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DETERMINANTS OF PORTUGUESE SERVICE EXPORTS: A GRAVITY MODEL APPROACH

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Abstract

The services sector has been an increasingly important player in world trade, driven largely by technological advances that have increased the number of tradable services and an increasing attempt to liberalise trade in services alongside trade in goods. Although the literature on trade in services is increasingly abundant, empirical studies in this sector remain scarce compared to studies analysing trade in goods, mainly due to the difficulty in statistically quantifying services transactions, given their intangibility. In Portugal, the tertiary sector has also been very relevant in the national economic panorama, which makes the study of the determinants of Portuguese exports in this sector relevant. According to our knowledge there is no other study focused on the same topic. For this purpose, a gravity equation is applied to a panel data, from 2000 to 2019, to empirically analyse how cultural, geographic, economic, and political/administrative factors impact Portuguese exports of services. The results show that GDP and GDP *per capita*, the existence of a common border, sharing a common language and English as a spoken language, belonging to the Eurozone, membership in the EU without sharing the same currency with Portugal and the existence of a trade agreement that extends to services positively impact exports of service, while geographical distance proves to be an obstacle to Portuguese service exports.

Keywords: international trade, Portugal, services, exports, Gravity Model
Jel Codes: C23, F10, F14, L80

Resumo

O setor dos serviços tem representado um peso cada vez maior no comércio mundial, impulsionado, em grande medida, pelos avanços tecnológicos que permitiram aumentar o número de serviços transacionáveis e pela crescente tentativa de liberalização do comércio de serviços, a par do comércio de mercadorias. Embora a literatura relativa ao comércio de serviços seja cada vez mais abundante, os estudos empíricos neste setor permanecem escassos quando comparados com os estudos que analisam o comércio de mercadorias, devido sobretudo à dificuldade em quantificar estatisticamente as transações de serviços, dada a sua intangibilidade. Em Portugal, o setor terciário tem igualmente registado uma grande relevância no panorama económico nacional, o que leva a que o estudo dos determinantes das exportações portuguesas neste setor seja relevante, não existindo ainda, de acordo com o nosso conhecimento, nenhum outro estudo focado no mesmo tópico. Para tal, aplica-se uma equação gravitacional a dados em painel, para o período de 2000 a 2019, de modo a analisar empiricamente como fatores culturais, geográficos, económicos e políticos impactam as exportações portuguesas de serviços. Os resultados obtidos demostram que o PIB e o PIB *per capita*, a existência de uma fronteira comum, partilha de uma língua comum e o inglês como língua falada, a pertença à zona Euro, a adesão à UE sem partilhar a moeda comum e a existência de um acordo comercial que se estenda aos serviços têm um impacto positivo nas exportações de serviços, enquanto a distância geográfica se revela um obstáculo às exportações portuguesas de serviços.

Palavras-chave: comércio internacional, Portugal, serviços, exportações, Modelo Gravitacional
Jel Codes: C23, F10, F14, L80

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List of Abbreviations

ASEAN	Association of Southeast Asian Nations
CEPII	Centre d'Études Prospectives et d'Informations Internationales
EU	European Union
FDI	Foreign Direct Investment
RTA	Regional Trade Agreement
GATS	General Agreement on Trade in Services
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GVA	Gross Value Added
KIBS	Knowledge Intensive Business Services
NTB	Non-Tariff Barrier
OECD	Organisation for Economic Co-operation and Development
SNA	System of National Accounts
UK	United Kingdom
UN	United Nations
USA	United States of America
WTO	World Trade Organisation

1. Introduction

International trade in services has been playing an increasingly important role in global commerce with modern economies being dominated by the service sector (Hoekman & Mattoo, 2012). According to the WTO (2019), services are an indispensable component for the current functioning of "increasingly complex and sophisticated industrial economies" (WTO, 2019, p. 14). Although their transactions represent on average only 20% of international trade flows (WTO, 2018), trade in services has been growing faster than trade in goods since 2011, contributing to higher shares of this sector in total GVA and employment (Amador & Cabral, 2009).

Over the last decades, developments in technology and the attempt to progressively liberalise services through the extension of international trade agreements to the tertiary sector - a process initiated by the implementation of GATS, in 1995 - have strongly supported the increasingly tradability of services (Júlio & Alves, 2011). Indeed, both factors have stimulated an increase in service transactions, which may also have a positive influence on services' productivity, due to increasing competitive pressures (Francois & Hoekman, 2010).

Advances in information and telecommunication technologies have particularly expanded the variety of services that can be traded internationally (Copeland & Mattoo, 2008), leading to a greater share of financial, computer and communication services (Amador & Cabral, 2009) and, consequently, contributing to a different vision of international trade in services. Until the 1980s - when service transactions gained relevance and the first studies concerning this sector began to emerge - trade in services was ignored by most researchers, reflecting the perception that services were not tradable (Hoekman & Braga, 1997). This concept has thus been changing.

Nonetheless, despite these advances, some services are still difficult to trade. In these cases, FDI has been the most suitable entry mode in foreign markets (Walsh, 2006), although restrictions on FDI remain particularly high in public services (especially postal services and water, natural gas and electricity supply), as they are seen as essential to countries' security and sovereignty (Golub, 2009).

The literature about international trade in goods is very extensive when compared to the number of studies on services trade. According to Amador and Cabral (2009), part of the explanation for the lack of literature on services is related to the novelty of this phenomenon, as well as to the persistent difficulties in collecting data for statistics. These are,

therefore, generally less detailed and extensive than statistics on trade in goods, so the empirical studies remain limited to the use of "bilateral trade data for only a small number of broad categories of services and for an equally small number of countries" (Gervais & Jensen, 2019, p. 332).

Over the last few decades, however, certain aspects of trade in services started to be explored and empirically analysed. Hence, among the existing literature on this topic, several empirical studies using gravity equations to acknowledge the determinants of bilateral trade in services have started to emerge (Harms & Shuvalova, 2020). The literature has not, for the time being, expressed any disapproval to the application of this traditional approach to trade in goods to trade in services, "provided that the particularities and shortcomings of the data are considered" (van Welsum, 2003, p. 22). Thus, the attempt of quantifying the impact of certain factors on services trade has been an increasing source of analysis and study in recent years.

With regard specifically to the Portuguese case, according to our knowledge, the literature has only focused on the characterisation of international trade in services in the national economy between 1985 and 2006 (Amador & Cabral, 2009) and from 2000 to 2010 (Júlio & Alves, 2011). Both Amador and Cabral (2009) and Júlio and Alves (2011) demonstrate (through descriptive techniques) that the services sector in Portugal has been growing both nationally and internationally, but do not clarify the determinants for the observed trends, namely the geographical patterns of services exports. In fact, when we focus on Portugal, we can notice that, as in most developed countries, services have been playing an increasingly decisive role in the Portuguese economy. According to data provided by *Banco de Portugal*, in 2019, Portuguese exports of services accounted for about 38% of the country's total exports and 16.6% of GDP.

This research aims to empirically analyse the impact/influence of cultural, geographical, economic, and political factors on Portuguese services exports over the past 20 years. Despite only a few studies have explored the link between services exports and economic growth, the existing literature on this topic has shown that, in most cases, services exports impact positively economic performance (e.g., Khoury & Savvides, 2006; Tiwari, 2011; Thomas, 2019). This makes the isolated study of exports a preferential focus of analysis in this investigation. Firstly, in Chapter 2, it will be reviewed the literature which focused on trade in services and the gravity model. Chapter 3 will present the methodology used in this research. Chapter 4, on the other hand, will show the evolution and some trends in the

Portuguese services sector over the last two decades. On Chapter 5, we will present and discuss the results of our model and finally, on Chapter 6, a conclusion will be presented.

2. Literature Review

This Chapter focus on revealing studies in the existing literature related to the services trade and the gravity model of trade. In this sense, firstly the conceptualization of services over the years will be analysed, followed by a discussion of the historical evolution of the gravity model, from the base model to the new augmented models. Finally, the empirical studies that have applied this model to trade in services will be presented.

2.1. Services and Trade in Services: Basic Concepts and Specificities

There is an inclusive and ongoing debate on how to define services and, given this ambiguity in the conceptualization of services, the concept of international trade in services does not find a consensual definition either (Hoekman & Mattoo, 2012).

The first effort to clarify how trade in services differs from trade in goods was made by Hill (1977). Based on the particular nature of services, traditionally considered intangible and non-storable, the author advocated that a service is "a change in the condition of a person, or of a good belonging to some economic unit, with the prior agreement of the former person or economic unit" (Hill, 1977, p. 318). In this definition he points out the fact that a service must be provided to another economic unit, otherwise, without the presence of two entities, its existence is impossible.

This definition was further detailed by Bhagwati (1987), who recognised two other relevant characteristics of services: (i) physical movement is not always a necessary condition in service transactions (e.g., television broadcasts and digitalized radio); (ii) there are services that can be incorporated in goods, making the distinction between goods and services more complex.

Stern and Hoekman (1987), on the other hand, distinguished four categories of services: (i) "separated services" - neither the consumer nor the producer needs to move (such as services embedded in goods or services that are marketed electronically); (ii) "services located by the consumer" - the producer moves to the consumer (as with some consulting services); (iii) "services located by the producer" - the consumer moves to the producer's location (the biggest example is tourism); (iiii) "non-separated services" - consumer and producer need to move (e.g. entertainment services). This categorization, analogous to the division of services in Sampson and Snape (1985), later inspired the classification of service transactions carried out by the GATS, which also intended to provide a consensual definition

of services.

In this way, the GATS definition of trade in services is based on "the physical location of both the producer and the consumer" (European Commission, et al., 2002, p. 13), defining services trade in four distinct modes: "*cross-border supply* (Mode 1), *consumption abroad* (Mode 2), *foreign affiliates trade in services* (Mode 3) and *presence of natural persons* (Mode 4)" (European Commission, et al., 2002, p. 15). In the first mode, both the consumer and the supplier stay in their locations and the service crosses the border, not the agents involved in the transaction (this covers all the services provided at distance); in the second mode, the consumer has to go abroad to consume the service (this happens, typically, for tourism abroad); mode 3, in turn, refers to the creation or acquisition of "an affiliate, branch or representative office by service suppliers in another location through which they provide their services" (European Commission, et al., 2002, p. 16); in the fourth and final mode, an individual provides a service in a foreign country as an independent provider (e.g., consultant, health professional) or as an employee of a service provider (e.g., consulting, engineering, construction company).

The non-storability of services assumed by a traditional point of view led to two imperative allegations: firstly, "it meant that the service had to be consumed at the same time as it was produced" (van Welsum, 2003, p. 4) and, secondly, "that the producer and the consumer had to be in the same place" (van Welsum, 2003, p. 4), so one of the parties would have to move. Therefore, following the idea that services could not simply be considered intangible and non-storable, Banga (2005) added two important particularities of services by considering that in addition to non-tradability and non-storability, services are "heterogeneous and flexible in production" and that "imperfect competition is highly relevant for services" (Banga, 2005, p. 6).

Lejour and Smith (2008, p. 173) suggested the role of KIBS as inputs to production and to trade in goods, distinguishing three types of situations covered by the portion occupied by services in manufacturing: services that could be outsourced, but the firm prefers to preserve the production in-house; those who are part of the construction process and cannot be outsourced; and, lastly, services produced for sale either as joint products or as a distinct add-on service. According to them, whenever KIBS are provided, "tacit, technical and market knowledge is more easily disseminated" (Lejour & Smith, 2008, p. 183), contributing positively to productivity and innovation.

Hill's (1977) conceptualization of services inspired the SNA Manual, which defines

services as "the result of a production activity that changes the conditions of the consuming units, or facilitates the exchange of products or financial assets", recognising that for a service to be provided we must necessarily have two entities involved in the transaction (SNA, 2008, p. 96). Accordingly, services' intangibility promotes the link between at least two countries for a transaction to occur (when these two entities belong two to different locations), since in trade in services tasks are assumed bilaterally, in contrast to the multilateralism of tasks when inserted in production and trade in goods (Copeland & Mattoo, 2008).

The heterogeneity of services previously advocated by Banga (2005) and Lejour and Smith (2008) was corroborated by Lennon (2009) who considered this heterogeneity displays itself in different circumstances: (i) the presence of the two parties involved in the transaction is often necessary for it to actually occur (differentiation by location); (ii) in some cases there is a customization of certain services to better respond to the tastes and needs of consumers (differentiation by client); (iii) some services require a very specialized workforce, making the replacement between two sorts of services very costly in both time and money; finally, (iiii), services are "heterogeneous in terms of quality, as they are labour-intensive, and the quality of labour used may vary significantly" (Lennon, 2009, p. 4).

More recently, Eichengreen and Grupta (2013) subdivided services into two distinctive categories: (i) "traditional services", which include tourism, transports, insurance and financial services; (ii) "modern services", referring to computer services, information and complementary services.

All in all, it is possible to conclude that the services sector was considered for a long period of time as the sector of the economy where international trade could not happen, since it was considered necessary to have a physical contact between the two entities involved in the transaction, in order for it to occur (Lejour & Smith, 2008). However, new technological improvements, particularly the Internet, have contributed to overcome this traditional and historical vision by strongly reducing transaction costs. (Lennon, 2009).

2.2. The Gravity Model of Trade: historical development

The gravity model, as can be inferred from its name, "is based on Newton's Law of Universal Gravitation relating the force of attraction between two objects to their combined mass and the distance between them" (Deardorff, 1998, p. 9). Tinbergen (1962) was the first to employ gravity to explain the volume of bilateral trade patterns. Since then, being an

essential working tool for a wide range of research areas, the gravity model has been successfully applied to explain and predict bilateral trade flows, which are set to be proportional to the economic dimension/size of the countries involved (measured by the GDP) and inversely proportional to the distance between them (classically measured as the distance between the capital cities of the countries under analysis) (Anderson, 2011). The fundamental gravity model of trade is thus introduced by the following equation:

$$F_{tj} = G\frac{M_t^{\alpha} M_j^{\alpha}}{D_{tj}^{\gamma}} \quad (1)$$

where F_{tj} represents trade flows from t (country of origin) to j (country of destination); M_t and M_j embody the economic dimension of both countries (measured through GDP); D_{tj} symbolises the geographical distance between countries, and, finally, G is the constant term.

