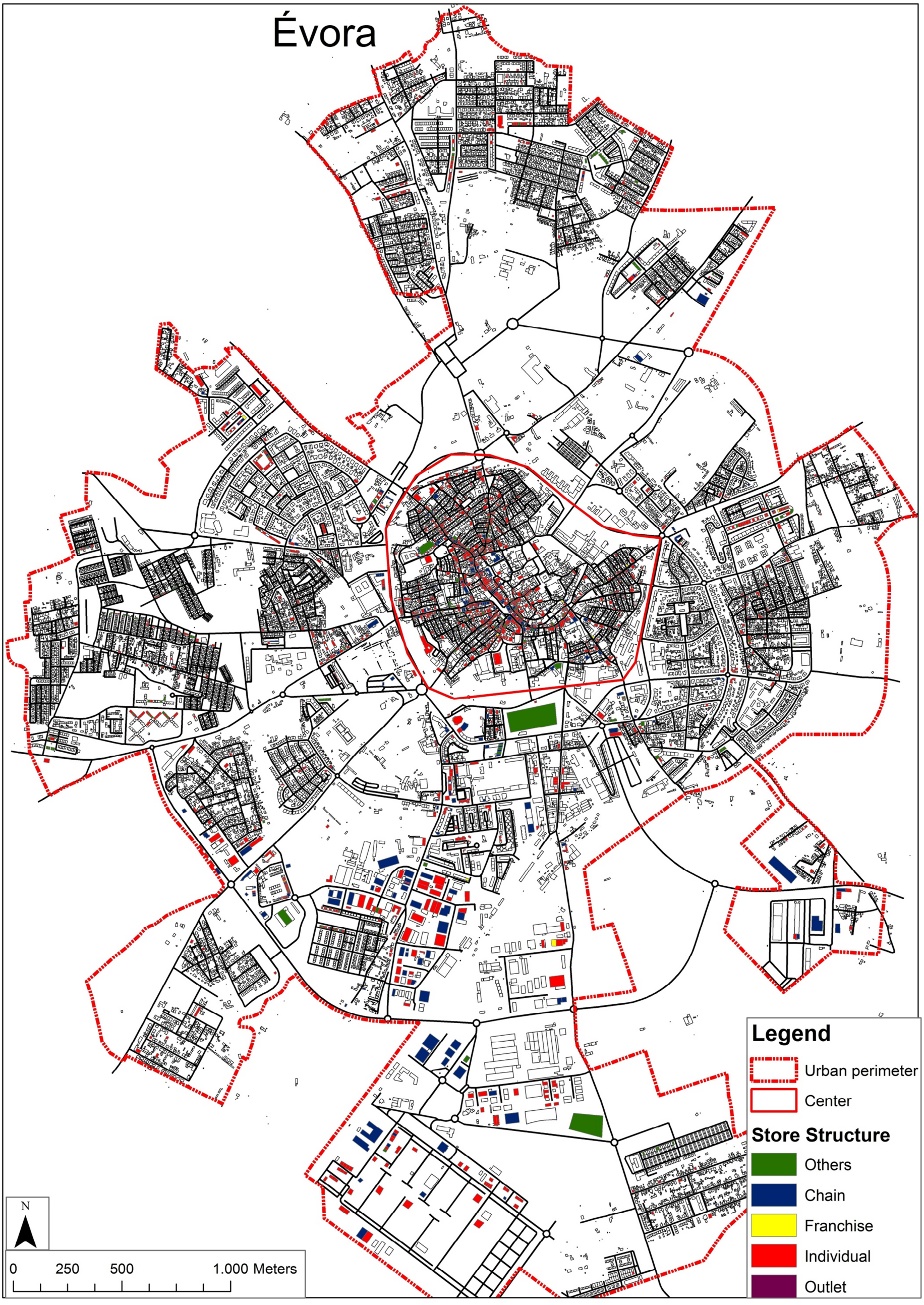

Évora
Legend
Urban perimeter
Center
Store type
Others
Modern
Traditional
N
0
250
500
1.000 Meters

Annex 13 – Store Structure distribution maps

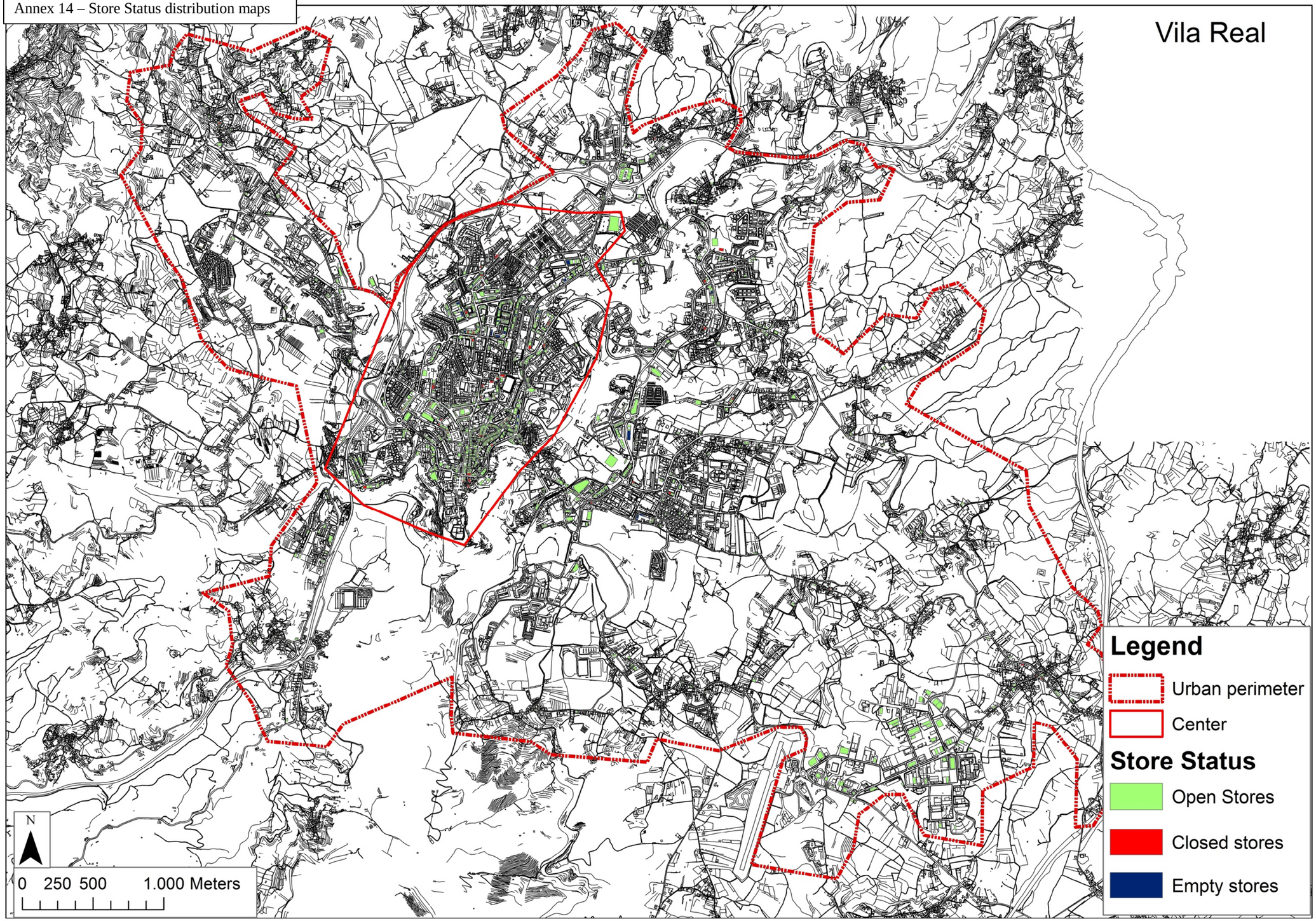


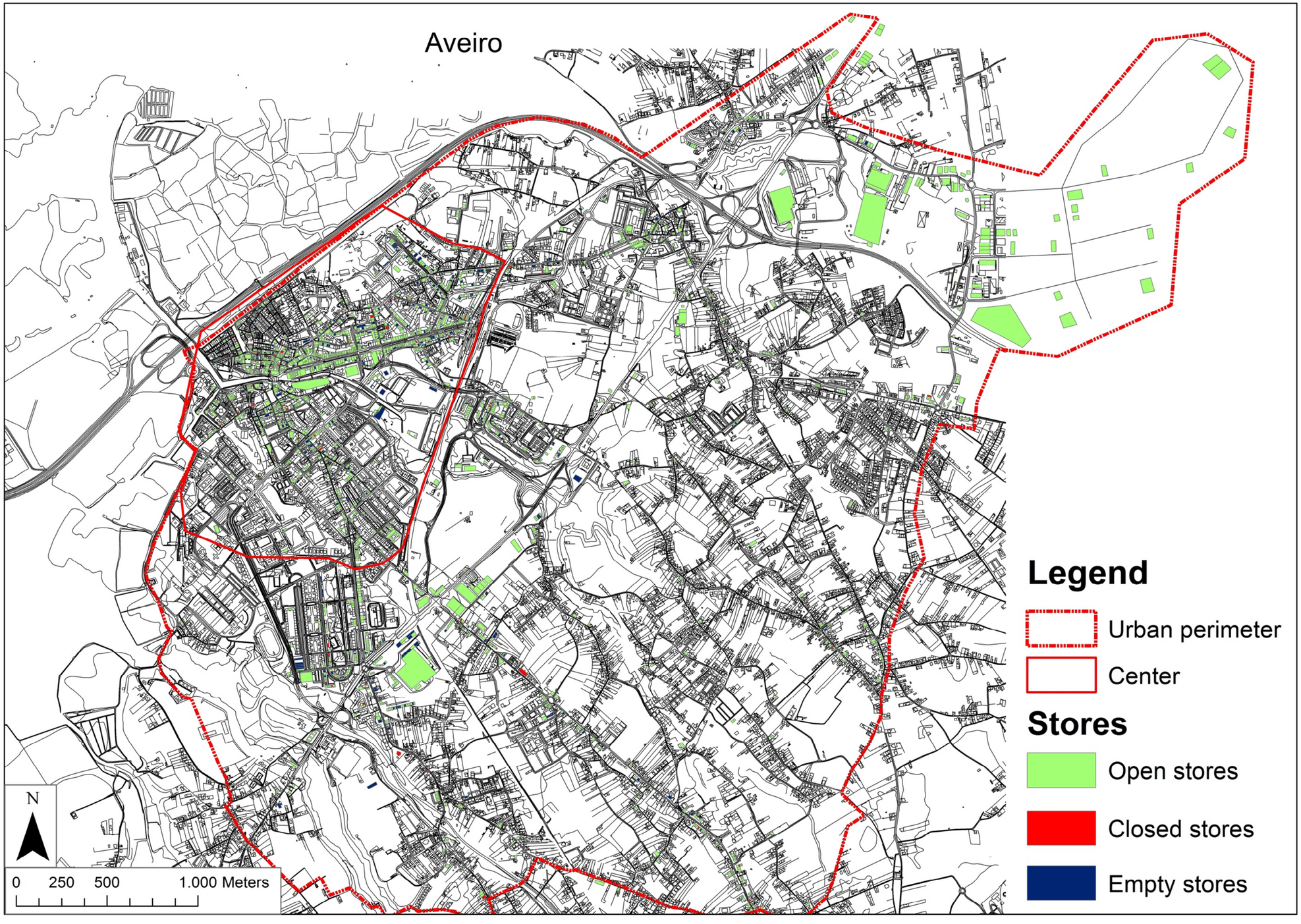

Aveiro
N
0 250 500 1.000 Meters
Legend
Urban perimeter
Center
Store Structure
Others
Chain
Franchise
Individual
Outlet

