THE IMPACT OF CAPITAL STRUCTURE ON STARTUPS' GROWTH

by

Francisca Maria Melo do Carmo Silva

Supervision:

Professor Júlio Manuel dos Santos Martins

Professor Paulo Ricardo Tavares Mota

2015

Biography Note

I am Francisca Maria Melo do Carmo Silva, Portuguese, 23 years old and live in Braga. I have got a Bachelor's degree in Management from University of Minho and, in 2012, spent one semester studying at the Autonomous University of Madrid as part of the Erasmus Programme.

Currently I am attending the Master in Finance of the Faculty of Economics of the University of Porto, which I plan to finish this year, by the end of September. Since I am about to conclude my master dissertation, I will start an internship in the Management Control Department of Bosch Car Multimedia in Braga.

Acknowledgments

This dissertation would not be possible without the contribution of several people to whom I would like to express my gratitude:

to my supervisor, Professor Júlio Martins, for his valuable technical guidance and scientific supervision and to my co-supervisor Professor Paulo Mota, for his recommendations on important issues of the dissertation;

to Professor Ana Cristina, from University of Minho, for her kind availability to help with statistical issues;

to UPTEC, in the person of Isabel Silva, collaborator of the Communication and Image Department, for providing the required information on startups;

to my parents for their encouragement and constant support.

I also have a word of sincere thanks to those who in many ways helped me to carry out this work.

Abstract

Most of the existing literature on growth determinants of companies suggests that capital structure decisions are of paramount importance. This is likely to be particularly so due to the present financing constraints. However, very few studies focus on startups, probably due to their lack of track record. The situation is more severe in the Portuguese case since no focus is given on the matter to Portuguese startups in the literature. Once startups can give a good contribution to improve industrial performance, there seems to be a need for a better understanding of the financing constraints of startups, how they can be overcome and, also, to what extent startups' financing decisions have influence on their growth. This work contributes to this problematic by studying the impact of capital structure on startups growth, based on information for the years 2010 and 2011 of a sample of 21 Portuguese startup firms. The startups' sample was obtained from startups incubated in UPTEC science and technology park. This study is based on a linear regression model explaining the influence of the capital structure (the key explanatory variable) on growth (measured by relative sales' growth). The regression also includes other (control) variables considered important to explain the complex growth phenomenon of companies. These variables are firm's size, age and liquidity. The estimation results clearly show that the debt-to-equity ratio, the measure used for capital structure, and the age of startups have a negative impact on sales' growth, while liquidity and size have a positive one. The results suggest that the amount of debt raised by startups should be controlled, and that they should move rapidly from the exploratory to the execution phase in order to favor the growth of the company.

Keywords: capital structure, startups, sales' growth, financing constraints, debt-to-equity ratio.

Sumário

A maior parte da literatura sobre determinantes de crescimento das empresas sugere que a estrutura de capitais é um fator importante a ter em conta. Esta visão é reforçada no atual contexto dadas as restrições ao financiamento existentes. No entanto, muito poucos estudos incidem sobre startups, provavelmente devido à falta de informação histórica. A situação é ainda mais severa em Portugal uma vez que não é dada, nesta matéria, a atenção devida às startups Portuguesas. Uma vez que as startups podem dar um bom contributo para a performance industrial, parece haver a necessidade de um melhor entendimento dos constrangimentos ao financiamento das startups, como é que eles podem ser ultrapassados e, também, até que ponto as decisões de financiamento das startups têm influência no seu crescimento. Este trabalho contribui para esta problemática através do estudo do impacto da estrutura de capitais no crescimento das startups, baseado em informação dos anos 2010 e 2011 de uma amostra de 21 startups portuguesas.

A amostra das startups foi obtida através das startups incubadas no UPTEC. O estudo baseia-se num modelo de regressão linear que explica a influência da estrutura de capitais (principal variável explicativa) no crescimento (mensurado através do crescimento relativo das vendas). A regressão inclui também outras variáveis (de controlo) consideradas importantes para a explicação do complexo fenómeno de crescimento das empresas. Estas variáveis são a dimensão da empresa, a idade e a liquidez. Os resultados da regressão demonstram claramente que o rácio dívida/capital próprio, a medida utilizada para a estrutura de capitais, e a idade das startups têm um impacto negativo no crescimento das vendas, enquanto a liquidez e a dimensão têm um impacto positivo. Os resultados sugerem que a quantidade de dívida utilizada pelas startups deve ser controlada e que estas devem passar rapidamente da fase exploratória para a fase de execução, de modo a favorecer o crescimento da empresa.

Palavras-chave: estrutura de capitais, startups, crescimento das vendas, restrições ao financiamento, rácio dívida/capital próprio.

Table of Contents

1. Introduction 1

1.1. Scope and objectives 1

1.2. Structure of the dissertation 2

2. Literature Review 3

2.1. Definition of startups 3

2.2. Financing constraints and the decision about capital structure 4

2.3. Types of financing sources available to startups 10

2.4. Startups financing in Portugal 12

2.5. Determinants of firms' growth 18

3. Modelling and Operationalization 29

3.1. Sample selection and model variables 29

3.2. Data selection and variables measurement 30

3.2.1. The dependent variable of the model 30

3.2.2. The explanatory variables of the model 31

3.3. Model and Methods 32

4. Empirical Results 38

5. Discussion of Results 40

6. Conclusion 45

6.1. Main Conclusions 45

6.2. Limitations and future research 47

List of Tables

Table 1: Some of the main theories of capital structure 8
Table 2: Main studies about the impact of capital structure on firm's growth 24
Table 3: Summary of the determinants of firms' growth 27
Table 4: Test of Normality of Residuals 34
Table 5: Multicollinearity Analysis 37
Table 6: ANOVA Table 38
Table 7: Model Summary 39
Table 8: Coefficients 39

List of Figures

Fig. 1: Normal distribution of the dependent variable (histogram) 32
Fig. 2: Normal distribution of the dependent variable (probability plot) 33
Fig. 3: Test of normality of residuals (probability plot) 34
Fig. 4: Evaluation of the homogeneity of variances (residual scatterplot) 35
Fig. 5: Evaluation of the presence of outliers (boxplot of the residuals) 35

Acronyms

AICEP – Agência para o Investimento e Comércio Externo de Portugal

APBA – Federação Portuguesa de Business Angels

CF – Cohesion Fund

CMVM – Comissão do Mercado de Valores Mobiliários

COMPETE – Programa Operacional para a Competitividade e Internacionalização

EAFRD – European Agricultural Fund for Rural Development

EMFF – European Maritime & Fisheries Fund

EO – Entrepreneurial Orientation

ERDF – European Regional Development Fund

ESF – European Social Fund

FINOVA – Fundo de Apoio ao Financiamento à Inovação

FNABA – Federação Nacional de Associações de Business Angels

IAPMEI – Instituto de Apoio às Pequenas e Médias Empresas e à Inovação

ICT – Information and Communication Technologies

IPO – Initial Public Offer

KFS – Kauffman Firm Survey

NTBF – New Technology-based Firm

OECD – Organisation for Economic Co-operation and Development

QREN – Quadro de Referência Estratégico Nacional

PPL – People (Plataforma de Crowdfunding)

PME – Pequenas e Médias Empresas

R&D – Research and Development

SME - Small and Medium Enterprises

UPTEC – Parque de Ciência e Tecnologia da Universidade do Porto

VC – Venture Capital

VIF – Variance Inflation Factor

1. Introduction

1.1.Scope and objectives

This dissertation was developed to satisfy the partial requirements of the Master in Finance of the Faculty of Economics of the University of Porto.

Startup firms can give a good contribution to improve Portuguese industrial performance. They can generate important businesses and, as a consequence, help to overcome the economic and social crisis that Portugal is experiencing for quite a few years. For these reasons, and given the role startups play on competition, innovation, export potential and employment growth (startups represented, in 2013, 18% of new jobs in Portugal (Faria, 2013)), we considered this study worthy of attention. However, for this to occur, startups need to be successful and grow. The problem is that financing constraints might hamper the growth of these companies, as suggested by several studies such as Kerr and Nanda (2009), Beck et al. (2005) and OECD (2006). However, the existing literature lacks studies examining the impact of different forms of financing on startups growth, mainly the Portuguese ones. Therefore, we believe that there is a clear need to understand startups' financing constraints, how they can be overcome and, on the other hand, to what extent startups' financing decisions have influence on their growth. This suggests the following research question which is taken as central to this dissertation: How does capital structure influences startups growth?

Based on this research question, as a primary focus we decided to analyse the impact of startups' *debt-to-equity ratio* on *sales' growth.* However firms' growth is a complex phenomenon and it cannot be explained by only one determinant. Several other factors have influence on firms' performance and growth. This way, we decided to study three other determinants of startups' growth, namely size, age and liquidity, which were found to be significant variables in several studies related to firms' growth, e.g. Liu and Hsu (2004), Almus and Nerlinger (1999), Molinari et al. (2009).

This dissertation includes a total sample of 21 Portuguese startups which were incubated in the Parque de Ciência e Tecnologia da Universidade do Porto (UPTEC) during

2010 and 2011. We used the IBM® SPSS® Statistics (version 22.0) to estimate a multiple linear regression. We made a residuals' analysis/diagnosis to confirm that data met the following required five assumptions: 1) normality of residuals; 2) homoscedasticity (or homogeneity of variances); 3) absence of outliers; 4) independence of residuals; and 5) absence of multicollinearity.

Our results show that the debt-to-equity ratio and the age of the startup have a negative impact on sales' growth, i.e., the dependent variable, while liquidity and size show a positive impact on the dependent variable. We compare these results to the ones previously found in the literature, and we attempt to find possible explanations for them.

1.2.Structure of the dissertation

This dissertation is structured as follows. After this introduction, we review the relevant literature. Then, in chapter three, we discuss the operationalization of the study, focusing on the sample selection and description, variables measurement and methodology. The empirical results and their discussion come on chapters four and five respectively. Finally, chapter 6 concludes. We also mention the shortcoming found in this work and we make some proposals for future research.

2. Literature Review

In this section, wereviewthe literature regarding capital structure decision, financing constraints faced by startups, financing sources for startups in general and particularly for the Portuguese ones, and determinants of firms' growth, with particular focus on the role of the capital structure.

2.1.Definition of startups

There is no full agreement on what actually a startup is. Different authors define startups differently. A simple and rough view of startup is just a newly established company. Some authors use interchangeably the terms "startups" and "new small firms". This may be due to the fact that both share some common characteristics. The same happens with "innovative small and medium enterprises" (ISMEs) and "new technology-based firms" (NTBF). Some of this can be in fact startups but others cannot. Studies about these three kinds of firms are also presented because we believe this helps understanding and will add value to the work developed in this dissertation.

We present a definition of startup which in our view fits the spectrum of perspectives of multiple authors (Blank and Dorf, 2012; Damodaran, 2009; Graham, 2012). We define startup as a temporary company in the exploratory phase, with an ill-defined business model based on untested hypotheses, aiming at achieving a clear, innovative and scalable business model. After the exploratory phase where the firm tries to find a suitable, desirably ideal business model, the company can start the execution phase, ceasing to be a startup. In the execution phase, the company executes a well-defined, fully validated, repeatable and scalable business model (Blank, 2012). This phenomenon is irrespective of the age of the startup. Usually a startup is a relatively young firm, but this is not always a requirement for characterizing startups. If a company has more than 5 years but is still looking for a viable business model, it is still considered a startup. *Search* versus *execution* is what mainly differentiates a new venture, i.e., a startup, from an existing business unit. It is important to clarify that although the startup name was

brought during the “dot com bubble”, i.e., when a great number of companies that do most of their business on the internet were found, there are startups that are not web-based neither technology-based firms. Other characteristics of startups are a limited history, small revenues, dependence on private equity such as friends, family, venture capital (VC) and business angels, and high failure rates (Damodaran, 2009).

