Debt financing and firm growth: European evidence on start-ups

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Abstract

This paper investigates the bank financing policy of new small and medium-sized enterprises (SMEs), its evolution and its impact during their early stages of growth over their first 10 years. Our analysis is based on a large European panel dataset on early stage SMEs founded between 2007 and 2015. The study provides some useful advice for practitioners and managers regarding the controversial relationship between debt financing and life cycle. First, our results reveal a dynamics of firm' financial behavior over their age. We find that the debt policy's impact on entrepreneurial firms' growth is remarkably instable over time. Specifically, debt is positively related to firm start-up stage growth with a decreasing pattern over time. Second, we find that debt financing has a significant impact on the firm's productivity over time as well as on firms' probability of bankruptcy. Notably, we also find that the effect of debt on firm growth at early-stage is amplified by industry external financial dependence and by working capital levels; it suggests that our main relationship depends considerably upon the financially valuable core-business. Interestingly, we also observe that the long-term debt appears to sustain the more the firm's growth. Finally, we perform additional analyses to expand our baseline results and provide directions for future research.

Key words: Bank loans; Trade credit; Information asymmetry; start-ups, start-up stage; SMEs growth

JEL classification: G30; G32, L26

1. Introduction

One of the most controversial questions regarding firms' capital structure decisions is how firms evolve through their financial life cycle. [1] Theoretical and empirical literature has analyzed abundantly the determinant of SMEs' financial behavior (e.g., Berger and Udell 1998; Petersen and Rajan, 1994).

According to the financial life-cycle theory (Sahlman, 1990; Berger and Udell, 1998), the various phases of a business's life cycle determine the firm's financial needs, the availability of financial resources, and the related cost of capital. Following this traditional view of startups, at birth, new firms rely on initial insider and angel financing, then venture capital, and after a while, they finally resort to long term bank loans prior to the initial public offering. In contrast, according to reverse financial life cycle hypothesis (Petersen and Rajan, 1994; Hamilton and Fox, 1998), young or small firms may find very difficult to raise money from angels or venture capitalists who target particularly innovative and promising firms (Kaplan and Strömber 2003 ; Politis 2008) ; this may explain why many "start-ups" rely on bank debt as initial source of finance. Subsequent business growth should lead to a rebalancing of capital structure in later years, reducing the use of debt. To the best of our knowledge, no study currently exists which provides an integrative perspective on the effects of debt financing dynamics which could help to understand the overall effects of all start-ups' debt choices. In particular, capital structures choice may have an impact on firms' future growth.

First, our study investigates how debt financing encourages early stage firms' growth and how this relationship evolves over time. Thus, we want to contribute to this line of research by exploring the role of debt in early stage firms, from birth and over their first 10 years. In particular, we want to investigate if debt supports or damage corporate growth around the firm's lifecycle, and to what extent. According to the financial life cycle theory (Carey et al. 1993; Berger and Udell 1998) , early-stage firms start using equity sources of finance and subsequently rebalance their capital structure in later years by using debt. In contrast, according to the reverse life cycle theory (Petersen and Rajan, 1994; Hamilton and Fox, 1998), bank debt provides the required funds at the start-up phase; thereafter, the use of bank debt may be explained by the entrepreneur's aim to sustain growth and also retain control of the business. As the firm grows, entrepreneurs remain inclined to re-inject self-generated financial resources into the firm. These funds provide further capital and thus the

[1] In this paper, when we refer to startups, we do not focus on venture-capital backed startups, but on all new firms created. We use the term « ealy stage » to identify firms during the first 10 years of their life cycle. At the same time we use the term « startups » or « start-up stage » to identify firms at very early stage phases.

fraction of borrowing from banks declines as the firm matures. These baseline theoretical arguments suggest an instable relation between bank debt financing and growth over the time. We investigate these questions from a large sample of European early-stage firms over the 2007-2015 period. Consistent with reverse financial life cycle hypothesis (Petersen and Rajan, 1994; Hamilton and Fox, 1998), we find that debt is positively related to firm growth at birth, with a decreasing pattern during early stages. These results suggest that firm's debt level is an important explaining factor of SMEs' growth, with different levels of impact (positive or negative) around their life cycle.

Our study also advances currently limited understanding of the consequences of debt financing investigating how bank debt financing influence firm's productivity and its probability of bankruptcy (e.g., Coad et al., 2016; Kale and Arditi, 1998; Bonaccorsi di Patti and Gobbi 2001). Our findings suggest that debt financing has a positive and significant impact of productivity, with a decreasing impact over the years. In addition, we find evidence on a negative effect of debt on probability of bankruptcy at the start-up stage, which, however, becomes positive in the following years.

Our study also examines the boundary conditions under which our theoretical arguments are most likely to hold. Specifically, we provide a somewhat clearer picture of the moderating role of industry external financial dependence. Previous studies highlight that firms‘ behaviors are different not only with respect to their managerial orientation but also regarding the different industry affiliations (Bradley et al., 1984; Harris and Raviv, 1991; Mian and Smith, 1992; Rajan and Zingales 1998). Still, previous research has found evidence of the central role of working capital management for the growth of firms (e.g., Churchill and Mullins, 2001; Deloof, 2003). Consequently, in this paper, we also explore the moderating effect of a financially valuable core-business of the relation between bank debt financing and growth. The data also suggests that the relationship between debt financing and growth patterns is heterogeneous according to industry dynamics. and that a financially valuable core-business positively moderate our main relationship.

Lastly, we analyze if debt-maturity choices (e.g., Barclay and Smith 1995, Barclay et al. 2003) have a different impact on business growth. Our study shows that the long-term debt is more effective in promoting sales growth with respect short-term debt.

Our study directly contributes to the literature on new venture financing (e.g., Ueda, 2004; Cumming, and Vismara, 2017). We contribute to these lines of research by empirically disentangling different underlying mechanisms behind the debt financing-growth relationship. Specifically, we answer to the numerous calls for empirical studies addressing how firms' characteristics are related to productivity and probability of failure at the early stage. This topic remains relatively unanswered (e.g., Coad et al., 2016; Kale and Arditi, 1998). Addressing this gap

is relevant, as SMEs are likely to take over specific strategic financial decisions in comparison with large firms (e.g. Andrieu et al., 2019). Still, in demonstrating how debt financing benefits are strongly contingent on industry and working capital management, our study suggests that several previous empirical findings on debt financing-growth relationship (e.g., Coleman and Robb, 2012) may be highly sensitive to these boundary conditions.

The paper proceeds as follows. Section 2 introduces the institutional background and develops the baseline hypotheses. The data collection process and methodology are discussed in Section 3. The section 4 presents the main results and the robustness tests. The paper ends up with conclusions.

2. Literature background: Capital structure and the growth of start-ups

The research on the choice of debt financing by firms has grown both theoretically and empirically over the past four decades. One of the several streams of research on this topic has highlighted that firms evolve through a financial life cycle. However, there is disagreement concerning sequential financing choices of debt and equity along the life of the firm.

Following the financial life cycle theory (Carey et al. 1993; Berger and Udell 1998), several papers find that the use of debt is increasing with age. Small firms are less likely to rely on bank financing and more likely to rely on internal financing (Chavis et al. 2011). In contrast, in line with the reverse life cycle perspective (Petersen and Rajan, 1994; Hamilton and Fox, 1998), other papers report that younger firms are highly levered because especially in the very early stages, entrepreneurs are unable to raise all capital from their own funds or by external equity financing (Huyghebaert, and Van de Gucht, 2007; Huyghebaert et al.2007; La Rocca et al. 2011; Robb and Robinson, 2014; Deloof and Vanacker, 2018; Bonaccorsi di Patti and Nigro, 2018) [2]

While these studies focused mainly on the determinants of financing choices for SMEs over time, they also neglected the link between debt and firm growth. Yet, growth and its financing are main issues for entrepreneurs. In this paper, we investigate two questions. First, i*s there a link between the level of indebtedness and firms' growth?* and second, if yes, *how does the relationship evolve over time for start-ups?*

[2] While these works focus on the dynamics of capital structure over time, other studies examine other questions related to firm bank debt financing. For example, Mishra and McConaughy (1999) find that family firms use less debt because founding family CEOs are more averse to control risk, the risk of losing control. Cosh et al. (2009) comparing rejection rates in applications for several type of outside financing type in UK market, find that rejection rates are lower in credit markets than from other sources of outside capital. Chua et al. (2011) and more recently, Hillier et al (2018) considering agency problem between shareholders and lenders find that family firms in US have less binding debt contracts because lenders perceive lower agency costs. Deno et al (2019) focusing on a large sample of German firms examine the impact of accounting information disclosure on bank debt access.