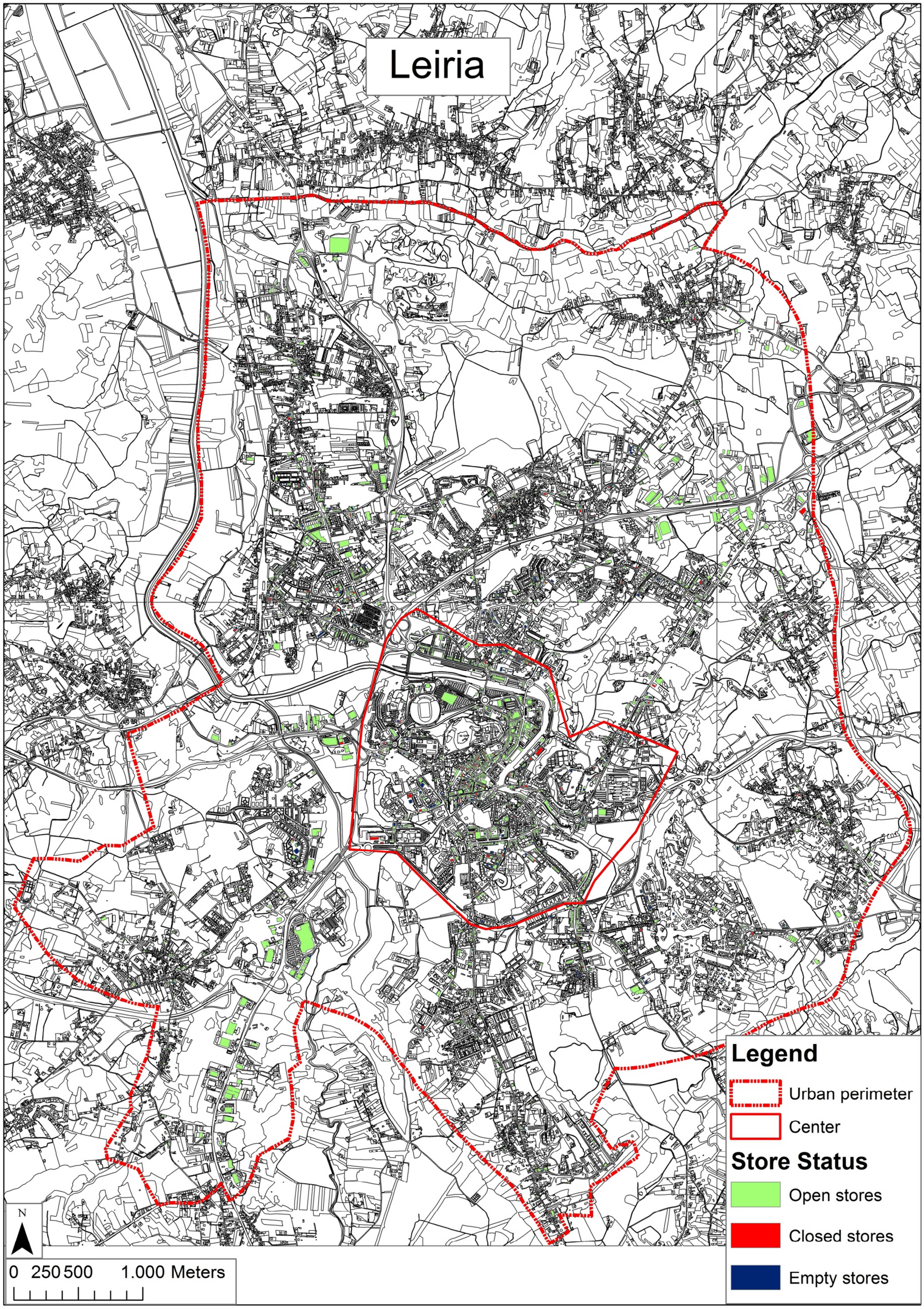

Leiria
Legend
Urban perimeter
Center
Store Structure
Others
Chain
Franchise
Individual
Outlet
N
0 250 500 1.000 Meters

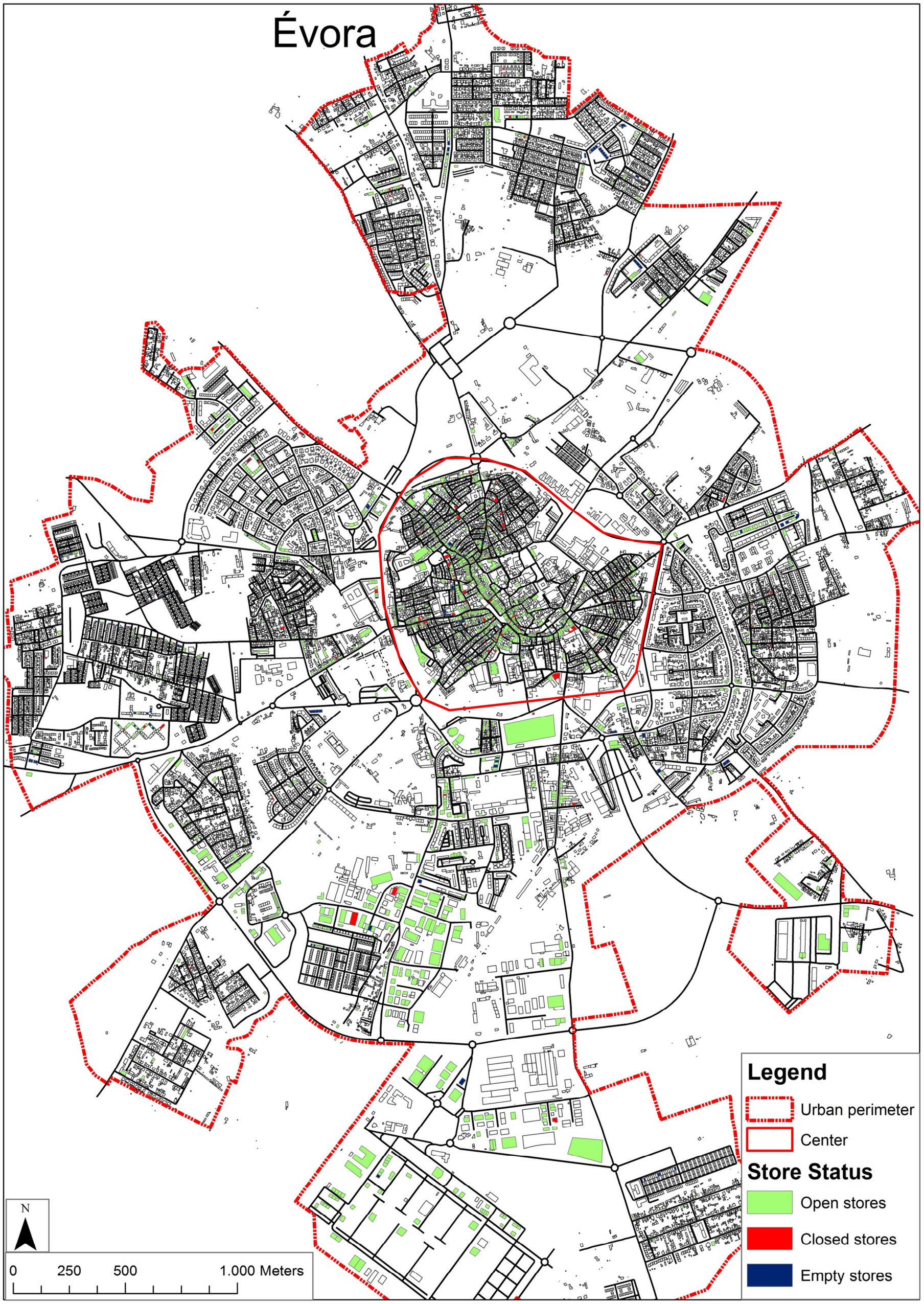

Évora
Legend
Urban perimeter
Center
Store Structure
Others
Chain
Franchise
Individual
Outlet
N
0
250
500
1.000 Meters

Annex 14 – Store Status distribution maps



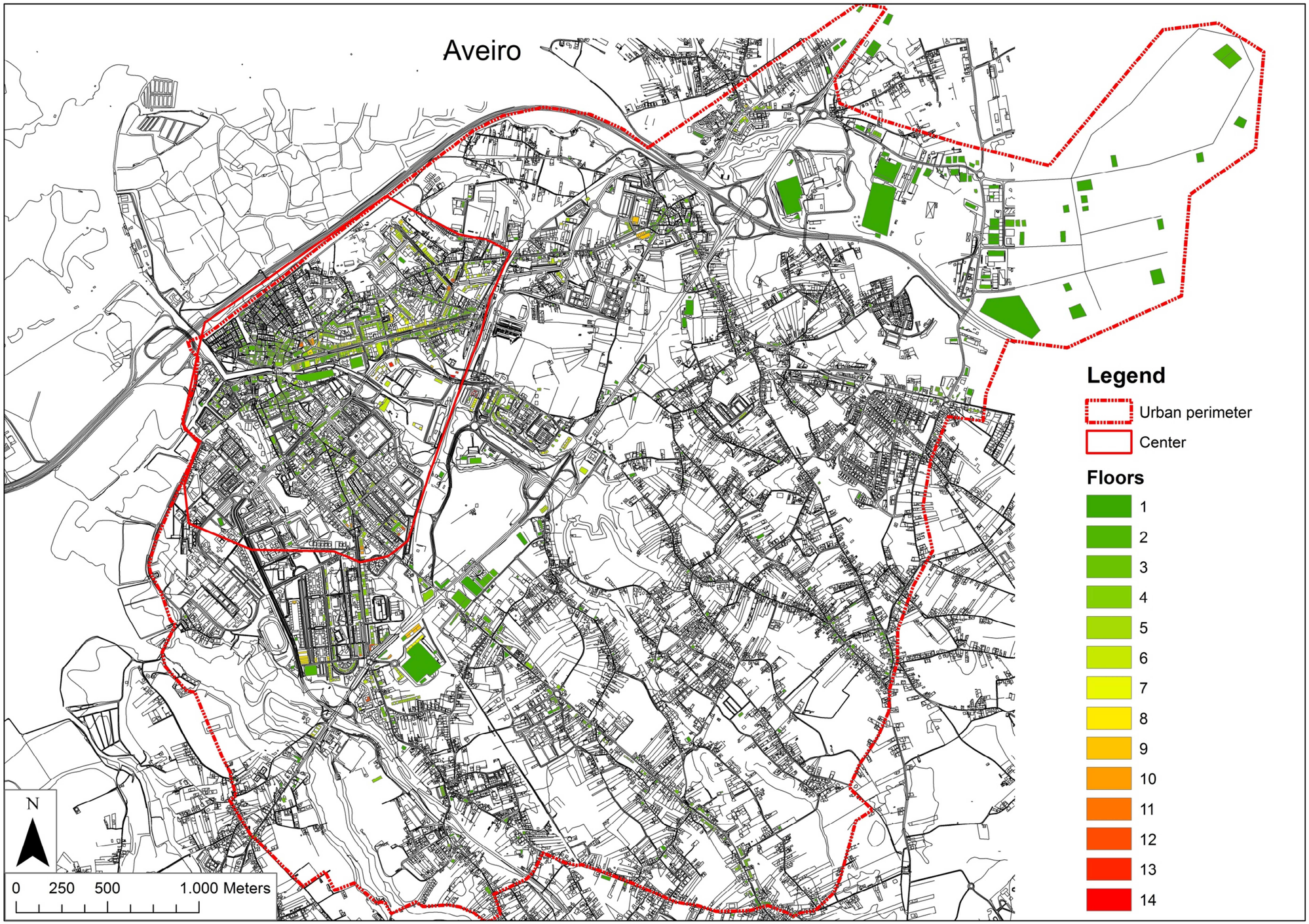

Aveiro
N
0 250 500 1.000 Meters
Legend
Urban perimeter
Center
Stores
Open stores
Closed stores
Empty stores

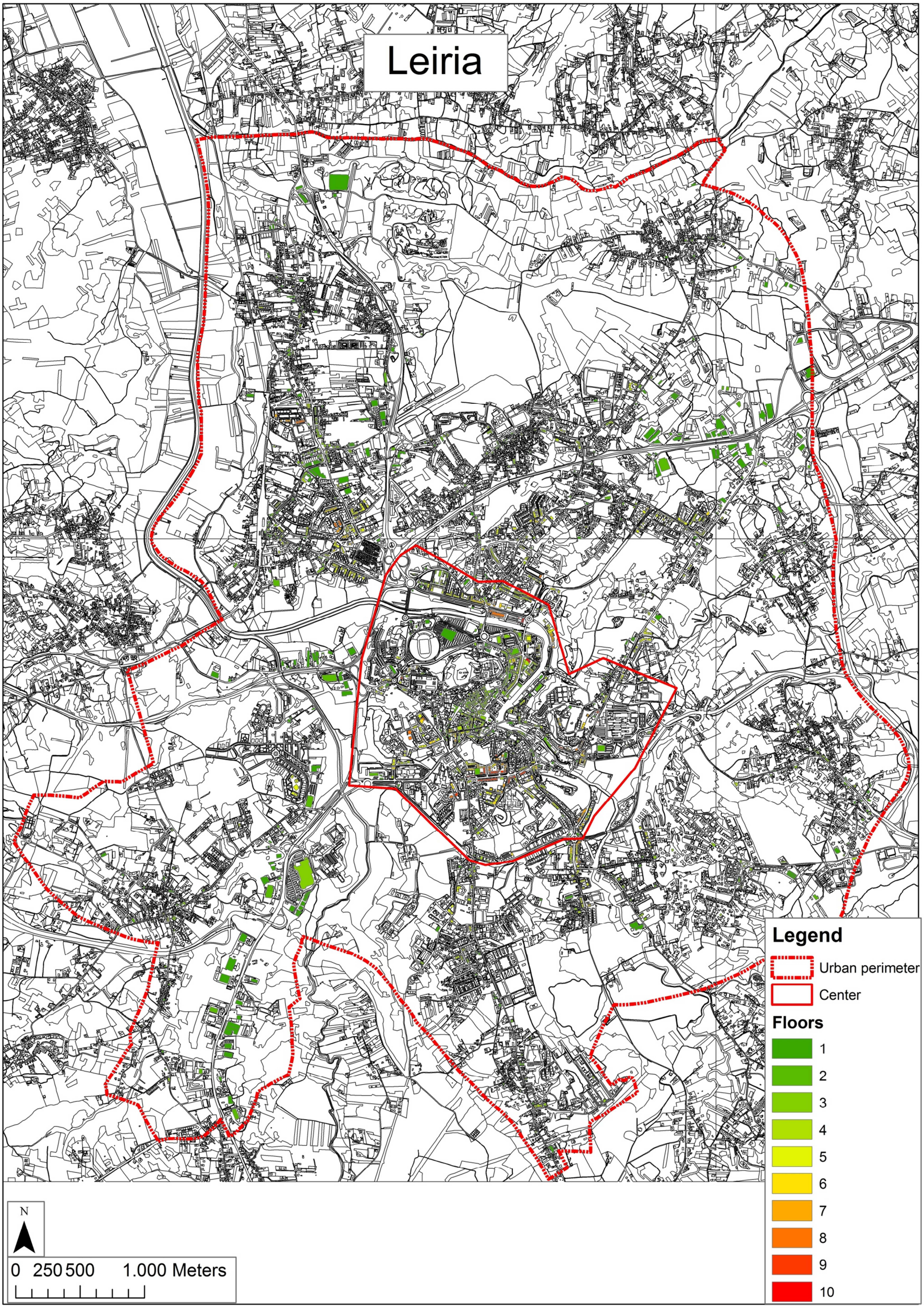

Leiria
Legend
Urban perimeter
Center
Store Status
Open stores
Closed stores
Empty stores
N
0 250 500 1.000 Meters