2.2.Financing constraints and the decision about capital structure

Access to finance is a key determinant for business start-up, development and growth of small and medium enterprises. These companies have very different needs and face different challenges as compared with large firms. Academic literature has focused on understanding several dimensions of financing constraints. Several studies, such as Kerr and Nanda (2009) and OECD (2006), state that financing constraints are one of the biggest concerns impacting potential entrepreneurial businesses around the world, referring that they fade away at a fast rate during their initial years of existence due to inadequate financial resources and lack of funding. Moore (1994) found that constraints on early capitalization, i.e., restricted access to debt or external sources of equity, had a debilitating effect on the development of knowledge-intensive firms. In fact, some of the 20 OECD and 10 non-OECD economies that have participated in the survey prepared by the SME and Entrepreneurship Division of the OECD Centre for Entrepreneurship, SMEs and Local Development (CFE), noted that the gaps were most evident in the case of startups and/or high-tech firms. OECD (2006) call these type of firms innovative small and medium enterprises (ISMEs), i.e., firms, often in high technology sectors, with new business models and high growth prospects. ISMEs only account for a small share of all SMEs. In brief, these companies present higher than average risk and uncertainty but they have the possibility to achieve higher than average returns. ISMEs have the potential to yield high benefits in creating new employment and introducing cutting-edge technology into the economy. According to this report, many governments have concluded that ISMEs generate considerable gains in income, exports and productivity. However, they also say that the availability of finance is a precondition for the foundation of such firms. Since these

companies usually have negative cash flows, untried business models and uncertain prospects for success, they might have difficulties accessing funding sources such as bank lending, government guaranteed loans and traditional stock exchanges. Baldwin et al. (2002) used a sample of roughly 3000 small firms born between 1983 and 1986 and concluded that new small firms face a more uncertain competitive environment than other businesses, evidenced by more variable rates of return and higher rates of infant mortality. This way, firms that operate in riskier environments can expect to face higher costs of external finance, leading many to rely more extensively on internal sources of equity. In addition, they often have limited market power, lack of management skills, uncertainty and informational asymmetries, inadequate business plans, absence of adequate accounting track records, insufficient collateral to secure loans, among others. According to Zider (1998), access to loan capital is inexorably tied to the firm's ability to provide collateral, i.e., property or other assets, against which the debt can be secured.

Robb and Robinson (2012) study capital structure choices of entrepreneurs at the seed stage of a firm, specifically in the first year of operation. The paper uses data from Kauffman Firm Survey (KFS) which tracks nearly 5000 firms that started in 2004 in the United States. One of the main conclusions is that new firms rely heavily on external debt sources such as bank loans, and less extensively in internal funds. The authors are aware that the common view is that startups' informational opaqueness makes them poor candidates for lending. However, their findings show that, although data suggests that informal investors are important for startups, around 80%-90% of startups' capital is made up in equal parts of owner equity and bank debt. On the contrary, OECD (2004) states that, at the seed stage, the most common source of financing for OECD members and non-member are personal savings of entrepreneurs, family and friends. Similarly, Gartner et al. (2012) argue that the majority of financing (57% of all financing) for emerging ventures comes from the personal contributions of its founders. According to OECD (2004), this happens because firms at this stage are highly risky and the lack of tangible assets makes it extremely difficult to secure a loan from banks. In addition, it is difficult for banks to properly assess the creditworthiness of these companies due to, among other factors, the lack of accounting records and inadequate financial statements or business plans. OECD

(2004) suggests that once a firm starts growing and reflecting positive cash flows, external financing sources including bank loans and venture capital become available. According to this study, the financing gap faced by startups in their first years of operation can have two different motives. It can reflect the supply-side, the demand-side or both. While the supply-side constraints exist if there are no available sources of finance on terms and conditions suitable for this type of firms, the demand-side constraints predominate if they do not make use of existing financing opportunities due to the lack of good projects or lack of persuasive business plans. In addition, OECD (2006) verified that in all countries, survey's responses of SMEs indicate that the lack of knowledge about financing options constitutes a barrier to finance. Even entrepreneurs with considerable expertise in their own specialties often lack knowledge about the possibilities of obtaining financing and, at the same time, they are frequently not able to articulate well a business plan that meets the requirements of the bankers or investors. Moreover, the owners of the firm may not be fully aware of the implications for the firm's cash flow that some types of credit may entail or of the implications for the control of the firm implied by different forms of equity. This shows that entrepreneurs have significant gaps in information and skills needed to access external finance.

Cassar (2004) studied the types of financing used by startups in the early years of operation. The results show that long-term leverage appears to constitute around 20% of the capital of new firms. This relatively low long-term leverage observed is consistent with evidence that entrepreneurs use short-term financing and personal savings in the start-up phase. The study also shows that external financing represented 40.2% of the capital of new firms, where 16.9% of the financing was provided by bank financing. Generally, most firms had some form of debt financing (90.1%). However, only roughly half the sample was using some form of long-term and bank financing.

One possible way of entrepreneurs overcoming, or at least minimizing, the problem of deficient information about financing options, or the lack of capability to articulate a business plan that meets the requirements of the investors, is through business parks and incubators. They often help companies gain access to information and technical support, such as the services of lawyers, accountants and consultants. Such facilities are often

operated in partnership with key stakeholders, such as banks, stock exchanges, local authorities, universities and large businesses (OECD, 2006). Business and technical assistance have been identified as important outcomes in the incubation process. According to Scillitoe and Chakrabarti (2010), business planning, tax assistance, personnel recruiting, marketing, management, accounting, general legal expertise, accessing financial capital and accessing business contracts are examples of business assistance that incubators provide to ventures. Technical assistance includes access to university research activity and technology, laboratories and workshops' space and facilities, industry contacts, technology transfer processes, intellectual property rights protection and technological know-how skills.

As we aim to study the influence of capital structure on startups' growth, we present in the following table some of the main theories developed several decades ago in order to explain how firms in general choose their capital structure.

Table 1: Some of the main theories of capital structure

Main theories of capital structure	Authors	Determinants of capital structure
Capital Structure Irrelevance Theory	Modigliani and Miller (1958)	Under certain assumptions the market value of a firm is independent of its capital structure. It does not matter if the firm's capital is raised by equity or debt.
Trade-off Theory	Kraus and Litzenberger (1973)	A company chooses the optimal capital structure by balancing the costs of financial distress and the tax saving benefits of debt.
Pecking Order Theory	Myers and Majluf (1984)	There is an order of preference for the financing of new projects. Firms prefer internal funds, then debt, and equity as a last resort. The pecking-order theory states that the hierarchy is structured this way because of the transaction costs involved in each form of financing, especially those associated with the problem of asymmetric information.

However, Atherton (2009) indicates that new ventures do not always or necessarily follow the established explanations of financing structures and patterns summarized in the previous table. Several factors affect firms' financing decisions and hence their financial structure. For example, some entrepreneurs do not desire the ownership dilution and external control, so they prefer to rely either on internal resources or some form of debt financing. Companies might prefer debt also because it reduces agency costs by reducing the cash flow available for spending at discretion of managers. Moreover, the threat caused by failure to pay the debt motivates managers and their organizations to be more efficient (Jensen, 1986). However, debt is generally considered not to be an appropriate form of financing for startups at least at the seed stage when revenue generation and profitability are still very uncertain. On the other hand, OECD (2004) argue that startups have difficult

access to public equity markets due to the significant fixed costs such as underwriting, registration and advisory fees, and other expenses related to auditing, certification and dissemination of accounting information as well as stock exchange fees. This way, entrepreneurs tend to secure equity financing from private investors who are attracted to this type of firms for their high potential for growth and profits. The problems related to asymmetric information that debt financiers face are now reduced for private equity investors who are actively engaged in the governance of the firm. Some authors also argue that entrepreneurs' preferences towards risk and control desire also influence the choice of financing sources. On the other hand, Cassar (2004) states that the size of a firm is consistently an important explanation in the decision to use debt and bank financing by start-ups. In addition, this author states that firms with a relative lack of tangible assets appear to be financed through less formal means, where nonbank financing, such as loans from individuals unrelated to business, plays a more important role in the capital structure of start-ups. Also, Baldwin et al. (2002) show that there is evidence that R&D intensity and debt intensity are negatively related. According to them, equity is more important than debt in industries that are both more risky and in knowledge industries with substantial investments in R&D. Therefore, firms that devote a larger portion of their investment expenditure to soft assets are less likely to exhibit debt-intensive capital structures. In addition, these authors demonstrate that firms with more robust growth expectations are more likely to develop debt-intensive long-term capital structures.

In summary, startups and new small firms face significant financing constraints due to their high risk, uncertainty and information opacity, which affect their investment capability and growth. Therefore, most studies suggest that these firms rely to a great extent on internal sources of equity such as personal savings of entrepreneurs, family and friends, in order to overcome these obstacles (Gartner et al., 2012; Baldwin et al., 2002; OECD 2004; Cassar, 2004; Honjo and Harada, 2006). However, startups also use external financing, not as much as internal financing but it is still considerable. In fact, according to Cassar (2004), most of the startups have some form of debt financing (around 90% of startups). In addition, business parks and incubators help startups to have access to finance

by providing them with different forms of support highly contributing for their success and growth.

2.3.Types of financing sources available to startups

Startups funding might include internal seed capital, angel finance, venture capital, commercial bank, trade credit, government sponsored finance and others. Some studies, such as OECD (2004), suggest that each growth phase might have different financing requirements. According to OECD (2004), startups, in the earliest phase of the life cycle, tend to be highly risky and with prospect of years of negative earnings. In this stage, the more common types of financing are personal savings of entrepreneurs, family and friends. In the second phase, investment is still highly risky with high failure rates, but not as much as in the previous phase. In this case, business angels are the prevailing funding source. In addition to funds provision, they contribute their expertise, knowledge and contacts both formally and informally to the business they invest in. Kerr et al. (2010) suggest that angel investments improve entrepreneurial success. They conclude that angel-funded firms are significantly more likely to survive at least four years and to raise additional outside financing. In addition, these firms are also more likely to show improved venture performance and growth. However, these authors state that access to capital per se may not be the most important value-added that business angels bring. Some "softer" features, as they call them, such as the angel's mentoring previously mentioned, may be the most relevant factors influencing their growth.

Venture capital is used in a later stage of the life cycle of a firm. Venture capitalists minimize uncertainty and informational asymmetries associated with young firms by actively investigating firms intensively before providing capital and monitoring them afterwards. Examples include spreading out financing in stages over time, forming alliances or syndicates with other venture capitalists, becoming a member of the board of directors, and arranging compensation schemes. Venture capitalists screen entrepreneurial projects, structure financing deals, and monitor the performance of the companies in which they take equity stakes. They also provide non-financial resources like customer and supplier

contacts, technical expertise and employee recruitment, which may improve the chances of success for unproven technologies and business models (Kerr and Nanda, 2009).

As startups become larger, they increasingly rely on institutional investors and banks as their primary source of finance (OECD, 2004). However, private banks are often seen as an inadequate financing source for startups because, as already mentioned, they usually do not have collateral to offer, so they are charged high interest rates and there is no flexibility in the payment period.

Finally, owners might want to transfer the ownership of the startup to another firm or investors. According to OECD (2004), common exit mechanisms are initial public offers (IPO) and trade sale. IPO enable firms to obtain finance more cheaply from banks. This reduction in the cost of bank credit may partly be related to improved financial information associated with stock exchange listing or from the stronger bargaining position of the company or the greater availability of tangible assets from receivables and inventories.

Baldwin et al. (2002) focused on the proportional use of different funding sources by new Canadian small firms and divided them into three groups of different size: 1-9 employees; 10-24 employees; more than 25 employees. The results revealed that there is no significant difference between the three size classes. According to these authors, capital market limitations suggest that new small firms will rely more extensively on internal sources of funds. Around 51% of the sample relies on internal sources, 39% on retained earnings and 12% on capital from owners and managers. Banks and trust companies are responsible for the second major part of the funds used to financing new small firms (34%). Innovative sources of funds, i.e., related firms, joint ventures, public markets and silent partners (family investors), account for very little (4%) of the funding mix. Often businesses can also benefit from credit granted by suppliers which is the only other significant source of funding, responsible for 7% of the average source mix. On the other hand, venture capital funding is a case in point. It accounts, on average, for less than 1% of all funding of Canadian small firms. Berger and Udell (1998) document that the three largest sources of funding are the principal owner, commercial banks, and trade creditors, which together account for over 70% of total small business finance. However, these results

are probably not generalizable to Portugal. The following section presents an overview of startups financing in our country.

2.4.Startups financing in Portugal

Portuguese Government is engaged in initiatives to support startups, which confirms the need and interest in creating conditions for these to survive (Abreu, 2012). The "Programa Estratégico para o Empreendedorismo e Inovação", created by the Portuguese Government, provides some insights for those who want to create or develop a business. The "Guia Prático do Empreendedor" prepared in 2012 under the aforementioned program, summarizes the available financial support for entrepreneurs in Portugal, both public and private. Business Angels, QREN (Quadro de Referência Estratégico Nacional) (that was in effect between 2007 and 2013 and has now been replaced by the "Portugal 2020" program), Venture Capital (including a public operator of Venture Capital), and credit lines to SMEs, are some financing sources mentioned in the program.