According to the financial life cycle theory (Carey et al. 1993; Berger and Udell 1998), it can be more difficult for start-ups to obtain external funding and particularly bank financing: bankers may more difficultly understand the business' quality and cannot rely on a successful track record. Therefore, due to asymmetric information, early stage firms are informationally opaque firms and could resort less to debt to finance growth[3]. Firms should be able to increase the weight of debt over equity over the years. Berger and Udell (1998) argue that debt, due to informational opacity and the higher interest rate applied by lenders to hedge against the higher probability of bankruptcy, is costly for young firms. Conversely, informal financing ("love money"), internal financial resources (Carpenter and Petersen, 2002), and venture capital or angel finance (Davila et al., 2003; Ueda, 2004; Cumming, 2005; Schwienbacher, 2007; Kerr et al., 2014) can be more suitable for start-ups' growth. New ventures and early-stage firms, typically of small size, with no reputation on the market and informational opaque, cannot credibly convey their quality and are the most dependent on internal finance. Empirically, Lang et al. (1996) find a negative relation between leverage and growth basing on a sample of large firms. These authors suggest a current high debt level reduces the funds currently available for investments and the ability to raise additional debt for future investments. Moritz et al. (2016) use survey data from European SMEs and find that the younger SMEs are less likely to rely on bank financing and more likely on mixed financing and internal resources when growth is happening. However, other studies do not confirm the financial life cycle theory, even in the US context (Robb and Robinson 2012).

According to the reverse life cycle perspective (Petersen and Rajan, 1994; Hamilton and Fox, 1998; La Rocca et al. 2011), debt financing provides financial support at the early stage phase since internal and informal financial resources are usually insufficient to enable the firm's growth. In particular, the banking industry is crucial to channel financial resources towards start-ups which are plagued by asymmetric information problems, and whose investment expenditures are strongly constrained by the availability of other external finance. The venture capital industry concentrates its funding only a small selection of promising or high-tech firms (Sahlman, 1990; Tykvova 2007; Cumming and Johan, 2008). Theoretically, Tirole (2010) and empirically Epure and Guasch (2020) explain that debt, despite some costs (illiquidity and bankruptcy), has a positive disciplinary effect since it creates incentives not to divert free cash flow. In addition, debt financing can be also chosen by the entrepreneur to retain control of the business (e.g., Jensen and Meckling, 1976; De Bettignies and Brander, 2007; Huyghebaert, and Van de Gucht, 2007).

[3] As Kaplan, S., & Stromberg, P. (2003) and La Rocca et al. (2011) suggest, both pecking order and life cycle theories result from information asymmetries: the changing degree of informational opacity that a firm faces drives its financial life cycle. Vaznyte and Andries (2019) recently provide an extension of Pecking Order Theory. These authors find that start-ups are more likely to follow the traditional financing hierarchy when their entrepreneurial orientation is low.

Several empirical investigations at the international level generally support the positive impact of indebtment for future growth. Ayyagari et al. (2010) use Chinese firms' survey data and find that, while more firms use informal financing than bank financing, only bank financing is associated with higher growth rates. Cassar (2004) shows from Australian survey data that start-ups that have strong growth expectations are also more likely to use debt. Coleman and Robb (2012) and Cole and Sokolyk (2018), using the Kauffman Firm Surveys, find that US firms that obtain external debt at the firm's start-up stage exhibits superior growth rates. However, although the taxonomy of the sources of funding is different, Bongini et al. (2019), using European SMEs survey data, show that a higher turnover growth is associated with a more intensive use of market-based financing resources (new equity issued to external investors or debt securities) by SMEs who made these choices.

Firms at the early stage that incur higher financing cost should necessarily try to use external debt more efficiently and consequently favor the growth rebalancing their capital structure in later years, reducing the use of debt.

Formally, our two alternative first hypotheses state:

Hypothesis 1_a: Bank debt financing is negatively related to firm growth at start-up stage, with an increasing pattern during early stages.

Hypothesis 1_b: Bank debt financing is positively related to firm growth at start-up stage, with a decreasing pattern during early stages.

3. Method

3.1 Data

We focus on European early stage non-financial firms of small and medium size. Firm-level data are collected using the database Orbis from Bureau Van Dijk, containing balance sheets of SMEs private and public firms across Europe. We select firms i) legally founded between 2007 and 2015 and ii) have less 250 employees in their initial year of operation. We have also excluded new firms where the owner was a financial or industrial firms.

In particular, we drop all financial, insurance, government/public sector and education to get a sample of non-financial firms. For example, we excluded public-owned firms because these firms' policy may be influenced by regulatory issues. The Orbis database has the most extensive collection of comparable financial and business information SMEs across all industries. We use data from

several countries to observe variation in legal environments, investor protection and capital markets development, which are related with different levels of agency and information costs (Ferreira and Vilela, 2004). Moreover, since start-ups and early stage firms are very informationally opaque, a cross-country sample fits very well with our paper's aim. To avoid survival ship bias, the data from Orbis were extracted each year, in September over the 2007-2015 period.

Our sample is made up of the following EU countries: Austria, Belgium, Bosnia and Herzegovina, Croatia, Czech Republic, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Italy, Latvia, Lithuania, Luxembourg, Montenegro, Netherlands, Norway, Portugal, Russian, Serbia, Slovakia, Slovenia, Spain, Ukraine, United Kingdom. They represent about 90% of the total EU GDP, based on Eurostat statistics for 2010.

To prevent potential misrepresentation, we leave out economically meaningless observations, consisting of outliers or data entry inaccuracies. For example, we remove observations in case of non-positive values for total book assets. We only select firms for which all required information to calculate our variables is available. Lastly, to limit the outliers' potential , we winsorize at the 1st and 99th percentile all variables before performing data description and empirical analysis.

After performing our data selection, we end up with an unbalanced panel, comprising 367,455 early stage firms (1,058,740 firm-year observations) for eight years (2007-2015) in 27 countries.

3.2 Model

We introduce here our empirical methodology. To investigate our first hypothesis (H.1), we consider the direct effect of debt financing on firms' sales growth. We include a set of control variables in the regressions. These are firm-specific and country-specific variables jointly included in the model with year and industry dummies (3-digits).

We conduct our analysis at different firm's age, from birth to maturity, i.e. for 1 to 10 years of category of age. Thus, we perform a cross-sectional analysis for each year of age of the firms.

We examine our main hypothesis (H.1), that studies the relationship between firms' capital structure and its sales growth along its lifetime, according to the following baseline model:

$$\textit{SMEs' sales growth} = f(\textit{Debt, Control variables}).$$

To estimate these models based on cross-section data, we use the ordinary least squares (OLS) technique, controlling for robust standard errors clustered at country level. The variables

used are described in the following Table 1.

Here Table 1

SMEs' growth is measured as: sales of the year (t+1) minus sales of the year (t) scaled by sales of the year (t). At early stages, a firm (if successful) is supposed to grow rapidly in sales. Growing SMEs generally require additional financial resources, thus we have then to consider the role of debt. Debt, which is a proxy for the capital structure of SME, is measured by the ratio of long-term and short-term interest bearing (financial) debt scaled by total assets (Rajan and Zingales 1995).