Initially, the use of the gravitational model faced strong criticism because its connection to any of the theories explaining international trade was not obvious (Deardorff, 1998). However, this limitation has been overcome by several authors, including Anderson (1979), Bergstrand (1989), Deardorff (1998), and Anderson and van Wincoop (2003), who showed that the gravity model is in accordance with traditional trade theories, particularly the Heckscher-Ohlin Model, the Ricardian Model, and Krugman's monopolistic competition.

At the beginning of this century, the Internet has become one of the most important spheres of several businesses (Castells, 2001). Finding new trading partners in various parts of the globe became easier, however, a larger market also challenges companies to overcome a greater number of barriers in order to increase their activities internationally (Castells, 2001). "Trade costs can then assume a variety of forms, specifically, transportation costs, currency conversion, customs costs, information acquisition, communication costs and many other issues that should be considered" (Ferro & Ribeiro, 2016, p. 608). Therefore, over the years, the basic gravity framework has been augmented by adding other variables capable of having a significant influence on international trade flows (Walsh, 2006).

Indeed, even though it is commonly believed that globalization has turned the world into a "global village" (McLuhan, 1962), distance is still relevant to international trade (Ghemawat, 2001). The gravity model was thus of extreme relevance to the formulation of the CAGE framework, which aims to analyse cultural (C) administrative (A) geographical (G) and economic (E) dimensions of distance capable of impacting both firm's foreign investment strategies and international trade patterns (Ghemawat, 2001).

Regarding cultural factors, differences in language, race, religious beliefs, practices and social norms can be reported as indicators of cultural distance, which can have an important influence upon bilateral trade (Ghemawat, 2001). Among these characteristics, when studying the relationship between economy and language, Marschak (1965) pointed out linguistic similarities as one of the most relevant aspects determining international trade. In fact, while language differences can hamper international trade, language similarities can improve it due to the importance of communication costs often forgotten. (Ferro & Ribeiro, 2016). Thus, a common shared language "can decrease the fixed costs of trade and influence the choice of export location" (Ferro & Ribeiro, 2016, p. 610), even though Helpman, Melitz and Rubinstein (2008) have noticed that it does not affect the export capacity once that choice has been taken.

In terms of political/administrative determinants of trade, a common regional trading bloc and a common currency, historical past bonds (e.g., colonial ties), government policies and the quality of institutions represent relevant matters (Ghemawat, 2001). Integration in the EU, for instance, comes in many studies as having a positive effect on bilateral trade flows between member countries (Kox, Lejour, & Montizaan, 2005). On the other hand, the role of the WTO in the progressive liberalisation of international trade, specifically through the GATT and the GATS, has also been an important trade facilitating factor (Copeland & Mattoo, 2008). Furthermore, in the recent study carried out by Goekman, Vermeulen and Vézina (2020), past colonial relations ("imperial capital") are proven to have a positive impact on current bilateral trade between countries.

When considering the geographic distance, beyond the distance between the country's capital, other characteristics should be taken into consideration, such as sharing a common border, topography, the lack of sea or river access, differences in climate, or weak transportation and communication links (Ghemawat, 2001). Distance is considered in most models as an approximation to transport costs, being presented as a barrier to trade and, as such, it is expected to have a negative impact on trade flows (Anderson, 2011).

Apart from GDP, the differences in income of the inhabitants, in the costs and quality of natural, financial, human and infrastructural resources and intermediate inputs should also be accounted as impactful economic factors upon trade patterns (Ghemawat, 2001). According to Ghemawat (2001, p. 144), "the wealth or income of consumers is the most important economic attribute that builds distance between countries", having a noticeable effect on the intensity of trade and the country's trading partners.

Lastly, in recent studies, technological factors have also been indicated has determinants to international trade, with the addition to the gravity equation of different variables as, for instance, the number of Internet users (Choi, 2010).

Altogether, the gravity equation has been an attractive topic of research, widely applied to several empirical fields (Shahriar, Qian, Kea, & Abdullahi, 2019). Indeed, since 2003, renewed interest in the gravity model has risen, mainly due to the contribution of Anderson van Wincoop (2003), and although the number of studies regarding trade in goods remain higher than those concerning trade in services, the applicability of the gravity model to services has been increasingly advocated whitin the literature.

2.3. The Gravity Model of Trade in Services

The increasing relevance of international trade in services gave rise to a few studies focusing on the comparative advantage of services between developing and developed economies (e.g., Deardorff, 1985; Trefler, 1993; Davis and Weinstein, 2001; Hisanaga, 2008; Fourie, 2011; Chen and Whalley, 2014), as well as on the link between trade in services and economic growth (e.g., Khoury and Savvides, 2006; Tiwari, 2011; Thomas, 2019). Additionally, although international outsourcing of services is another area where empirical evidence is still scarce, Hijzen, Pisu, Upward and Wright (2007), Liu and Tefler (2008) and Geishecker and Görg (2008) gave particular relevance to this topic in their researches, the first using firm-level data. Nonetheless, among the existing literature on services trade, empirical studies using gravity equations to identify the determinants of bilateral trade have been broadly held over the past years, as seen in Table 1 for easier comprehension.

According to Baldwin and Taglioni (2006), the success of this model applied to both goods and services trade rests on three essential reasons: international trade flows are important elements in economic relations, which makes the study of their development patterns an interesting topic; the necessary information is easily accessible, despite some lack of data on services; and, finally, the large number of empirical studies that have already used this model as a base, gave it high credibility among the literature. In fact, since the early 2000s, given the growing importance of services at the international level, significant improvements in existing statistics for the sector started to emerge, mainly due to the OECD action in formulating a specific database for services, dividing them into 12 categories. Table 1 presents a summary of major empirical studies of services trade that use the gravity model.

Table 1: Empirical studies

Author(s)	Countries	Period	Estimation Method	Main results
Grünfeld and Moxnes (2003)	22 OECD countries	1999	Pooled OLS & Fixed effects	The economic dimension has a positive effect on trade in services, while the geographical distance between countries and the existing barriers have a negative impact
Kox and Lejour (2005)	EU countries that were also members of the OECD	1999-2001	Pooled OLS & TLS	High heterogeneity between two countries has a significant negative effect on trade in services
Ceglowski (2006)	28 OECD countries	1999-2000	Pooled OLS	Linguistic and geographical proximity and regional trade agreements have a positive effect on service flows
Kimura and Lee (2006)	10 OECD countries and 47 trading partners	1999-2000	Pooled OLS	The cultural and geographic distance between countries assumes greater relevance in services trade than in goods trade
Walsh (2006)	27 OECD countries and 50 trading partners	1999-2001	Pooled OLS, Fixed Effects & Random Effects	The economic dimension and the existence of a common language are the most determining factors in the trade of services
Choi (2010)	151 countries	1990-2006	Pooled OLS	Small influence of the Internet in the aggregate commerce of services
Kandilov and Grennes (2010)	Exports from 35 low and high-income countries to 9 Western European EU members	2002-2004	PPML	The weight of geographical distance varies according to the types of services: important for construction services, but less significant in the case of computer services
Lee (2012)	22 OECD countries and 34 trading partners	1999-2010	PPML	Proficiency in English has a significant impact on trade in services, with particular importance in some types of services: communication, financial, commercial and insurance services
Salmani, Pourebrahim and Saremi (2013)	Developing countries	1990-2011	Pooled OLS	The Internet has a positive and significant effect on trade in services in developing countries and a positive relationship between trade in services and GDP

Shepherd and van der Marel (2013)	103 countries	2007-2010	QML	Trade restriction policies have a negative impact on trade in all sectors except wholesale and retail
Nasir and Kalijaran (2014)	EU members, US, South-East Asian countries	2002-2011	PPML	The export potential of emerging economies in South Asia is considerably weaker when compared to developed economies in North America and Europe
Anderson, Borchert, Mattoo and Yotov (2018)	28 countries	2000-2007	Fixed Effects	National geography and institutions play significant roles in explaining international flows of services
Nordås (2018)	Nordic countries	2011-2013	PPML	Cultural distance does not have a significant effect on aggregate bilateral trade in services
Harms and Shuvalova (2020)	EU members, US, Japan and 54 destination countries	2004-2016	PPML	Cultural distance has a significantly negative impact on total bilateral trade in services and most types of services

Legend: OLS (Ordinary Least Squares); TLS (Total Least Squares); PPML (Poisson Pseudo-maximum Likelihood); QML (Quasi-maximum Likelihood)

One of the first conclusions that we can take from Table 1 is that all studies reported include multiple countries under analysis, contrasting with the aim of this investigation, which focuses on the Portuguese economy, rather than on a group of countries. This may suggest that data availability is still a limitation to researches in this field, but also makes this investigation an exploratory study to future analysis.

In this sense, the first empirical studies begin to arise from 2003 onwards, where the study carried by Grünfeld and Moxnes (2003) on the assessment of the determinants of international trade in services and FDI can be highlighted. Their main results are the positive effect of the economic dimension (measured through GDP and GDP *per capita*, the latter to allow comparison of data between high- and low-income countries) on trade in services, as opposed to the adverse effect of the geographical distance between countries, especially on FDI. Regional trade agreements, on the other hand, do not appear to contribute positively to trade in services, having an insignificant effect. According to the authors, this "may reflect the fact that many of the free trade agreements fail to include services" (Grünfeld & Moxnes, 2003, p. 18). As for the effect of services trade liberalization, it increases the countries' exports by 30% to 50%, according to their estimates, depending on the countries involved. Indeed, "Spain, Japan, Korea, and Ireland are the countries with the largest potential increase in exports, while France, Germany and the Nordic countries have less to gain in terms of exports" (Grünfeld & Moxnes, 2003, p. 20). Nevertheless, this study only focuses on the aggregate study of trade in services, which may indicate that difficulties in finding statistical information on services trade disaggregated by categories persisted at the time. This limitation was later overcome by Walsh (2006), the first to use a gravity equation to measure determinants on disaggregated services trade.

The analysis of the impact of different national regulatory policies among countries has been a subject of study by several authors, among which it is possible to emphasize the study held by Kox and Lejour (2005), who developed an innovative index to evaluate the regulatory heterogeneity among countries, "based on detailed pair-wise country comparisons with respect to a large number of regulation items that affect service markets" (Kox & Lejour, 2005, p. 7). The authors hence assumed that this factor represents one of the main barriers to international trade in services. Accordingly, one of the principal results obtained was consistent with a first assumption taken on this paper: a high regulatory heterogeneity among trading partners represents a significant negative determinant on services trade between them.

Ceglowski (2006) and Kimura and Lee (2006) also tried to apply a gravity equation to trade in services in order to compare their results with the results obtained in previous studies concerning trade in goods. Both studies include the existence of a common currency and geographical adjacency as dummy variables. Kimura and Lee (2006, p. 107) also included "a trade weighted measure of distance between countries", concluding that the geographical distance between countries seems to be more significant in trade in services than it is in merchandise trade. Similarly, Ceglowski (2006) concluded that linguistic and geographical proximity and the presence of RTAs have a positive effect on trade for the sample of countries analysed. Except for the significance of the belonging to a RTA, both studies are in accordance with most of the conclusions of the previous Grünfeld and Moxnes study, reinforcing the possibility of applying the gravity model also to trade in services.

In recent years, the emergence of the Internet called into question a series of new improved business models and headed to a modern globalized and digital era. Given the growing relevance of the Internet in all economic operations, Choi (2010) focused on the impact of the Internet on trade in services. To this end, he added a new variable to his gravity model regarding the number of Internet users in the countries under analysis, concluding, however, that the variable was not significant. Later, Salmani, Pourebrahim and Saremi (2013) also intended to study the effect of the Internet on services trade, having has a comparative study Choi's paper. This research, however, focused on developing countries, concluding that, contrarily to the previous study, the Internet plays an important role in international trade in services in that sample of countries.

Kandilov and Grennes (2010) focused on the determinants of exports from a variety of countries with different income levels to importing countries in Western Europe. In this sense, the authors concluded that the weight of geographical distance differs according to the different categories of services: it is crucial mainly for construction services, but nearly insignificant in the case of computer services. Therefore, Kandilov and Grennes (2010) showed that the gravity model can be applied only to service exports, presenting valid results.

The growing relevance of the English language in most developed countries and its possible impact on the development of international trade in services was the subject of analysis in Lee's (2012) paper, recognizing that "most studies have concentrated on direct policy measures such as tariffs and NTBs, paying little attention to language effects" (Lee K. , 2012, p. 291) As a main result, the author highlighted the significant positive impact of the English language on international trade in services, particularly in financial, insurance,

communications, and other business services.

The research conducted by Shepherd and van der Marel (2013) has a similar focus of analysis to Walsh (2006) by including a STRI to evaluate the "impact of regulation on cross-border services trade at the sectoral level" (Shepherd & van der Marel, 2013, p. 1398). This indicator proved to be of high significance contrarily to Walsh's (2006) results. In addition to the aspects related to regulatory policies, this study includes the membership in an RTA as a variable, similarly to Grünfeld and Moxnes (2003), Ceglowski (2006) and Kimura and Lee (2006). Furthermore, the authors also incorporated the EU membership to make it "possible to gauge the average effects of RTAs on services trade, and to see whether or not the most advanced regional integration project in services—namely the EU—has additional trade boosting effects" (Shepherd & van der Marel, 2013, p. 1405). Accordingly, by taking both of these dummy variables into account, Shepherd and van der Marel (2013) concluded that belonging to an RTA does not have a significant positive impact on services trade, while the EU membership registered a positive and significant effect.