The existent literature has shown that business angels are the main investors of startup companies (Aernoudt, 2005). The FNABA (Federação Nacional de Associações de Business Angels), and the APBA (Associação Portuguesa de Business Angels), are probably the most important groups of Portuguese startups' investors. The APBA analyses more than 150 requests for support from startups per year and, on average, about 10% are supported (Diário Económico, 2013). According to Banha (2006), business angels play a key role as an equity financing source for projects submitted by qualified entrepreneurs especially those leading companies with high use of technology. Banha (2015) states that over the last three years, based on two financing lines set up by FINOVA program and under management of "PME Investimentos", business angels had the opportunity to invest in 150 startups with less than three years of activity. The total amount was around 45 million euros which enabled the direct creation of more than 200 skilled jobs. Henriques (2012) studied the business angel's investing process, in particular the Portuguese case. When analysing the pre-investment stage, the author concludes that, for those business angels who have a pre-screening strategy, which correspondents to 59% of the surveyed

business angels, the stage of the company (45%) and required funding (41%) are the two main criteria. The company may be in the seed, early or late stage, but normally business angels do not want to invest in companies in the late stage. After the screening step, what impacts the business angels' decision the most is the idea or potential opportunity, which is responsible for the classification of 4.46 on a scale from 1 to 5. In addition, the existence and composition of the team (3.86), business plan quality and financial projections (3.34) and the fact that the entrepreneur is already known (3.33) are also important factors that will make Portuguese business angels proceed with a specific investment opportunity usually by convoking a pitch session. During the decision-making stage, important criteria for the evaluation of startups are revenue potential, enthusiasm and commitment level of the entrepreneur, persistency and survivability of the team, openness to angels' input, track record of the team, among others. In addition, in the validating step, 82% of the surveyed business angels considered very important to perform due diligence. Before taking the investment to the next step, they also validate the idea with potential clients (68%) and with industry experts (68%). Additionally, 59% of the respondents considered that auditing the business plan and financial forecasts are also relevant for decision-making. During the investment process, startups' valuation does not seem to be relevant, once 78% do not perform company valuation. Instead, they focus on financing requirements of the firm (64%). The next step of the decision-making stage is negotiation. The main topics discussed in this phase are: 1) negotiation of the equity percentage, 2) compensation plans for the entrepreneur or the management team and 3) contract clauses such as anti-dilution or drag-along rights. The authors also documented that Portuguese business angels normally try to secure from 20% to 49% of equity. Only 27% try to get more than half of the company. The decision-making stage also includes the structuring phase where performance incentives for the management team (91%) and exit time protection clause (82%) are established. According to these authors, in Portugal, business angels assume 55% of the times the role of consultant, coach and technical expert and 73% of the times only coaching services. This way, Portuguese business angels help startups with customer acquisitions, making available their own network, providing technical support and influencing other investors which improve the chance of the firm getting future funding. In

fact, the involvement of business angels with startups is very active and contributes in large scale to their success (Sequeira, 2014). Another interesting insight is that business angels in Portugal tend to have a small investment horizon. According to this study, 41% of surveyed angels expect to maintain an investment in portfolio for 3 to 5 years. The sample average expected holding period is 3.6 years. Finally, the investment process ends with a harvesting event. The most likely to happen in Portugal is a trade sale (financial or strategic). IPOs assume a very residual role, with only 5% following this exit mechanism.

On the other hand, the "Portugal 2020" program is a partnership agreement between Portugal and the European Commission which brings together the five European funds (ERDF, CF, ESF, EAFRD and EMFF). From 2014 to 2020, Portugal will receive around €25 billion euros from EU funds that will be allocated within sixteen operational, thematic and regional programs, where COMPETE 2020 (Programa Operacional para a Competitividade e Internacionalização), will be the one receiving the majority of the amount. In COMPETE 2020, companies, especially SMEs, are the main recipients. In its website, they refer that the main goal is to stimulate the entrepreneurship, the innovative capacity and the development of more advanced strategies based on qualified human resources and with a strong focus on cooperation and other ways of partnerships, such as networks and clusters.

A venture capitalist is a "company's partner" that shares all business risks and contributes to the management and valorisation of the firm. The role of venture capital in the economic development, as entrepreneurship and innovation support, is still relatively weak in the Portuguese economy. However, the legal and fiscal framework seems to help the creation of new VC in Portugal. The exemption of corporate tax on capital gains realized on the alienation of their investments on startups, the easier access with the simplification of the constitution and functioning of the VC process and the reduction of the minimum amount required for the establishment of a venture capital company, are some examples of legal and fiscal changes in the country that have been encouraging the creation of VC (Duarte, 2007). It was in 1986 that legislation appeared in Portugal for creating venture capital companies. During the early years initiatives emerged in this field from the public sector of the Portuguese economy, either through public banks or through the

IAPMEI (Instituto de Apoio às Pequenas e Médias Empresas e à Inovação). The first private venture capital company was created two years later and since then its use has been growing over the years. However, according to the 2013 Annual Report of Venture Capital Activity prepared by CMVM, the value under management of Portuguese venture capital companies has fallen almost 17% between 2012 and 2013. Nonetheless, the value under management of venture capital funds has consistently grown, registering an increase of 15.3% during the same period. According to the 2013 Management Report and Accounts of Portugal Ventures, Portuguese venture capital activity was still, in percentage of GDP, below the European average in that year (0.137% in Portugal vs. 0.26% in Europe). The distribution of venture capital investment in Portugal, for type of investment, in 2013 is also mentioned in the report: later stage (2%), replacement (3%), start-up (5%), growth (17%), buyout (18%) and turnaround (55%). Bilau and Couto (2010) surveyed 63 Portuguese innovative nascent entrepreneurs who unsuccessfully tried to get financed from venture capital. According to the authors, the main reasons for this were: 1) the small size of the VC market in Portugal, 2) the limited public policies to support VC participation such as the clarification of the legal framework regulating the activity, attribution of tax benefits or direct government funding, 3) the lack of interest of the venture capitalists in pre start-up phase investments, i.e., period from the business idea to the date of the first sale, and 4) the unwillingness of venture capital companies to provide small amounts of capital. Bilau and Couto (2010) also suggest that it is likely that in a country like Portugal with an underdeveloped IPO Market the exit mechanism might be a factor that retracts the investments of the VCs. This comes from the idea that large investors are more willing to supply funds to venture capital firms if they feel that they can later recoup their investment. Duarte (2007) found that a major cause for reduced development of this industry is precisely the absence of a capital market that supports disinvestment through IPO, so usually the divestment is effected through the sale of the participation to the project promoters. The "Portal das PME" mentions that the sale can also be made to third parties, either to traditional investors or to other venture capital societies (which in this case is called secondary buy-out). In addition, according to the "Portal das PME", in Portugal, venture capital companies have little interest in small operations such as seed capital

investments, contrary to what happens in Spain and other high-growth countries such as Finland and Ireland. Banha (2006) refers that usually VCs are not willing to invest under 250 000 euros in Portugal, while in UK that amount is more than 500 000 euros. Bilau and Couto (2010) state that in 2005 the seed and start-up phases represented 26.5% of the investment made by the VCs in Europe, while in Portugal the percentage was almost a half. This way, the authors suggest that the relative lack of interest of VCs in investing in firms in this phase might be one of the reasons for the rejection of Portuguese nascent entrepreneurs' proposals by the VCs.

CMVM is responsible for the supervision of the thirty-seven venture capital companies and the eighty-one venture capital funds in Portugal (CMVM website). There is also a public venture capital company since 2012, called Portugal Ventures. This entity results from the merger of three public venture capital companies: "AICEP Capital Glopal", "InovCapital" and "Turismo Capital". Portugal Ventures focuses its investment policy in science and technology-based innovations as well as in companies with projects with international expansion and associated with tourism.

Credit lines to SMEs is also a possible financing source for startups. They are based on partnerships between banks, mutual guarantee companies and IAPMEI. Mutual Guarantee is a private system of mutual character to support small and medium enterprises which consists in providing financial guarantees in order to facilitate obtaining financing by companies. The "Portal das PMEs" also mentions leasing and factoring as possible types of financing for PMEs.

Another funding source available to entrepreneurs is crowdfunding. According to Mollick (2014), crowdfunding allows founders of for-profit, artistic and cultural ventures to fund their projects by drawing on relatively small contributions from a relatively large number of individuals using platforms on the internet, without standard financial intermediaries. According to Lusa (2014), most Portuguese people are unaware of this relatively new concept, yet the Portuguese crowdfunding platforms have already raised, since its establishment in 2011, around one million euros. This value is still low, especially compared with the US market, but with a tendency to rise. For instance, Kickstarter, the world's largest funding platform for creative projects based in the United States, has

reported receiving, from its founding on April 2009 until March 2014, over $1 billion in pledges from 5.7 million donors to fund 135000 projects (Kickstarter website). According to Lusa (2014), in Portugal, PPL and Massivemov are the largest funding platforms with rates of success of around 49% and 52%, respectively. PPL has already raised more than 500 000 euros and Massivemov has raised more than 103 400 euros from their beginning until June 2014. According to Pedro Domingos, the co-founder of PPL, the Portuguese crowdfunding market is still giving the first steps, having a huge potential as a complement to traditional financing. Victor Ruivo, director of MarkUp, another company that promotes crowdfunding projects in Portugal, told Lusa that there is a general lack of knowledge since more than 90% of people does not know what is crowdfunding and companies, which are the major interested parties, perhaps ignorance is even greater. Lusa (2014) also mentions Olmo and BES Crowdfunding (now Novo Banco Crowdfunding), working in collaboration with PPL, as well-known platforms promoting and supporting social projects in Portugal. By contrast, the individuals who invest in companies are compensated in line with the value delivered. However, contributions are returned to investors if they do not reach the value set by the project promoter in the set time period. Despite the progress, this new type of financing is still finding several obstacles in Portugal, including the difficulties in using the platforms by individuals, the online payments and even a feeling of insecurity about the destination of the money (Lusa, 2014).

It is also important to mention the role of business incubators in Portugal and their impact on startup's financing. According to Marques (2005) the concept and reality of business incubators generally refers to the practice of providing different operating and financing conditions at a low cost in order to project the development of new businesses. Government politicians realized that the vast majority of new businesses do not survive due to three common problems: 1) lack of capital; 2) weak management capacity; 3) an insufficient understanding of the market (Lewis, 2002). Marques (2005) shows that most of Portuguese business incubators provide the following three basic ingredients: 1) business environment and learning opportunities; 2) quick access to mentors and investors; 3) market visibility. This way, it seems that business incubators might help companies to overcome the aforementioned problems. Regarding financing, incubators can help

companies prepare their business plan before requesting investors funding for the initial phase. In addition, incubators can organize forums about funding sources and they might allow an approximation of investors to startups. Incubators may also participate in the companies' capital, which will generate future earnings when these businesses grow. Marques (2005) also verified that companies with larger number of employees, increased activity in R&D and established in economic sectors of advanced technologies, are more likely to create a link with university-based incubators than other type of firms. The prevailing economic sectors in Portuguese incubators, based on the sample used by the author, are those technologically more sophisticated, including Information and Communication Technologies, responsible for 48.1% of the incubated companies, and Biotechnology an Health, responsible for 8,9%. This study also shows that 88.6% of the companies have less than 10 employees which leads to the conclusion that incubated companies are mainly micro and small enterprises. Regarding the level of financial literacy, Couto (2013) shows that 66% of the surveyed entrepreneurs of incubated companies present good results (levels of financial literacy of 4 and 5, on a scale from 1 to 5). In addition, the same study shows that the areas that need more external help, at the beginning of the business, are accounting (65%), finance (35%) and business planning (34%).

2.5.Determinants of firms' growth

Firm's growth is a complex phenomenon and it cannot be explained by only one determinant. Several factors have influence on firms' performance and growth. However, as Davidsson et al. (2005) argue, it is difficult to capture a coherent picture from all the literature regarding determinants of firms' growth. Differences in perspectives and interpretations, operationalisations, empirical contexts, modelling and analysis approaches, as well as the inherent complexity of the phenomenon itself, are likely to be the causes of this difficulty in aggregate coherent determinants of firms' growth. In addition, these authors show that part of this lack of coherence may also be due to the heterogeneous nature of "growth". In fact, firms can expand along different dimensions, i.e., employees, sales, profit, among others, and show many different growth patterns over time.

According to Zhou and Wit (2009), the determinants of firm's growth can be classified into three perspectives: individual, organizational and environmental determinants. The authors concluded that organizational determinants have the most influence on firms' growth. For instance, the older the firm, the less likely it is to grow. In addition, they state that availability of financial capital and firm's scalability, i.e., its preparedness to grow, are also found to be crucial to firms' growth. After an extensive study of the literature regarding the determinants of firms' growth, seven determinants – growth motivation, specific skills, need for achievement, firm's age, financial performance, extra finance and readiness to grow – are found by Zhou and Wit (2009) to be most important for the growth of any firm.