We use various control variables. *ROA* (Return On Assets), which is commonly used as proxy for SMEs profitability, is measured as EBIT (Earnings Before Interest and Taxes) scaled by total asset. *Size* is measured as the log of the SMEs' total assets. *Tangibility* controls for the typology of asset and is calculated as the ratio of tangible fixed assets on total assets. It is important to control for *Size* and *Tangibility*, since largest SMEs and SMEs with higher tangibility of asset could have an easier access to financial markets. *Cash Holdings*, measured as the ratio between cash and cash equivalent scaled by total asset, is also an important control variable, since several studies observed a substitution relationship between debt and cash holdings (e.g. Ozkan and Ozkan 2004). *GDP Growth* is the GDP per capita growth obtained from the World Bank's World Development Indicators and is used as a measure of economic development. To capture the degree to which a financial channel affects SMEs access to external capital, we consider a proxy of country financial development (*financial development*), based on the variable of domestic credit to private sector by banks (% of GDP) by the World Bank (Demirguc-Kunt and Levine, 2004). Finally, to measure the dynamics of new businesses registered in each country we use the new business density indicator from the World Bank (*Entrepreneurship density*).

4. Results

4.1 Descriptive statistics

Table 2 shows the descriptive statistics of the variables employed in the analysis based on the polled whole sample, to provide a general overview of the variables.

Here Table 2

Table 2 illustrates the distribution and the financial behavior of EU SMEs. It presents for all the variables mean, median, standard deviation, minimum value, maximum value and 25th and 75th percentiles. The mean value of sales growth is 6.710% and the median value is -0.08%. The standard deviation is 29.4%. The high volatility observed in sales growth reflects the high uncertainty of SMEs businesses in the early stages of their life cycle. Specifically, we note that mean value of the first quartile is negative (-0.633%) while for the third quartile the mean value is 1.187%.

The mean value of bank debt financing is 17.2% and the median value is 0.050% while the standard deviation (SD) is 23.2%. The mean value of debt financing for the first quartile is zero while this value in the third quartile is 28.6%. Several firms that have zero leverage reveal that they use only equity financing, which is something observed for pure startups. We also note a high dispersion in control variables, which is something expected in a sample of start-ups and early stage firms.

Table 3 reports the mean, median and standard deviation for the all the variables at different ages (from firms at the 1st year of age to firms at the 10th year of age). Sales growth, in mean value, shows a decreasing trend. In terms of median, the same decreasing trend is observed, with a positive growth that shifts to be negative after the 5th year of ages. The variability, in terms of SD, is slightly decreasing for sales growth, whereas it is almost stable along the years for debt. Firms'size and the percentage of tangible asset in the balance sheet increase over the year, as expected (both in terms of mean and median). The performance of the firms (measured by ROA) decreases along with the age of the firms (both in terms of mean and median). Similarly, the weight of cash holdings is decreasing along the age, but after the 7th year of age it becomes steady. We illustrate these results by Figure 1. It reports the mean value of Sales Growth and Debt along all the ages of analysis. It graphically shows the decreasing trend in business growth and the increasing trend in the use of debt.

Here Table 3

Here Figure 1

To investigate the potential multicollinearity issues that could bias our empirical analysis, we provide some additional analysis. First, we report in Table 4 the correlation matrix considering a polled sample for all firms at different age. Multicollinearity issues seem negligible, given the almost absence of significant correlations between variables that could affect the validity of our econometric results. We also report the VIF (Variance Inflation Factor) test, in the last column of

Table 4 which is the max value in the analysis for each subsample of firms corresponding to age categories. It confirms of the absence of multicollinearity. Moreover, to check for the problem of cross-section multicollinearity, we report the VIF value for the samples in each year of firm's age. Table 5 reveals that the VIF values for each age category are very low, and then the multicollinearity problems seem negligible.

Here Table 4

Here Table 5

Lastly, Figure 2 depicts the correlation between Sales Growth$_{t+1}$ and Debt along firms' age. At the start-up stage, the correlation between Sales Growth$_{t+1}$ and Debt is highly positive; it subsequently decreases along with firms' in the early stage. The correlation shifts to be negative in the 5th year of age, and after the negative trend accelerates. These changing trends revealed by the descriptive statistics and correlations analyses along with firm's different ages are strong motivations for our analyses. In particular, it appears to be highly relevant to investigate what is the causal relationship between these variables that appear to move in opposite direction over time.

Here Figure 2

3.2 Main results for the relationship between bank debt financing and growth

We investigate the effect of debt decisions on SMEs' growth and how this effect is conditioned by industry external financial dependence.

Table 6, from column (1) to column (10), shows the effect of debt on SMEs' growth along the first ten years of firm's life. Along the early stages of the firm, it worth noting that the debt's coefficient is positive and statistically significant, with a decreasing effect from column (1) to column (10). Specifically, the reported coefficient is 10.415 during the first year (column 1). This coefficient is statistically significant at the 1% level. In the intermediate years (column 2 to column 9) the values of debt's coefficients decrease gradually, moving from 8.182 for firms in the 2nd year of age to 3.355 for firms in the 9th year of age. In the last year of age of the sample (column 10) the coefficient is 2.619 but not statistically significant. This trend in the debt's regression coefficients is even better showed graphically through Figure 3. Finally, Figure 4 expand previous regression results, reporting the marginal effects of different levels of bank debt financing on sales growth

along the early stage phases. We find that, for very high levels of debt, the marginal effect of debt financing on firm's growth becomes on average more significant and with a much more pronounced decreasing trend over the years.

Here Table 6

Here Figure 3

Here Figure 4

All these results suggest that having financial resources available, thanks to bank debt financing, improves the growth speed, all the more the firms are young. This speed effect on growth is decreasing along the age of the firms. So, at the very early stage, having debt improves a lot the capability of start-ups to growth, while this effect is reducing onward in the early stage. This result is in line with the trade-off trend showed in the descriptive of Figure 1, where the sales growth is decreasing along the age of the SMEs while the level of Debt is increasing along the ages, and Figure 2, where the correlation between sales growth and debt shifts from positive to negative.

Therefore, the outcome of the analysis based on Table 6 confirms our hypothesis H.1b. Debt is positively related to firm growth at start-up stage, with a decreasing pattern onward during early stages.

3.3 What are the effect of bank debt financing on firm's productivity?

In this section, we intend to verify whether the use of debt in the early stage is favorable to firm's productivity. Specifically, although the use of debt accelerates the growth of the firms in the early stage, we are interested in assessing whether this growth is able to improve the firm productivity. It is not sure that the growth promoted by the use of debt will create corporate development and better productivity. Thus, we want to make sure that there is not a growth for sake. In the early stage accounting measures of performance may be biased, and there is technological and market uncertainty of the new venture. To alleviate those issues, we then consider the effect of debt on corporate productivity (e.g., Coad et al., 2016). We measure productivity as sales per employee. Coad et al. (2016) find that innovation have a stronger and positive effect on productivity growth, especially for young firms. In a related manner, it is important to analyze if the productivity for early stage firms in Europe is linked to corporate debt level over the time. We expect that debt is positively related to firm productivity at start-up stage, with a decreasing pattern during early stages. Table 7 reports these results. Debt has a positive and significant impact of productivity, with

a decreasing impact over the years. Thus, debt not only provides a support for business growth but also improves firms' productivity. Debt seems to act as an incentive for better working and efficiency within the firms.

Here Table 7

3.4 What are the effect of bank debt financing on firm probability of bankruptcy?

Secondly, we want to be sure that the use of debt, although supporting higher sales growth, did not increase the probability of bankruptcy of firms in such critical and complex phases of their life cycle as the early stage. Thus, we want to verify if the growth through debt is financially sustainable. Many researches on bankruptcy agrees that small firms in the early stage are more likely to exit from the market than other firms (e.g., Kale and Arditi, 1998). Those firms could lack knowledge or experience (Jovanovic 1982), or may not be sufficiently endowed with the requisite resources to execute their strategy. Even more important, the financing of firms in early stage is very vulnerable to their relationship with the bank market that traditionally affects the provision of credit (Bonaccorsi di Patti and Gobbi, 2001). Therefore, debt may be a first-order factor in affecting the probability of bankruptcy of those firms.