As previously stated, technological improvements have expanded the extent of services that can be traded, specifically, modern services as defined by Eichengreen and Grupta (2013). Therefore, since many Asian economies represent important players in new technological developments, they are also increasingly participating in trade in services. (Kawai & Wignaraja, 2014). Hence, recognising these new specificities, Nasir and Kalijaran (2014) examined the export performance of emerging and developed Asian economies in some modern services. Their estimation results demonstrated that the export potential of emerging South Asian economies - some of them ASEAN members - is significantly weaker when compared with developed North American and European economies.

Anderson, Borchert, Mattoo and Yotov (2018) adopted a very broad perspective of the possible determinants to services trade. In addition to confirming some recurring results of the previous gravity model estimations, Anderson et al. (2018) also documented some new specificities of services trade, noting that national geographic characteristics, income, institutions, and technology play significant roles in explaining international trade patterns.

More recently, both Nordås (2018) and Harms and Shuvalova (2020) focused on the cultural determinants of services trade by including an "aggregate measure of cultural distance based on Hofstede's scores" (Harms & Shuvalova, 2020, p. 3) in their specifications. However, the results obtained were distinct. While Nordås (2018) concluded that cultural distance has an insignificant effect on bilateral trade in services, Harms and Shuvalova (2020)

found that cultural aspects do have a significantly negative impact on total services and disaggregated services. According to Harms and Shuvalova (2020), the difference between their outcomes and those of Nordås (2018) "may be due to the use of different samples - both in terms of country and period coverage - and different aggregate measures of cultural distance" (Harms & Shuvalova, 2020, p. 3). Therefore, from a disaggregate perspective, Harms and Shuvalova (2020) concluded that over the period under review cultural, financial and travel services were particularly impacted by the cultural distance between countries, while in transport services the estimated impact of this dimension was insignificant. Although it registered positive results due to the heterogeneity of the countries included in the study, as the authors conclude, the use of this variable still faces several limitations linked to its very availability and relevance for studies with smaller country samples (Harms & Shuvalova, 2020).

All things considered, the literature has not yet established any concerns to taking the gravity model, initially applied to trade in goods, and directing it to trade in services, "provided that the particularities and shortcomings of the data are considered" (van Welsum, 2003, p. 22). Consequently, several studies have been formulating different gravity equations based on the traditional model, focusing on potential determinants to services trade related to economic, cultural, geographical and political/administrative aspects. Table 2 presents a summary of trade services determinants as well as their impact sign based on the reviewed studies.

As far as the economic dimension is concerned, GDP and GDP *per capita*, as well as population, were used as variables, revealing a positive effect on international trade in services. Concerning geographical determinants, it was perceived that geographical distance registers a negative effect, while geographical proximity has an opposite effect. Yet, geographical distance is becoming less important, as registered by Kandilov and Grennes (2010), in the case of computer services. Furthermore, cultural aspects, such as a common official language or a common religion, listed a positive significant effect, indicating the importance of including this dimension in the estimates. In a clear way, the belonging to an RTA reveals to be a significant determinant to services trade, especially in the case of EU membership. It is also worth noting that some authors have used a STRI as a proxy to measure the impact of international trade policy restrictions, verifying that heterogeneity of regulation is one of the main barriers to trade in services. Indeed, in regard to services' market, "trade costs are largely related to regulatory measures that either create entry barriers or increase the cost burdens facing firms" (Miroudot, Shepherd, & Sauvage, 2013, p. 721). The effect of all these

dimensions and the variables used to measure them can be examined in Table 2.

Table 2: Determinants of services trade

Dimensions	Variables/Determinants	Author(s)	Effect on international trade in services
Economic	GDP	Grünfeld and Moxnes (2003); Kox and Lejour (2005); Ceglowski (2006); Kimura and Lee (2006); Choi (2010); Salmani, Pourebrahim and Saremi (2013); Lee (2012); Nasir and Kalijaran (2014); Anderson et al. (2018);	+
	GDP *per capita*	Grünfeld and Moxnes (2003); Ceglowski (2006); Kimura and Lee (2006); Walsh (2006);	+
	Population	Walsh (2006); Choi (2010); Salmani, Pourebrahim and Saremi (2013)	+
Geographical	Distance between the countries (usually between the capitals)	Grünfeld and Moxnes (2003); Kox and Lejour (2005); Kimura and Lee (2006); Walsh (2006); Choi (2010); Salmani, Pourebrahim and Saremi (2013); Kandilov and Grennes (2010); Lee (2012); Shepherd and van der Marel (2013); Nasir and Kalijaran (2014); Anderson et al. (2018); Nordås (2018); Harms and Shuvalova (2020)	-
	Adjacency/ contiguity/ common borders	Ceglowski (2006); Walsh (2006); Lee (2012); Shepherd and van der Marel (2013); Anderson et al. (2018); Nordås (2018); Harms and Shuvalova (2020)	+/-
	Time zone differences	Kandilov and Grennes (2010)	-
Cultural	Common official language	Ceglowski (2006); Kimura and Lee (2006); Walsh (2006); Kandilov and Grennes (2010); Shepherd and van der Marel (2013); Nasir and Kalijaran (2014); Anderson et al. (2018); Nordås (2018); Harms and Shuvalova (2020)	+
	Common religion	Anderson et al. (2018); Harms and Shuvalova (2020)	+
	Hofstede's cultural dimensions	Nordås (2018); Harms and Shuvalova (2020)	0/+
Administrative	Common colonial heritage	Lee (2012); Shepherd and van der Marel (2013); Nasir and Kalijaran (2014); Nordås (2018); Harms and Shuvalova (2020)	+
	RTA and/or EU membership	Grünfeld and Moxnes (2003); Ceglowski (2006); Kimura and Lee (2006); Walsh (2006); Lee (2012); Shepherd and van der Marel (2013); Nasir and Kalijaran (2014); Anderson et al. (2018); Harms and Shuvalova (2020)	0/+
	STRI	Grünfeld and Moxnes (2003); Kox and Lejour (2005); Shepherd and van der Marel (2013); Nasir and Kalijaran (2014)	-

	Common currency	Ceglowski (2006); Anderson et al. (2018)	+
	Common legal origins	Kandilov and Grennes (2010); Anderson et al. (2018); Nordås (2018)	+
	Political Stability/ Relative quality of institutions	Grünfeld and Moxnes (2003); Kandilov and Grennes (2010); Harms and Shuvalova (2020)	+
Technological	Internet users	Choi (2010); Salmani, Pourebrahim and Saremi (2013); Nasir and Kalijaran (2014)	0/+

Looking specifically to the Portuguese case, despite the growing importance of the services sector to the country's economy, according to our knowledge, no other study has used a gravity equation to study the determinants of service exports, which makes this an interesting research topic.

3. Methodology

This Chapter introduces the methodology adopted in this investigation to evaluate the determinants of Portuguese service exports for the period between 2000 and 2019. The traditional gravity model of trade is the foundation of the econometric model formulated, we than use an augmented version of the traditional model similarly to the previously presented empirical studies. The Chapter is divided into three Sections. Section 3.1 outlines characterization of the variables, and data sources. Section, 3.2, specifies the econometric model. Section 3.3 characterizes the sample included in this study and, finally, Section 3.4 provides a descriptive assessment of the variables in the model.

3.1 Variables characterization and data sources

The dependent variable of this dissertation is the Portuguese exports of services. However, considering the purpose of this work, we tried to disaggregate total exports into other categories considering the availability of statistical data. In this sense, besides total exports, exports of travel and other services (resulting from the difference between total services and travel) were also included. The data was extracted from the OECD database as this proved to be the most accurate statistical source. Occasionally, this data was supplemented by data from UN Comtrade, which proved to be effective when there was an absence of records in the OECD database.

In order to determine which factors influence Portuguese service exports, a similar methodology to the studies analysed in Section 2.3 was followed, involving the estimation of an augmented gravity equation where *GDP* and geographic distance (*DIST*) are included as the basic independent variables. Other relevant variables are also added to determine their impact on Portuguese service exports, namely GDP *per capita*, common border, common official language, English as an official language, trade agreement that includes services, membership of the Eurozone, membership of the EU common currency, internet users and political stability. Initially, it was thought to also use a dummy variable to capture the existence of a common colonial past among the countries. However, given the sample of countries included in our sample, this variable overlapped with the existence of a common language, being therefore redundant.

In most studies, the use of the variables GDP and GDP *per capita* are intended to be a proxy for the market potential, and therefore in this study we chose to include both

variables as in Grünfeld and Moxnes (2003), Ceglowski (2006) and Kimura and Lee (2006). The use of GDP is justified by the need to measure the impact of the absolute size of a destination market on Portuguese service exports, whereas the GDP *per capita* intends to measure the impact of the purchasing power of a given destination market. In the case of services trade these two variables are expected to have a positive impact. Geographic distance is intended to represent trade costs affected by distance normally, transportation costs and as such is generally presented as a barrier to trade. Yet, it might have a less significant impact on services since some of these do not require a physical movement/transport. In this model, this variable measures the distance in kilometres between the capitals of the two countries, so between Lisbon and the capital of the destination market - a negative effect is expected. Other geographic factors refer to the existence of a common border between Portugal and the export destination market - this variable was also added and it applies only to Spain.

The variable common language represents the cultural proximity between two countries and, for that reason, a better market knowledge and a greater possibility of fostering trade. As previously discussed in more depth, studies on the relevance of language that began in the 1960s with Marschak's (1965) paper on this topic have been focusing, among other matters, the influence of a common spoken language between trading partners in establishing and maintaining fruitful relationships between them (Ferro & Ribeiro, 2016). This variable is therefore expected to have a positive effect.

Regarding linguistic proximity between trading partners, another dummy variable will be included, considering the importance of communication in international services provision and the relevance of English around the world. According to the Portuguese National Statistics Institute (INE) report (2016), the most recent national statistical source in this field, in 2016, 71.8% of people aged between 18 and 64 said they knew a language other than their mother tongue. Among the foreign languages most spoken among Portuguese people, English (59.6%), French (21.5%) and Spanish (14.8%) stand out. Focusing on English, 33.8% of those who knew this language could understand and communicate reasonably well and produce simple texts and 25.6% mastered it perfectly (orally and in writing). Thus, it is considered interesting to include a dummy variable referring to countries whose official language is English, assessing how significant this factor can be. As the previous variable, we expect a positive impact of this determinant.

To understand the influence of trade agreements and monetary union on services

exports three dummy variables were added. Since Portugal belongs to the Eurozone, the first of these variables assumes the value 1 when the destination market shares the same currency. This variable is expected to have a positive impact on exports. The second variable evaluates the impact of the EU membership when the partner country belongs to the EU but has not adopted the common currency. This variable might positively impact trade, but its effect is expected to be smaller than the previous variable. The membership of a common trade agreement - that is not the EU - is the last dummy variable used in the model and represents the administrative and economic proximity with that country that translates into a reduction in transaction costs. This variable represents the existence of a bilateral trade agreement between countries that includes services. A positive effect is also expected.

The quality of institutions that govern, regulate, enforce laws and shape the way a country is governed is seen as essential for a sustained social and economic development (Linders, Slangen, de Groot, & Beugelsdijk, 2005). Poorly developed institutions introduce negative externalities, which affect trust between parties, constrain how business is done and increase transaction costs, leading naturally to reduced trade flows (Linders et al., 2005). A firm that exports to a foreign market on an institutional level similar to that of its domestic market is better able to succeed since it is spared high adjustment costs, which can arise from ignorance and uncertainty related to business contingencies (Linders et al., 2005). As in most studies (e.g., Grünfeld & Moxnes, 2003; Kandilov & Grennes, 2010), political stability is measured in this research through the indicator "Political Stability and Absence of Violence/Terrorism Estimate" from The Worldwide Governance Indicators (The World Bank database) and refers to the absence of violence and terrorism as well as to the democratic stability of political regimes in place. This indicator assumes values between -2.5 and 2.5, the first value representing the lowest level of stability and the second the highest. It is expected that the higher the value of this indicator, the more positive its impact on exports.

Lastly, to assess how the Internet may influence Portuguese services exports a variable representing the number of Internet users was added, similarly to Choi (2010); Salmani, Pourebrahim and Saremi (2013) and Nasir and Kalijaran (2014). A positive impact of this variable over national exports is expected.

Table 3 summarizes the variables used, their proxies, the expected effect on Portuguese exports and data sources.

Table 3: Independent variables in this study, proxy, expected effect and data sources

Variable	Proxy	Expected effect	Data source
GDP	Annual real Gross Domestic Product at constant prices of 2010 (millions of USD)	+	World Bank
GDP *per capita*	Annual real Gross Domestic Product *per capita* at constant prices of 2010 (millions of USD	+	World Bank
Distance	Distance in kilometres between the countries' capitals	-	CEPII
Common Border	Dummy variable: common border (1); no shared landborder (0)	+	CEPII
Common Language	Dummy variable: common language (1); no shared language (0)	+	CEPII
Spoken English	Dummy variable: English as an official language (1); other official language(s)	+	CEPII
Eurozone[1]	Dummy variable: Eurozone membership (1); no shared currency (0)	+	International Monetary Fund
EU member without the Eurozone[2]	Dummy variable: EU membership but no shared currency (1); non-EU membership (0)	+	WTO, European Union, and International Monetary Fund
Trade Agreements	Dummy variable: trade agreement that extends to services (1); inexistence of any trade services agreement (0)	+	WTO
Political Stability	"Political Stability and Absence of Violence/Terrorism Estimate"	+	The Worldwide Governance Indicators (The World Bank database)
Internet Users	Internet users per 100 inhabitants	+	World Bank

[1] Given the inclusion of the dummy variable *BORD*, where Spain is the only country that represents the value 1 due to the existence of a common border, this country will be excluded from this group of countries in the regressions presented in Tables 9, 10 and 11.

[2] Given the inclusion of the dummy variable *ENG*, where the UK is included, and in order to avoid multicollinearity between the two variables as this destination of Portuguese exports is very relevant, this country will be excluded from this group of countries in the regressions presented in Tables 9, 10 and 11.