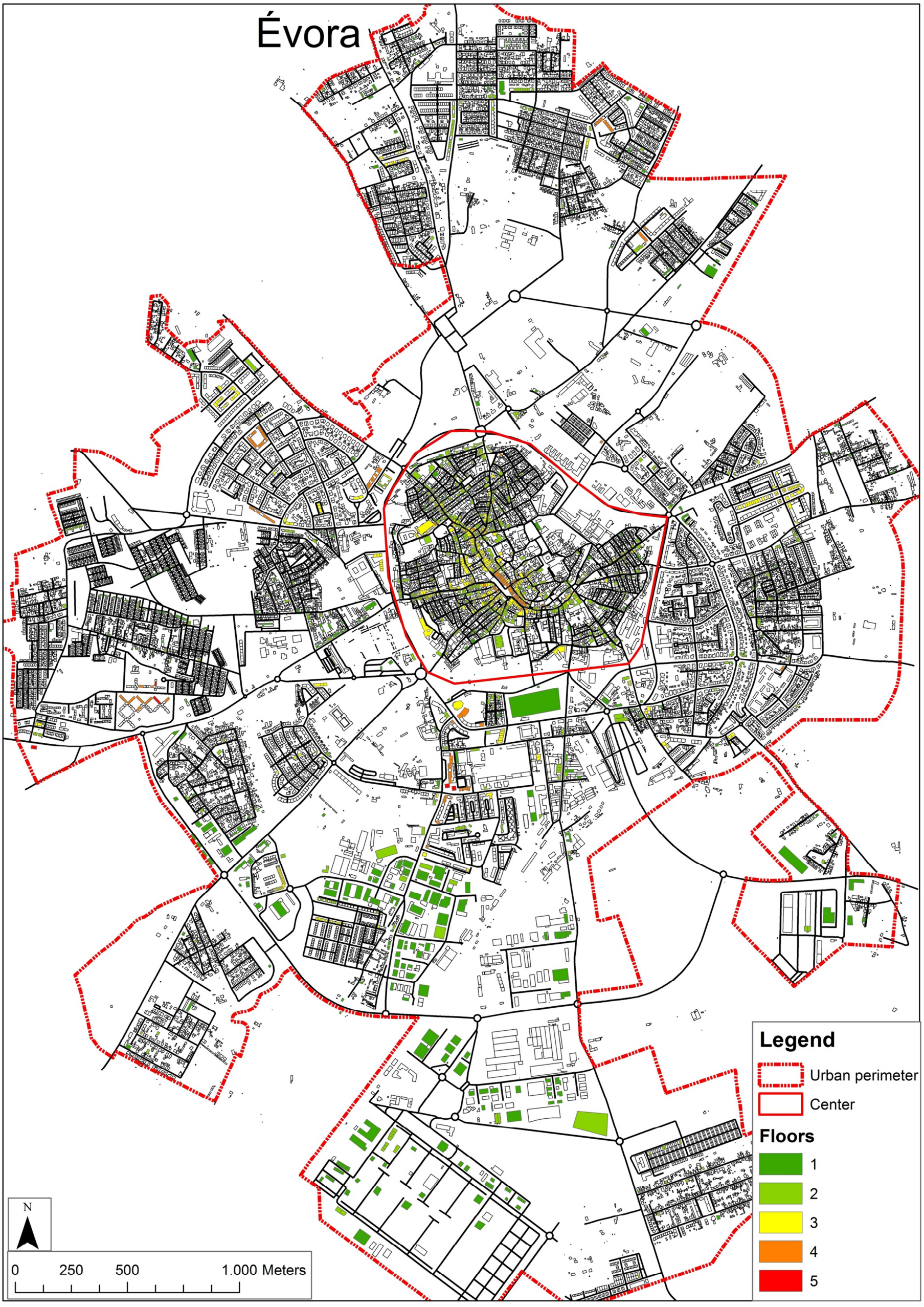

Évora
Legend
Urban perimeter
Center
Store Status
Open stores
Closed stores
Empty stores
N
0
250
500
1.000 Meters

Annex 15 – Building height

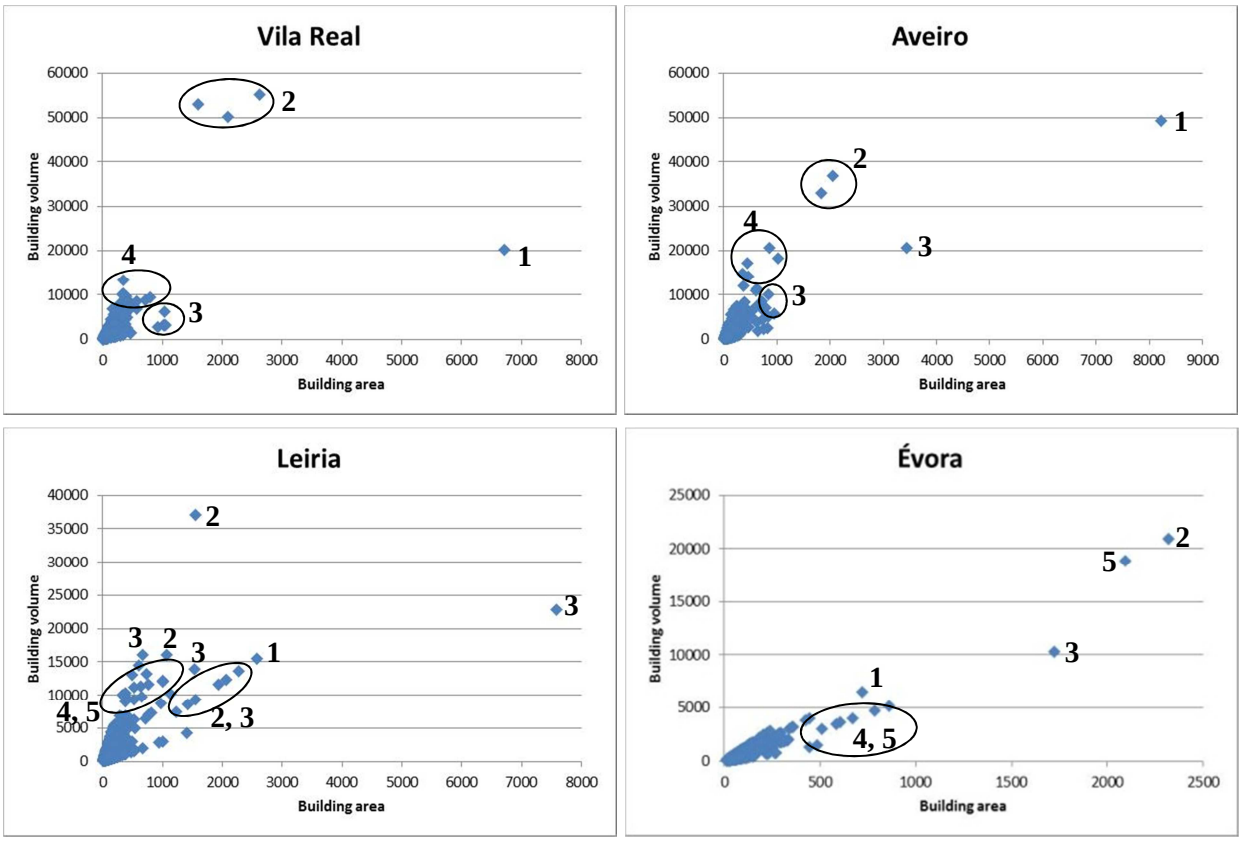



Aveiro
Legend
Urban perimeter
Center
Floors
1
2
3
4
5
6
7
8
9
10
11
12
13
14
N
0 250 500 1.000 Meters


Leiria
Legend
Urban perimeter
Center
Floors
1
2
3
4
5
6
7
8
9
10
N
0 250 500 1.000 Meters


Évora
Legend
Urban perimeter
Center
Floors
1
2
3
4
5
N
0
250
500
1.000 Meters

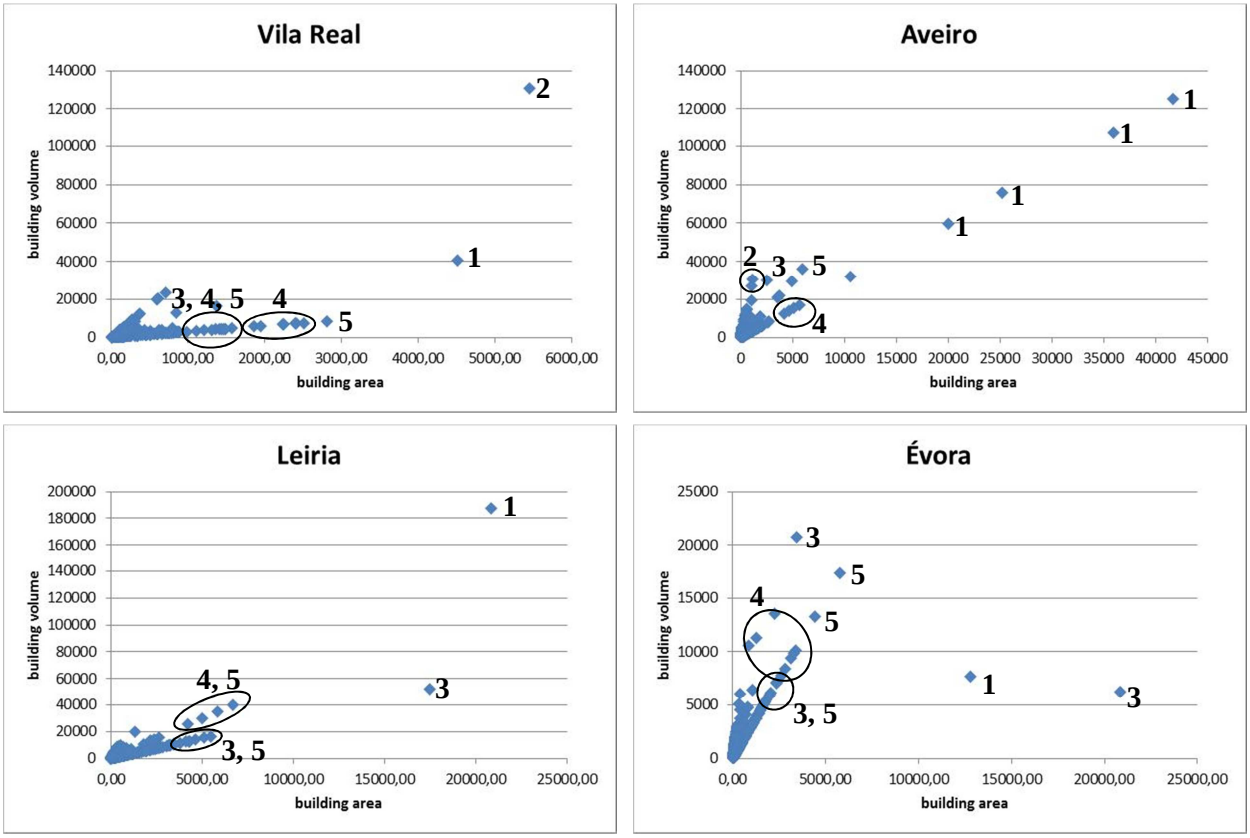
Annex 16 – Store distribution by area and (partial) building volume in the city centers and in the peripheries



1. Shopping centres / 2. Commercial arcades / 3. Large ‘Food & Beverage’ establishments

4. ‘Services and other activities’ and ‘Home’ / 5. ‘Restaurants & Cafés’ and ‘Leisure and culture’

Store distribution by area and (partial) building volume in the city centers



1. Shopping centres / 2. Commercial arcades / 3. Large 'Food & Beverage' establishments

4. 'Services and other activities' / 5.'Home'

Store distribution by area and (partial) building volume in the peripheries

Annex 17 – Store distribution, by category and by quantile, in the segments of the second to the sixth quantile

Percentage of stores in the second and third quantiles ('yellow') by retail category, for r= n

	Vila Real			Aveiro			Leiria			Évora		
	City	Cen.	Per.	**City**	Cen.	Per.	**City**	Cen.	Per.	**City**	Cen.	Per.
Integration (to-movement)												
M1	**40,1**	40,7	39,1	**28,7**	30,0	26,4	**32,6**	30,7	35,7	**38,4**	40,5	35,4
M2	**6,6**	6,4	6,9	**7,6**	7,8	7,2	**8,3**	8,4	8,2	**8,3**	7,4	9,6
MC	**7,0**	7,3	6,3	**16,7**	21,4	8,5	**14,5**	19,3	6,9	**14,2**	17,6	9,6
C	**33,1**	30,0	39,1	**24,3**	18,3	34,7	**23,1**	20,5	27,4	**22,2**	16,8	29,8
S	**7,0**	7,3	6,3	**7,3**	6,8	8,3	**7,3**	7,1	7,5	**8,5**	9,8	6,7
Others*	**6,2**	8,3	2,3	**15,5**	15,8	14,9	**14,1**	14,0	14,3	**8,4**	8,0	9,0
Total	**100**	100	100	**100**	100	100	**100**	100	100	**100**	100	100
Choice (through-movement)												
M1	**40,2**	38,4	44,6	**32,1**	33,3	30,4	**32,9**	30,2	36,4	**38,6**	36,2	40,7
M2	**7,1**	8,1	4,8	**7,2**	6,8	7,8	**8,6**	9,2	7,8	**7,4**	7,9	6,9
MC	**20,5**	27,3	4,2	**15,8**	20,6	9,5	**12,0**	17,7	4,5	**15,3**	21,2	10,0
C	**22,6**	16,2	38,0	**24,8**	17,0	35,4	**25,5**	21,8	30,4	**21,7**	19,1	24,1
S	**5,5**	5,1	6,6	**7,5**	8,6	6,1	**7,6**	7,8	7,4	**6,7**	7,9	5,6
Others*	**4,1**	5,1	1,8	**12,5**	13,8	10,8	**13,4**	13,3	13,6	**10,3**	7,7	12,7
Total	**100**	100	100	**100**	100	100	**100**	100	100	**100**	100	100