Specifically, we verify if bank debt level has an impact on the bankruptcy probability (Altman and Sabato, 2007). Several studies have been previously conducted on the topic of bankruptcy prediction (e.g., Altman, 1984; Altman and Sabato, 2007; Munoz-Izquierdo et al., 2019; Altman et al., 2010). They generally develop prediction models based on accounting ratios. Following Arcuri and Levratto (2020), in our study, we run a probit regression model where the dependent variable is the probability of bankruptcy, a dummy variable that takes value 1 if a firm requested an official bankruptcy procedure and 0 if it is normally operating. . Table 8 reports these results

Here Table 8

Table 8 reveals a negative effect of debt on bankruptcy probability in the first year, an insignificant effect in the years 2 and year 3, and a positive increasing impact in the following years. Although the mean value of the variable probability of bankruptcy, as expected, is decreasing along the age of the firms, the relationship between debt and bankruptcy probability is not linear along the age of the firm. Whereas start-ups have higher bankruptcy probability compared to older firms, higher leverage ratios reduce the bankruptcy probability in the first year of age. In contrast,

this effect turns to be positive and increasing when firms become older than 4 years of age after that debt results to damage business survival with an increasing magnitude after this age.

Hence, using debt allows new firms, at the very early stage (firms at the 1st year of age), not only to experience higher growth (Table 6) and better productivity (Table 7), but also to reduce the bankruptcy probability (Table 8). Later, starting from the 4th year of age and older, the effect of debt on the probability of bankruptcy switches to be positive, increasing this positive effect in the upcoming ages.

3.5 *Moderating role of industries in external financial dependence*

Whereas our baseline hypothesis relates to the impact of external bank financing on firm growth, in this section we discuss whether this relationship is moderated by industry-specific financial features. We expect that the influence of debt financing on growth capacity to equally affect all early-stage firms and that the observed differences may depend on higher or lower dependency/reliance on external finance in the industry of affiliation to achieve their growth plans.

Previous studies have shown that industry characteristics have a relevant influence both on financial leverage and financing patterns (Bradley et al. 1984; Harris and Raviv 1991; Mian and Smith 1992; Sun and Xiaolan, 2019).[4] Firms within a particular industry, facing similar prevailing circumstances, tend to adopt an analogous financing pattern (Cassar and Holmes, 2003). A review of the literature (Harris and Raviv, 1991) suggested a strong relationship between industry classification and average firm leverage ratio, highlighting the existence of differences across industries but consistency within them. Overall, the firm's life cycle is affected by the industry it operates in. The effect of industry affiliation on the life cycle has been already suggested by Weston and Brigham (1981). They claimed that the life cycles differ between high-growth and low-growth industries, or between emerging and traditional industries.

Therefore, firms operating in different industries have a different dependence on – or natural demand for – external financing with direct implications on their information acquisition in the capital budgeting process and on the subsequent growth capacity (Maksimovic et al.,1999). Focusing on listed firms, Rajan and Zingales (1998) and Bena and Ondko (2012) show that there are specific industries that depend more on external finance for technological reason (as opposed to internal finance, e.g. retained earnings) to support growth. In some sectors, firms have to infuse large investments that will generate positive cash flows only after a delay of several years; consequently, these types of firms depend more on external resources.

[4] Previous studies have also noted the relevance of industries as a way to cope with difficult business conditions. Cowling et al. (2014) and Peric and Vitezic (2016) find that firms in all manufacturing sectors in particular experienced significant declines in sales and employment, during a period of economic crisis.

This finding may be particularly true for early stage SMEs. Specifically, in the start-up and early stages phase firms require external financial resources (Cassar 2004). These informational opaque firms (Berger and Udel 1998) often have to conform to financial needs that show similarity at industry level. The literature has shown that the industry dynamics of the SMEs have a key influence on firm' financing choices. For example, La Rocca et al. (2010) show that firms in manufacturing sectors use more bank loan financing and Andrieu et al. (2018) find that firms in these sectors have an easier access to bank debt financing, due to lower information asymmetries. However, little research has been devoted to understanding the impact of industry external financial dependence for start-ups, early stage financing policies and their effect on business growth. Typically, start-ups and early stage firms have few internal resources to sustain growth, implying a greater requirement on bank financing, especially if these firms operate in industries more dependent on external finance. More specifically, we contend that industry more reliant on external finance can shape start-ups' behavior which could effectively manage relationship with banks through close and continued interaction, and in this way improve their growth capacity. Consequently, we can expect that Industry external financial dependence positively moderated the relationship between bank debt and business growth.

To measure the dependence to external finance by each industry, we followed the idea by Rajan and Zingales (1998) and Cetorelli and Strahan (2006), as we consider the degree to which cash flow generated by operational activities is sufficient to cover investment. We calculated the industry external financial dependence index, named "Industry EFD", as a median value of the difference between capital expenditures and cash flow from operations, scaled by capital expenditures, for all firms in the same industry. Thus, we used a "Dummy Industry EFD" equal to 1 for SMEs that operate in an industry that is typically external financially dependent (having expenditure for investment higher of free cash flow from operation), and zero otherwise.

In terms of mean's comparison, firms in high financially dependence industry have, as expected, higher debt (0.20 compared to 0.15 for firms in low financially dependence industry) and even higher sales growth (6.81 compared to 6.65). These firms are typically larger in terms of size (6.90 compared to 6.19) and have the possibility to account on more tangible asset (0.23 compared to 0.09).

Table 9, from column (1) to column (10), reports regressions results concerning the main effect of debt on SMEs' sales growth and then its effect moderated by industry external financial dependence (*Dummy Industry EFD*).

Here Table 9

All regression coefficients of the interaction terms (Debt × Industry EFD) are statistically significant with a positive effect, showing the relevance of industry financial specificity. Industries significantly differ from one another in terms of their degree of dependence on external sources of financing, and differences in an industry's external financial dependence also affect the capability of debt to sustain firm growth. The jointly effect of the main variable (Debt) and the interaction term (Debt × Industry EFD) is decreasing from firms in the 1st year of age to firms in the 10th year of age. This means that the sensitivity of growth rate to debt financing increases significantly when a start-up belongs to a sector that is highly in need of external finance support, with a decreasing pattern along the early stage period. Therefore, for firms operating in external finance dependent industries, the role of debt on firm's growth is amplified.

3.6 Moderation effect of financially wealthy core-business

A growth in sales may be related to a growth in fixed investments (tangible and intangible assets) and a growth in working capital. In the case of the latter, the business generates a financial need that has to be covered in the short-term. Vice versa, if a firm is able to keep under control working capital, financial resources can be better dedicated to growth. Thus, we intend to consider the role of Net Operating Working Capital (NOWC) as a possible moderator of bank debt-growth relationship. In particular, the higher the NOWC, the less the firm is able to self-generate cash flows: NOWC absorbs financial resources that are not available for growth.. High levels of NOWC may be seen negatively by banks during the screening process (Churchill and Mullins, 2001). Such constraints would lead firms to use debt for financing working capital needs, rather for sustaining their growth through long term projects: firms may have to use funds from banks for the day-by-day management, instead of investing in the creation of partnerships, improving firm's brand, expanding the products/service offering, developing a more focused marketing strategy and customer relationships. Few studies have examined how working capital is able to influence the relationship between debt financing and firm growth. Thus, we investigate if investment in working capital may hamper the ability of firms to finance their growth and capacity to undertake value-creating projects (Deloof, 2003).

Empirically, Kieschnick et al. (2013) find that the higher the firm's bank debt level, the less valuable are investments in net operating working capital. Higher working capital levels require additional debt financing which increase financing expenses and reduce firm value. These results

suggest that firms with a high net working capital signal their lower financial capacity in managing the firm, given that the cash conversion cycle absorbs financial resources. Such firms may have an reduced bank debt capacity to support growth, and a positive NOWC could be a changing factor shaping the effect of debt on firm growth at early-stage.