Audretsch (2012) argues that it can be found two specific types of determinants of companies' growth: 1) determinants which are specific to the firm and 2) those which are specific to the location. The author mentions that the studies concerned with firm-specific characteristics have identified three main determinants that are linked to growth: firm size, firm age and the industry within which the firm operates. Firm size in this context has been discussed for decades. The older literature holds that growth is independent of size (Hart and Prais, 1956; Simon and Bonini, 1958; Hymer and Pashigan, 1962). This was first shown by Robert Gibrat and is now recognized as Gibrat's law. Nevertheless, some support a positive relationship between these two variables (Singh and Whittington, 1975; Mateev and Anastasov, 2010; Liu and Hsu, 2004). However, Evans (1987) and almost all recent studies related to firms' growth show that there is a negative relationship between firm size and growth (Audretsch, 2012). Notwithstanding these findings, Jovanovic (1982) argues that smaller firms grew faster but they are more likely to fail than large firms. In any case, it has been found that the small, young and new firms and firms in knowledge-based and technology based industries tend to exhibit higher rates of growth (Audretsch, 2012). However, this author concluded that regarding high-growth firms, the situation is strikingly different. The high-growth firms accounting for most of the employment growth tend to be larger and more mature. In addition, they are not associated to any particular industry. Regarding location, the author states that there is strong evidence suggesting that these type of firms tend to benefit from being located in geographic clusters and agglomerations.

According to Porter (1998), a concentration of industry activity in a geographic region affects firm performance because it fosters local competition which requires firms to innovate in order to remain competitive. Another way in which an industry cluster stimulates growth is by providing greater access to both customers and partners. Lechner and Dowling (2003) highlight, in particular, the importance of partners' contribution in enabling firms to meet their strategic objectives, especially in terms of innovative activity. Actually, Audretsch (1995) shows that, for those firms which survive the first few years, both survival and growth is higher in subsequent years for firms in more innovative industries. On the other hand, BERR (2008) finds that high growth firms exhibit a higher tendency to hold intellectual property and intangible assets, including trademarks, than do lower growth firms. Among other reasons, intangibles may be perceived by lenders as providing some form of security. In this way, they might have a positive effect on financial constraints and hence the access to financial capital becomes easier, which has already been proven to be crucial for firm's growth (Zhou and Wit, 2009). On the contrary, Cassar (2004) suggests that high-technology small firms that invest heavily in soft assets (research and new technology) at the expense of traditional hard assets (plants and equipment) have less to salvage in the event of failure and hence this will influence negatively the access to external financing by these firms. Almus and Nerlinger (1999) also argue that age and size are significant factors, along with liabilities and networks. According to Wiklund et al. (2007), entrepreneurial orientation (EO), i.e., orientation for pursuing new opportunities, and growth attitude of small business managers have significant positive impact on growth On the other hand, they argue that dynamism (an environmental determinant) has a direct negative impact on small business growth, which suggests that firms in dynamic environments grow slower than those in more stable environments, if their levels of entrepreneurial orientation are held constant. However, these authors show that if firms have a high entrepreneurial orientation, dynamism has a positive impact on their growth. Dynamic environments are environments where market demand is constantly shifting and opportunities become abundant. In addition, Baum and Locke (2004) found that specific variables of entrepreneurs' traits, skill, and motivation such as goals settings, self-efficacy and communicated vision (related to growth aspirations) are also significant predictors of

venture growth. Barkham et al. (1996) identified 25 factors which have a statistically significant and largely independent influence on small firm growth. These authors concluded that a mix of particular personal characteristics and qualifications together with appropriate strategy aims and methods are conducive to faster growth. They show that those who succeed in their study are "younger owners with professional qualifications who own a number of businesses, working with others to run their businesses". In addition, strategy aims that are profit-oriented and that recognize the great importance of marketing are the most successful. Attention to improvements in the production process and to cost or price cutting were also successful strategies. Among the strategy methods employed, the use of formal market research was very important as was direct contact with customers and the avoidance of selling through agents. On the other hand, firms with a smaller range of products seem to have advantage over their competitors. In addition, despite some financial constraints, firms which sought to raise external capital grew faster. There was also strong evidence that a strategy of incremental product improvement is a key means of accelerating growth. Related to this latter finding, Lee and Shim (1995) show that the relationship between firm growth and R&D expenditure is significantly positive using high-tech firm data from U.S. and Japan. Theoretically, R&D helps firms upgrade technology and improves their capability to innovate the products. Additionally, Molinari et al. (2009) studied the relationships between firm financial structure and growth for a large sample of Italian manufacturing firms and concluded, like Mateev and Anastasov (2010) that firms with higher liquidity tend to grow more. Moreover, they found that firm growth is positively correlated with non-financial liabilities, such as firm's provisions for pensions and other social obligations as well as trade debt, and also because it is not sustained by a long term debt maturity. Finally, the authors show that the estimated coefficient of equity-to-assets ratio is negative, suggesting that firms that grow more are less reliant on self-financing and rise more external funds than low growth firms. However, these fast-growing companies seem to be less bank-backed than companies with lower growth.

There are, in fact, several studies regarding the influence of capital structure on firms' growth. Several important issues are involved in financial structure decisions. Examples are

the cheaper cost of debt compared to equity, the increase in risk and in the cost of equity as debt increases, and the benefit of the tax deductibility of debt.

A number of theories have been advanced for explaining the importance of firms' capital structure. Cole and Sokolyk (2014), who use the Kauffman Firm Surveys of nearly 5000 U.S. start-up firms that were established in 2004, state that the initial capital structure decision is very important for the survival and growth of firms. They found that firms that use debt in their initial capital structure, in particular firms that use business debt instead of personal debt, are significantly more likely to survive their first three years of operations and to achieve higher levels of revenues. Business credit is, according to this study, the only source of financing that consistently shows significant positive effect on the performance outcomes of start-up firms. Therefore, the authors suggest that the availability of financial capital is not sufficient to improve the firm's performance. They argue that, contrary to what is suggested by the credit-rationing theory of information asymmetry (Stiglitz and Weiss, 1981), banks are successful in screening and monitoring brand-new businesses with no prior history on record of operations. In fact, they show that more than 40% of all entrepreneurial firms successfully obtain business loans, primarily from banks, at the firm's start-up. In addition, Robb and Robinson (2012) show that more than 40% of initial startups' capital structure comes from external debt financing. Similarly, Coleman and Robb (2012) document that rapid growth technology-based firms rely on higher amounts of external debt during the startup year. On the other hand, Lang et al. (1996) show that there is a negative relationship between leverage and the future growth at the firm level. However, these authors state that leverage does not prevent growth for firms that have good investment opportunities. According to them, leverage is negatively related to growth for firms with low Tobin's q ratio, but not for high-q firms. The Tobin'q ratio is calculated as the market value of a company divided by the replacement value of the firm's assets. This way, this negative relationship only holds for "firms whose growth opportunities are either not recognized by the capital markets or are not sufficiently valuable to overcome the effects of their debt overhang". Similarly, Cassar (2004) concluded that startups with the intent to grow appear to be more likely to use bank financing, a result consistent with the increased incentives in establishing credit

relationships as early as possible for these type of firms. In addition, Liu and Hsu (2004), when examining the determinants of Taiwan's manufacturing firm growth, in particular, the effects of corporate financial choices and financial structure on firm growth, concluded that age, size, capital-intensity, lagged R&D, level of investment, return on total assets and export ratio have significantly positive effects on growth. The signs of these variables were expected to be positive, except for age and size. In these two cases, findings are inconsistent to what recent studies have been documenting. Furthermore, the study shows that high debt to equity ratio is associated with lower corporate growth, while profitability is associated with higher firm growth. As Liu and Hsu (2004, p. 81) state: "the relatively sound financial structure of a firm will facilitate its growth". Additionally, Liu and Hsu (2004) document that firms that can be financed more from either banks or equity market will enjoy higher rates of growth compared to other firms in the same industry. Actually, they argue that this relationship is much stronger for technology-intensive firms. These authors also state that high bank-financing ratio and internal financing are associated with a higher firm growth. Finally, Loi and Khan (2012) study, among other factors, the impact of solvency on growth, concluding that this indicator, which is defined as shareholders' equity divided by total assets, has a negative impact on firm growth. Thus, the larger the proportion of equity compared to liabilities, the smaller the firm growth. Table 2 summarises of the main studies related to the impact of capital structure on firms' growth.

Table 2: Main studies about the impact of capital structure on firm's growth

Author(s)	Aim of the study	Sample	Relevant conclusion(s)
Molinari et al. (2009)	Establish the relationship between capital structure and growth (measured by employees' growth rate).	9315 Italian manufacturing firms (data from 1998 to 2003)	Firms that grow more are less reliant on self-financing (negative relationship between equity-to-assets ratio and growth).
Coleman and Robb (2012)	Explore the extent to which various theories of capital structure "fit" in the case of new technology-based firms.	4000 firms in the USA from the Kauffman Firm Survey (KFS)	High-growth firms (defined as firms with more than $100K of revenues) used significantly higher levels of external debt than non-high-growth firms.
Liu and Hsu (2004)	Determine the impact of different variables, including the debt-to-equity ratio, on firms' sales growth.	280 listed and OTC Taiwan's manufacturing firms (data from 1991 to 2002)	High debt-to-equity ratio is associated with low corporation's growth.
Lang et al. (1996)	Show the relationship between leverage and future growth.	640 large industrial firms (data from 1970 to 1989)	There is a strong negative relationship between leverage and firm's growth for firms with low Tobin's q ratio, but not for high-q firms.
Cole and Sokolyk (2014)	Study how debt financing affects the survival and growth of startups.	Nearly 5000 U.S. startups from the KFS.	Startups obtaining business debt during their first year of operations grow faster and survive longer.
Robb and Robinson (2012)	Study the behavior and decision-making of newly founded firms and test if startups with greater levels of external capital have better growth prospects.	Nearly 5000 U.S. startups from the KFS.	The outside debt-to-total capital ratio has a positive and highly significant effect on revenue's growth and employees' growth.

Cassar (2004)	Find the determinants of startups' capital structure. In particular, the authors study the relationship between startups' growth intentions and bank financing.	292 startups from Business Longitudinal Survey (data from 1996 to 1998)	Startups with the intent to grow appear to be more likely to use bank financing, a result consistent with the increased incentives in establishing credit relationships as early as possible.
Loi and Khan (2012)	Study, among other factors, the impact of solvency on growth (measured by average turnover growth over the period 2002 to 2006)	Belgian companies from the Bel-first database (data from 2002 to 2006)	Solvency (measured by shareholders' equity divided by total assets) has a negative impact on firms' growth.

Some authors also argue that staged finance can help firms to grow. Banks may provide staged finance in the form of loans that may be renewed later and expanded as entrepreneurs ask for a broader financing (Molinari et al., 2009). Stulz (2001) suggests that staged finance reduce asymmetric information and Semenov (2006) argue that this improve the access of firms to external finance and increase their investment spending capacity. Actually, according to Wang and Zhou (2002, p. 132), "key characteristics in venture capital financing are staging the commitment of capital and preserving the option to abandon the project". Instead of providing all the agreed capital upfront, venture capitalists invest in stages to keep the project under control and to avoid moral hazards. In particular, according to these authors, staged finance induces a higher effort from the entrepreneur. Semenov (2006) also argues that close bank-firm relationships appear to significantly reduce capital market imperfections and lead to higher availability of investment financing for firms. Similarly to Liu and Hsu (2004), Semenov (2006) shows that there is a relationship between capital intensity and firm growth. This author suggests that firms from countries where bank-firm relationships are closer may on average be more capital-intensive, and the increase in capital-intensity would represent a more important source of productivity growth than for firms in countries with predominantly arm's-length bank-firm

relationships. In fact, there are a lot of theories about capital structure decision and its relationship with firm growth, as we have already mentioned.