3.2 Econometric model

Once the explanatory variables are defined, it is possible to present the gravity equations that we will estimate, which derive from an expansion of the basic version, as already mentioned. Two models were considered for each specification of the dependent variable in order to avoid multicollinearity among the dummy variables used. Thus, one of the models excludes Spain from the group of euro zone countries since it is the only country that has a common border with Portugal and the UK from the group of countries that belong to the European Union but do not share the common currency, since this country is already included in the group of English-speaking countries. The other model includes both countries in each of their respective groups in order to allow a faithful assessment of the validity of both models. Consequently, the equations used in this study are:

$$\begin{aligned} Ln(Exp_{xjt}) = {} & \beta_0 + \beta_1 ln(GDPPC_{jt}) + \beta_2 ln(GDPPC_{jt}) + \beta_3 ln(DIST_{xj}) \\ & + \beta_4 ln(BORD_{xj}) + \beta_5 ln(COM\_LANG_{xj}) + \beta_6 ln(ENG_{jt}) \\ & + \beta_7 ln(TRADE\_AGR_{xj}) + \beta_8 ln(EUR\_WTO\_ES_{jt}) \\ & + \beta_9 ln(NON\_EUR\_WTO\_UK_{jt}) + \beta_{10} ln(POL\_STAB_{jt}) \\ & + \beta_{11} ln(NET\_USERS_{jt}) + \varepsilon_{xtj} \end{aligned} \tag{2}$$

$$\begin{aligned} Ln(Exp_{xjt}) = {} & \beta_0 + \beta_1 ln(GDPPC_{jt}) + \beta_2 ln(GDPPC_{jt}) + \beta_3 ln(DIST_{xj}) \\ & + \beta_4 ln(BORD_{xj}) + \beta_5 ln(COM\_LANG_{xj}) + \beta_6 ln(ENG_{jt}) \\ & + \beta_7 ln(TRADE\_AGR_{xj}) + \beta_8 ln(EUR_{jt}) + \beta_9 ln(NON\_EUR_{jt}) \\ & + \beta_{10} ln(POL\_STAB_{jt}) + \beta_{11} ln(NET\_USERS_{jt}) + \varepsilon_{xtj} \end{aligned} \tag{3}$$

where x represents the exporting country (Portugal); j symbolises the importing economy and t expresses time. Ln (.) and εxjt refer to the natural logarithm and the error term, respectively. Exp_{xjt} represents the real Portuguese service exports in year *t* to the partner country *j* in US millions of dollars (constant prices 2010). The real values were obtained by deflating the current values, using the GDP deflator. With regard to the independent variables, GDP_{jt} refers to country's *j* GDP in year *t* and $GDPPC_{jt}$ is the GDP *per capita* of

country *j* in year *t*. The first dummy $BORD_{xj}$ assumes the value 1 if there is a common border between Portugal and trade partner *j*, and 0 otherwise. Then the two dummy variables concerning linguistic, aspects COM_LANG_{xj} and ENG_{jt}, assume the value 1 if both countries share a common language or if partner *j* is an English-speaking country, respectively, and 0 if these conditions are not met. $TRADE\_AGR_{xj}$ represents the existence of a trade agreement that extends to services between Portugal and country *j*; $EUR\_WTO\_ES_{jt}$ and EUR_{jt} assume the value 1 if country *j* belongs to the Eurozone, whereby in the first Spain is deliberately excluded from this group of countries, 0 if not; $NON\_EUR\_WTO\_UK_{jt}$ and NON_EUR_{jt} assume the value 1 if country *j* belongs to the EU but not to the Eurozone, with the first excluding the UK, and 0 if this does not occur; NET_USERS_{jt} concerns the number of internet users per 100 inhabitants in country *j* in year *t* and, finally, POL_STAB_{jt} refers to the political stability index recorded in country *j* in year *t*.

3.3 Sample characterization

The countries considered in our sample were strongly influenced by the available data for the period between 2000 and 2019. In this sense, excluding countries for which no statistics are available or for which Portuguese service exports were null, we were faced with a sample of 48 trading partners. Regarding disaggregate service exports, the only category where data for a representative sample was available concerns travel exports with a sample of 42 countries. Therefore, from the difference between the total number of exports and exports of travel services, we calculated the total exports of other services for the same sample of countries where travel data could be collected. The destination countries' list can be found in the Annexes (Table A2 and TableA3). Nevertheless, it should be noted that the countries included in our sample represent around 96% of total Portuguese services exports.

3.4 Descriptive analysis of the model's variables

Before moving to the analysis of the model's results and having defined the variables and equations that will be used, it is necessary to elaborate a brief descriptive analysis of the dependent and independent variables selected in our study. Since a different number of observations was obtained due to data availability, statistics for total services are presented separately from travel and other services.

3.4.1 Descriptive analysis of the dependent variables

Regarding the three dependent variables in our study that concern total exports of services, travel exports and other services exports, a brief descriptive analysis concerning the mean, minimum and maximum values, standard deviation, and number of observations is presented in Table 4.

Table 4: Descriptive statistics: dependent variables

Variable	Mean	Maximum	Minimum	Standard Deviation	Observations
X	532687	6847025	881.09	1054476	960
Xtravel	260533.2	3905458	212.1084	549845.7	840
Xothers	272154	2941567	106.1	521760.3	840

The main conclusion we can take from Table 4 is that it is noticeable a large discrepancy between the maximum and minimum values recorded in all three dependent variables, resulting in a relatively high standard deviation. The maximum value corresponds in all variables to Portuguese service exports to the UK in 2019. On the other hand, the lowest values regarding total and travel exports were registered to exports directed to Estonia in 2002 and 2005, respectively. The minimum value registered for other services exports belongs to Portuguese exports to Malta in 2003.

Figures 1, 2 and 3 provide a temporal comparison between the mean of the years analysed for each dependent variable. Although some occasional falls were recorded in 2009 and 2015, we can notice that all dependent variables registered a sharped growth over the last 20 years, which became even more eminent since 2016.

Figure 1: Mean by year: total services exports, 2000-2019

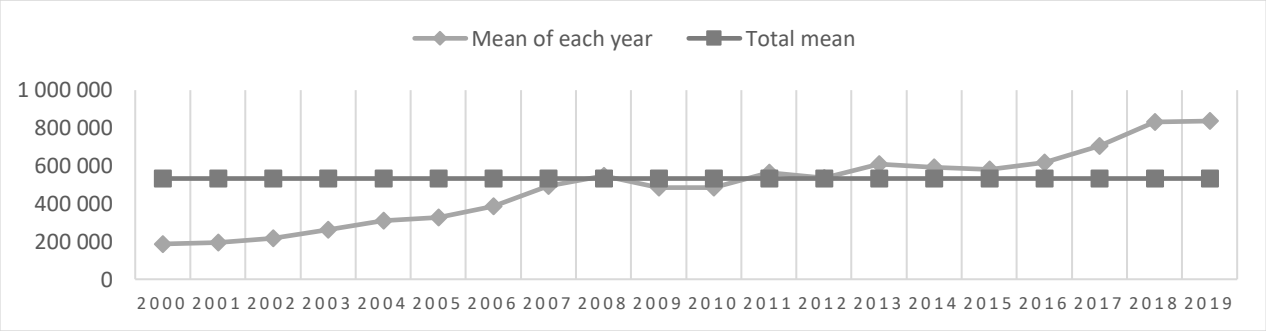


Figure 2: Mean by year: travel exports, 2000-2019

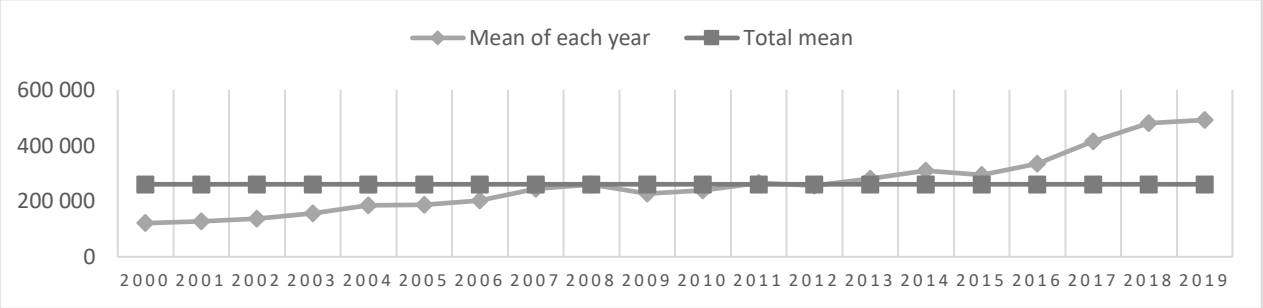
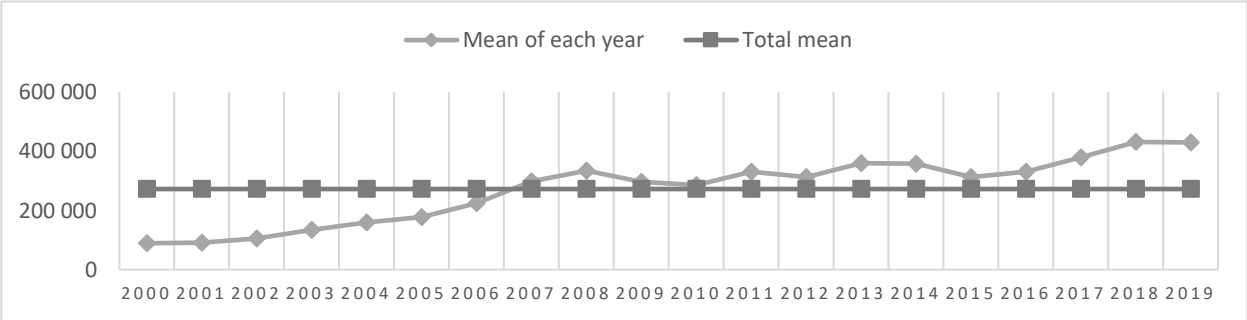


Figure 3: Mean by year: other services exports, 2000-2019



In geographical terms, by analysing Figures 4, 5 and 6, over the 2000 to 2019 period six destinations of Portuguese exports clearly stand out in the first dependent variable (*X*): Angola, Brazil, France, Germany, Spain and the UK. As regards travel (*Xtravel*) and other services, the main geographical destinations out of the 42 countries analysed were Brazil (even though apparently less significant in travel services), France, Germany, Spain, and the UK.

Furthermore, it is also possible to conclude that there is a large discrepancy between the value of Portuguese service exports, which are concentrated in a small group of destination countries led by the UK. A more detailed analysis of the relevance of service exports to the Portuguese economy and their sectorial and geographic specialisation will be presented in Chapter 4.

Figure 4: Mean by country: total services exports, 2000-2019

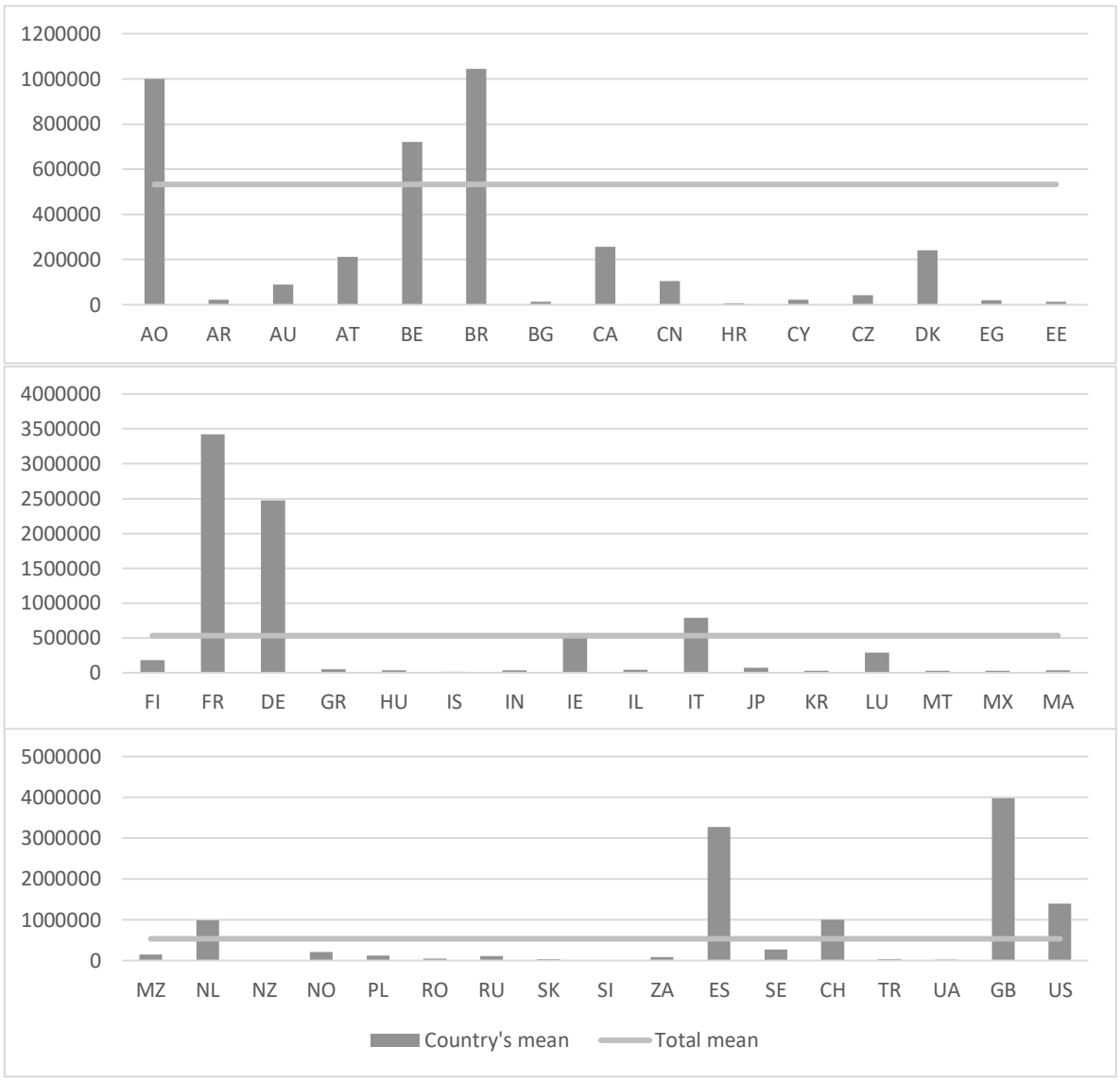
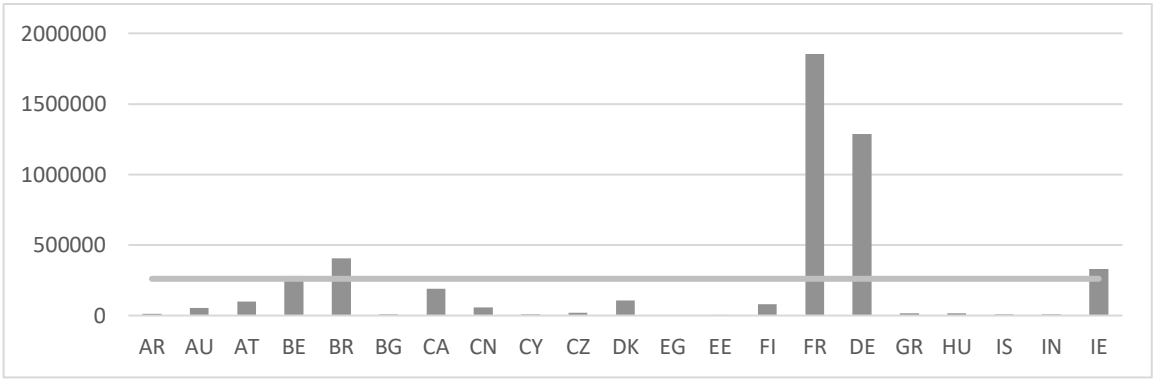