We investigate whether the effect of debt on firm growth at early-stage is negatively moderated for firms having positive working capital investment. We measure NOWC as accounting receivables plus inventory minus accounting payables. Firms with positive NOWC have low accounting receivables and inventories and high accounting payables. They recover customer payments quicker than they pay their suppliers, which generates long-term resources available for business. We create an interaction term between the variable Debt and a dummy variable that take a value of 1 if firm have a positive NOWC *(Debt × Dummy positive WC)* and 0 otherwise. Table 10 shows the results of our investigations on this moderating effect. In particular, Table 10 from column (1) to column (10) shows the main effect of Debt on sales growth and then the effect of the interaction term. Statistically, the effect of debt on sales' growth is significantly moderated by the variable Positive WC. In particular, the interaction term (Debt × Positive WC) values show that for firm with positive NOWC, the role of debt in sustaining growth is reduced. This confirms that a business that has a positive NOWC can have an difficult access to financial credit, which reduce its growth in sales by debt.

Here Table 10

3.7 Is there a different effect if we consider short-term rather than long-term debt financing?

The effect of debt on business growth can be different according to the maturity of debt. Short-term debt has different features in comparison to long-term debt. Short-term debt has the advantage that the period during which an opportunistic firm can exploit its creditors without being in default is limited, the expropriation of creditors' value by managers is reduced, and loans can be repriced or terminated to reflect new information. Therefore, it provides financial flexibility that signals future growth opportunities (Barclay and Smith 1995, Barclay et al. 2003) and gives owners/managers strong incentives to avoid poor outcomes and wasteful activities, thus imposing financial and managerial discipline (Jensen 1986, Diamond 1991). Short-term debt is often suggested as a way to solve corporate governance problems regarding investment distortion (Myers 1977); it reduces

underinvestment problems, thereby reducing asymmetric information and increasing efficiency (Myers and Majluf 1984). On the other side, long-term debt protects a firm from liquidation by imperfectly informed creditors, instead leaving its control in the hands of the manager/entrepreneur. It also prevents opportunistic creditors from using the threat of liquidation to expropriate the profits of healthy companies (Sharpe 1990, Rajan 1992), offers lower interest rates, and avoids shortening of the investment horizon ("short-termism").

All these arguments suggest that firms in the early stage of their life cycle, may be very well dependent on short-term debt, since repayment of the debt and interests allow effective monitoring by banks (Myers, 1977; Barclay and Smith 1995). Short-term maturity debt gives a bank greater flexibility and strengthened protections of their investments which is especially valuable when firm quality cannot be determined at start-up stage (Nini et al.,2012; Fan et al. 2012; Masiak et al., 2019). However, long-term debt could be related to tangible long-term investments that provide collateral assets, supporting the growth of the company. Thus, counterbalancing effects are at work, and over time we may hypothetize that they may be a substitution effect between short-term and long-term debt.

Figure 5 highlights the different trend in short-term debt and long-term debt for the first ten years of firms' age. This graph representation suggests a greater use of short-term debt especially in the early years of the life cycle. Yet, it does not answer to the following question: what about the marginal effect on the firm's growth of these different forms of debt?

Tables 11 (panel A and panel B) shows the role of long-term debt and short-term debt on firm growth. The different maturity of debt is measured as long-term financial debt scaled to total asset and loans scaled to total asset, respectively. We find that the long-term debt seems to be more effective in promoting sales growth, both in terms of statistical significance and magnitude, with a decreasing pattern similar to our main model's results showed in Table 6 considering debt as a whole (without sorting for maturity). Long-term debt is typically used for long-term investments inside the company that provides collateral assets to guarantee the repayment. This source of finance seems to be the more relevant in supporting growth-creating activities.

Here Figure 5

Here Table 11

3.8 Robustness tests

We do a number of additional analyses and tests to validate our findings.

Different measures of firm's growth. Although changes in sales is the most obvious measure of the business healthy and growth opportunity, to appreciate how the product/service generate interest in the customers, it is possible to use alternative variables. We test our main results using as dependent variable total assets growth (% annual change), employment growth and even industry-adjusted sales growth. In all the cases our main results remain confirmed.

Different measures of Debt usage and maturity. We used also the natural log of total bank debt as alternative to the variable Debt, that was measured as proportion of bank debt to total asset. Even in this case, our main results remain confirmed. Moreover, we used the natural logarithmic for long-term debt and short-term debt. In this case, it becomes more evident that long-term debt is particularly relevant in shaping firms' growth, while short-term debt results statistically significant only at the start-up phase and slightly in the second year of age.

Different measures in the moderators. We want to test whether our results are confirmed using different proxy for the role of external financial dependence. As a different proxy of external financial dependence, we use the indicator provided by Deloof and Vanacker (2018) and Cetorelli and Strahan (2006) to measure financial bank dependence. The idea of Deloof and Vanacker (2018) states that firms operating in different industries have a different dependence on - or innate demand for - bank debt. This argument is suggested to be particularly effective for start-ups, which tend to conform to industry practices (Smith and Smith, 2004). Consequently, firms operating in bank dependent industry rely more on bank debt to finance growth. Specifically, we calculated the median ratio of bank debt to total assets for firms in 4-digit industry, measured in non-crisis year (in a regular going concern). The results showed the same sign and a similar pattern of Table 6. Thus, our results are confirmed.

Econometric technique. We tested if the results were confirmed even with a correction of the standard errors for the possible dependence of the residuals within country clusters jointly with firm-specific cluster. Even clustering standard errors at the firm and country level our main results remain the same[5].

Crisis and year effects. Our results could be affected by the crisis period that is part of the period of the analysis. Thus, we decided to split the sample in two sub-samples of four and five years (during

[5]We used the Stata-routine written by Mitchell Petersen to cluster standard errors by two dimensions: see http://www.kellogg.northwestern.edu/faculty/petersen/htm/papers/se/se_programming.htm.

the crisis and after the crisis) and run all the regression models for each of the two sub-samples. Considering a sub-sample based on the years from 2011 to 2015, our findings remain identical. With regards to the sub-sample based on the years from the 2007 to the 2010, the results and the financial pattern were confirmed just at the very early stage.

What about the relationships in firms at later stage of the life cycle? We applied our main model to older firms, from 11 years old and up. For firms having up of 13 years of age the results revealed a negative effect of debt on firm's growth, when statistically significant. Even considering a whole sample of all firms at different age (from start-ups to up), the best functional form, showing the higher R squared, is the one including the variable Debt and its squared term. And the outcome still suggests a decreasing effect of debt on sales' growth in the early stage, that turns to be positive in the later stage. Thus, in the early stage the role of debt on firm's growth is different compared to older firms.

Restricted industry samples. Although we control in the regressions for industry effects, we applied the same approach of Deloof, La Rocca and Vanacker (2019) to tests our results for a sub-sample without service firms (NACE codes from 10 to 33). The results confirm our main findings.

Business angel and venture capital investments. As suggested by Deloof et al. (2019), it is important to scrutinize the potential role in capital structure decisions and debt usage of early stage firms by business angel and venture capital availability of funds (Berger and Udell 1998). We collected from OECD Stat further data about the venture capital investments, in the form of start-up and other early stage investments, as percentage of GDP at country level. This measure allows to account for the availability of venture capitalists in a country to support the finance of firms. The new results, based on 21 out of the 27 countries in our sample, confirm qualitatively and quantitatively our main outcomes.

4. Discussion and contributions

4.1. Contributions and theoretical implications

Literature in entrepreneurial finance (Carey et al. 1993; Berger and Udell, 1998) suggests that the firm's life cycle is a strong determinant of firms' financing decisions. The present study responds to calls for additional contribution on the role of bank debt in the earliest stages of a firm's life cycle

(Deloof and Vanacker 2018). While common wisdom in the academia suggests in line with Berger and Udell (1998) that start-ups and early stage firms are mainly financed by equity capital, the role of banks for entrepreneurial financing has been neglected. As argued by Deloof, La Rocca and Vanacker (2019), citing Cumming and Vismara (2017), there is a bias in the entrepreneurial finance literature which strictly focus on equity financing. A relatively recent literature claims that, for start-ups and early stage firms, the role of debt is underestimated (Huyghebaert, Van de Gucht and Van Hulle 2007) and empirical investigation is needed (Deloof and Vanacker 2018). We push a step further the literature on the relevance of start-ups' financing.. Extending past works on bank debt financing choices (e.g., Huyghebaert, and Van de Gucht, 2007; Huyghebaert et al.2007; La Rocca et al. 2011; Robb and Robinson, 2014), and on the relationship between corporate financing and start-ups' growth (e.g., Moritz et al, 2016; Cassar, 2004; Cole and Sokolyk, 2018), our study makes it possible to evaluate the impact of debt on firm growth along the early stage of firms, from the start-up year onward, and for first ten years of firm's life.