Zhou and Wit (2009) state that barriers that may hinder growth of small businesses are normally related to institutional and financial barriers. Institutional constraints are mainly related to the interaction with government, including legalization, taxation and government support. On the other hand, financial barriers represent lack of financial resources. As already mentioned, it has been argued that credit constraints, lack of external debt and equity capital are the main obstacles to startups' growth. Becchetti and Trovato (2002) also show that small surviving firms have higher than average growth potential but this potential may be limited by the scarce availability of external finance and lack of access to foreign markets. Therefore, according to Honjo and Harada (2006), internal finance plays an important role in achieving the growth of SMEs by overcoming financial constraints. If all firms were equal to access to capital markets, external funds would provide a perfect substitute for internal capital. This way, a firm's financial structure would be irrelevant to investment and growth (Honjo and Harada, 2006). However, capital market imperfections give rise to credit rationing which creates divergences between the costs of internal and external finance because of the difference of transaction costs. In fact, a number of studies on capital market imperfections have examined the impact of financial constraints on investment decisions and firm growth (Becchetti and Trovato, 2002; Musso and Schiavo, 2008; Fazzari et al., 1988). Additionally, Beck et al. (2005) studied whether different financial, legal and corruption issues that firms report as constraints actually affect their growth rates. They found that the smallest firms are the most adversely affected by all three constraints. In addition, firms that operate in underdeveloped systems and with higher level of corruption are more heavily affected by all constraints.

The following table summarizes the literature reviewed regarding the determinants of firms' growth.

Table 3: Summary of the determinants of firms' growth

Dimensions	Determinants of firms' growth	Authors	Impact on growth (sign)
Firm-specific determinants*	Age*	Zhou and Wit (2009)	-
		Audretsch (2012)	-
		Almus and Nerlinger (1999)	-
		Barkham et al. (1996)	-
		Liu and Hsu (2004)	+
	Preparedness to grow	Zhou and Wit (2009)	+
	Financial Performance	Zhou and Wit (2009)	+
	Size*	Audretsch (2012)	-
		Almus and Nerlinger (1999)	+
		Liu and Hsu (2004)	+
		Singh and Whittington (1975)	+
		Mateev and Anastasov (2010)	+
		Evans (1987)	-
		Gibrat's law	0
	Intangible assets	BERR (2008)	+
	Networks	Almus and Nerlinger (1999)	+
	Entrepreneurial orientation	Wiklund et al. (2007)	+
	Marketing	Barkham et al. (1996)	+
	External Capital	Barkham et al. (1996)	+
	R&D	Lee and Shim (1995)	+
		Liu and Hsu (2004)	+
	Liquidity	Molinari et al. (2009)	+
		Mateev and Anastasov (2010)	+
	Non-financial liabilities	Mateev and Anastasov (2010)	+
	Capital Structure (measured by level of equity)*	Mateev and Anastasov (2010)	-
		Loi and Khan (2012)	-
		Molinari et al. (2009)	-
		Loi and Khan (2012)	-

	Capital Structure (measured by level of debt)*	Cole and Sokolyk (2014)	+
		Coleman and Robb (2012)	+
		Liu and Hsu (2004)	-
		Lang et al. (1996)	-
		Cole and Sokolyk (2014)	+
		Robb and Robinson (2012)	+
	Bank Financing	Liu and Hsu (2004)	+
		Cassar (2004)	+
	Capital-intensity	Liu and Hsu (2004)	+
		Semenov (2006)	+
	Level of investment	Liu and Hsu (2004)	+
	Return on Assets (ROA)	Liu and Hsu (2004)	+
	Export ratio	Liu and Hsu (2004)	+
Individual determinants	Need for Achievement	Zhou and Wit (2009)	-
	Growth motivation*	Zhou and Wit (2009)	+
		Wiklund et al. (2007)	+
		Baum and Locke (2004)	+
	Specific skills	Zhou and Wit (2009)	+
	Goals setting	Baum and Locke (2004)	+
	Self-efficacy	Baum and Locke (2004)	+
	Profit-orientation	Barkham et al. (1996)	+
Environmental determinants	Location (proximity from clusters)	Audretsch (2012)	+
		Porter (1998)	+
	Dynamism (EO held constant)	Wiklund et al. (2007)	-
	Dynamism (EO varies)	Wiklund et al. (2007)	+

Notes: Dimensions and determinants with an asterisk (*) means that they are mentioned more frequently in the literature as having impact on business growth. The value 0 means that the associated determinant is not dependent of firms' growth. EO is the abbreviation of Entrepreneurial Orientation.

3. Modelling and Operationalization

This chapter includes the sample description and selection criteria, the data selection and measurement and the methodology adopted in this work towards answering the research question addressed, "how capital structure influences startups' growth".

3.1.Sample selection and model variables

This study uses data from financial statements of the years 2010 and 2011 of Portuguese startups located in the UPTEC. This science and technology park offers two types of business support structures: the Incubators and the Business Innovation Centres. We were provided with information regarding firms included in both areas. Firms in UPTEC are looking for a place and mechanisms to operationalize their projects and activities. They seek to take advantage from available facilities and technical expertise and also from synergies that are likely to be generated by being close and interacting with departments and interface institutes of the University of Oporto involved in R&D and innovation.

Due to the difficulty in separating startups from other types of firms that might not be truly startups, and having into account that startups are predominantly new firms, we decided to exclude from the initial sample all firms that operate for more than seven years. Although this decision may be questionable, we support it on the fact that the older the firm is, the less likely it is to be a startup. In addition, we excluded negative equity firms and firms with abnormal growth of sales (or abnormal decreasing sales), because this situations are not "stable" and might bias the results. This reduces the initial sample (of 43 firms) to a smaller sample with 21 startups that was used in the study. The sample includes startups from technological, creative industries, biotechnological and marine sectors, which are the four existing hubs in the UPTEC. The following sub-section discusses the variables under study and their measurement.

3.2.Data selection and variables measurement

This section intends to present the selected variables and data used in this study as well as how the variables are measured.

The main aim of this master dissertation is to establish the relationship between capital structure and startups' growth. However due to the complexity of the firms' growth phenomenon and to the fact that firm's size, age and liquidity were found to be significant variables in several studies of firms' growth, as already mentioned in the literature review, these variables were also included in the analysis. For this purpose, we need to define the dependent variable and the independent variables to be used in our model.

3.2.1. The dependent variable of the model

The dependent variable has to measure the firms' growth. Several proxies can be used to assess company's growth. These include sales' growth, growth in employees, growth in R&D expenditures, growth in payroll expenses and growth in profit (Carton and Hofer, 2006). Garnsey et al. (2006) state that a firm's growth can also be measured in terms of investment funds or value of the firm (assets, market capitalization, economic value added). However, most empirical studies use sales' growth as the primary measure of growth (Carton and Hofer, 2006), since all firms need to have sales to survive and grow. Capon et al. (1990) state that sales' growth rate is a generally accepted performance indicator since it is positively and robustly associated with other measures of firm financial performance. In addition, it is argued that sales often "precede" the other indicators, as pointed out by Flamholtz (1986): it is the increase in sales that leads to the increases in assets and employees. Thus, we decided to use the relative sales' growth as our dependent variable, which includes positive and negative values of growth. Relative growth is commonly used in studies of firm growth and it is usually measured by the growth rate in percentage terms (Davidsson et al., 2005).

3.2.2. The explanatory variables of the model

The explanatory variables selected to be included in the model were the debt-to-equity ratio, firm age, firm size and liquidity. This selection was based on three main reasons. The first is that the growth determinants must be directly quantifiable. Therefore, some qualitative growth determinants difficult to measure, such as networks, preparedness to grow, motivation of the entrepreneur, specific skills, experience of the team and other specific variables of entrepreneurs' traits, were set aside from the outset. The second is that the variables are used as growth determinants in several studies existent in the literature mainly of small, medium and large firms. Studies on startups growth are scarce and to our knowledge none has used the four independent variables that we have selected. This is one of the reasons why we though it pertinent to use them. This way, we can verify if the conclusions drawn for startups resemble those of other types of companies. In addition, data for the mensuration of the determinants has to be available on the financial statements obtained. Therefore, the impact of some indicators such as R&D expenditures or the use of staged finance were also not possible to study.

As Liu and Hsu (2004), capital structure, which is the main focus of this study, is measured by debt-to-equity ratio. Firms' size is measured by total assets, as in Hymer and Panshigian (1962). Since we do not have access to cash flow statements of most of startups, we do not adopt the cash flow-to-revenues ratio to measure liquidity, as suggested by Molinari et al. (2009). Instead, we measure it by the current ratio, i.e., current assets-to-current liabilities ratio as in Mateev and Anastasov (2010). Finally, the firms' age is measured by the number of years since inception by 2010.

3.3. Model and Methods

This section briefly presents the methodology adopted in this study. As mentioned before, the total sample consists of 21 Portuguese startups, which were incubated in UPTEC during the period under study (2010 and 2011). The theoretical model explaining firms' growth as a function of the explanatory variables is formulated as follows:

$$Y_i = \beta_0 + \beta_1 DE_i + \beta_2 SIZE_i + \beta_3 AGE_i + \beta_4 LIQ_i + \varepsilon_i$$

where Y_i is the i^{th} observation of the dependent variable *startups' growth*, the explanatory variables DE_i, $SIZE_i$, AGE_i and LIQ_i correspond to the i^{th} observation of the debt-to-equity ratio, size, age and liquidity, respectively, in 2010. The coefficients β_j, with j=0 to 4, represent parameters to be estimated, where β_0 is the constant term (or intercept) and ε_i is the i^{th} statistical error. The dependent variable is fitted to a normally distribution, as shown in fig. 1 and fig. 2. As we can see in the previous table 3, most of the existent literature suggests a positive relationship between sales' growth and size, debt-to-equity ratio and liquidity, and a negative relationship between the dependent variable and startups' age.

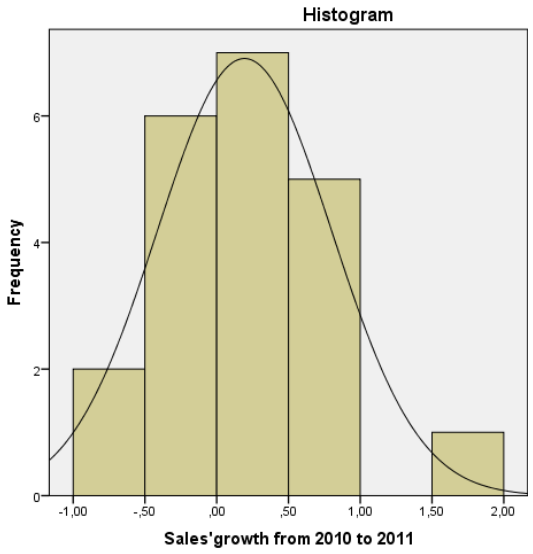

Fig. 1: Normal distribution of the dependent variable (histogram)

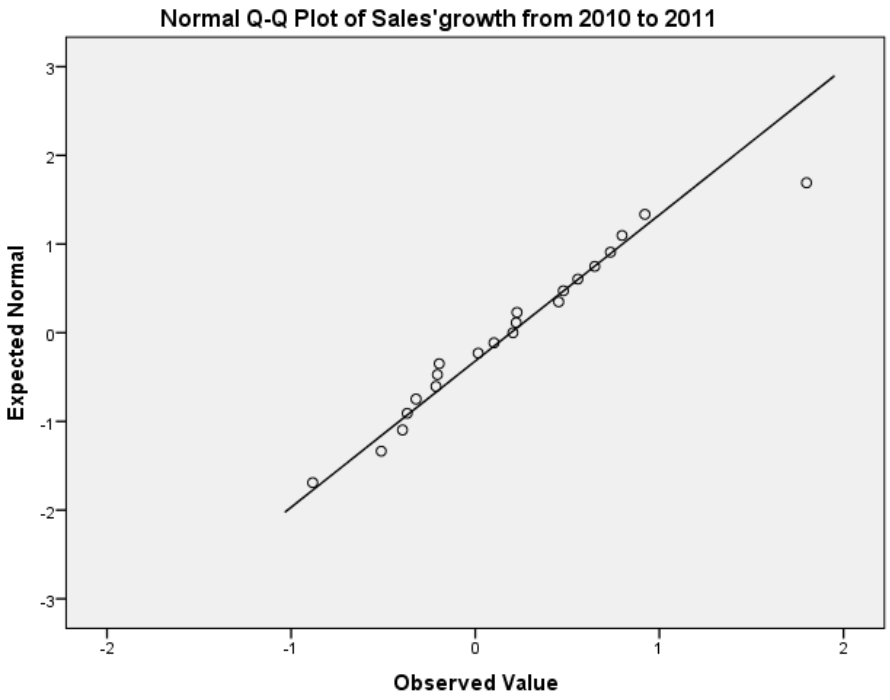

Fig. 2: Normal distribution of the dependent variable (probability plot)

We have used the IBM® SPSS® Statistics (version 22.0) application to run a multiple linear regression. After, we made a residuals' analysis/diagnosis to check the validity of applying linear regression. This is valid only if the data meets the following five assumptions: 1) normality of residuals; 2) homoscedasticity (or homogeneity of variances); 3) absence of outliers; 4) independence of residuals; and 5) absence of multicollinearity. The failure to meet these assumptions can change the output and reduce the predictive accuracy of the results as well as their statistical significance. In our case, all assumptions are met. Since our sample is smaller than 30, we use the Shapiro-Wilk test instead of the Kolmogorov-Smirnov test, to check the normality of residuals. The p-value was 0.575 which is higher than the significance level of 0.05, so we do not reject the null hypothesis that the residuals follow a normal distribution (table 4). We also used a graph to analyse the normality of the residuals (fig. 3).