* Multi-commercial or of Category unknown (closed or empty)

Percentage of stores in the fourth, fifth and sixt quantiles ('blue') by retail category, for r= n

	Vila Real			Aveiro			Leiria			Évora		
	City	Cen.	Per.	**City**	Cen.	Per.	**City**	Cen.	Per.	**City**	Cen.	Per.
						Integration (to-movement)						
M1	**38,0**	33,3	38,5	**37,7**	44,9	33,3	**31,4**	35,6	30,9	**40,4**	71,4	39,4
M2	**5,1**	0	5,6	**7,6**	6,0	8,6	**6,0**	8,9	5,7	**3,8**	7,1	3,7
MC	**1,9**	6,7	1,4	**7,8**	7,5	7,9	**4,5**	15,6	3,2	**6,7**	7,1	6,7
C	**49,4**	60,0	48,3	**21,7**	9,8	28,8	**32,1**	15,6	33,9	**28,0**	14,3	28,5
S	**5,7**	0	6,3	**9,4**	15,5	5,9	**7,8**	2,2	8,4	**5,2**	0	5,3
Others*	**0**	0	0	**15,8**	16,2	15,5	**18,3**	22,2	17,8	**15,9**	0	16,4
Total	**100**	100	100	**100**	100	100	**100**	100	100	**100**	100	100
						Choice (through-movement)						
M1	**36,2**	36,2	36,2	**32,1**	34,5	29,4	**30,5**	33,3	26,7	**40,1**	51,2	35,1
M2	**9,0**	9,6	7,8	**7,8**	7,8	7,8	**5,7**	7,1	3,9	**6,7**	6,6	6,7
MC	**9,5**	12,1	3,4	**11,5**	14,5	8,1	**12,8**	18,7	4,7	**5,9**	10,7	3,7
C	**33,4**	29,1	44,0	**20,6**	14,5	27,6	**24,9**	17,0	35,9	**26,2**	10,7	33,2
S	**6,3**	6,0	6,9	**8,9**	9,7	8,1	**7,0**	6,2	8,0	**9,0**	14,0	6,7
Others*	**5,5**	7,1	1,7	**19,0**	19,1	19,0	**19,0**	17,6	20,8	**12,1**	6,6	14,6
Total	**100**	100	100	**100**	100	100	**100**	100	100	**100**	100	100

* Multi-commercial or of Category unknown (closed or empty)

Percentage of stores of each type of retail category that are in the second and third quantiles ('yellow') for r= n

	Vila Real			Aveiro			Leiria			Évora		
	City	Cen.	Per.	**City**	Cen.	Per.	**City**	Cen.	Per.	**City**	Cen.	Per.
						Integration (to-movement)						
M1	**38,4**	37,5	40,2	**55,0**	62,5	44,3	**69,6**	76,0	62,4	**50,5**	66,8	36,3
M2	**30,0**	25,9	41,4	**55,4**	62,1	45,9	**63,7**	63,0	65,0	**51,4**	50,0	53,1
MC	**17,5**	13,3	55,0	**64,1**	68,2	50,6	**71,6**	71,2	73,3	**45,9**	44,4	50,0
C	**40,1**	41,0	38,9	**61,1**	77,8	50,9	**61,3**	73,1	51,3	**48,6**	61,8	41,6
S	**42,7**	41,4	45,8	**53,4**	51,4	56,5	**61,9**	65,5	57,1	**62,4**	74,2	47,1
Others*	**46,3**	46,6	44,4	**60,6**	68,8	49,6	**63,0**	70,9	53,8	**43,9**	74,1	29,1
Total	**35,9**	33,7	40,8	**58,5**	66,0	48,8	**65,7**	71,7	58,0	**49,6**	60,2	39,8
						Choice (through-movement)						
M1	**43,1**	42,8	43,8	**51,3**	52,2	50,0	**44,0**	43,4	44,8	**48,8**	46,7	50,7
M2	**36,4**	39,5	27,6	**44,1**	40,8	48,6	**41,4**	40,0	43,8	**44,2**	41,9	46,9
MC	**57,5**	60,0	35,0	**50,7**	49,2	55,7	**37,1**	38,0	33,3	**47,7**	41,9	63,2
C	**30,7**	26,8	36,0	**52,1**	54,1	50,9	**42,4**	45,2	40,1	**45,8**	55,1	40,8
S	**37,8**	34,5	45,8	**45,5**	48,6	40,6	**40,7**	41,8	39,3	**47,0**	47,0	47,1
Others*	**34,3**	34,5	33,3	**40,9**	45,0	35,5	**37,8**	39,2	36,1	**51,8**	55,6	50,0
	40,2	40,8	39,0	**48,8**	49,5	47,9	**41,3**	41,7	40,9	**47,7**	47,1	48,3

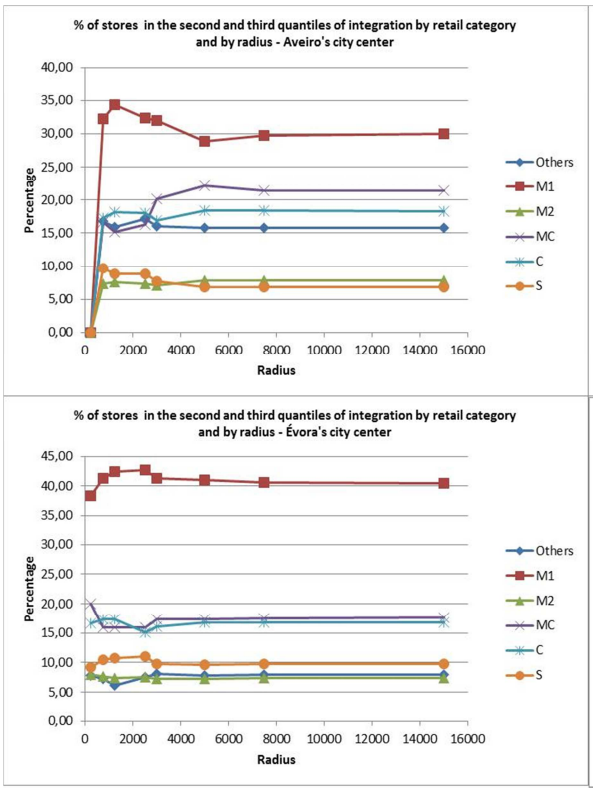
* Multi-commercial or of Category unknown (closed or empty)

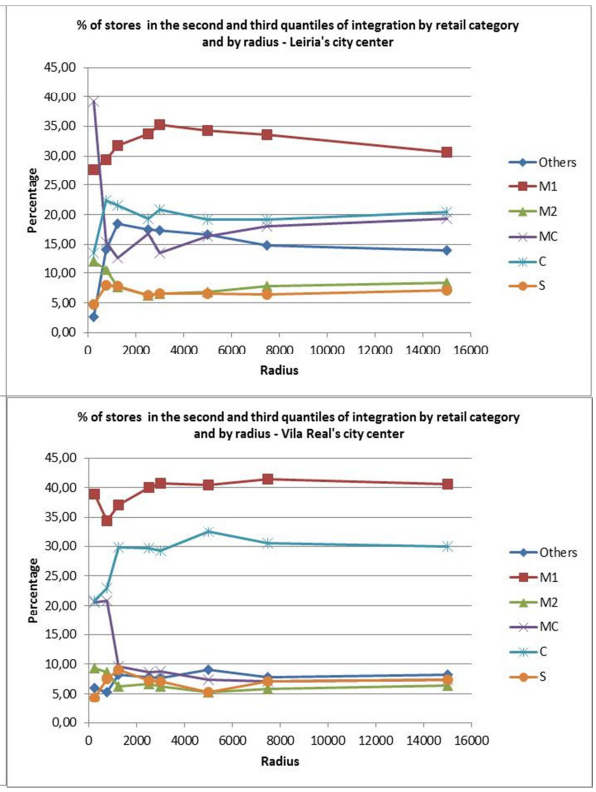
Percentage of stores of each type of retail category that are in the fourth, fifth and sixt quantiles ('blue') for r= n

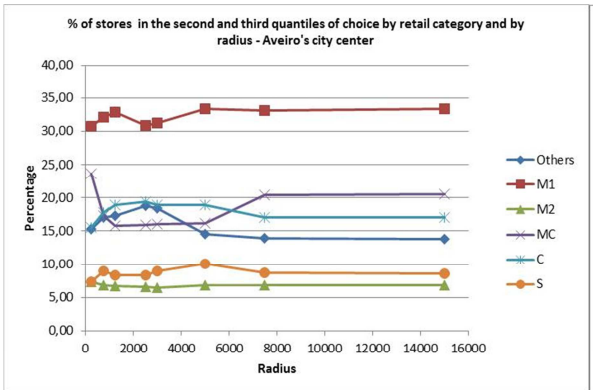
	Vila Real			Aveiro			Leiria			Évora		
	City	Cen.	Per.	**City**	Cen.	Per.	**City**	Cen.	Per.	**City**	Cen.	Per.
						Integration (to-movement)						
M1	**11,5**	1,4	32,5	**39,6**	30,1	52,9	**18,3**	3,9	34,3	**27,6**	3,3	49,0
M2	**7,3**	0	27,6	**30,5**	15,5	51,4	**12,6**	3,0	28,8	**12,3**	1,4	25,0
MC	**1,5**	0,6	10,0	**16,3**	7,8	44,3	**6,0**	2,6	21,7	**11,3**	0,5	42,6
C	**18,8**	3,8	39,4	**30,0**	13,4	40,0	**23,2**	2,5	40,4	**32,0**	1,5	48,2
S	**11,0**	0	37,5	**37,6**	37,6	37,7	**18,0**	0,9	40,5	**19,7**	0	45,1
Others*	**0**	0	0	**33,9**	22,8	48,9	**22,3**	5,0	42,6	**43,3**	0	64,5
Total	**11,3**	1,5	33,6	**32,1**	21,2	46,1	**17,9**	3,2	36,9	**25,8**	1,7	48,3
						Choice (through-movement)						
M1	**27,5**	28,7	24,9	**39,0**	38,0	40,4	**31,7**	38,0	24,7	**24,0**	20,4	27,1
M2	**32,7**	33,3	31,0	**36,2**	33,0	40,5	**21,4**	24,4	16,3	**18,8**	10,8	28,1
MC	**19,0**	18,9	20,0	**27,9**	24,4	39,2	**30,8**	31,8	26,7	**8,6**	6,6	14,7
C	**32,1**	34,3	29,1	**32,9**	32,5	33,1	**32,2**	27,9	35,7	**26,1**	9,6	34,9
S	**30,5**	29,3	33,3	**41,0**	38,5	44,9	**28,9**	26,4	32,1	**29,9**	25,8	35,3
Others*	**32,8**	34,5	22,2	**47,3**	43,9	51,8	**41,3**	41,2	41,4	**28,7**	14,8	35,5
Total	**28,5**	29,0	27,2	**37,0**	34,9	39,9	**32,0**	33,0	30,7	**22,5**	14,5	29,9

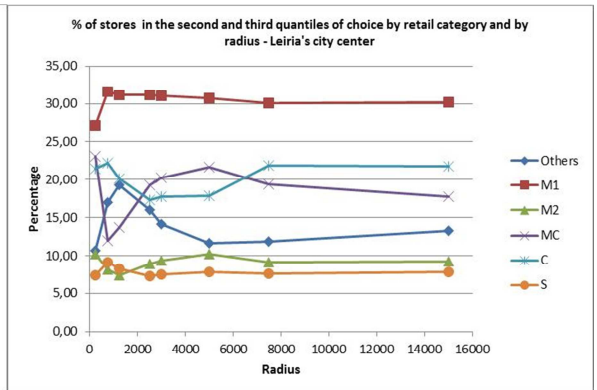
* Multi-commercial or of Category unknown (closed or empty)

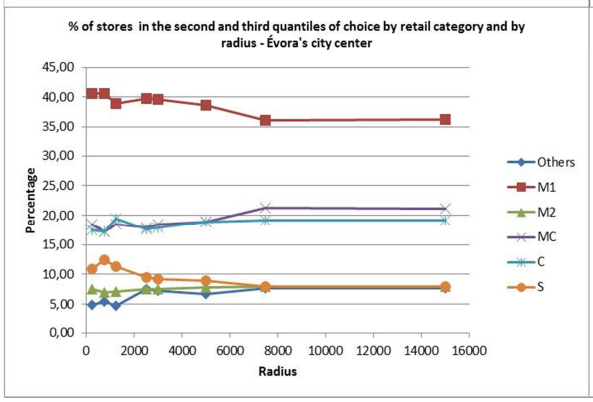
Annex 18 – Percentage of stores in the second to the sixth quantile of 'integration' and 'choice', by retail category and by radius, for the centers