The present study provides several contributions to the entrepreneurial finance literature. It shows that debt strongly supports start-ups' growth. It also shows that there is a decreasing pattern resulting in the relationship along the early stage. Having debt at start-up and early stages revealed to be as a valuable tool in supporting the growth of the early stage firms. Our study offers a comprehensive analysis of the dynamics of debt effect over the startup's lifetime

By analysing the effect of bank financing on productivity (e.g., Coad et al., 2016) and on firms' survivorship (e.g., Kale and Arditi, 1998; Bonaccorsi di Patti and Gobbi 2001), our framework contributes to expanding the knowledge on whether growth is valuably supported by debt for start-up and early stage firms or if this source of funding is a potential growth for sake

The present study also investigates the boundary conditions under which our theoretical arguments are most likely to hold. The moderating effects of industry external financial dependence and working capital level observed in this study extend a burgeoning literature on these topics.

Industry-specific features could moderate our main relationship between bank debt financing and growth. The industry dynamics has also been investigated as a moderator in several studies. Rajan and Zingales (1998) and Bena and Ondko (2012) show that industries significantly differ from one to another in their degree of dependence on external sources of financing. Following these authors, we argue that differences in an industry's external financial dependence also affect the firm debt capability to sustain firm growth. Thus, in some industries the effect of debt on SMEs' growth could differ.

The Working Capital level is also a possible moderator of bank debt-growth relationship. Financial institutions appreciate firms with negative net working capital that have a financially valuable core-business and are better able to auto-generate a flow of cash(e.g., Churchill and Mullins, 2001).

Our study offers also confirms the relevant role of debt maturity. By demonstrating a greater capacity of long term debt to foster firm's growth, this study extends prior research on debt maturity, which has mainly focused on the role of the determinant of debt maturity (Barclay and Smith, 1995; Fan et al. 2012; Masiak et al., 2019).

The results in this paper do not undermine the theory of financial life cycle of Berger and Udell (1998), but posit the jointly role of debt since the start up stage. Simply, even at the start up and early stage phase of the life cycle, it is relevant to sustain growth the usage of debt, beyond other source of finance.

4.2. Contributions to empirics and practice

The study provides some useful advice for practitioners and managers regarding the controversial relationship between debt financing and life cycle. Our findings support the role of debt as fuel to growth at the start-up and early stage phases of the firms' life cycle. Yet, the outcome concerning the positive role of debt for growth has to be caught *cum granu salis*. It does not mean that only bank debt has to be used to sustain growth at the start-up phase but it may be used jointly with equity. While debt has been previously criticized in the startup context (Berger and Udell 1998), our results add a different perspective.

Next, our study extend research on the role of bank debt as we analyze its impact on growth pattern as well as firms' outcome. Specifically, our findings extend previous work on firm productivity (e.g., Coad et al., 2016) and bankruptcy risk (e.g., Kale and Arditi, 1998) at start-up stage. We found a positive impact of debt on productivity with a decreasing pattern during early stages. We also found that debt is negatively related to firm's probability of bankruptcy at very early stage years, with an opposite pattern during following years. The use of bank debt by firms in the early stage seems to play a role in improving corporate productivity, although with a decreasing effect along the years, and shaping bankruptcy risk, since it reduces the probability of bankruptcy for new firms at the start-up year with a reverse effect from firms having 4 year of age onward.

We further tested the role of debt in early stage growth rate by examining the moderating role of industry finance dependence and working capital. Overall, our results reveal a significant role of these variables suggesting that industry dynamics and of working capital play an important role in explaining our baseline relationship. Our analysis reveals also that long term debt has a more

relevant impact on firm's growth. These findings contribute to understand the informative role of maturity in bank debt financing, better explaining manager decision-making during early-stage phases.

We suggest that policy makers should support convenient provision of debt finance to start-ups and very early stage firms. The use of debt provides firms in the early stage with more potential to grow and better productivity along the years jointly with a higher probability to survive at least in the first year of age. These effects are stronger for new firms at start up time .

4.3. Limitations and directions for future research

To conclude, we point some limitations of our study. Our results open avenues of research regarding the impact of capital structure decisions for young firm and the dynamics of these decisions over the firm's lifetime. In particular, they show that firm's early stage growth is widely affected by bank debt. Firms in the early stage are in need of finance to make the proper investments and execute their strategies. Potential capabilities may not be sufficiently endowed with the equity and even more considering internally generated resources. Although the analysis does not allow to order for priority and relevance the different source of finance for start-ups and early stage firms, using bank debt resulted a relevant factor in fostering growth for these kind of firms.

The prospect of taking on debt, or deciding how much and when to take it on, is an issue that usually keeps many entrepreneurs up at night. It is highly important for firms' managers to keep the debt load manageable. As a consequence, further research should try to appreciate the magnitude of the different source of finance through a comparison. Several approaches may be used. For example, survey and questionnaires might be very useful to investigate if there is an order of preference in the financing sources for these firms or if these firms, from their birth, and how they try to adjust their capital structure around an optimal combination of debt and equity after a few years of operations.

Moreover, we also find that industry external dependence is significant in moderating our main relationship. The role of debt in fostering corporate growth is amplified for early stage firms that operate in industries that are financially dependent from external finance. In addition, the role of industry is relevant, even for young firms, as generally suggested by Harris and Raviv (1991). Thus, further research should investigate which industry features are more relevant for start-ups and early stage firms in shaping capital structure decisions. The degree of regulatory statement, the degree of growth opportunity or technology, the degree of capital intensity, the role of labour force, and so on are all potential directions that future research should examine.

5. Conclusions

This study intended to improve our understanding of debt financing-growth relationship. In particular, it aimed to improve our understanding of the role of start-ups' debt financial and growth implications, examining the conditions under which this financing decisions matters. This study advances the literature on entrepreneurial finance by examining the effects of debt financing on startups' growth and their productivity and on the probability of bankruptcy. Empirical analysis of a large sample of EU startups reveals that debt financing encourages early stage firms growth and productivity reducing the probability of bankruptcy and that these relationships evolves over time. In addition, this study adds insight investigating the boundary conditions under which theoretical arguments are most likely to hold.

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Table 1 – Description of the variables in the baseline model.

Dependent variables	***Calculation***	***Source***
Sales Growth$_{t+1}$	(Sales$_{t+1}$ – Sales$_t$) / Sales$_t$	Orbis of Bureau Van Dijk
Explanatory variables		
Debt$_t$	(Long-Term Debt + Loans) / Total Assets	Orbis of Bureau Van Dijk
ROA$_t$	EBIT / Total Asset	Orbis of Bureau Van Dijk
Size$_t$	ln(total assets)	Orbis of Bureau Van Dijk
Tangibility$_t$	Tangible Assets / Total Assets	Orbis of Bureau Van Dijk
Cash Holdings$_t$	Cash & cash equivalents / total assets	Orbis of Bureau Van Dijk
GDP Growth$_t$	Growth rate of gross domestic product	World Bank database: seijk
Financial development	Domestic credit to private sector by banks as a percentage of GDP	World Bank database:
Entrepreneurship density	New business density (new registrations per 1,000 people ages 15-64). New businesses registered are the number of new limited liability corporations registered in the calendar year.	World Bank database:

Table 2 – Descriptives concerning the polled sample of firms as combination of firms in different age.