Figure 5: Mean by country: travel exports, 2000-2019



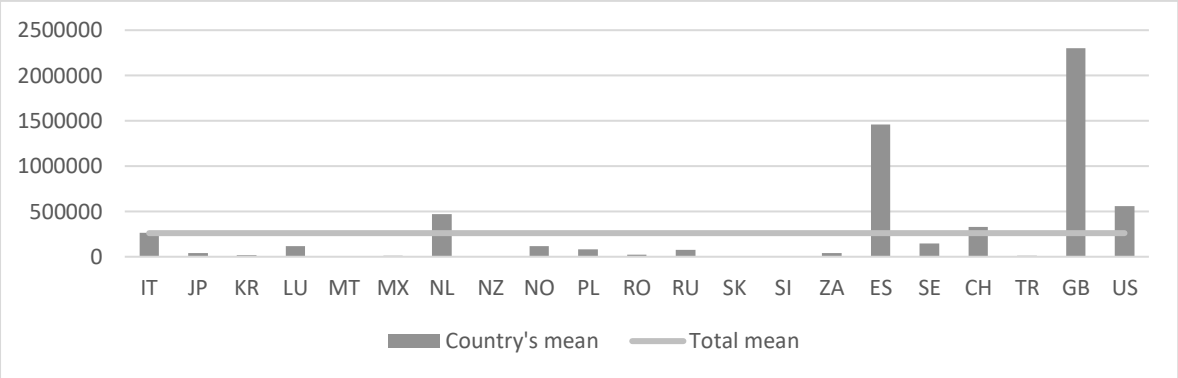
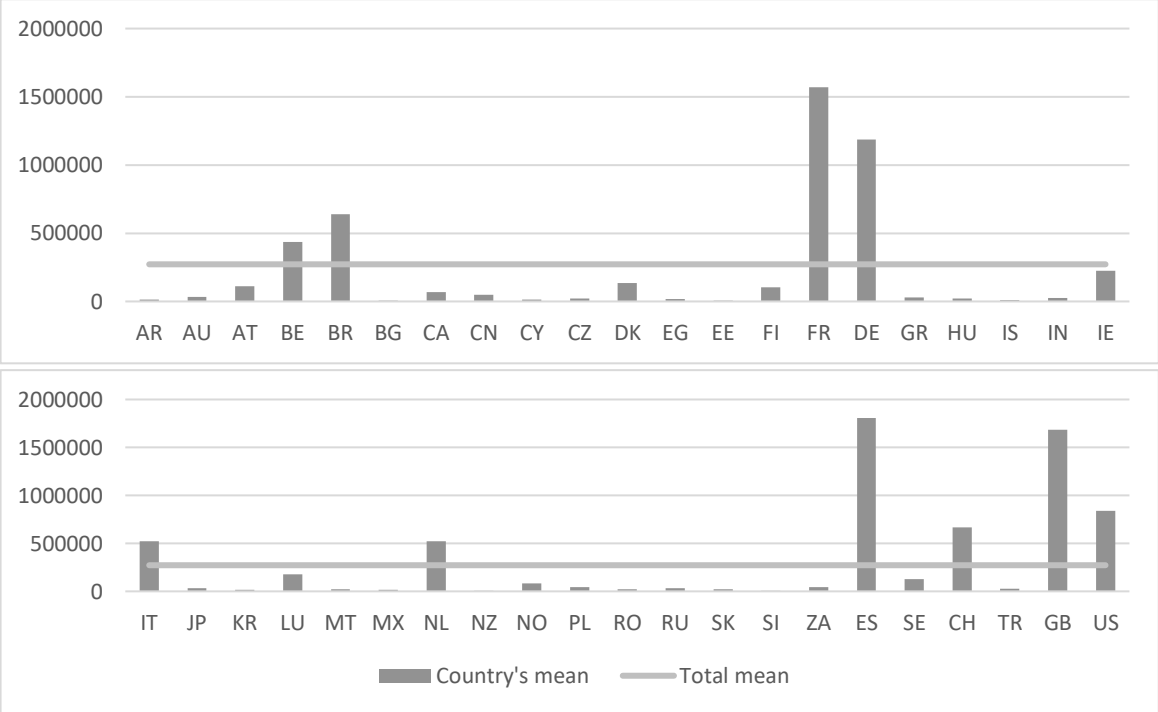


Figure 6: Mean by country: other services exports, 2000-2019



3.4.2 Descriptive analysis of the independent variables

Since a different number of observations was obtained due to data availability, descriptive statistics for total services independent variables are presented separately from travel and other services, allowing a more effective analysis.

Total services

Table 5 presents a summarisation of all independent variables in the regression for total services, excluding the dummies, which have their own representation in Table 6.

Table 5: Descriptive statistics for total services

Variable	Mean	Maximum	Minimum	Standard deviation	Observations
GDP	1213638	18300385	5131	2525647	960
GDPPC	29522.05	11968.30	289.75	23573.25	960
DIST	4578.04	19335.40	500.92	4007.24	960
POL_STAB	0.43	1.76	2.04	0.81	960
NET_USERS	55.44	99.02	0.11	28.92	960

Starting with de GDP variable, the maximum value registered is about 18 million US dollars, which refers to the United States' GDP in 2019. On the other hand, Mozambique's GDP in 2000 registered the lowest value. Since our sample of countries includes both large economies such as the United States and China, and other less relevant economies for a 20-year time period., this variable appears to be quite dispersed, resulting in a high standard deviation. On the other hand, GDP *per capita*'s variable mean is about 29.5 million US dollars, with the maximum being Luxembourg's GDP in 2007 and the minimum being Mozambique's GDP *per capita* in 2000.

Regarding the variable measuring the physical distance, its mean is 4578.037 kilometres, with the lowest value being the distance between Lisbon and Madrid and the highest between Lisbon and Wellington.

The indicator for political stability shows a mean of 0.425008. The maximum value reflects the Dutch index for 2000 whereas the minimum value was presented by Angola also in 2000. Over the 20 years analysed, Angola and Turkey were the countries that registered the lowest quality on this indicator. On the other hand, the countries with the most positive results are the Netherlands, Austria, Finland and Iceland.

The variable concerning the number of internet users presented a mean of 55.44294, with the highest value belonging to the percentage of internet users in Iceland in 2019, and the lowest value relates to Mozambique in 2000, where the number of internet users was almost null.

Table 6: Descriptive statistics for total services: dummy variables

Variable	Mean (%)	Observations
COM_LANG	6.25	960
ENG	14.48	960
TRADE_AGR	11.07	960
EUR	35.24	960
NON_EUR	18.81	960

Note: Since only Spain shares a common border with Portugal, it was not considered relevant to include this variable in the Table

Analysing the main dummy variables separately, of the countries included, only a mere 6% share a common language with Portugal and about 14,4% have English as an official language. The countries covered by services trade agreements with Portugal represent around 11% of the sample included and those that share the same currency represent more than 35%. The ones in the EU but have not adopted the euro symbolize 19% of our sample.

Travel and other services

Table 7 presents the results of the descriptive statistics for the observed data included in the estimations of the travel and other services models.

Table 7: Descriptive statistics for travel and other services

Variable	Mean	Maximum	Minimum	Standard deviation	Observations
GDP	1372699	18300385	7026	2662297	840
GDPPC	32462.86	111968.30	826.59	23445.05	840
DIST	4653.15	19335.40	500.92	4171.58	840
POL_STAB	0.54	1.76	-2.01	0.75	840
NET_USERS	59.12	99.02	0.53	27.24	840

The results obtained are not very different from those observed for the sample collected at the level of total exports of services as expected as only 6 countries were excluded from our sample due to lack of statistical data. The means obtained are however a little higher for all variables. This is due to the exclusion of some less developed countries, which present

lower values for the variables analysed, resulting in a higher global average.

In this regard, the USA remains the country with the highest registered GDP and Luxembourg, the highest GDP *per capita*. At the geographical level there is no change either with Spain being the closest partner and New Zealand the furthest away. The Netherlands remains the country with the highest level of political stability, recorded in 2000, while Turkey registered the lowest score on this indicator in 2016. Finally, India recorded in 2000 the lowest number of internet users per 100 inhabitants of the countries in our sample and Iceland the highest in 2019.

Table 8: Descriptive statistics for travel and other services: dummy variables

Variable	Mean (%)	Observations
ENG	16.5	840
TRADE_AGR	11.1	840
EUR	32.5	840
NON_EUR	18.8	840

Analysing the dummy variables separately as done previously, there are also no great oscillations in relation to what was analysed at the level of the previous dependent variable. Of the countries included about 16.5% have English as an official language. The countries covered by services trade agreements with Portugal represent around 11.1% of the sample included and those that share the same currency represent 32.5%. The ones that are in the EU but have not adopted the euro symbolize about 18.8% of our sample.

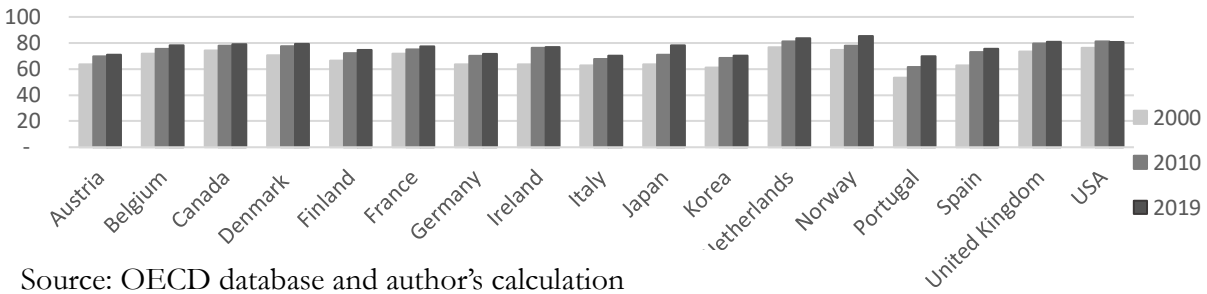
4. Trends in the Portuguese services sector: 2000-2019

Before analysing the empirical results of our model, in this Chapter we will discuss the main trends in the international trade of services in the Portuguese economy, both nationally through the study of its relevance for total Portuguese exports and for the national GDP, and internationally by analysing comparative advantages indices.

4.1 Employment and GVA

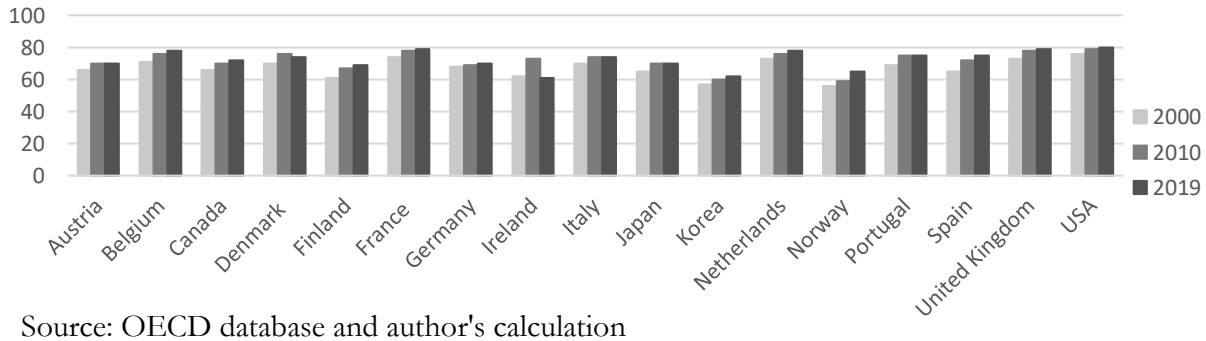
With regard to the relevance of services in employment, it can be seen that similarly to other industrialized countries, services are the major employer sector in the various economies, employing more than 50% of the population in all countries in the sample analysed (Figure 7). In Portugal, the services sector employed about 70% of the Portuguese working population in 2019. The two countries where the sector employs the most population are the USA and the UK, assuming about 80% of the employed population. Services are also of enormous importance in terms of GVA, accounting for around 75% of the GVA in Portugal (Figure 8).