Table 4: Test of Normality of Residuals

	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Studentized Residual	.107	21	.200	.963	21	.575

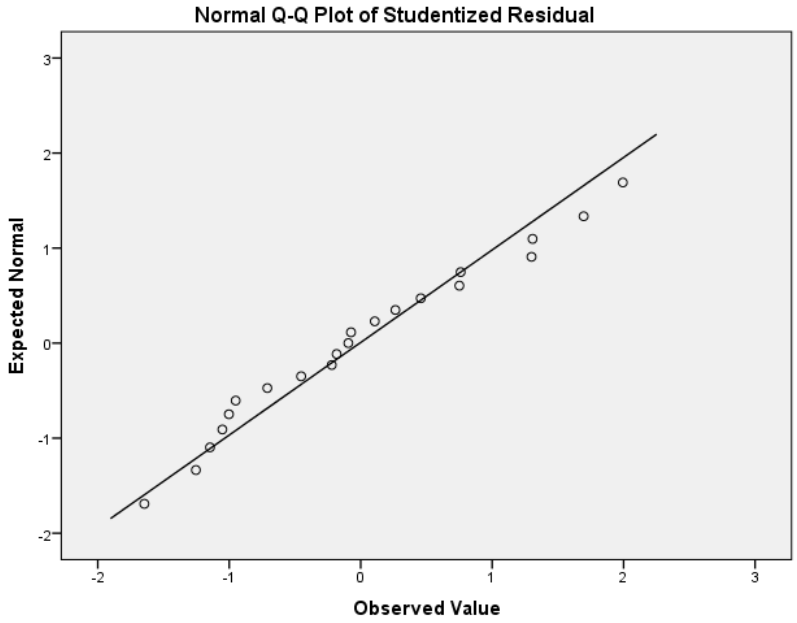

Fig. 3: Test of normality of residuals (probability plot)

The criterion for normal distribution is the degree to which the plot for the actual values coincides with the line of expected values. In this case, the plot of residuals closely fits this line, clearly suggesting that the residuals are normally distributed. In order to test the homogeneity of variances we used a residual scatterplot, which provides a visual examination of the homoscedasticity between the predicted dependent variable scores and the errors (fig. 4).

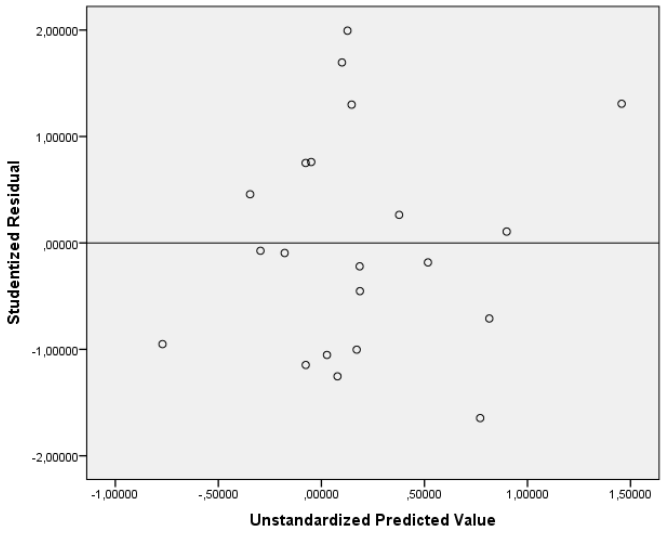

Fig. 4: Evaluation of the homogeneity of variances (residual scatterplot)

The points in the scatterplot were randomly distributed around 0, with no particular behaviour or trend, so we have evidence that the variance of the residuals is homoscedastic. A boxplot of the residuals were also created in order to confirm the absence of outliers (fig. 5). In this graph there was no observation that did not fit the overall pattern of the data, so we conclude that the absence of outliers' assumption is also met.

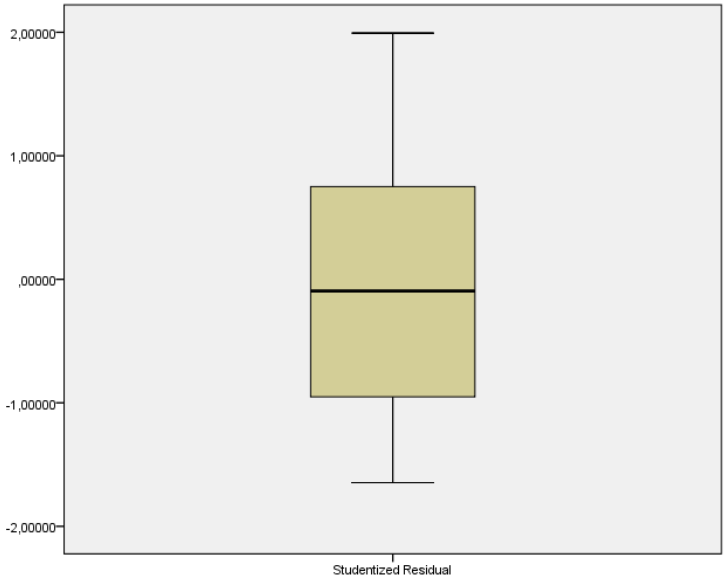

Fig. 5: Evaluation of the presence of outliers (boxplot of the residuals)

For the data to meet the fourth assumption the residuals must be completely random. Any kind of systematic behaviour indicates the presence of any error or gap in the model. In other words: autocorrelation must not be present. We used the Durbin–Watson statistic in order to detect the eventual presence of autocorrelation in the residuals. The Durbin-Watson test statistic tests the null hypothesis that the residuals from a regression are not auto-correlated against the alternative that the residuals follow an autoregressive process. Our value of Durbin-Watson statistic (d_W) is 1.933 (computed using SPSS). Knowing that n=21 (sample size), k=4 (number of explanatory variables excluding the constant term) and α=0.05 (significance level), the table of Durbin-Watson critical values gives us the lower bound (d_L) of 0.927 and the upper bound (d_U) of 1.812. Since:

$$d_U < d_W < 4 - d_U \text{ <=> } 1.812 < 1.933 < 2.188$$

we do not reject the null hypothesis with a significant level of 5%. Thus, the residuals are considered to be independent. Finally, multicollinearity refers to a situation in which two or more explanatory variables in a multiple regression model are highly correlated. The multicollinearity may impact the estimation of the parameters. The variance inflation factor (VIF) is a way to detect multicollinearity in a model. This indicator measures how much the variance of a coefficient is inflated by collinearity. Normally, a VIF of 5 or 10 and above indicates a multicollinearity problem. In our case, all values of VIF are lower than 5, so the assumption that variables are not highly correlated is met (table 5).

Table 5: Multicollinearity Analysis

	Collinearity Statistics	
	Tolerance	VIF
(constant)		
Debt-to-equity ratio in 2010	.807	1.240
Size in 2010	.914	1.094
Age in 2010	.861	1.162
Liquidity in 2010	.818	1.222

Once the assumptions were met, we can move on to the presentation of the results.

4. Empirical Results

This chapter aims to present the main results of this dissertation, leading to the determination of the regression coefficients β_j of the model of the firms' growth.

As shown in the previous chapter, based on data from start-ups, we proposed multiple linear regression model to account for the influence of the four selected explanatory variables (capital structure, liquidity, size and age) on the dependent or response variable (sales' growth). We have shown, in the previous chapter that, on the basis of the sample data from startups at UPTEC, all the assumptions of linear regression were satisfied. Therefore we can now move on to generate and analyse the results required.

ANOVA analysis, whose results are shown in table 6, shows that the F value is statistically significant at a level of 0.05. So this suggests that there is a significant linear relationship between firms' growth and the explanatory variables. This confirms the validity of our linear regression model.

Table 6: ANOVA Table

	Sum of Squares	df	Mean Square	F	Sig.
Regression	4.811	4	1.203	7.565	.001
Residual	2.544	16	.159		
Total	7.355	20			

The r-squared, i.e., coefficient of determination, of the model is 0.654 which means that 65.4% of the response variable can be explained by a combined variation of the four explanatory variables of the model (see table 7). The adjusted r-squared is 0,568 meaning that the combination of the four independent variables has strong explanatory power.

Table 7: Model Summary

R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
			R Square Change	F Change	df1	df2	Sig. F Change
.654	.568	.39875	.654	7.565	4	16	.001

The following table (table 8) summarizes the results of the regression equation and gives the coefficients and the constant of the linear regression model proposed. This is shown in column B. All the relevant regression coefficients are statistically significant.

The estimated model is the following:

$$\hat{Y}_i = -1.532 - 0.052DE_i + 0.208SIZE_i - 0.568AGE_i + 0.115LIQ_i$$

Our results show that the debt-to-equity ratio and the age of the start-up have a negative impact on sales' growth, while liquidity and size show a positive impact on the dependent variable. However the results are not statistically significant when applying the same model to the following period (2011-2012).

Table 8: Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	-1.532	.899		-1.705	.108
Debt-to-equity ratio in 2010	-.052	.016	-.524	-3.204	.006
Size in 2010	.208	.075	.424	2.756	.014
Age in 2010	-.568	.216	-.418	-2.636	.018
Liquidity in 2010	.115	.052	.358	2.205	.042

5. Discussion of Results

Our results regarding the relationship of debt-to-equity ratio and the firm's growth show for startup firms a negative relationship, similar to that shown by Liu and Hsu (2004) for manufacturing companies. As we found, these authors show that high debt-to-equity ratio is associated with low sales' growth when examining Taiwan's manufacturing firms. Similarly, Lang et al. (1996) found that there is a strong negative relationship between leverage and growth of large industrial firms with a low Tobin's q ratio, i.e., firms with marginal growth opportunities and poor performance (although, in principle, startups have high growth opportunities). A possible explanation for the negative relationship between debt and growth is mentioned by Myers (1977). This author shows that if a firm's debt overhang is too large, it might prevent the company from raising funds to finance positive net present value projects. The same way, instead of using future profits to grow the business, the firm has to allocate a portion to debt payments, which in the case of new small firms may be very expensive (Baldwin et al., 2002). Overuse of debt can severely limit future cash flow and hinder growth. On the other hand, it is also possible that a negative relationship between growth and debt might arise because managers of firms with valuable growth opportunities choose low leverage, as suggested by Lang et al. (1996). This might happen because these firms might not be able to take advantage of their investment opportunities if they have to raise additional outside funds. The high costs of debt or even the impossibility to raise capital might prevent firms' growth. Moreover, companies might not want to put on the hook the collateral or personal guarantees that lenders may ask for.

So, on one hand there are studies, as ours, that show the existence of a negative relationship between debt and growth of companies. On the other hand, other studies argue that debt fosters growth. Our results differ, for instance, from Molinari et al. (2009), Cole and Sokolyk (2014), Robb and Robinson (2012) and Loi and Khan (2012). In a general way, these authors conclude that companies, some of which are startups, should use some degree of liabilities to finance their activities if they want a higher growth rate.

Just like the debt-to-equity ratio, the age of the firm show a negative relationship with sales' growth. This was already expected. It makes sense that in their first years of life

startups have an expressive growth and that over the years this growth decreases (because sales start from zero). Audretsch (2012) provides a review of the literature concerning the determinants of high-growth firms and concludes that, in general, growth rates are higher for younger enterprises. Using 523 Dutch small and medium sized firms, Zhou and Wit (2009) also find a negative relationship between age and firm growth. In addition, our finding matches the results of Almus and Nerlinger (1999), who finds the same relationship for young firms, in particular new technology-based firms and non-innovative firms. They conclude that after a straight increase in growth rates at earlier stages, the partial effect of age on growth starts to decline. According to the authors, this threshold is reached after 3.1 years in the "HighTech Industries" and after 3.0 years in the "Medium-Tech Industries", whereas in "other manufacturing firms" the decline starts after 2.6 years. On the contrary, Liu and Hsu (2004) conclude that age has significantly positive effects on growth of Taiwan's manufacturing firms. Apparently, this finding is not aligned with those from most of the studies that have been reported.