	Mean	Median	SD	Min	1° quartile	3° quartile	Max
Sales Growth$_{t+1}$	6.710	-0.008	29.400	-1.000	-0.633	1.187	234.182
Debt	0.172	0.050	0.232	0.000	0.000	0.286	0.910
Size	6.421	6.616	1.979	0.888	5.191	7.878	10.236
ROA	0.101	0.051	0.234	-0.643	0.011	0.142	1.177
Tangibility	0.212	0.099	0.253	0.000	0.008	0.349	0.941
Cash Holdings	0.110	0.039	0.164	0.000	0.007	0.139	0.812
GDP growth	0.722	0.700	3.365	-14.814	-1.691	2.744	11.087
Financial development	0.747	0.559	0.378	0.000	0.453	0.929	2.482
Entrepreneurship density	3.574	3.897	1.763	0.481	2.443	4.235	17.981

Number of observations: 1.076.185. For the description of the variables, see Table 1.

Table 3 – Descriptives for Sales Growth$_{t+1}$ and Debt at different ages (from firms at the 1st year of age to firms at the 10th year of age).

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
		Firms in the 1st year of age	Firms in the 2nd year of age	Firms in the 3rd year of age	Firms in the 4th year of age	Firms in the 5th year of age	Firms in the 6th year of age	Firms in the 7th year of age	Firms in the 8th year of age	Firms in the 9th year of age	Firms in the 10th year of age
Sales Growth$_{t+1}$	Mean	8.264	8.017	7.618	7.091	6.785	6.434	6.118	5.891	5.501	4.920
	Median	0.103	0.058	0.032	0.010	-0.009	-0.023	-0.035	-0.044	-0.050	-0.058
	SD	32.01	31.73	31.14	30.06	29.75	29.24	28.35	27.84	26.93	25.05
Debt	Mean	0.138	0.156	0.169	0.175	0.178	0.179	0.180	0.182	0.182	0.182
	Median	0.000	0.010	0.031	0.048	0.058	0.066	0.072	0.080	0.085	0.090
	SD	0.230	0.237	0.240	0.238	0.235	0.232	0.230	0.228	0.224	0.220
Size	Mean	5.620	5.865	6.122	6.337	6.496	6.596	6.676	6.779	6.881	6.982
	Median	5.676	5.951	6.247	6.490	6.677	6.797	6.899	7.020	7.136	7.244
	SD	5.620	5.865	6.122	6.337	6.496	6.596	6.676	6.779	6.881	6.982
ROA	Mean	0.139	0.121	0.109	0.100	0.096	0.094	0.092	0.087	0.084	0.079
	Median	0.057	0.056	0.054	0.052	0.051	0.050	0.050	0.048	0.048	0.047
	SD	0.139	0.121	0.109	0.100	0.096	0.094	0.092	0.087	0.084	0.079
Tangibility	Mean	0.146	0.171	0.192	0.207	0.218	0.225	0.231	0.240	0.247	0.253

	Median	0.023	0.048	0.072	0.090	0.104	0.117	0.127	0.142	0.154	0.167
	SD	0.146	0.171	0.192	0.207	0.218	0.225	0.231	0.240	0.247	0.253
Cash Holdings	Mean	0.130	0.120	0.113	0.109	0.106	0.105	0.103	0.103	0.103	0.103
	Median	0.049	0.042	0.040	0.038	0.037	0.037	0.036	0.036	0.037	0.038
	SD	0.130	0.120	0.113	0.109	0.106	0.105	0.103	0.103	0.103	0.103
GDP growth	Mean	0.662	0.721	0.749	0.827	0.843	0.875	0.735	0.580	0.583	0.603
	Median	0.700	0.700	0.700	0.731	0.956	0.924	0.700	0.700	0.700	0.700
	SD	0.662	0.721	0.749	0.827	0.843	0.875	0.735	0.580	0.583	0.603
Financial development	Mean	0.672	0.682	0.703	0.721	0.738	0.753	0.771	0.794	0.818	0.840
	Median	0.548	0.548	0.548	0.548	0.559	0.559	0.559	0.588	0.723	0.815
	SD	0.672	0.682	0.703	0.721	0.738	0.753	0.771	0.794	0.818	0.840
Entrepreneurship density	Mean	3.685	3.652	3.572	3.527	3.512	3.553	3.581	3.569	3.553	3.529
	Median	3.926	3.926	3.897	3.891	3.829	3.855	3.855	3.663	3.424	3.247
	SD	3.685	3.652	3.572	3.527	3.512	3.553	3.581	3.569	3.553	3.529

Table 4 – Correlations concerning the polled sample of firms as combination of firms in different age.

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	Max VIF
1	Sales Growth$_{t+1}$	1.00									
2	Debt	0.00	1.00								1.18
3	Size	-0.25	0.24	1.00							1.35
4	ROA	0.01	-0.16	-0.27	1.00						1.14
5	Tangibility	-0.03	0.31	0.25	-0.11	1.00					1.18
6	Cash Holdings	0.04	-0.22	-0.27	0.25	-0.23	1.00				1.18
7	GDP growth	-0.00	-0.02	-0.04	0.06	0.01	0.04	1.00			1.11
8	Financial development	-0.09	0.18	0.36	-0.15	0.11	-0.04	-0.25	1.00		1.27
9	Entrepreneurship density	0.02	0.04	-0.08	0.06	0.04	0.06	0.16	0.03	1.00	1.05

Correlations greater than 0.03 or lower than -0.03 are statistically significant at the 0.05 level or lower.

Table 5 - VIF test (Variance Inflation Factor) for the samples in each year of firm's age.

		(1) Firms in the 1st year of age	(2) Firms in the 2nd year of age	(3) Firms in the 3rd year of age	(4) Firms in the 4th year of age	(5) Firms in the 5th year of age	(6) Firms in the 6th year of age	(7) Firms in the 7th year of age	(8) Firms in the 8th year of age	(9) Firms in the 9th year of age	(10) Firms in the 10th year of age
2	Debt	1.15	1.17	1.19	1.19	1.2	1.2	1.19	1.19	1.19	1.19
3	Size	1.43	1.4	1.37	1.34	1.32	1.3	1.29	1.27	1.25	1.22
4	ROA	1.19	1.15	1.14	1.12	1.12	1.12	1.12	1.12	1.11	1.11
5	Tangibility	1.2	1.2	1.2	1.19	1.18	1.17	1.15	1.14	1.14	1.13
6	Cash Holdings	1.16	1.17	1.18	1.18	1.19	1.19	1.19	1.19	1.19	1.2
7	GDP growth	1.12	1.1	1.09	1.1	1.12	1.13	1.12	1.1	1.1	1.12
8	Financial develop.	1.28	1.26	1.25	1.27	1.26	1.26	1.25	1.23	1.23	1.24
9	Entrepr. density	1.05	1.05	1.05	1.05	1.06	1.06	1.06	1.06	1.06	1.07

Correlations greater than 0.03 or lower than -0.03 are statistically significant at the 0.05 level or lower.

Table 6 – Results concerning the relationship between Debt and Sales Growth$_{t+1}$ in the early stage (from 1st to 10th year of age): baseline model (hypothesis 1).