Figure 7: Share of the services sector in employment (2000-2019, %)



Source: OECD database and author's calculation

Figure 8: Share of the services sector in GVA (2000-2019, %)

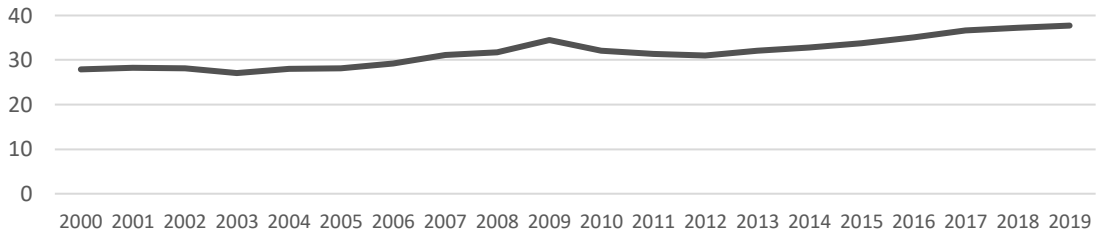


Source: OECD database and author's calculation

4.2 Portuguese international trade in services (2000-2019)

Similarly to most developed countries, the weight of Portuguese service exports over total national exports has been gaining increasing importance with a growth of 10 percentage points over the past two decades (Figure 9).

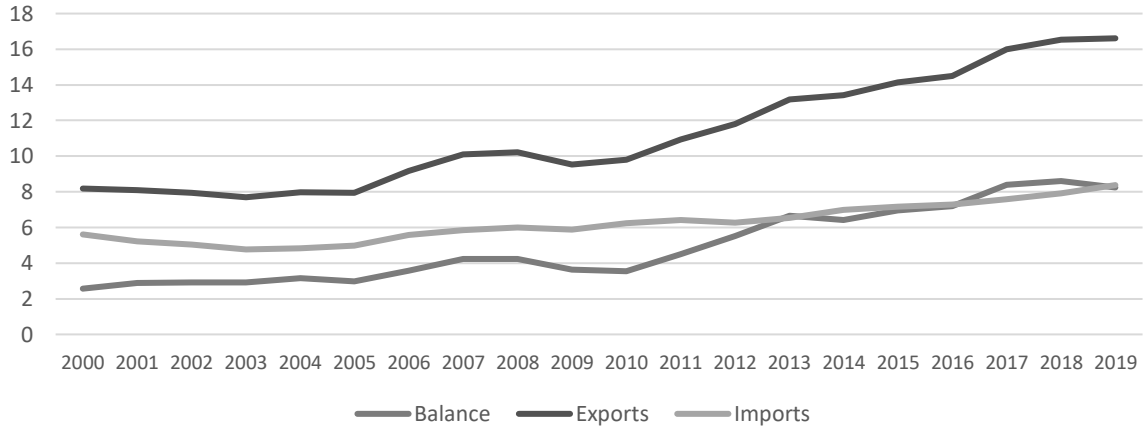
Figure 9: Portuguese services exports in total exports (2000-2019%)



Source: Banco de Portugal and author's calculation

Figure 10 demonstrates that national services exports have been boosting faster than imports, experiencing an increase after 2005. Since then, only in 2009 (mainly due to the financial crisis) a small drop was registered.

Figure 10: The Portuguese services account (2000-2019, %)



Source: Banco de Portugal and author's calculation

4.3 Specialization patterns of Portuguese service exports

In this Subsection we will analyse the patterns of specialization of the Portuguese service exports both in terms of their sectorial and geographical distribution over the last 20 years.

Starting with the sectorial analysis of Portuguese service exports, as for the weight of the main subsectors framed in services (Table 9), travel, transportation and telecommunication, computer and information services stand out as the most relevant in the Portuguese economy, representing together almost 80% of total services exports in 2019. Among the most minor exported services are intellectual property, insurance and pension services, personal, and cultural and recreational services. These three services combined represent less than 2% of total exports. In terms of variation, following the positive evolution of total exports from 2000 to 2019, all services registered positive variations with the exception of financial services. With variation rates above the total average are transportation, construction, charges for the use of intellectual property, and telecommunications, computer and information services. Indeed, telecommunications, computer and information services registered a remarkable evolution becoming the third most exporting subsector of national services in 2019.

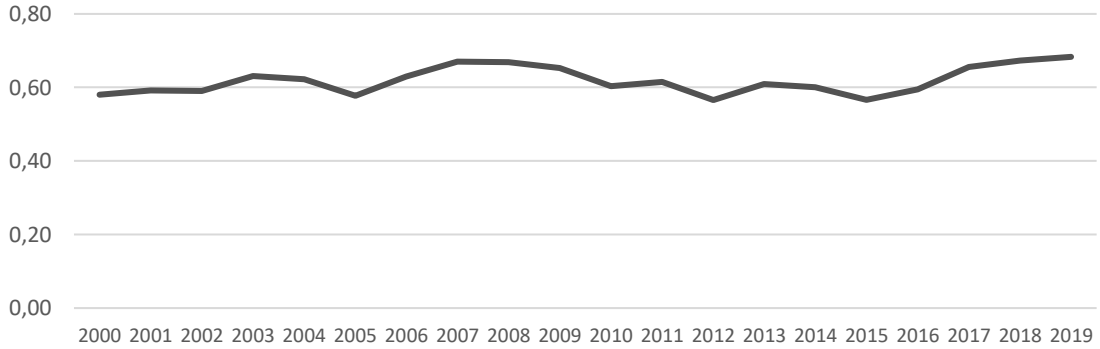
Table 9: Structure of Portuguese service exports by main categories (Million euros, %)

Subsectors	2000	Share (%)	2019	Share (%)	Variation (%)
Transportation	1 499.1	14.8	7 548.9	21.2	40.6
Travel	5 720	56.3	1 8291	51.3	219.8
Construction	163,6	1.6	769.1	2.2	370.1
Insurance and pension services	71.1	0.7	182.9	0.5	157.2
Financial services	692.9	6.8	406	1.1	-41.4
Charges for the use of intellectual property	27.2	0.3	111.4	0.3	309.6
Telecommunications, computer and information services	245.1	2.4	2 083.4	5.8	750
Personal, cultural and recreational services	147.7	1.5	281	0.8	90.3
Others	1 585.20	15.6	5 991.1	16.8	277.9
Total service exports	10 151.80	100	35 664.7	100	251.3

Source: PORDATA, Banco de Portugal and author's calculation

Although Portugal does not seem to have much relevance for the total world exports of services at a first glance (Figure 11), it is the 31st largest exporter in this sector (see Table A1 in the Annexes), mainly due to the role of transportation and travel services, which represent together more than 70% of the country's service exports as previously seen. Thus, in 2000, Portuguese exports of services represented about 0.58% of total exports, while in 2019 their value increased to 0.68%. As would be expected, there was a small drop in exports in the years referring to the financial crisis. In the top five places are some of the world's largest economies in terms of GDP, namely, the USA, the UK, Germany, France and China.

Figure 11: Portuguese service exports in total world service exports (2000-2019, %)



Source: CHELEM-BOP and author's calculation

Proceeding with the geographical specialization patterns analysis, we used the revealed comparative advantage index expressed in equation (4). Comparative advantage indices make it possible to ascertain the relative advantages (or disadvantages) of a certain country, in a certain industry or product by measuring trade flows (Amador, Maria, & Cabral, 2007). The idea of using trade flows to create an index where it would be possible to determine the relatively stronger or weaker sectors of an economy came from Liesner (1958), and his theory was later refined and popularized by Balassa (1965). In this sense, the Balassa Index - so-called because of its founder's name - is the most commonly used index to measure comparative advantages. Since Balassa popularised it, several authors have followed a similar methodology to create indices for various sectors of the economy in different countries and over different periods.

This indicator is then derived by looking at the relative structure of a country's exports over time and uses the share of a given sector in world exports to normalise the export share of that sector for each country. A result greater than 1 indicates that the country shows a comparative advantage in the sector during the period in question, i.e. the country is

relatively specialised in the export of the good or service, while a result below 1 reveals a comparative disadvantage in the sector. The index is then presented by the following formula:

$$RCA = \frac{\frac{X_{ij}}{X_j}}{\frac{X_{ik}}{X_k}} \quad (4)$$

where i is the product/service; j is the country under analysis; k represents the reference zone, in this case, the world; and, lastly, X refers to exports. In this sense, Table 10 considers Portugal and the top 5 exporters of services worldwide to analyse which are the strongest and weakest subsectors of the 6 economies in question. Except for insurance and pension services, financial services and personal, cultural and recreational services, all service subsectors gained relevance in terms of comparative advantage between the two periods, which proves the positive and relevant growth of the services sector in the Portuguese economy, corroborating the results obtained by previous indicators. Furthermore, during the last years, the country registered a comparative advantage in transportation, travel and construction services, revealing the greatest advantage in the sample of countries concerned in both transportation and travel services. Notwithstanding the positive evolution of telecommunications, computer and information services in Portuguese exports, the country has not improved its comparative advantage in this category over the last years due to the fact that an effective growth in this subsector has taken place worldwide.

Although the USA are the world's largest exporter of services and could be expected to show great comparative advantages, the country does not show comparative advantage in most subsectors. Indeed, its greatest advantage is in financial services and the UK, in charges of the use of intellectual property and personal, cultural, and recreational services. Even in the other services category, the country reveals revealed comparative disadvantages, unlike the UK, Germany and France. On the other hand, China's strongest advantage is in the construction subsector, where the country has been gaining an increasing relevance as has now a prominent role. Indeed, similarly to Portugal, the country has revealed a positive evolution in most services while the USA, the UK, Germany and France have lost their advantage in several categories.

Table 10: The relative specialization of service exports: Balassa Indices

	Portugal		USA		UK		Germany		France		China	
	2000-2003	2016-2019	2000-2003	2016-2019	2000-2003	2016-2019	2000-2003	2016-2019	2000-2003	2016-2019	2000-2003	2016-2019
Transportation	0.7956	**1.2792**	0.7786	0.6260	0.7881	0.5827	0.7389	**1.1642**	0.9203	0.9436	0.3226	**1.0555**
Travel	**1.9774**	**2.1583**	**1.0304**	0.9868	0.6663	0.5275	0.7300	0.5269	**1.1326**	0.9191	0.7736	0.7534
Construction	**1.2422**	**1.4027**	0.5076	0.1723	0.1369	0.4727	1.8370	0.4018	**1.1460**	0.7114	0.7081	**3.4349**
Insurance and pension services	0.3297	0.1958	0.6975	0.8526	**3.4394**	**2.6673**	**1.1603**	**1.5771**	0.7847	**1.3171**	0.1254	0.8260
Financial services	0.4570	0.1326	**1.3799**	**1.7120**	**3.2887**	**2.2791**	**1.3511**	0.8381	0.2977	0.5362	0.0155	0.1728
Charges for the use of intellectual property	0.0467	0.0506	**2.9772**	**2.0670**	**1.1576**	0.8837	0.6252	**1.4981**	0.9163	0.8645	0.0258	0.2986
Telecommunications, computer and information services	0.4672	0.4692	0.7330	0.5505	**1.1553**	0.7067	**1.1654**	0.8623	**1.4833**	0.6575	0.6020	**1.2259**
Personal, cultural and recreational services	0.8729	0.5948	**2.3400**	**2.0767**	**1.4052**	**1.0611**	0.4427	0.6300	**1.6910**	**1.2769**	0.2151	0.2740
Others	0.4898	0.6315	0.7335	0.9200	**1.9861**	**1.4577**	**1.2307**	**1.2654**	**1.3209**	**1.4070**	0.0003	0.0030

Source: CHELEM-BOP and author's calculation
Note: values in blue reveal a comparative advantage in the subsector

Regarding trade partners, the main destinations of Portuguese service exports are the 11 countries described in Table 11, with the UK standing out as the main destination of national exports, in both periods, followed by France and Spain, the 2nd and 3rd main destinations, respectively. Together, all these 11 countries represented more than 80% of total Portuguese service exports during the years under review and the first 5 major destinations of Portuguese exports of services remained the same. Lastly, we can conclude that Portuguese exports of services are mostly directed to European countries, with the US, Angola and Brazil being the main exceptions. We also highlight an increase in the importance of Brazil and Angola for exports in the average of the last two years as opposed to a decrease in the importance of Italy and Belgium.

Table 11: Main destinations of Portuguese service exports (%)

Partner	2000-2001 share (%)	Ranking	2018-2019 share (%)	Ranking
UK	17.4	**1**	16.5	**1**
France	13.9	**2**	14.0	**2**
Spain	13.6	**3**	11.6	**3**
Germany	11.1	**4**	10.2	**4**
USA	8.5	**5**	6.8	**5**
Brazil	2.5	**9**	4.5	**6**
Switzerland	1.8	**10**	4.1	**7**
Netherlands	3.0	**8**	4.0	**8**
Belgium	6.1	**6**	2.9	**9**
Angola	1.7	**11**	2.7	**10**
Italy	3.1	**7**	2.5	**11**
Others	17.1	---	20.2	---
Total	100.0	---	100.0	---

Source: PORDATA, Banco de Portugal and author's calculation

5. Empirical Results and Discussion

In this Chapter, we present the estimation of our augmented gravity model described in equations (2) and (3) and discuss its empirical results and interpretation, comparing our results with those obtained in previous studies. Given the data available the empirical analysis is organized considering first the aggregate data, meaning total exports of services; second, the exports of travel; and, finally, the remaining services (total services excluding travel).

In this research, similarly to the studies presented in Section 2.3, we use a panel data analysis for the period between 2000 and 2019. This type of sample, among other reasons, allows our study to be carried out for a relatively extended period of time, improving the efficiency of econometric estimations and avoiding the risk of choosing an unrepresentative year (Greene, 2000). In the econometric literature, three models are considered appropriated for panel data: pooled OLS, fixed effects model and random effects model. The pooled OLS does not consider the heterogeneity of neither the countries nor the period, assuming that all countries and periods are homogeneous (Wooldrige, 2010). The fixed effects model should be adopted if the effects variables are correlated, and the random effects method will be the best option when this is not the case. In our model, period fixed effects were chosen over country fixed effects to be able to include all the explanatory variables.