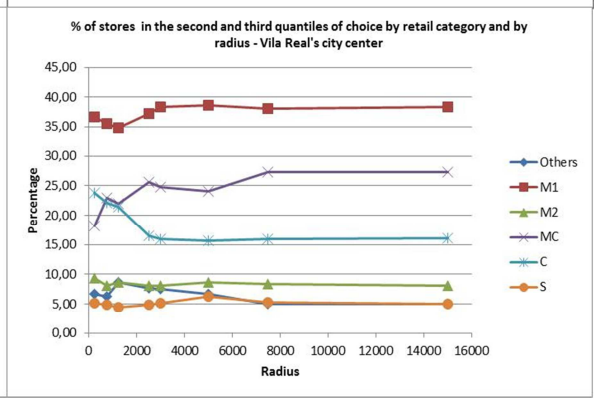


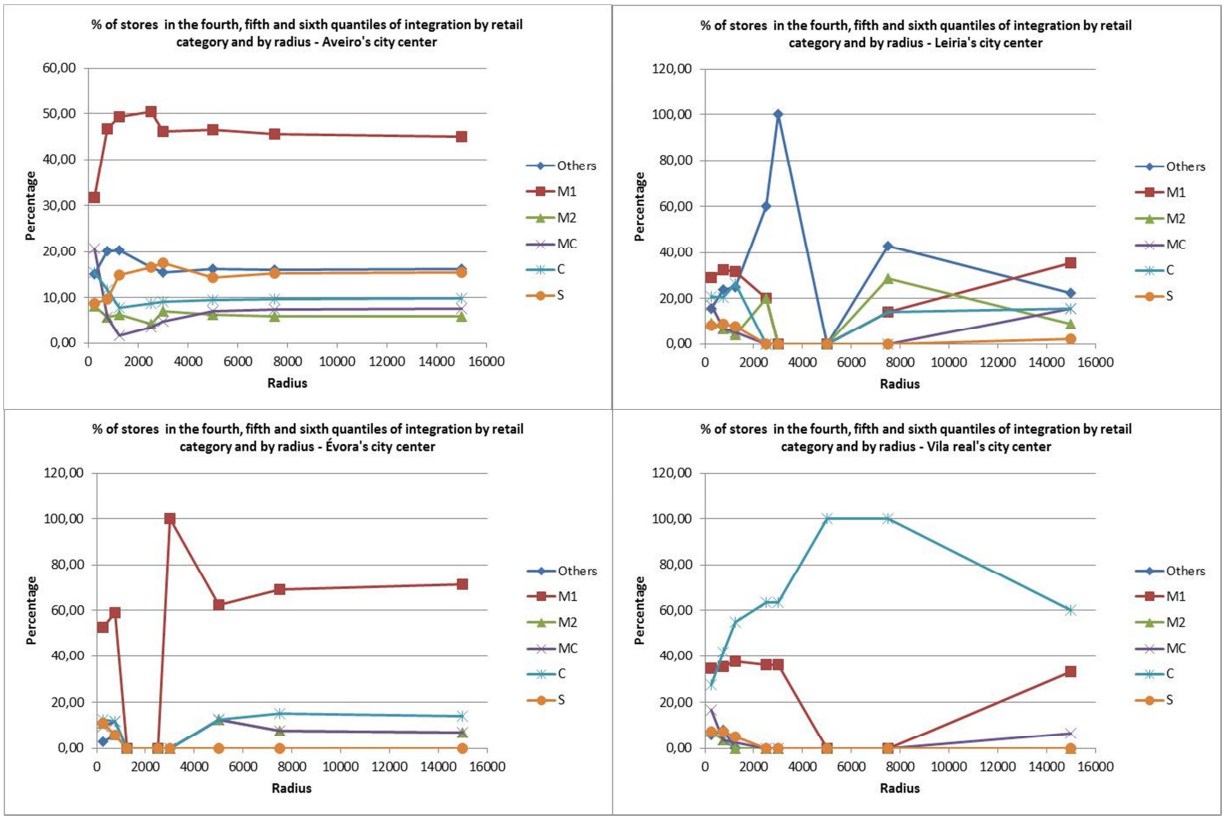


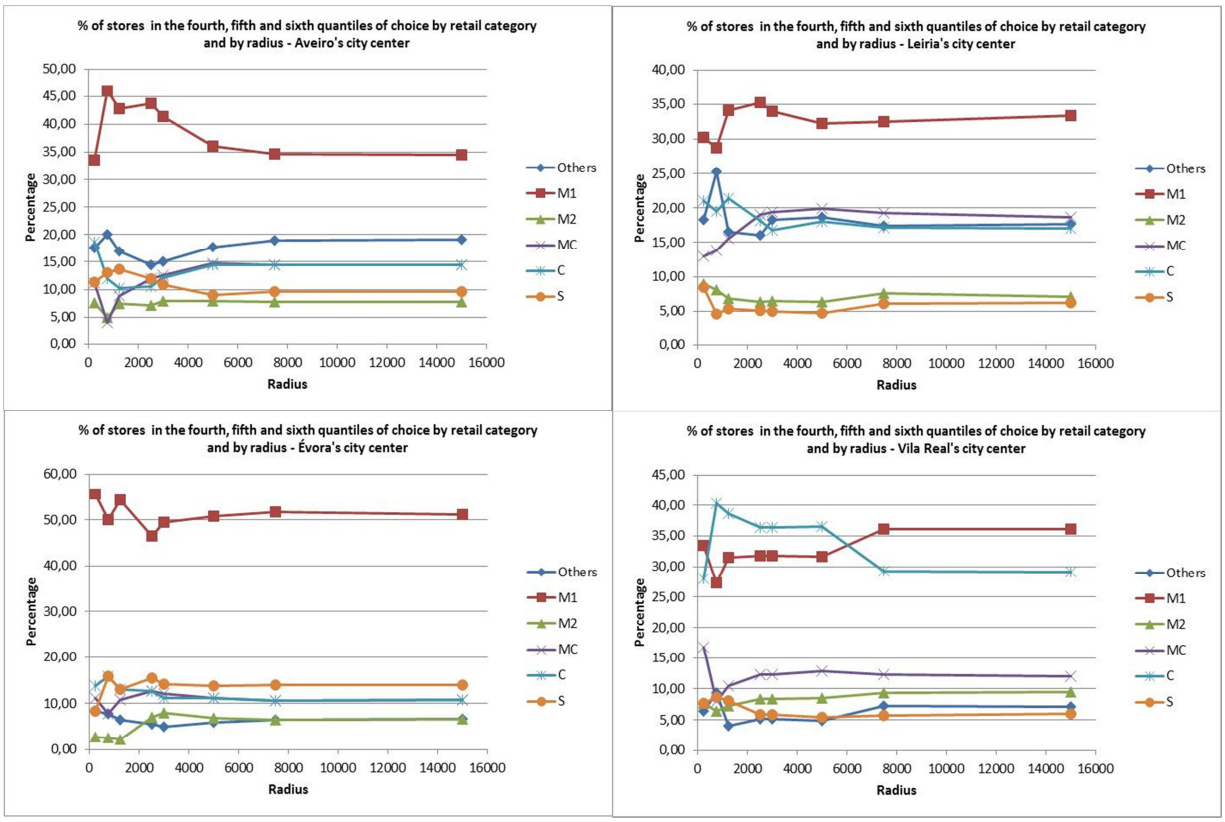




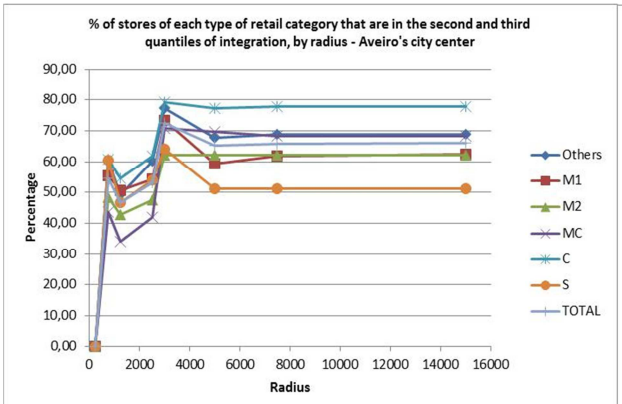


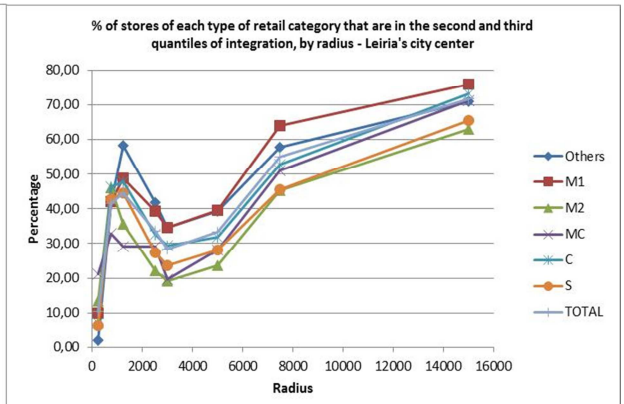


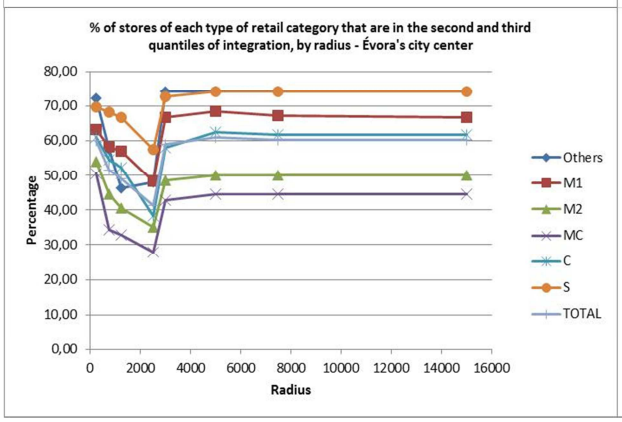

% of stores in the fourth, fifth and sixth quantiles of integration by retail category and by radius - Aveiro's city center
% of stores in the fourth, fifth and sixth quantiles of integration by retail category and by radius - Leiria's city center
% of stores in the fourth, fifth and sixth quantiles of integration by retail category and by radius - Évora's city center
% of stores in the fourth, fifth and sixth quantiles of integration by retail category and by radius - Vila real's city center
Percentage
Radius
Others
M1
M2
MC
C
S

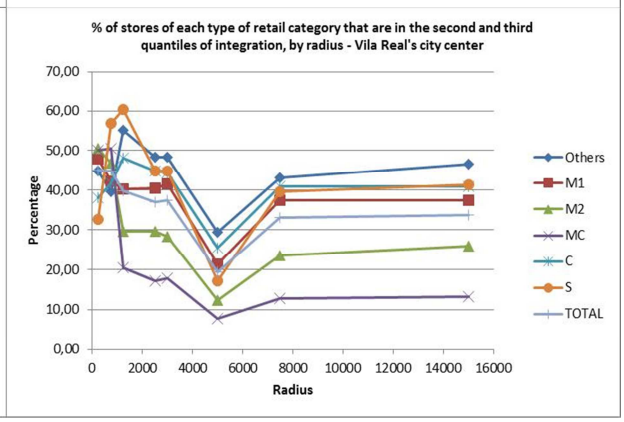

% of stores in the fourth, fifth and sixth quantiles of choice by retail category and by radius - Aveiro's city center
% of stores in the fourth, fifth and sixth quantiles of choice by retail category and by radius - Leiria's city center
% of stores in the fourth, fifth and sixth quantiles of choice by retail category and by radius - Évora's city center
% of stores in the fourth, fifth and sixth quantiles of choice by retail category and by radius - Vila Real's city center
Percentage
Radius
Others
M1
M2
MC
C
S

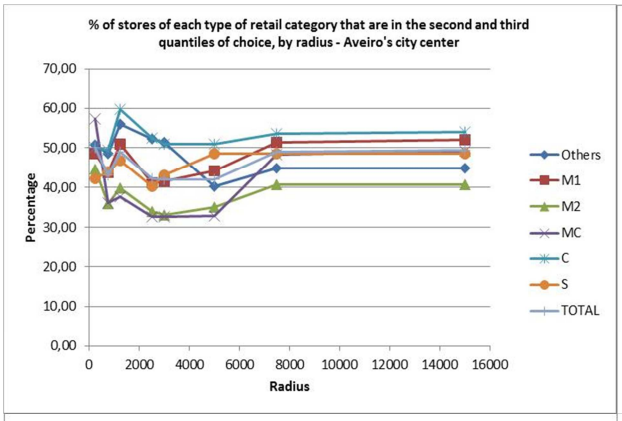
Annex 19 – Percentage of stores of each type of retail category that are in the second to the sixth quantiles of 'integration' and 'choice', by radius, for the centers