Unlike what happens with the variables debt-to-equity ratio and age, the variable size has a positive coefficient. This suggests that larger startups have better growth performance than smaller ones. This result is somehow in line with other studies such as Liu and Hsu (2004), Singh and Whittington (1975), who analyzed 2000 UK quoted companies, and Mateev and Anastasov (2010), who explored SMEs in central and eastern Europe. Evans (1987), however, argues that the small firms tend to exhibit higher rates of growth when examining 0-to-6-year-old firms from U.S. Small Business Administration. However, the measures of size and growth used by Evans (1987) are different from those used in our study. Size is measured here by the number of employees and growth rate is defined as the annual logarithmic change in employment. These different measures of size and growth might have contributed for the divergence of results. Gibrat's Law that states that firm growth is independent of firm size is not also confirmed in our case.

A possible explanation for the positive relationship between size and growth is suggested by Penrose (1959). According to this author, "as the firm grows, it continually gains additional managerial service, through accumulation of experience, and induction of new managers. Further, a larger firm may not require a commensurate increase in

administrative (organizing and coordinating) tasks, because of increased efficiency of usage of existing managerial services, adoption of decentralized management, and growing levels of automation".

We also studied the impact of startups' liquidity on sales' growth. We conclude that there is a positive relationship between these two variables. This relationship was expected and is in line with the literature review. In addition to Molinari et al. (2009), who conclude that firms with higher liquidity tend to grow more (with growth measured in number of employees), Mateev and Anastasov (2010) also show, using fixed and random effects models, for a sample of SMEs of central and eastern European firms, that the estimated coefficient of the liquidity variable (measured by the current ratio) is positive and statistically significant. Thus, the hypothesis formulated by the authors that there is a strong and positive relationship between liquidity and a firm's growth (measured by growth of revenues) is confirmed. A possible explanation is that companies with a lower level of liquidity will have more cash constraints and will have more difficulties in repaying suppliers, which hinder their growth (Loi and Khan, 2012). Furthermore, Gill and Mathur (2011) expect that surplus cash will lessen financing constraints, enabling the company to finance growth opportunities at a lower cost. And logically, having the opportunity to invest at a reduced cost, the firm will be more motivated to invest, aiming for growth.

As we have seen, there are studies with apparently different conclusions regarding the impact of the selected variables on growth. However, this is not fully unexpected since these studies are to some extent different from ours, either because of the different nature of the population of firms or of the variables used, or the different temporal, geographic, economic and even political reality. For example, many of the studies mentioned above regarding the impact of the four selected variables on growth use different measures to represent the same reality. Moreover some studies refer to medium and large companies. Additionally, established businesses have different funding requirements, backgrounds, perspectives, and track records. As we saw earlier, startups financing is quite different from the financing of larger companies.

The negative relationship between the debt-to-equity ratio and sales' growth, is to some extent expected. To this may contribute the banks approach to evaluation of

companies. The evaluation that banks (debt financing) make of companies is normally based on the past performance of the company, reflected in its financial statements. However, an emerging company such as a startup, might not even have such financial statements and will hardly satisfy the banks' requirements. Moreover, the lack of tangible assets to secure the loans can limit the access to them. However, startups also get bank financing. In this case, they will have less cash available because they will have regular loan payments, which can put a damper on the startup's ability to grow. But, probably the positive relationship of equity and growth, implicit in our model, is also influenced by venture capital and business angels. Venture capital, comparing to banks, seems to be a better financing alternative for startups because when they analyse the enterprise they focus on the potential of the business idea and its future ability to generate profits. Venture capitalists provide non-financial resources like customer and supplier contacts, technical expertise, employee recruitment, among other services, which may improve the chances of success for unproven technologies and business models (Kerr and Nanda, 2009). However, their intervention in Portugal is quite small. Similarly, business angels in Portugal, also providers of equity financing, help startups with customer acquisitions, making available their own network, giving also technical support and influencing investment on startups. These contributions can greatly improve the firm position for getting better funding. The relationship business angels have with startups contributes to a great extent to their success (Sequeira, 2014). This helps to explain the negative relationship between debt-to-equity ratio and growth.

In summary, our results suggest that startups with a high debt-to-equity ratio might be limiting future cash flow and harming the potential for growth. This view is not shared by some studies on the influence of capital structure on the growth of firms, including startups. They argue that some degree of liabilities favours growth. A further conclusion from our results is that the younger and the larger (in terms of total assets) a startup is and the more "liquid" assets (more liquidity) a startup has the better, when it comes to growth. We didn't find studies regarding the impact of liquidity on startups' growth but those on firms in general refer that liquidity fosters growth. So in this respect it seems that we can extend these finds to startups. Among several studies on the impact of age on firms' growth, only

one found a positive impact between them. The conclusions related to the positive influence of size on growth were also in line with most of the studies.

6. Conclusion

6.1. Main Conclusions

The main aim of this master dissertation was to analyse the impact of capital structure, measured by the debt-to-equity ratio, on startups' growth. Sartups' growth was measured by the relative sales' growth.

There are several studies focusing on the impact of capital structure on firms' growth, but very few focussed on startups. For this reason, we considered this study a valid contribution to the subject at hand. In order to contextualize the topic, we reviewed the existing literature regarding startups' financing, in which we included an overview of the financing constraints faced by these companies, decisions about capital structure, main types of financing sources and, especially, the main financing sources for Portuguese startups. From this review it was clear that firms' growth is a complex phenomenon and cannot be explained by a single determinant alone. Several factors can have influence on performance and growth of startups. Therefore we decided to study the influence on startups' growth of other important variables namely firms' size, age and liquidity, which emerged from the detailed review of the literature regarding the determinants of firms' growth. We used data from financial statements corresponding to the years 2010 and 2011 of 21 Portuguese startups located in the UPTEC park of science and technology.

A multiple linear regression model was developed based on startups' data. We found that the debt-to-equity ratio and the age of startups have a negative impact on sales' growth, while liquidity and size have a positive one.

The negative relationship between debt-to-equity ratio and startups' growth may be explained according to two apparently opposite perspectives. One, resulting from large incurred debt restricting the ability of the startup to raise funds to invest in new projects capable of catalysing growth. The other, resulting from high growth prospects which make that startup opt for lower debt strategies in order to avoid restriction on fund raising, but also based on the high probability of financing itself using the profits resulting from sales' growth. The latter perspective, i.e., strategies of low debt under valuable growth

opportunities, was suggested by Lang et at (1996) for large size companies and the former was put forward by Myers (1977) and Baldwin et al. (2002) in relation to firms in general, not startups in particular.

We also hypothesize that the intensive support of several kinds given by business angels and venture capitalists to startups, who are also providers of equity, favours growth of startups.

Some managerial implications come from this research. The negative relationship between debt-to-equity ratio and startups' growth seems to show that there is a great need to control the amount of debt raised by startups. Although it is possible that some degree of debt financing might not be detrimental to the startups' performance, they should be concerned to not let this ratio grow too much because it can create difficulties of several natures which may prevent the growth of the company. Our finding regarding the negative influence of the age on startups' growth suggests that startups should not remain as startups for many years. In other words, they should try to move to the execution phase relatively quickly because remaining in the exploratory phase for many years may bring unaffordable costs and thereby adversely affect growth or even survival. The positive relationship between size, measured by total assets (both tangible and intangible), and startups' growth seems to suggest that startups, found to be greatly affected by financing constraints, should have the sufficient amount of tangible assets to be used as collateral for obtaining loans more easily. In addition, a great level of assets probably increases the productivity and hence the sales' growth. Unlike tangible assets, intangible assets do not have liquidation value so they probably do not serve as collateral. However, our results may also suggest the importance of intangible assets such as firm-specific human capital, networks, specific know-how that increases enterprise efficiency and innovative property such as R&D, copyrights and trademarks, for startups' growth. Finally, the positive impact of startups' liquidity on their growth suggests that startups should have enough cash to meet their short-term needs. Moreover, a balanced level of liquidity may probably reduce financing constraints, enabling startups to finance growth opportunities at a lower cost.

6.2.Limitations and future research

The initial aim of this dissertation was to assess the impact of capital structure on startups' survival, instead of startups' growth. Consequently, at the beginning, the research question was "how does capital structure influences the likelihood of bankruptcy of startups?" and, thus, the main focus of the study was the establishment of the relationship between the explanatory variable *Net Worth (book value)/book value of total debt* and the dependent variable *Z*, i.e., *the likelihood of bankruptcy*, of the Z-Score model (Altman, 1968). However, this initial research question was dropped because, contrarily to what happens with companies that are still operating, data from companies that have already died were not to be available. Incubators (such has UPTEC) tend to eliminate data from startups that cease to exist. At least, this seems what has happened with the one cooperating in this investigation. For this reason we have decided to change the theme of the dissertation for "the impact of capital structure on startups' growth".

Bankrupcy of medium and large firms has been widely studied. However, bankruptcy prediction for small firms has not attracted so much attention, most probably due to the lack of financial data available. Actually, after a study of the literature we did not find any study focusing on bukrupcy of startups. So, the initially aim of this dissertation work is still open to research and, therefore we propose this for future work, with the advice for ensuring that data can be obtained.

Our model show a pattern of relationships between startups growth and the four explanatory variables used but, we recognize that the findings may not be generalizable, since the sample is somewhat small and originated only from UPTEC, i.e., taking into account a restricted geographical region, and the UPTEC hubs: Technological, Creative Industries, Biotechnological and Marine. The results using startups of different sectors might vary.

In addition, we may be facing a problem of endogeneity, in particular a problem of reverse causality. For instance, we conclude that capital structure is associated with sales' growth. But which causes which? On one hand, a low debt-to-equity ratio is expected to

lead to a higher growth but, on the other hand, a higher growth might allow the firms to self-finance their activities rather than incur additional debt.

Apparently the robustness of the study of capital structure on startups' growth could be improved through future work by: 1) extending the research period; 2) using a larger sample size; 3) not only using sales' growth, but also using other measures of growth to test the robustness of the different growth measures such as growth of employees, growth in profit or growth in the value of the firm; 4) including a larger spectrum of industrial sectors; and 5) testing a richer empirical model. In addition to this, it would be clarifying to relate the success and growth of Portuguese startups with their specific financing sources. It would also be pertinent to repeat the analysis with the same variables but for companies that are not startups in order to verify if the relationships found in our model would remain the same.

References

Abreu, Pedro (2012), "Portuguese Startups: Benefits and Consequences of a Model of Tax Deferral", Dissertation (Master in Business Administration), Universidade Católica Portuguesa.

Almus, M. and E. A. Nerlinger (1999), "Growth of New Technology-Based Firms: Which Factors Matter?", *Small Business Economics*, Vol. 13, No. 2, pp. 141-154.

Altman, E. (1968), "Financial ratios, discriminant analysis and the prediction of corporate bankruptcy", *Journal of Finance*, Vol. *23, No. 4, pp.* 589-609.

Altman, E., R. Haldeman and P. Narayanan (1977), "Zeta Analysis: A New Model to Identify Bankruptcy Risk of Corporations", *Journal of Banking and Finance*, Vol. 1, No. 1, pp. 29-54.

Altman, E. (1993), *Corporate Financial Distress and Bankruptcy: Predict and Avoid Bankruptcy, Analyze and Invest in Distress Debt*, New York: John Wiley & Sons, Inc.

Atherton, A. (2009), "Rational actors, knowledgeable agents: extending pecking order considerations of new venture financing to incorporate founder experience, knowledge and networks", *International Small Business Journal*, Vol. *27, No. 4, pp.* 470-95.

Audretsch, D. (1995), "Innovation, growth and survival*", International Journal of Industrial Organization*, Vol. 13, No. 4, pp. 441-457.

Audretsch, David (2012), "Determinants of High-Growth Entrepreneurship ", Report prepared for the OECD/DBA International Workshop on "High-growth firms: local policies and local", University of Indiana, United States.

Baldwin, John, Guy Gellatly and Valerie Graudreault (2002), "Financing Innovation in New Small Firms: New Evidence From Canada",

Working Paper No. 190, Statistics Canada Analytical Studies Series 11F0019MIE.

Banha, Francisco (2006), "Business Angels: Uma Solução para Financiar as Startups", Gesventure Newsletter, Portugal.

Banha, Francisco (2015), "Uma semana para encontrar projetos para investir", Revista Invest.

Barkham, Gudgin, Hart and Hanvey (1996): Barkham, R., G. Gudgin, M. Hart and E. Hanvey (1996), *The Determinants of Small Firm Growth, Vol. 12*, Gateshead, Tyne and Wear, UK: Athenaeum Press.

Baum, R. and E. Locke (2004), "The Relationship of Entrepreneurial Traits, Skill, and Motivation to Subsequent Venture Growth", *Journal of Applied Psychology*, Vol. 89, No. 4, pp. 587-598.

Blank, S. and B. Dorf (2012), *The Startup Owner's Manual*, K&S Ranch Consulting.