To choose between the model that would perform more reliable results, we started by running the redundant fixed effects test to see if fixed effects were needed over the pooled OLS model. The results suggested that fixed effects were necessary since a p-value of 0.000 was obtained. Additionally, to see if we should use the random effects model over fixed effects, we run the *Hausman* test. A p-value of 0.000 was once again obtained, which led us to reject the null hypothesis, concluding that the best model for our data set was the fixed effects model.

5.1 Total services exports

Table 12 presents the results of the econometric analysis of the model, considering exports of total services as the dependent variable and excluding Spain from the dummy variables concerning the group of countries belonging to the Eurozone (*EUR*) and the UK from those that are only part of the EU (*NON_EUR*). The results including Spain and the UK can be found in the Annexes for comparison (Tables A4, A5 and A6).

Table 12: Estimation results for total service exports

Dependent Variable: ln(*X*)

Independent Variables	Pooled OLS	Period Fixed Effects			
		Model A	Model B	Model C	Model D
DIST	-0.0002*** (8.888)	-0.0002*** (7.233)	-0.0002*** (8.588)	-0.0002*** (8.611)	-0.0002*** (8.555)
BORD	2.6659*** (0.079)	1.8799*** (0.078)	2.5979*** (0.081)	2.5961*** (0.082)	2.6063*** (0.084)
ln(***GDP***)	0.7036*** (0.019)	0.6156*** (0.021)	0.6911*** (0.019)	0.6971*** (0.019)	0.6971*** (0.019)
ln(***GDPPC***)	0.1496*** (0.049)	0.72088*** (0.026)	0.4356*** (0.039)	0.4124*** (0.041)	0.3379*** (0.055)
COM_LANG	5.0243*** (0.214)	4.7457*** (0.213)	4.7783*** (0.194)	4.7606*** (0.193)	4.8142*** (0.198)
ENG	1.4915*** (0.103)	1.1713*** (0.090)	1.4564*** (0.096)	1.4404*** (0.097)	1.4468*** (0.097)
TRADE_AGR	0.7666*** (0.131)		0.7971*** (0.117)	0.7636*** (0.122)	0.7371*** (0.124)
EUR_WTO_ES	1.4192*** (0.091)		1.2672*** (0.085)	1.2365*** (0.093)	1.2589*** (0.093)
NON_EUR_WTO_UK	0.5551*** (0.085)		0.4459*** (0.076)	0.4124*** (0.085)	0.4173*** (0.085)
POL_STAB	-0.1626*** (0.047)			0.0569*** (0.049)	0.0165 (0.052)
NET_USERS	0.0216*** (0.001)				0.0057** (0.002)
Observations	960	960	960	960	960
Adjusted R^2	0.8343	0.8085	0.8457	0.8458	0.8467
Wald-F Test	433.7926 (0.000)	157.6808 (0.000)	182.1864 (0.000)	175.9537 (0.000)	171.0118 (0.000)
F-Test for Fixed Effects		562.7411 (0.000)	486.2572 (0.000)	437.7875 (0.000)	400.2066 (0.000)

Notes: (i) the dependent variable is the natural logarithm of total service exports; (ii) under each estimate is the value of the respective standard deviation, which, because we used the diagonal white estimator, validates the statistical inference and ensures that standard deviations are obtained based on estimators consistent in

heteroscedasticity and/or autocorrelation; (iii) the symbols *, ** and *** indicate the individual significance of the explanatory variable for the significance level of 10%, 5% and 1%, respectively; (iv) The adjusted R^2 indicates the adjusted coefficient of determination; (v) the Wald-F test corresponds to the regression global significance test, with the p-value below; (vi) in the F-Test for fixed effects, in parentheses, the p-value is also indicated.

The results obtained show that except for political stability, all individual variables included in the model are statistically significant for different significance levels. The estimates obtained for the regression coefficients are under the expected sign identified by the literature.

Starting with the geographic distance between Portugal and its trade partners (*DIST*), it is estimated that a 1km increase in the distance between Portugal and its trading partner leads to a 0.02% decrease in exports to that partner, *ceteris paribus*. In all previous studies geographical distance proved to play a significant and negative role over aggregate trade in services, although its weight may vary according to different types of services (Kandilov & Grennes, 2010). In this study, however, there were no significant changes in the other two categories presented, as will be noticed. As for the common border variable (*BORD*), we find that the estimated value of Portuguese service exports is 1254.9% higher for the country that share a border with Portugal, *ceteris paribus*. In other words, since Spain is the only country with which we share a land border, exports from Portugal's to Spain are 1254.9% higher than the expected normal value based in the analysis – meaning in the absence of the border. The positive impact of this variable on Portuguese service exports is line with other studies yet this is greater than the impact recorded in Ceglowski (2006); Walsh (2006); Lee (2012); Shepherd and van der Marel (2013); Anderson et al. (2018); Nordås (2018) and Harms and Shuvalova (2020).

Regarding GDP and GDP *per capita*, 0.7 is the estimated elasticity of exports with respect to GDP, *ceteris paribus*, and 0.34 is the estimated elasticity of exports concerning GDP *per capita*. A value between 0 and 1 is considered inelastic, since variation in GDP has a small impact on exports. In other words, a 1% increase in the trade partner's GDP, originates an estimated increase of about 0.7% in exports to that partner, *ceteris paribus*, and a 1% increase in the partner's GDP *per capita* leads to an increase of 0.34% in exports to that economy. In the case of GDP *per capita*, similar results had already been obtained by Grünfeld and Moxnes (2003); Ceglowski (2006); Kimura and Lee (2006); Walsh (2006), which leads us to conclude that in a country with higher GDP *per capita*, consumers tend to have greater purchasing power, which increases the intensity of Portuguese service exports.

The common language variable (*COM_LANG*) presents the highest coefficient of

all the variables considered. It is estimated that the value of Portuguese exports to countries that share the same language is 12224.8 % higher than exports to other countries, *ceteris paribus*. Regarding the countries with English as an official language, we can conclude that all other things being equal, the estimated value of national exports to these group of countries is 325% higher. This estimate presented similar results to those obtained in the empirical studies reviewed earlier, with the exception of Kandilov and Grennes (2010), whose result proved to be positive but not statistically significant.

Additionally, as expected, the three dummies *TRADE_AGR*, *EUR_WTO_ES* and *NON_EUR_WTO_UK* positively influence Portuguese exports of services. No other study has differentiated these variables in these way, however, except for Grünfeld and Moxnes (2003) and Shepherd and van der Marel (2013) all previous studies that examined the impact of trade agreements and EU membership have registered a significant and positive impact of these determinants on trade in services. The variable *EUR_WTO_ES* is the one that most influences service exports out of all these three variables: it is estimated that the value of Portuguese exports to countries that belong to the Eurozone are 252.2% higher than exports to other countries, *ceteris paribus*. On the other hand, over the same conditions, the estimated value of exports to EU members that do not share the common currency excluding the UK is only 51.8% higher, whereas the value of exports to countries that have stablished service trade agreements with Portugal is 109% higher.

Similarly to the results obtained in Salmani, Pourebrahim and Saremi (2013), and Nasir and Kalijaran (2014), the number of internet users per 100 inhabitants (*NET_USERS*) in the partner country also positively impacts exports, as a 1% increase in this number leads to an increase of 0.57% in exports to that country, *ceteris paribus*.

5.2 Travel exports

Moving to the results of the econometric analysis of the model (Table 13), considering the exports of travel services as the dependent variable and excluding once again Spain and the UK from the dummies *EUR* and *NON_EUR*, respectively, we can verify that all variables are statistically significant and present the expected sign, including the political stability (*POL_STAB*). It is important to note that the internet users per 100 inhabitants variable (*NET_USERS*) was omitted in this model as it is not considered very relevant in this category.

Table 13: Estimation results for travel exports

Dependent Variable: ln(*Xtravel*)

		Period Fixed Effects		
Independent Variables	**Pooled OLS**	**Model A**	**Model B**	**Model C**
DIST	-0.0002*** (9.411)	-0.0002*** (8.688)	-0.0002*** (8.522)	-0.0002*** (8.544)
BORDER	2.3159*** (0.091)	1.7412*** (0.090)	2.2665*** (0.094)	2.3068*** (0.101)
ln(*GDP*)	0.7474*** (0.023)	0.7057*** (0.020)	0.7426*** (0.019)	0.7637*** (0.021)
ln(*GDPPC*)	1.0303*** (0.052)	1.0546*** (0.026)	0.9287*** (0.028)	0.8351*** (0.049)
COM_LANG	2.9428*** (0.103)	2.7062*** (0.075)	2.8740*** (0.072)	2.8679*** (0.071)
ENG	1.4271*** (0.111)	1.1699*** (0.110)	1.3651*** (0.106)	1.3461*** (0.108)
EUR_WTO_ES	0.9437*** (0.079)		0.7943*** (0.073)	0.7755*** (0.073)
NON_EUR_WTO_UK	0.6698*** (0.095)		0.5148*** (0.081)	0.4677*** (0.082)
POL_STAB	-0.1276* (0.073)			0.1536** (0.072)
Observations	840	840	840	840
Adjusted R^2	0.8393	0.8534	0.8709	0.8718
F-Test	481.7274 (0.000)	189.5997 (0.000)	203.0478 (0.000)	197.0304 (0.000)
F-Test for Fixed Effects		696.0284 (0.000)	606.0600 (0.000)	541.6608 (0.000)

Notes: (i) the dependent variable is the natural logarithm of travel exports; (ii) under each estimate is the value of the respective standard deviation, which, because we used the diagonal white estimator, validates the statistical inference and ensures that standard deviations are obtained based on estimators consistent in heteroscedasticity and/or autocorrelation; (iii) the symbols *, ** and *** indicate the individual significance of the

explanatory variable for the significance level of 10%, 5% and 1%, respectively; (iv) The adjusted R^2 indicates the adjusted coefficient of determination; (v) the Wald-F test corresponds to the regression global significance test, with the p-value below; (vi) in the F-Test for fixed effects, in parentheses, the p-value is also indicated.

Comparing these results with those obtained for total services exports, there is no change in the impact of geographic distance, i.e., it is estimated that a 1km increase in the distance between Portugal and its trading partner leads to a 0.02% decrease in travel exports to that partner, *ceteris paribus*. As for the common border variable (*BORD*), with other conditions remaining the same, the estimated value of Portuguese travel exports is 904.22% higher to Spain than to the other partners considered in the analysis that do not share a common land border. This result is very similar to that obtained in Walsh (2006) for travel services.

As regards GDP and GDP *per capita*, their impact remained positive, translating into even higher values when compared to total services for the latter: a 1% increase in the trade partner's GDP, originates an estimated increase of about 0.76% in travel exports to that partner, *ceteris paribus*, and a 1% increase in the partner's GDP *per capita* leads to an increase of 0.84% in travel exports to that economy.

In line with total services exports, the common language variable (*COM_LANG*) presents the highest coefficient of all the variables considered. However, its impact on travel exports is lower: it is estimated that the value of Portuguese travel exports to countries that share the same language is 1660% higher than exports to other countries, *ceteris paribus.* Regarding the countries with English as an official language, all other things being equal, the estimated value of Portuguese travel exports is 284.24% higher to this group of countries.

The two dummies *EUR_WTO_ES* and *NON_EUR_WTO_UK* still have a positive influence on travel export, as expected. In line with total services export, the variable *EUR_WTO_ES* is the one that most influences travel exports out of these two variables yet with a smaller impact. It is estimated that the value of travel exports to countries that belong to the Eurozone is 117.17% higher than exports to other countries, *ceteris paribus*, whereas the estimated value of exports to EU members that do not share the common currency (excluding the UK) is 59.63% higher, ceteris paribus.

As opposed to total services exports results, the political stability (*POL_STAB*) variable proves to be statistically significant to travel exports and presents the expected positive sign though with a small impact.

5.3 Other services exports

To deepen our analysis and to overcome the problems resulting from the scarcity of statistical data, we considered a new category of service exports labelled "other services" - that is total services excluding travel services. Therefore, by subtracting to the values of total exports of services the value of travel exports, we reached exports of other services, where transportation services are prominent. The results obtained are reported in Table 14. According to our knowledge, no other study to date has undertaken an analysis considering this specific categorisation, so it is not possible to stablish comparisons with results from other research.

Table 14: Estimation results for other services exports

Dependent Variable: ln(*Xothers*)

		Period Fixed Effects			
Independent Variables	**Pooled OLS**	**Model A**	**Model B**	**Model C**	**Model D**
DIST	-0.0002*** (1.055)	-0.0002*** (8.811)	-0.0002*** (8.866)	-0.0002*** (8.876)	-0.0002*** (9.888)
BORD	2.5403*** (0.091)	1.7143*** (0.068)	2.5267*** (0.088)	2.4634*** (0.089)	2.4618*** (0.089)
ln(*GDP*)	0.7588*** (0.024)	0.7113*** (0.023)	0.7931*** (0.023)	0.7628*** (0.02)	0.7633*** (0.023)
ln(*GDPPC*)	0.5057*** (0.067)	0.8437*** (0.032)	0.5742*** (0.041)	0.7182*** (0.052)	0.7309*** (0.067)
COM_LANG	3.3598*** (0.104)	2.9206*** (0.079)	3.1844*** (0.078)	3.2026*** (0.080)	3.1967*** (0.0818)
ENG	1.3651*** (0.115)	0.9369*** (0.116)	1.2642*** (0.107)	1.3029*** (0.103)	1.3020*** (0.102)
TRADE_AGR	0.7621*** (0.163)		0.6599*** (0.146)	0.7325*** (0.148)	0.7363*** (0.149)
EUR_WTO_ES	1.5759*** (0.099)		1.2899*** (0.097)	1.3535*** (0.098)	1.3493*** (0.0995)
NON_EUR_WTO_UK	0.9238*** (0.101)		0.6232*** (0.095)	0.7288*** (0.099)	0.7281*** (0.099)
POL_STAB	-0.5474*** (0.076)			-0.2623*** (0.0792)	-0.2534*** (0.003)

NET_USERS	0.0195*** (0.002)				-0.0009 (0.0031)
Observations	840	840	840	840	840
Adjusted R^2	0.8269	0.809912	0.843932	0.845533	0.845461
F-Test	365.2899 (0.000)	143.9893 (0.000)	163.0314 (0.000)	159.3653 (0.000)	154.0019 (0.000)
F-Test for Fixed Effects		511.8016 (0.000)	428.6056 (0.000)	391.2661 (0.000)	355.4404 (0.000)

Notes: (i) the dependent variable is the natural logarithm of other services exports; (ii) under each estimate is the value of the respective standard deviation, which, because we used the diagonal white estimator, validates the statistical inference and ensures that standard deviations are obtained based on estimators consistent in heteroscedasticity and/or autocorrelation; (iii) the symbols *, ** and *** indicate the individual significance of the explanatory variable for the significance level of 10%, 5% and 1%, respectively; (iv) The adjusted R^2 indicates the adjusted coefficient of determination; (v) the Wald-F test corresponds to the regression global significance test, with the p-value below; (vi) in the F-Test for fixed effects, in parentheses, the p-value is also indicated.