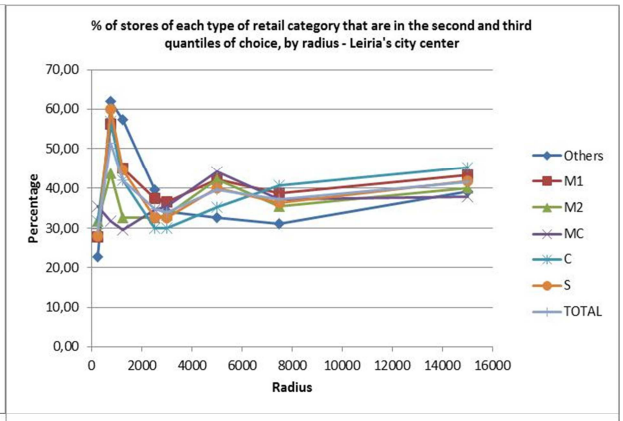


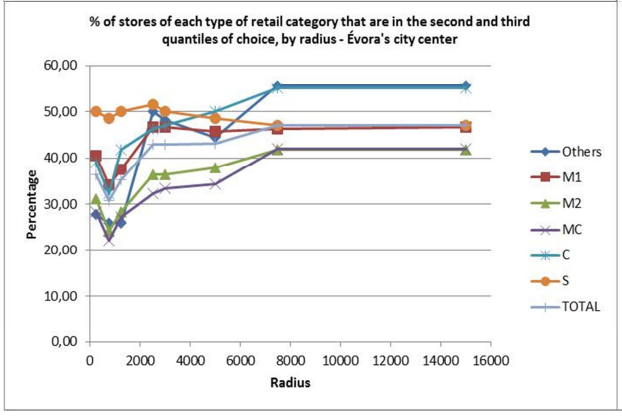


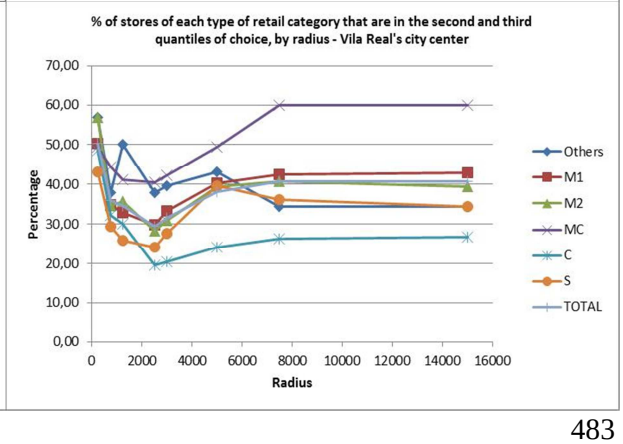


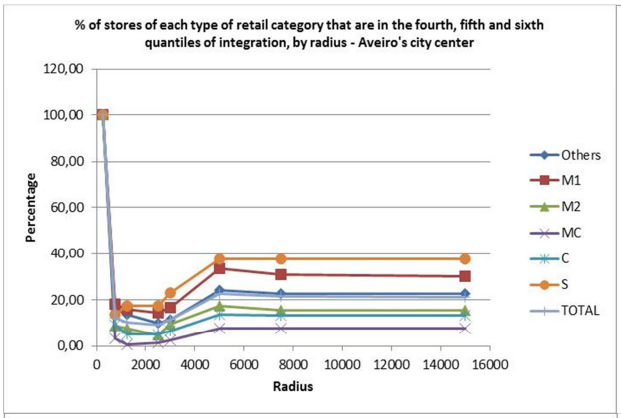


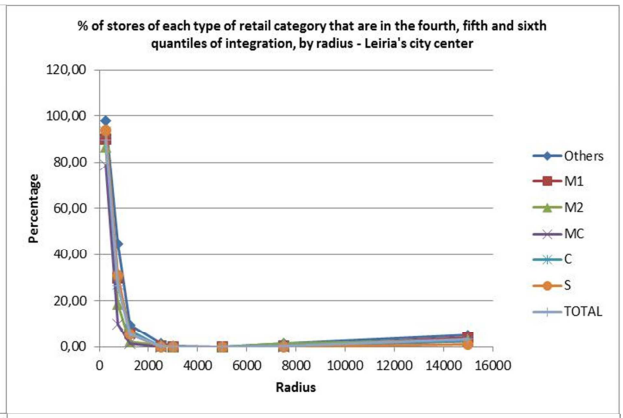


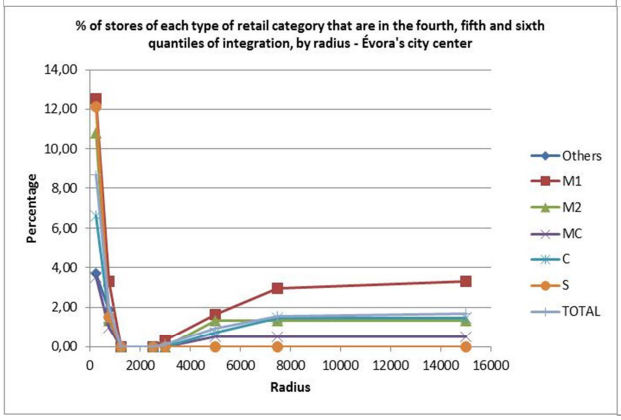


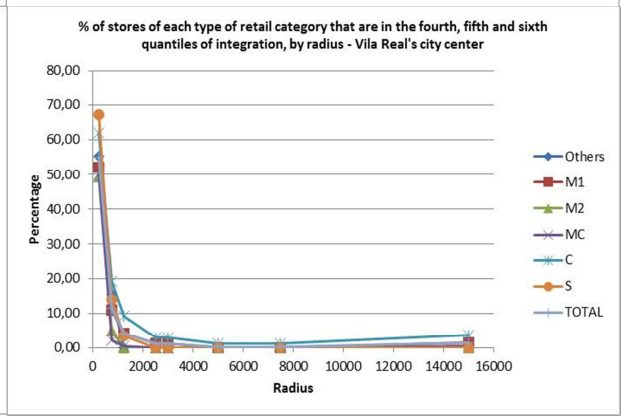


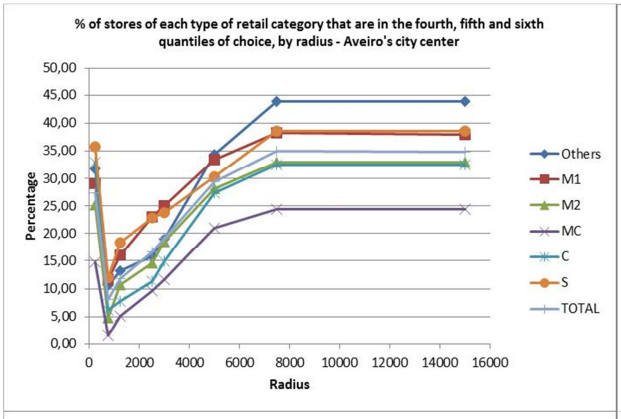


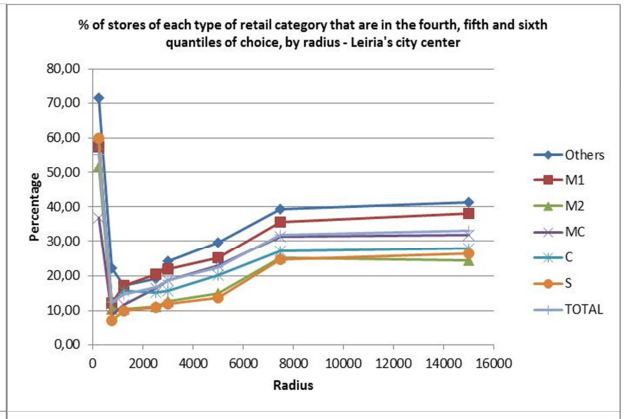

% of stores of each type of retail category that are in the fourth, fifth and sixth quantiles of integration, by radius - Aveiro's city center
Percentage
Radius
Others
M1
M2
MC
C
S
TOTAL

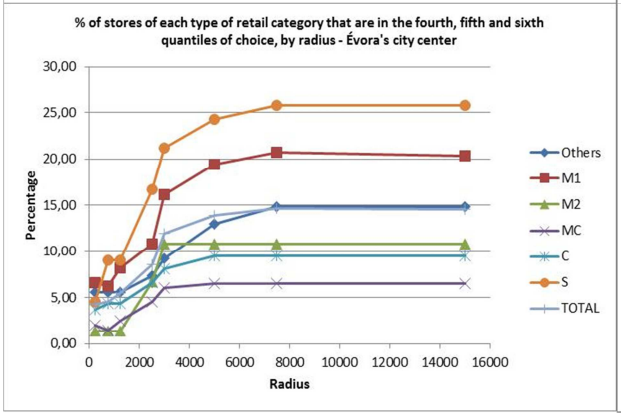

% of stores of each type of retail category that are in the fourth, fifth and sixth quantiles of integration, by radius - Leiria's city center
Percentage
Radius
Others
M1
M2
MC
C
S
TOTAL

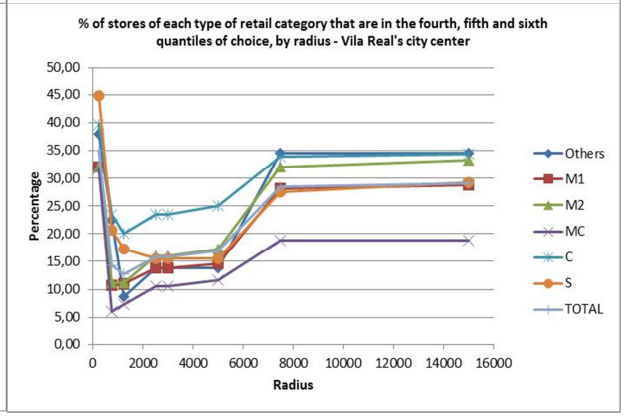

% of stores of each type of retail category that are in the fourth, fifth and sixth quantiles of integration, by radius - Évora's city center
Percentage
Radius
Others
M1
M2
MC
C
S
TOTAL


% of stores of each type of retail category that are in the fourth, fifth and sixth quantiles of integration, by radius - Vila Real's city center
Percentage
Radius
Others
M1
M2
MC
C
S
TOTAL

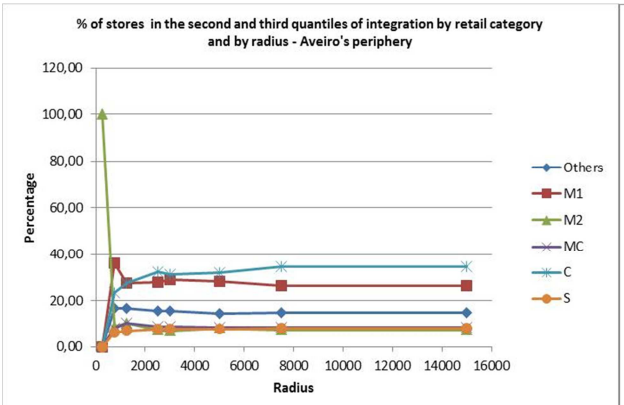

% of stores of each type of retail category that are in the fourth, fifth and sixth quantiles of choice, by radius - Aveiro's city center
Percentage
Radius
Others
M1
M2
MC
C
S
TOTAL

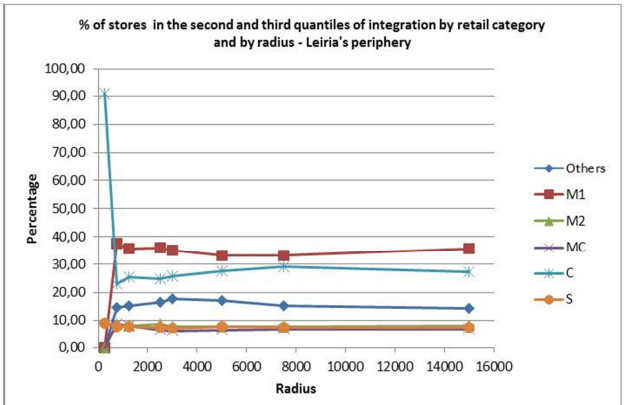

% of stores of each type of retail category that are in the fourth, fifth and sixth quantiles of choice, by radius - Leiria's city center
Percentage
Radius
Others
M1
M2
MC
C
S
TOTAL

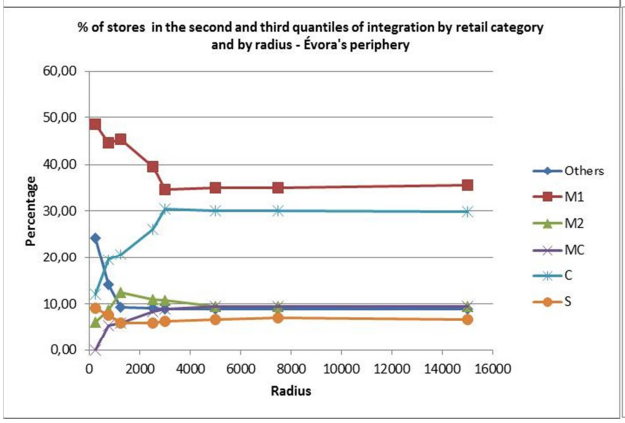

% of stores of each type of retail category that are in the fourth, fifth and sixth quantiles of choice, by radius - Évora's city center
Percentage
Radius
Others
M1
M2
MC
C
S
TOTAL

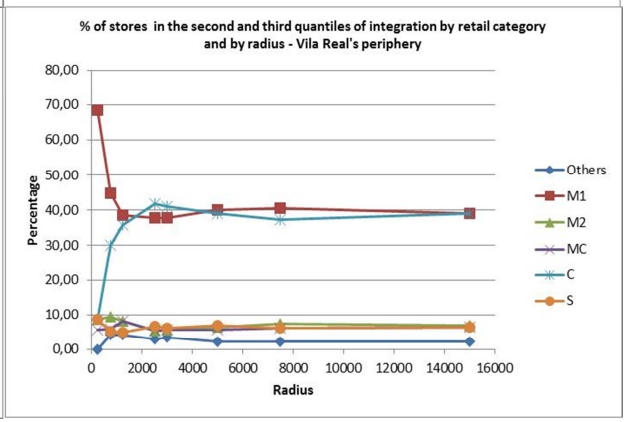

% of stores of each type of retail category that are in the fourth, fifth and sixth quantiles of choice, by radius - Vila Real's city center
Percentage
Radius
Others
M1
M2
MC
C
S
TOTAL