Beaver, W. (1966), "Financial Ratios as Predictors of Failure Prediction", *Journal of Accounting Research,* Vol. 4, pp. 71–111.

Becchetti, L. and G. Trovato (2002), "The Determinants of Growth for Small and Medium Sized Firms. The Role of the Availability of External Finance", *Small Business Economics,* Vol. 19, No. 4, pp. 291-306.

Beck, T., A. Dermirguç-kunt and V. Maksimovic (2005), "Financial and legal constraints to firm growth: does size matter?", *The Journal of Finance*, Vol. 60, No. 1, pp. 137-177.

Berger, A. and G. Udell (1998), "The economics of small business finance: The roles of private equity and debt markets in the financial growth cycle", Journal of Banking & Finance, Vol. 22, No. 6-8, pp. 613-673.

BERR (2008), "High Growth Firms in the United Kingdom: Lessons from an Analysis of Comparative UK Performance", BERR Economics Paper No. 3.

Bilau, J. and E. Couto (2010), "What Factors Determine the Failure in Obtains Venture Capital?", In 6th International Scientific Conference, Vilnius, Lithuania.

Capon, N., J. U. Farley and S. Hoenig (1990), "Determinants of Financial Performance, A Meta-Analysis", *Management Science* , Vol. 36, No. 10, pp. 1143- 1159.

Carton, R. B. and C. W. Hofer (2006), *Measuring Organizational Performance,* Cheltenham: Edward Elgar Publishing.

Cassar, G. (2004), "The financing of business start-ups", *Journal of Business Venturing, Vol. 19, No. 2, pp.* 261-283.

Chamberlain, T. (1990), "Capital Structure and the Long-Run Survival of the Firm: Theory and Evidence", *Journal of Post Keynesian Economics, Vol. 12, No. 3*, pp. 404-423.

Chung, Y., H. Na and R. Smith (2013), "How important is capital structure policy to firm survival?", *Journal of Corporate Finance,* Vol. *22*, pp. 83-103.

Cole, Rebel and Tatyana Sokolyk (2014), "Debt Financing, Survival, and Growth of Start-up Firms", 2014 Annual Meetings of the Financial Management Association, Nashville, TN USA.

Coleman, S. and A. Robb (2012), "Capital structure theory and new technology firms: is there a match?", *Management Research Review,* Vol. 35, No. 2, pp. 106-120.

Couto, Fernanda (2013), "Literacia Financeira e Empreendedorismo em Portugal", Dissertation (Master in Finance), Porto Faculty of Economics.

Damodaran, Aswath. (2009), "Valuing Young, Start-up and Growth Companies: Estimation Issues and Valuing Challenges", Stern School of Business, New York University.

Davidsson, P., L. Achtenhagen and L. Naldi (2005), "Research on Small Firm Growth: A Review", *Foundations and Trends in Entrepreneurship*, Vol. 6, No. 2, pp 69-166.

Diário Económico (2013), "Especial Business Angels", http://economico.sapo.pt/public/uploads/especiais_sp/business2011.pdf, accessed on 24 November 2014.

Duarte, Pedro (2007), "Capital de risco: análise da indústria em Portugal", Dissertation (Master in Finance), ISCTE.

Edmister, R. (1972), "An Empirical Test of Financial Ratio Analysis for Small Business Failure Prediction", *Journal of Financial and Quantitative Analysis,* Vol. 7, No. 2, pp. 1477–1493.

Faria, R. (2013), "Startups representam 6,5% do tecido empresarial em Portugal", http://www.jornaldenegocios.pt/empresas/detalhe/startups_representam_65_do_tecido_empresarial_em_portugal.html, accessed on 2 June 2015.

Fazzari, S. M., R. G. Hubbard and B. C. Petersen (1988)," Financing Constraints and Corporate Investment", Brookings Papers on Economic Activity, Vol. 1, pp. 141-195.

Flamholtz, E. G. (1986). *Managing the Transition from an Entrepreneurship to a Professionally Managed Firm*. San Francisco: Jossey-Bass.

Garnsey, E., E. Stam and P. Hefferman (2006), "New Firm Growth: Exploring processes and paths", *Industry and Innovation*, Vol. 13, No. 1, pp. 1-24.

Gartner, W., C. Frid and J. Alexander (2012), "Financing the emerging firm", *Small Business Economics*, Vol. 39, pp. 745-761.

Gill, A. and Mathur, N. (2011), "The impact of Board Size, CEO Duality, and Corporate Liquidity on the Profitability of Canadian Service Firms", *Journal of Applied Finance and Banking*, Vol. 1, No. 3, pp. 83-95.

Graham, P. (2012), "Startup Equals Growth", http://www.paulgraham.com/growth.html, accessed on 7 April 2015.

Hart, P.E. and S.J. Prais (1956), "The analysis of business concentration: A statistical approach", *Journal of the Royal Statistical Society*, *Series A*, pp. 150-191.

Hymer, S. and P. Pashigian (1962), "Firm size and rate of growth", *Journal of Political Economy*, Vol. 70, pp.556-569.

Jovanovic, B. (1982), "Selection and Evolution of Industry", *Econometrica,* Vol. 50, No. 3, pp. 649-670.

Kerr, William and Ramana Nanda (2009), "Financing constraints and Entrepreneurship", Harvard Business School Entrepreneurial Management Working Paper No. 10-013.

Kerr, William, Josh Lerner and Antoinette Schoar (2010), "The Consequences of Entrepreneurial Finance: A Regression Discontinuity Analysis", HBS Working Paper Number: 10-086.

Kraus, A. and R. Litzenberger (1973), "A State-Preference Model of Optimal Financial Leverage", *Journal of Finance*, Vol. *28*, No. 4, pp. 911-922.

Lang, L., E. Ofek and R. Stulz (1996), "Leverage, investment, and firm growth", *Journal of Economics*, Vol. 40, No. 1, pp. 9-29.

Lechner, C. and M. Dowling, (2003), "Firm Networks: External Relationships as Sources for the Growth and Competitiveness of Entrepreneurial Firms", *Entrepreneurship & Regional Development*, Vol. 15, No. 1, pp. 1-26.

Lee, J. and E. Shim (1995), "Moderating Effects of R&D on Corporate Growth in U.S. and Japanese Hi-Tech Industries: an Empirical Study", *The Journal of High Technology Management Research*, Vol. 6, No. 2, pp. 179-91.

Lewis, D. (2002), "Does Technology Incubation work? A Critical review of the evidence", Reviews of Economic Development Literature and Practice, No. 11.

Liu, W. C. and C. M. Hsu (2006), "Financial Structure, Corporate Finance and Growth of Taiwan's Manufacturing Firms," *Review of Pacific Basin Financial Markets and Policies*, Vol. 9, No. 1, pp. 67-95.

Loi, Teng and Arslan Khan (2012), "Determinants of firm growth: evidence from Belgian companies", Dissertation (Master in Applied Economics), Faculteit Economie en Bedrijfskunde, Universiteit Gent.

Lusa (2014), "Crowdfunding já angariou um milhão de euros em Portugal", http://www.publico.pt/economia/noticia/crowdfunding-um-modelo-em-crescimento-mas-ainda-pouco-conhecido-em-portugal-1639099, accessed on 2 February 2015.

Marques, João (2005), "As Incubadoras de Empresas com ligações à Universidade e a Cooperação Universidade – Indústria: o caso de Portugal", Thesis (PhD in Industrial Management), Universidade de Aveiro.

Mateev, M. and Y. Anastov (2010), "Determinants of Small and Medium Sized Fast Growing Enterprises in Central and Eastern Europe: A Panel Data Analysis", *Financial Theory and Practice*, Vol. 34, No. 3, pp. 269-295.

Mendes, Ivo (2013), "A importância do crédito bancário para as PME e os programas de incentivo ao investimento em Portugal", Internship report (Master in Economics), Universidade de Coimbra.

Modigliani, F. and M. Miller (1958), "The Cost of Capital, Corporation Finance and the Theory of Investment", *American Economics Review*, Vol. 48, No. 3, pp. 261-97.

Molinari, M., G. Fagiolo and S. Giannangeli (2009), "Financial Structure and Corporate Growth, Evidence from Italian Panel Data", Copenhagen Business School.

Mollick, E. (2014), "The dynamics of crowdfunding: An exploratory study", *Journal of Business Venturing*, Vol. 29, No. 1, pp. 1-16.

Moore, B. (1994), "Financing constraints to the growth and development of small high-technology firms", in A. Hughes and D. J. Storey (editors), Finance and the Small Firm, pp. 112-144, London: Routledge.

Musso, P. and S. Schiavo (2008), "The impact of financial constraints on firm survival and growth," *Journal of Evolutionary Economics*, Vol. 18, No. 2, pp. 135-149.

Myers, S. and N. Majluf (1984), "Corporate Financing and Investment Decision When Firms Have Information That Investors do Not Have", *Journal of Financial Economics*, Vol. 13, No. 2, pp. 187-221.

Myers, S. (1977), "Determinants of Corporate Borrowing", *Journal of Financial Economics*, Vol. 5, No. 2, pp. 147–175

OECD (2004), "Financing Innovative SMEs in a global economy", Background Report for the 2nd OECD Conference of Ministers Responsible for SMEs, Istanbul, Turkey.

OECD (2006), *The SME financing gap: Theory and Evidence*, OECD Publishing.

Penrose E. (1959), "The Theory of the Growth of the Firm", Oxford University Press: New York.

Pongsatat, S., J. Ramage and H. Lawrence (2004), "Bankruptcy Prediction for Large and Small Firms in Asia: A Comparison of Ohlson and Altman", *Journal of Accounting and Corporate Governance*, Vol. 1, No. 2, pp. 1-13.

Porter, M. (1998), "Clusters and the New Economics of Competition", *Harvard Business Review*, Vol. 76, No. 6, pp. 77-90.

Robb, A. and D. Robinson (2012), "The Capital Structure decision of New Firms", *The Review of Financial Studies*, Vol. 7, No. 1, pp. 153-179

Scillitoe, J. and A. Chakrabarti (2010), "The role of incubator interactions in assisting new ventures", *Technovation*, Vol. 30, No. 3, pp. 155-167.

Scott, J. (1981), "The Probability of Bankruptcy: A Comparison of Empirical Prediction and Theoretical Models", *Journal of Banking & Finance*, Vol. 5, No. 3, pp. 317-344.

Semenov, R. (2006) "Financial systems, financing constraints and investment: empirical analysis of OECD countries", *Applied Economics*, Vol. 38, No. 17, pp. 1963–1974.

Sequeira, Romão (2014), "O financiamento de startups com recurso a financiamento por business angels em Portugal: estudo de caso", Dissertation (Master in Business Science), Instituto Superior de Economia e Gestão, Universidade de Lisboa.

Singh, A. and G. Whittington (1975), "The Size and Growth of Firms", *The Review of Economic Studies*, Vol. 42, No. 1, pp. 15-26.

Simon, H. A. and C.P. Bonini (1958), "The size distribution of business firms", *American Economic Review, Vol.* 48, pp. 607-617.

Stiglitz, J. and A. Weiss (1981), "Credit rationing in markets with imperfect information", *American Economic Review*, Vol. 71, No.3, pp. 393-410.

Stulz, R. (2001), "Does financial structure matter for economic growth? A corporate finance perspective", in *A. Demirguc-Kunt & R. Levine* (editors), Financial structure and economic growth, Cambridge, The MIT Press.

Wang, S. and H. Zhou (2002), "Staged financing in venture capital: moral hazard and risks", *Journal of Corporate Finance*, Vol. 10, No. 1, pp. 131-155.

Wiklund, J., H. Patzelt and D. A. Shepherd (2007), Building an integrative model of small business growth, *Small Business Economics*, Vol. 32, No. 4, pp. 351-374.

Y. Honjo and N. Harada (2006), "SME Policy, Financial Structure and Firm Growth: Evidence From Japan", *Small Business Economics*, Vol. 27, No. 4-5, pp. 289-300.

Zhou, Haibo and Gerrit DeWit (2009), "Determinants and Dimensions of Firm Growth", SCALES EIM Research Reports.

Zider, B. (1998), "How Venture Capital Works", https://hbr.org/1998/11/how-venture-capital-works, accessed on 20th October 2014.

List of webpages:

COMPETE: http://www.pofc.qren.pt/compete, accessed on 5 December 2014

CMVM: http://web3.cmvm.pt/sdi/capitalrisco/index.cfm, accessed on 10 December 2014

Kickstarter: https://www.kickstarter.com/, accessed on 20 January 2015

Portugal Ventures: http://www.portugalventures.pt/pt-pt, accessed on 15 January 2015