There are no significant differences when comparing the results obtained with total services and travel. Except for internet users, all other variables are statistically significant and apart from political stability all present the expected sign. The unexpected sign of this variable may be due to the sample of countries considered, demonstrating the limitation in using this indicator for relatively limited samples.

Distance plays a similar role in all three estimated categories, while a common border has a great positive impact as in the other categories. GDP and GDP *per capita* also proved to have a significant positive impact over Portuguese exports of services. In the case of other services that are not travel services, with other conditions remaining the same, a 1% increase in the partner country's GDP and GDP *per capita* leads to an estimated increase of about 0.76% and 0.73% in exports to that partner, respectively.

In terms of linguistic factors, the two dummy variables (*COM_LANG* and *ENG*) proved to have a great positive impact over other services exports. These are in line with those results obtained when analysing travel services exports with the same sample of countries considered – common language with a bigger impact.

Concerning the three administrative determinants of other services exports, the belonging to the Eurozone proved to have the greater impact on exports out of all three variables, with an impact similar to total services exports. Yet, it deserves to highlight that EU membership has a bigger impact than in the other categories – this most likely reflects the higher degree of services trade liberalization within the EU.

6. Conclusion

Alongside the trend in most developed countries, the services sector has registered a significant and growing importance in Portugal, making this a relevant area of study and showing that a strategy of investing in the tradable sector should be followed due to the important contribution that these services can make to national economic growth through the stimulation of employment and GVA. This growing importance has been reflected in a greater number of studies focused on the determinants of international trade in services, among which this study was intended to be part of. However, despite the important steps that have been taken to progressively liberalize trade in services with particular emphasis on the GATS in 1994, there are still strong barriers caused mainly by domestic regulations that hinder further growth.

Travel is the main services export subsector in Portugal, accounting for more than 50% of total services. Nevertheless, the services sector reveals a growth potential that goes beyond travel services. In fact, since the beginning of the millennium, travel's share in Portuguese service exports has been slightly decreasing at the expense of other services as the country reveals comparative advantages not only in this sector, but also in transportation and construction services. Regarding geographical specialisation, it was clear that the UK is highly relevant as the main destination for services exports, so Brexit seems to pose a challenge for the country, making it essential to diversify exports destinations that are still very concentrated and dependent on a small number of countries/markets.

Using an extension of the traditional gravity model, this study aimed at analysing the determinants of Portuguese exports of services. The explanatory variables included consider the characteristics of the country, the studies analysed in the literature review and the availability of statistical data. Considering the difference between total exports of services and exports of travel, categories for which statistical data could be found for a significant sample of countries, it was possible to calculate the exports of the remaining services. The results obtained for the three categories were quite similar and mostly in line with what was expected. Economic, cultural, and administrative factors were found to impact Portuguese service exports in all models positively. In other words, GDP, GDP *per capita*, sharing a common language and English as a spoken language, belonging to the Eurozone, membership in the EU without sharing the same currency with Portugal and the existence of a trade agreement that extends to services positively impact Portuguese exports of services. Political stability and the number of internet users, on the other hand, proved to be insignificant in most

models. Sharing a common border with Spain has also shown a very positive impact on the three categories of service exports, surpassed only by sharing a common language and having English as a spoken language.

Finally, although the results of this study are statistically significant and do contribute to the research in this field, they face some limitations. Firstly, the sample size was significantly reduced due to data unavailability, which limited the number of countries contemplated in the panel. Consequently, the scope of this study cannot cover all exports, although it does manage to reach a substantial percentage (about 96% of all service exports). Secondly, also due to data absence, it was not possible to consider all categories of services, which only allowed an analysis of trade in services disaggregated at the level of travel services. Therefore, considering that despite the limitations on the availability of statistical data an effort has been made to provide a more detailed understanding on trade in services. It is expected that future studies may focus on a larger sample of countries and on a more detailed analysis of different categories of services trade.

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Annexes

Table A1 - Export shares in services by country (2019)

Ranking	Country	2019	%
1	USA	875 830 000	15,17
2	UK	418 363 463	7,25
3	Germany	346 551 861	6,00
4	France	294 034 852	5,09
5	China	244 359 155	4,23
6	Ireland	238 430 398	4,13
7	India	214 761 540	3,72
8	Japan	207 360 703	3,59
9	Singapore	204 813 689	3,55
10	Netherlands	202 820 199	3,51
11	Spain	157 087 849	2,72
12	Italy	121 726 303	2,11
13	Switzerland	121 641 790	2,100
14	Belgium	120 802 155	2,09
15	Luxembourg	110 577 688	1,92
16	South Korea	107 631 100	1,86
17	Hong Kong	101 178 881	1,75
18	Canada	100 843 654	1,74
19	Thailand	81 994 152	1,42
20	Austria	75 184 814	1,30
21	Sweden	75 082 469	1,29
22	Denmark	74 616 002	1,28
23	Poland	71 929 000	1,25
23	Australia	70 993 095	1,23
24	Turkey	64 746 000	1,12
25	Russia	62 785 880	1,09
26	Israel	55 550 200	0,96
27	Taiwan	51 842 000	0,90
28	Greece	44 875 698	0,78
29	Norway	45 244 529	0,77
30	Philippines	40 973 568	0,71
31	Portugal	39 445 718	0,68
32	Finland	35 420 890	0,61
33	Brazil	33 971 562	0,59
34	Mexico	31 683 475	0,55
35	Romania	30 254 325	0,52

Table A2 – Countries included in the sample (total services)

Angola	**France**	**Netherlands**
Argentina	**Germany**	**New Zealand**
Australia	**Greece**	**Norway**
Austria	**Hungary**	**Poland**
Belgium	**Iceland**	**Romania**
Brazil	**India**	**Russia**
Bulgaria	**Ireland**	**Slovakia**
Canada	**Israel**	**Slovenia**
China	**Italy**	**South Africa**
Croatia	**Japan**	**Spain**
Cyprus	**Korea**	**Sweden**
Czech Republic	**Luxembourg**	**Switzerland**
Denmark	**Malta**	**Turkey**
Egypt	**Mexico**	**Ukraine**
Estonia	**Morocco**	**UK**
Finland	**Mozambique**	**USA**

Table A3 – Countries included in the sample (travel and other services)

Argentina	**Italy**
Australia	**Japan**
Austria	**Korea**
Belgium	**Luxembourg**
Brazil	**Malta**
Bulgaria	**Mexico**
Canada	**Netherlands**
China	**New Zealand**
Cyprus	**Norway**
Czech Republic	**Poland**
Denmark	**Romania**
Egypt	**Russia**
Estonia	**Slovakia**
Finland	**Slovenia**
France	**South Africa**
Germany	**Spain**
Greece	**Sweden**
Hungary	**Switzerland**
Iceland	**Turkey**
India	**UK**
Ireland	**USA**

Table A4 – Estimation results for total services exports

Dependent Variable: ln(*X*)

Independent Variables	Pooled OLS	Period Fixed Effects			
		Model A	Model B	Model C	Model D
DIST	-0.0002*** (8.811)	-0.0002*** (7.233)	-0.0002*** (8.344)	-0.0002*** (8.423)	-0.0002*** (8.411)
BORD	1.2471*** (0.074)	1.8799*** (0.078)	1.3373*** (0.072)	1.3448*** (0.079)	1.3370*** (0.080)
ln(***GDP***)	0.7079*** (0.019)	0.6156*** (0.021)	0.7034*** (0.019)	0.7052*** (0.018)	0.7046*** (0.018)
ln(***GDPPC***)	0.1385*** (0.049)	0.72088*** (0.026)	0.3942*** (0.039)	0.3879*** (0.042)	0.3288*** (0.056)
COM_LANG	4.9909*** (0.211)	4.7457*** (0.213)	4.7584*** (0.191)	4.7544*** (0.191)	4.7957*** (0.194)
ENG	1.3741*** (0.093)	1.1713*** (0.090)	1.3538*** (0.086)	1.3513*** (0.087)	1.3557*** (0.087)
TRADE_AGR	0.8872*** (0.129)		0.9240*** (0.116)	0.9152*** (0.120)	0.8861*** (0.122)
EUR	1.5413*** (0.088)		1.4007*** (0.083)	1.3924*** (0.089)	1.4031*** (0.089
NON_EUR	0.7179*** (0.077)		0.6558*** (0.071)	0.6477*** (0.077)	0.6383*** (0.077)
POL_STAB	-0.1842*** (0.045)			0.0154 (0.047)	-0.0144 (0.050)
NET_USERS	0.0207*** (0.001)				0.0046* (0.002)
Observations	960	960	960	960	960
Adjusted R^2	0.8369	0.8085	0.8465	0.8464	0.8467
F-Test	448.4822 (0.000)	157.6808 (0.000)	189.8946 (0.000)	183.1801 (0.000)	177.6195 (0.000)
F-Test for Fixed Effects		562.7411 (0.000)	506.7071 (0.000)	455.6244 (0.000)	415.5160 (0.000)

Table A5 - Estimation results for travel exports

Dependent Variable: ln(*Xtravel*)

		Period Fixed Effects		
Independent Variables	**Pooled OLS**	**Model A**	**Model B**	**Model C**
DIST	-0.0002*** (9.601)	-0.0002*** (8.688)	-0.0002*** (8.651)	-0.0002*** (8.691)
BORDER	1.4101*** (0.081)	1.7412*** (0.090)	1.4988*** (0.0849)	1.5525*** (0.096)
ln(*GDP*)	0.7481*** (0.022)	0.7057*** (0.020)	0.7449*** (0.018)	0.7657*** (0.021)
ln(*GDPPC*)	1.0046*** (0.051)	1.0546*** (0.026)	0.9088*** (0.028)	0.8205*** (0.048)
COM_LANG	2.9309*** (0.102)	2.7062*** (0.075)	2.8680*** (0.072)	2.8646*** (0.071)
ENG	1.2801*** (0.105)	1.1699*** (0.110)	1.2453*** (0.099)	1.2352*** (0.101)
EUR	1.0279*** (0.083)		0.8821*** (0.0762)	0.86641*** (0.076)
NON_EUR	0.7881*** (0.090)		0.6638*** (0.079)	0.6305*** (0.079)
POL_STAB	-0.1187*** (0.071)			0.1447** (0.069)
Observations	840	840	840	840
Adjusted R^2	0.8425	0.8534	0.8711	0.8718
F-Test	499.7658 (0.000)	189.5997 (0.000)	211.0387 (0.000)	204.7190 (0.000)
F-Test for Fixed Effects		696.0284 (0.000)	630.1545 (0.000)	563.0228 (0.000)

Table A6 – Estimation results for other services exports

Dependent Variable: ln(*Xothers*)

		Period Fixed Effects			
Independent Variables	**Pooled OLS**	**Model A**	**Model B**	**Model C**	**Model D**
DIST	-0.0002*** (1.091)	-0.0002*** (8.811)	-0.0002*** (1.011)	-0.0002*** (1.020)	-0.0002*** (1.011)
BORD	0.9974*** (0.073)	1.7143*** (0.068)	1.2486*** (0.066)	1.1269*** (0.075)	1.1342*** (0.075)
ln(***GDP***)	0.7607*** (0.024)	0.7113*** (0.023)	0.8020*** (0.022)	0.7689*** (0.022)	0.7709*** (0.022)
ln(***GDPPC***)	0.4733*** (0.067)	0.8437*** (0.032)	0.5312*** (0.041)	0.6759*** (0.051)	0.7165*** (0.066)
COM_LANG	3.3384*** (0.103)	2.9206*** (0.079)	3.1885*** (0.077)	3.2003*** (0.079)	3.1822*** (0.080)
ENG	1.1793*** (0.109)	0.9369*** (0.116)	1.1385*** (0.099)	1.1562*** (0.095)	1.1534*** (0.094)
TRADE_AGR	0.8569*** (0.162)		0.7917*** (0.146)	0.8538*** (0.148)	0.8709*** (0.148)
EUR	1.6879*** (0.101)		1.4379*** (0.098)	1.4939*** (0.098)	1.4853*** (0.099)
NON_EUR	0.9971*** (0.095)		0.7926*** (0.091)	0.8735*** (0.093)	0.8806*** (0.093)
POL_STAB	-0.5277*** (0.073)			-0.2615*** (0.076)	-0.2358*** (0.079)
NET_USERS	0.0187*** (0.002)				-0.0031*** (0.003)
Observations	840	840	840	840	840
Adjusted R^2	0.830330	0.809912	0.849108	0.850635	0.850893
F-Test	374.2638 (0.000)	143.9893 (0.000)	169.6173 (0.000)	165.7624 (0.000)	160.5938 (0.000)
F-Test for Fixed Effects		511.8016 (0.000)	445.5106 (0.000)	406.7184 (0.000)	370.2572 (0.000)