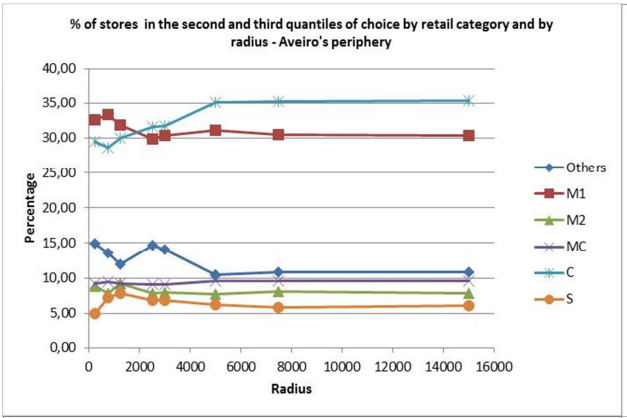
Annex 20 – Percentage of stores in the second to the sixth quantile of integration and choice, by retail category and by radius, for the peripheries

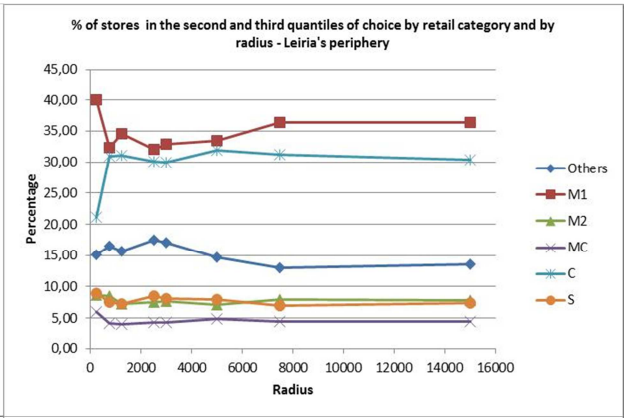


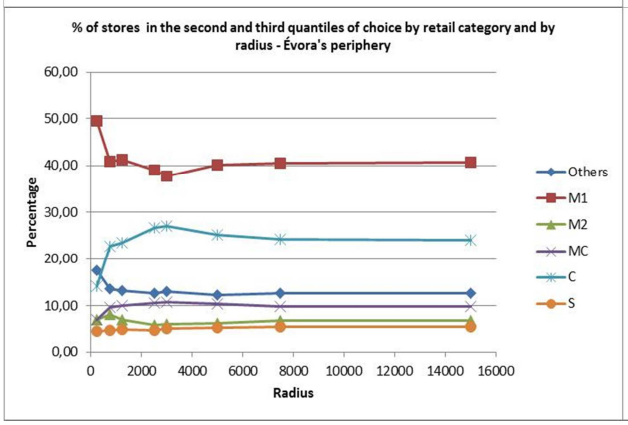


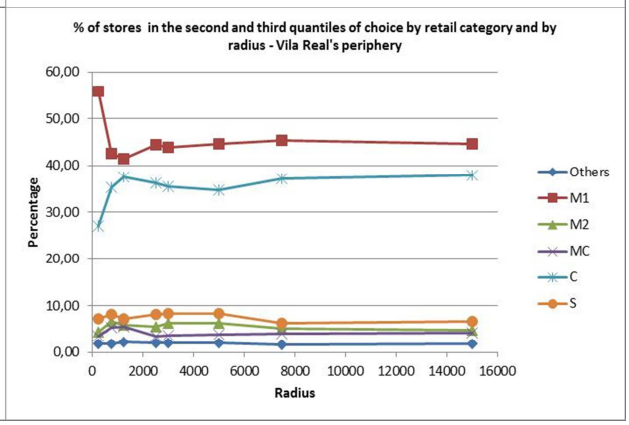


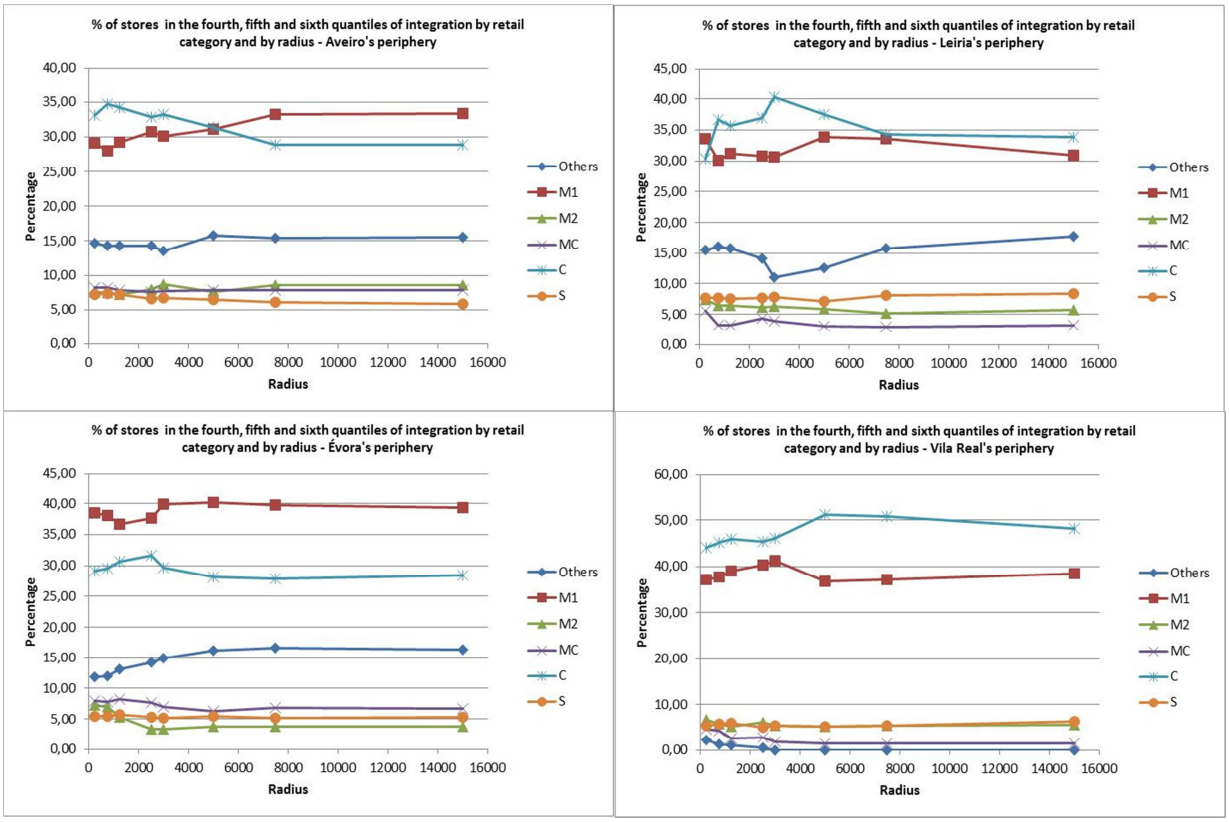


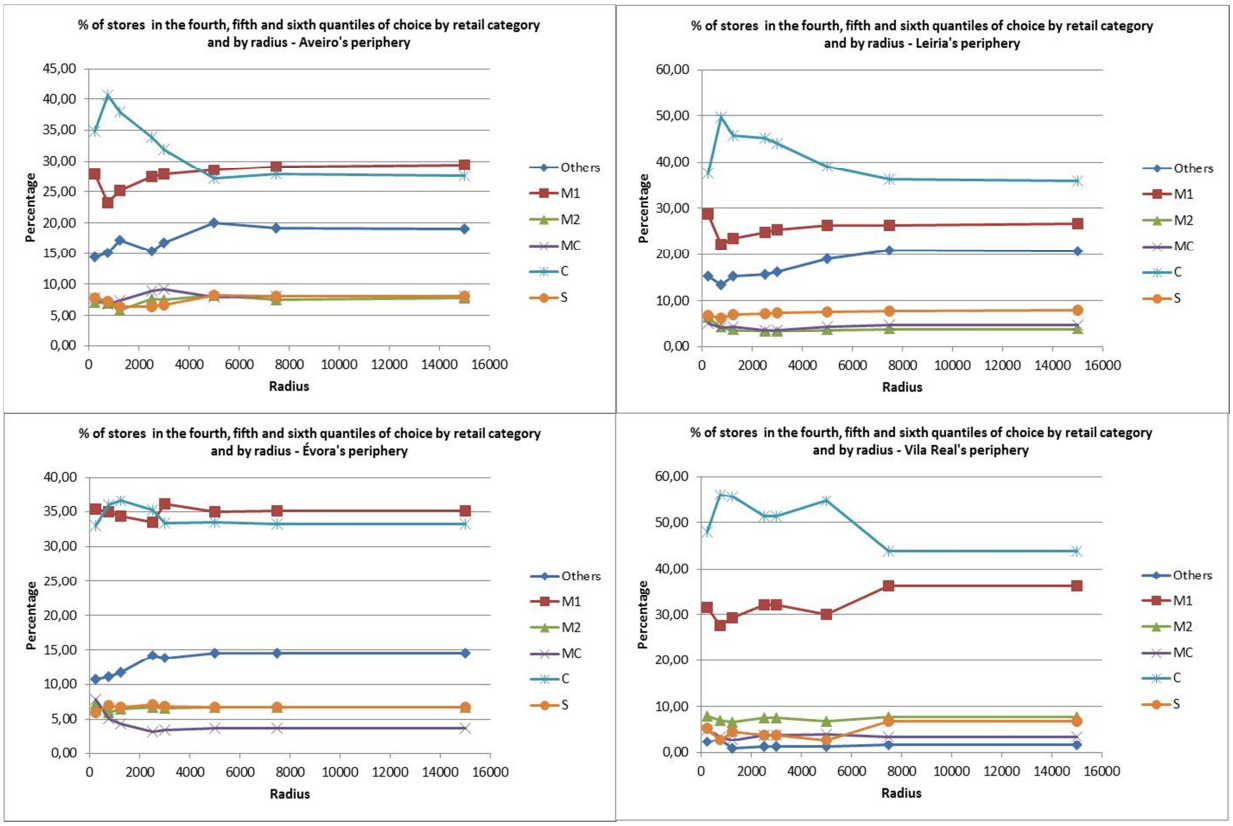




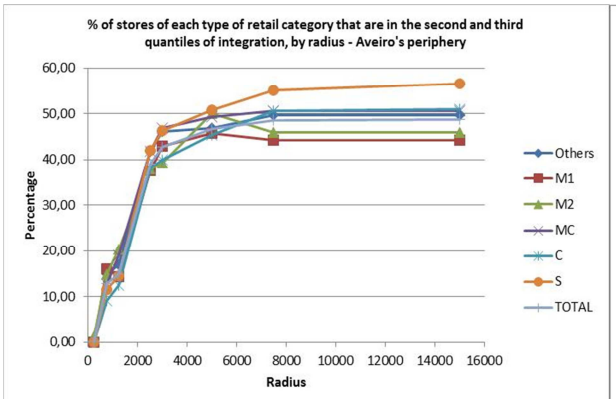


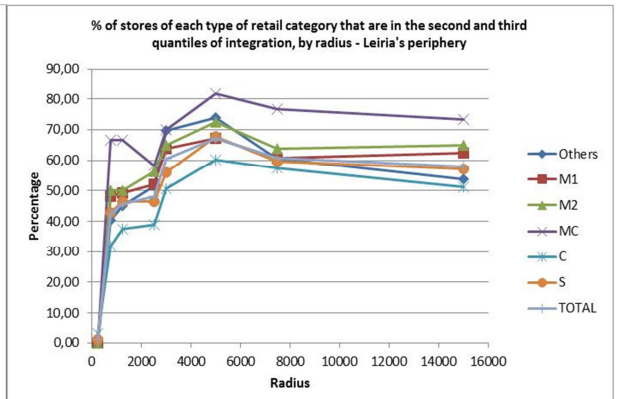


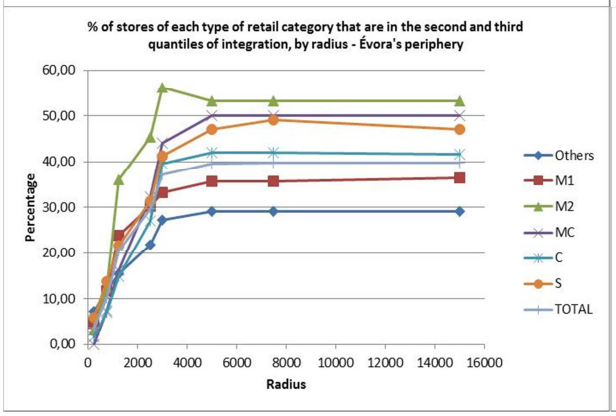

% of stores in the fourth, fifth and sixth quantiles of integration by retail category and by radius - Aveiro's periphery
% of stores in the fourth, fifth and sixth quantiles of integration by retail category and by radius - Leiria's periphery
% of stores in the fourth, fifth and sixth quantiles of integration by retail category and by radius - Évora's periphery
% of stores in the fourth, fifth and sixth quantiles of integration by retail category and by radius - Vila Real's periphery
Percentage
Radius
Others
M1
M2
MC
C
S

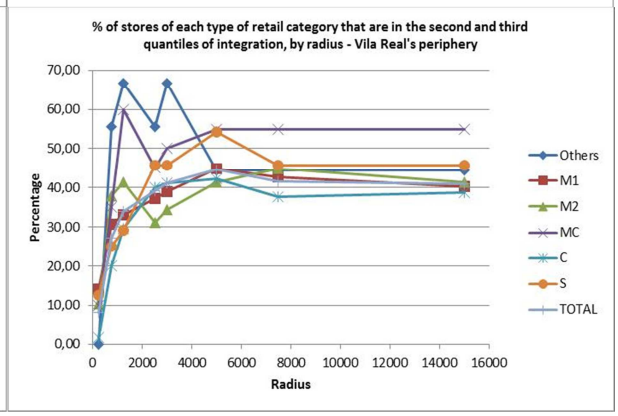

% of stores in the fourth, fifth and sixth quantiles of choice by retail category and by radius - Aveiro's periphery
% of stores in the fourth, fifth and sixth quantiles of choice by retail category and by radius - Leiria's periphery
% of stores in the fourth, fifth and sixth quantiles of choice by retail category and by radius - Évora's periphery
% of stores in the fourth, fifth and sixth quantiles of choice by retail category and by radius - Vila Real's periphery
Percentage
Radius
Others
M1
M2
MC
C
S

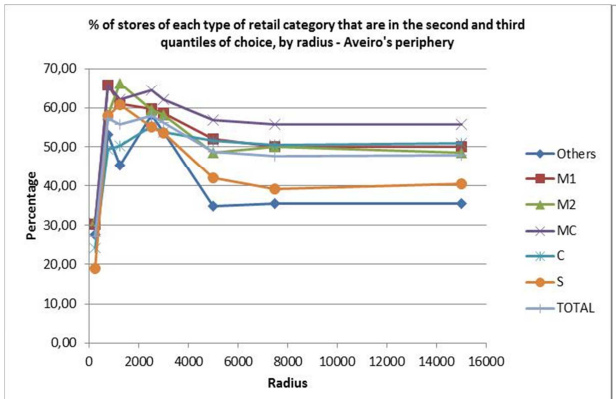
Annex 21 – Percentage of stores of each type of retail category that are in the second to the sixth quantiles of integration and choice, by radius, for the peripheries

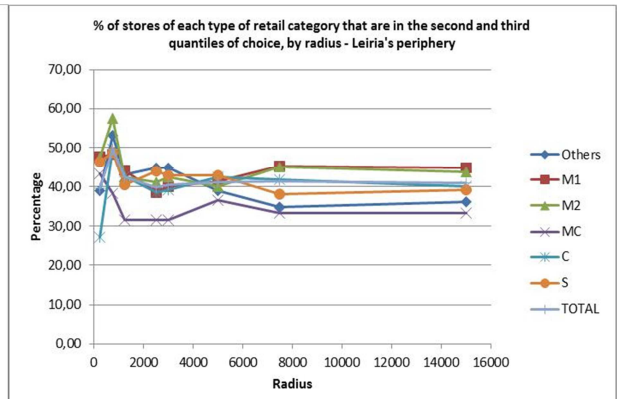


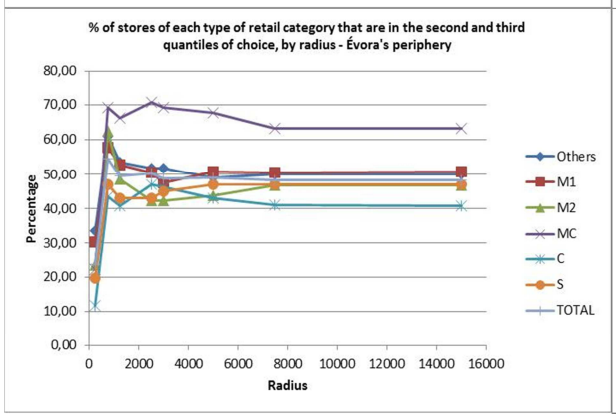


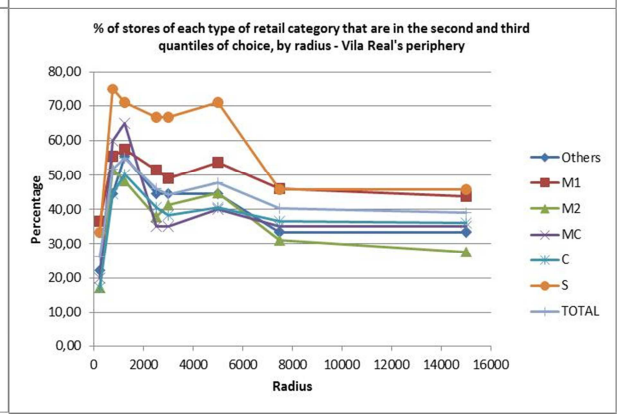


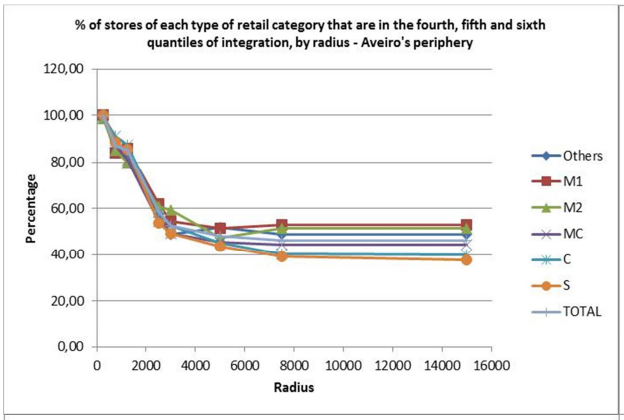


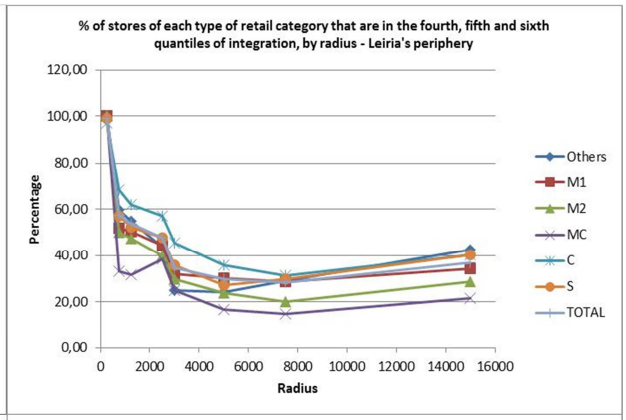


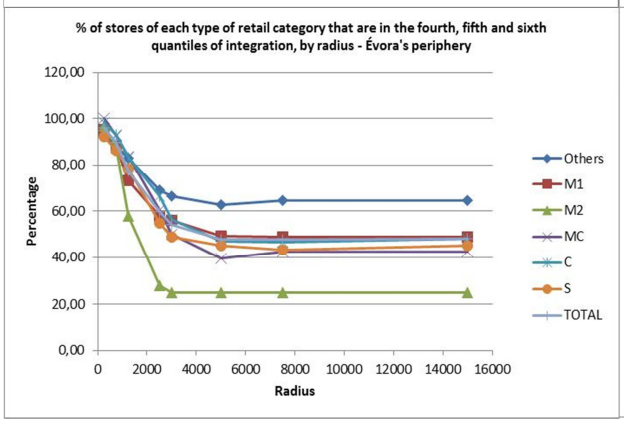


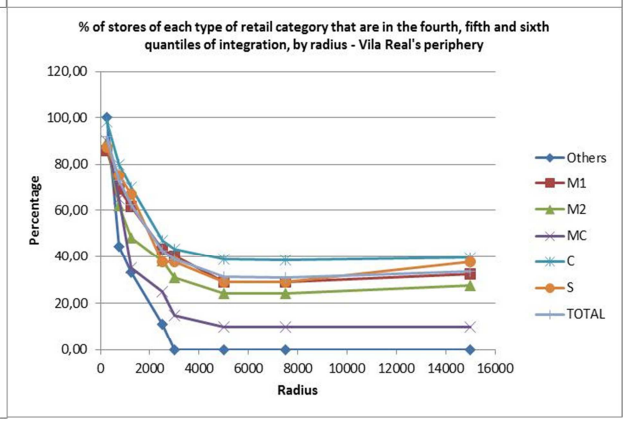


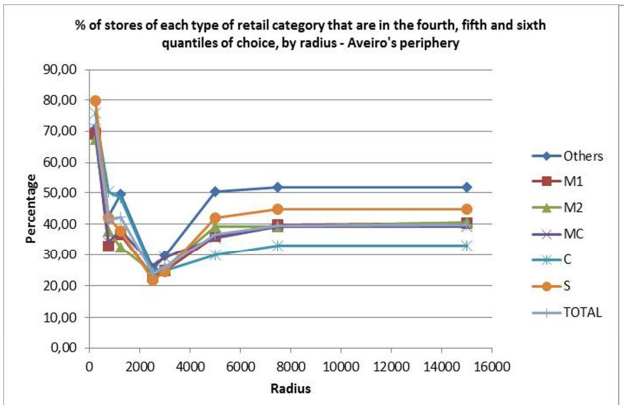


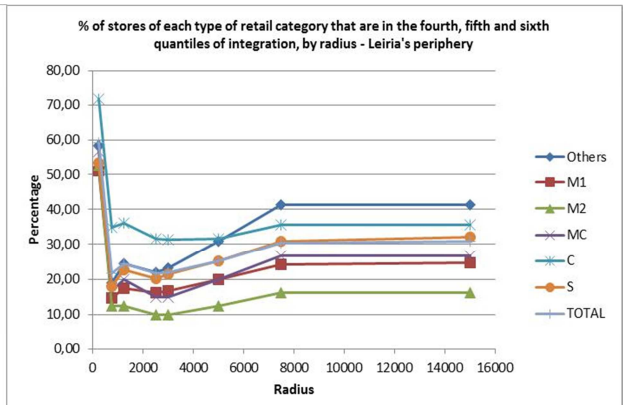

% of stores of each type of retail category that are in the fourth, fifth and sixth quantiles of integration, by radius - Aveiro's periphery
Percentage
Radius
Others
M1
M2
MC
C
S
TOTAL

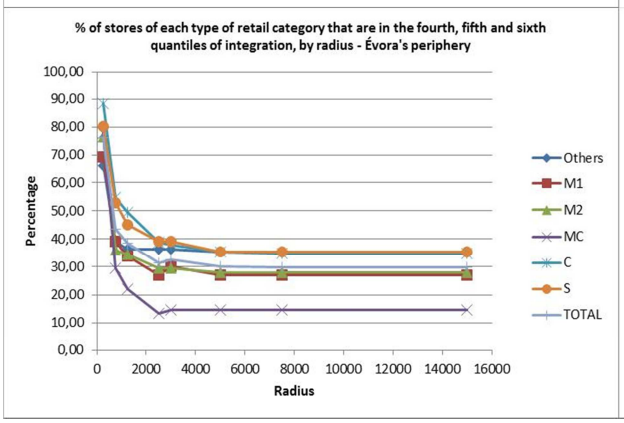

% of stores of each type of retail category that are in the fourth, fifth and sixth quantiles of integration, by radius - Leiria's periphery
Percentage
Radius
Others
M1
M2
MC
C
S
TOTAL

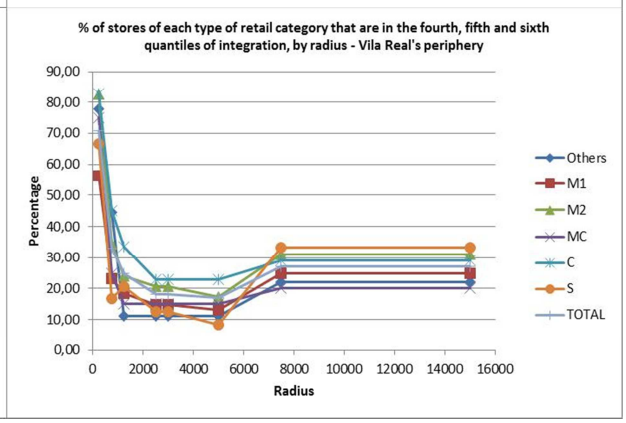

% of stores of each type of retail category that are in the fourth, fifth and sixth quantiles of integration, by radius - Évora's periphery
Percentage
Radius
Others
M1
M2
MC
C
S
TOTAL


% of stores of each type of retail category that are in the fourth, fifth and sixth quantiles of integration, by radius - Vila Real's periphery
Percentage
Radius
Others
M1
M2
MC
C
S
TOTAL


% of stores of each type of retail category that are in the fourth, fifth and sixth quantiles of choice, by radius - Aveiro's periphery
Percentage
Radius
Others
M1
M2
MC
C
S
TOTAL


% of stores of each type of retail category that are in the fourth, fifth and sixth quantiles of integration, by radius - Leiria's periphery
Percentage
Radius
Others
M1
M2
MC
C
S
TOTAL


% of stores of each type of retail category that are in the fourth, fifth and sixth quantiles of integration, by radius - Évora's periphery
Percentage
Radius
Others
M1
M2
MC
C
S
TOTAL


% of stores of each type of retail category that are in the fourth, fifth and sixth quantiles of integration, by radius - Vila Real's periphery
Percentage
Radius
Others
M1
M2
MC
C
S
TOTAL