	(1) Firms in the 1st year of age	(2) Firms in the 2nd year of age	(3) Firms in the 3rd year of age	(4) Firms in the 4th year of age	(5) Firms in the 5th year of age	(6) Firms in the 6th year of age	(7) Firms in the 7th year of age	(8) Firms in the 8th year of age	(9) Firms in the 9th year of age	(10) Firms in the 10th year of age
Debt	**10.415*****	**8.182*****	**7.490*****	**6.379*****	**6.345****	**4.196****	**4.360****	**4.267***	**3.355***	2.619
	(1.529)	(1.446)	(1.562)	(2.081)	(2.313)	(1.754)	(1.858)	(2.330)	(1.727)	(2.294)
Size	-4.018***	-4.231***	-4.358***	-4.404***	-4.488***	-4.419***	-4.118***	-4.141***	-4.128***	-3.824***
	(0.846)	(0.910)	(0.998)	(1.031)	(1.075)	(1.108)	(1.008)	(1.112)	(1.133)	(1.087)
ROA	-2.827***	-4.256***	-5.345***	-7.465***	-6.952***	-9.000***	-8.463***	-8.827***	-7.810***	-7.542***
	(0.583)	(0.936)	(1.326)	(1.558)	(1.755)	(2.002)	(1.804)	(2.132)	(1.670)	(2.257)
Tangibility	7.791***	4.816***	4.608***	3.205***	1.801**	1.088	1.260	-0.110	-1.038	-1.327
	(0.683)	(1.037)	(1.498)	(0.982)	(0.830)	(0.729)	(1.201)	(0.789)	(1.152)	(1.032)
Cash Holdings	2.124**	0.233	-1.792**	-1.786*	-2.480*	-2.635*	-3.549***	-2.010	-3.028*	-3.889**
	(0.903)	(0.818)	(0.741)	(0.931)	(1.339)	(1.441)	(1.191)	(1.204)	(1.519)	(1.668)
GDP growth	-0.241**	-0.444***	-0.212***	-0.202***	-0.159**	-0.140**	-0.196**	-0.152**	-0.124**	-0.091
	(0.099)	(0.079)	(0.062)	(0.069)	(0.062)	(0.067)	(0.073)	(0.063)	(0.045)	(0.056)
Financial develop.	-0.040	-0.048	-0.217	-0.485	-0.713	-0.518	-0.745	-0.511	-0.331	-0.641
	(1.966)	(1.817)	(1.655)	(1.509)	(1.238)	(1.205)	(1.066)	(0.996)	(1.088)	(0.753)
Entrepr. density	-0.023	0.107	-0.012	-0.023	-0.055	-0.004	0.025	-0.013	-0.050	-0.056
	(0.220)	(0.221)	(0.229)	(0.221)	(0.238)	(0.205)	(0.210)	(0.237)	(0.189)	(0.164)
R^2	0.069	0.074	0.074	0.077	0.079	0.078	0.075	0.078	0.081	0.077
Observations	103194	116541	115066	111596	109132	109296	108605	103605	98285	93275

Notes: Results concern a cross-sectional analysis based on firms having a certain age (from firms at the 1st year of age to firms at the 10th year of age) across the period 2008-2015. For the description of the variables, see Table 1. Robust standard errors clustered by countries, are reported in brackets. Year and industry dummies are included in the regressions while their coefficients are not reported in the Table. ***: denotes significance at the 1% level; **: denotes significance at the 5% level; *: denotes significance at the 10% level.

Table 7 – Results of the relationship between Debt and firm Growth Productivity$_{t+1}$ in early stage (from 1st to 10th year of age).

	(1) Firms in the 1st year of age	(2) Firms in the 2nd year of age	(3) Firms in the 3rd year of age	(4) Firms in the 4th year of age	(5) Firms in the 5th year of age	(6) Firms in the 6th year of age	(7) Firms in the 7th year of age	(8) Firms in the 8th year of age	(9) Firms in the 9th year of age	(10) Firms in the 10th year of age
Debt	**8.494*** **	**7.201*** **	**6.487*** **	**4.953*** **	**5.573** **	**4.016** **	**3.964** **	3.658	**3.299***	2.950
	(1.594)	(1.346)	(1.565)	(1.695)	(2.020)	(1.633)	(1.922)	(2.149)	(1.934)	(2.044)
Control Variables	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
R^2	0.084	0.085	0.081	0.085	0.091	0.086	0.086	0.088	0.094	0.092
Observations	82028	94042	93849	91757	90499	90705	89235	84964	80202	70046

Notes: Results based on a cross-sectional analysis based on firms having a certain age (from firms at the 1st year of age to firms at the 10th year of age) across the period 2008-2015. Robust standard errors clustered by countries, are reported in brackets. ***: denotes significance at the 1% level; **: denotes significance at the 5% level; *: denotes significance at the 10% level.

Table 8 –Results of the relationship between Debt and Probability of Bankruptcy in the early stage (from 1st to 10th year of age).

VARIABLES	(1) Firms in the 1st year of age	(2) Firms in the 2nd year of age	(3) Firms in the 3rd year of age	(4) Firms in the 4th year of age	(5) Firms in the 5th year of age	(6) Firms in the 6th year of age	(7) Firms in the 7th year of age	(8) Firms in the 8th year of age	(9) Firms in the 9th year of age	(10) Firms in the 10th year of age
Debt	**-0.024*** **	-0.001	0.008	**0.023*** **	**0.027*** **	**0.030*** **	**0.027*** **	**0.030*** **	**0.038*** **	**0.043*** **
	(0.008)	(0.007)	(0.008)	(0.008)	(0.007)	(0.008)	(0.007)	(0.007)	(0.004)	(0.006)
Control variables	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
R^2	0.066	0.071	0.073	0.075	0.080	0.076	0.075	0.078	0.080	0.102
Observations	103500	116968	115610	112241	109835	110056	109520	104653	99409	94314

Notes: Results based on a cross-sectional analysis based on firms having a certain age (from firms at the 1st year of age to firms at the 10th year of age) across the period 2008-2015. Robust standard errors clustered by countries, are reported in brackets. ***: denotes significance at the 1% level; **: denotes significance at the 5% level; *: denotes significance at the 10% level.

Table 9 – Results concerning the relationship between Debt and Sales Growth$_{t+1}$ in the early stage (from 1st to 10th year of age): the moderating role of Industry External Finance Dependence .

	(1) Firms in the 1st year of age	(2) Firms in the 2nd year of age	(3) Firms in the 3rd year of age	(4) Firms in the 4th year of age	(5) Firms in the 5th year of age	(6) Firms in the 6th year of age	(7) Firms in the 7th year of age	(8) Firms in the 8th year of age	(9) Firms in the 9th year of age	(10) Firms in the 10th year of age
Debt	**7.850*****	**5.963*****	**4.989****	**4.788***	**4.357***	**2.421**	**2.199**	**2.510**	**1.995**	**0.943**
	(2.018)	(1.756)	(1.839)	(2.348)	(2.272)	(2.274)	(2.013)	(2.297)	(1.872)	(2.002)
Debt × Industry EFD	**6.764*****	**5.766*****	**6.232*****	**3.861*****	**4.759*****	**4.275*****	**5.202*****	**4.157*****	**3.366*****	**4.159*****
	(1.446)	(1.205)	(0.540)	(1.029)	(1.410)	(1.414)	(0.831)	(0.937)	(0.715)	(1.109)
Industry EFD	1.389***	1.138**	1.003**	0.522	0.146	0.391	0.111	0.255	0.906	0.357
	(0.492)	(0.420)	(0.410)	(0.357)	(0.287)	(0.647)	(0.321)	(0.215)	(0.798)	(0.462)
Control variables	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
R^2	0.070	0.075	0.075	0.078	0.080	0.079	0.075	0.079	0.081	0.077
Observations	103201	116549	115074	111607	109146	109319	108635	103639	98323	93310

Notes: Results based on a cross-sectional analysis based on firms having a certain age (from firms at the 1st year of age to firms at the 10th year of age) across the period 2008-2015. For the description of the variables, see Table 1. Robust standard errors clustered by countries, are reported in brackets. ***: denotes significance at the 1% level; **: denotes significance at the 5% level; *: denotes significance at the 10% level.

Table 10 – Results of the relationship between Debt and Sales Growth$_{t+1}$ in early stage (from 1st to 10th year of age) moderated by financially wealthy core-business (Positive Net Operating Working Capital).

	(1) Firms in the 1st year of age	(2) Firms in the 2nd year of age	(3) Firms in the 3rd year of age	(4) Firms in the 4th year of age	(5) Firms in the 5th year of age	(6) Firms in the 6th year of age	(7) Firms in the 7th year of age	(8) Firms in the 8th year of age	(9) Firms in the 9th year of age	(10) Firms in the 10th year of age
Leverage	12.55***	11.11***	9.214***	10.52**	9.760*	7.038*	7.460*	8.971*	5.194	4.658
	(20.94)	(10.50)	(6.10)	(3.09)	(2.74)	(2.50)	(2.57)	(2.35)	(1.53)	(1.13)
Leverage X_positive WC	-3.186*	-3.970***	-2.282**	-5.355*	-4.338*	-3.552	-3.875*	-5.722*	-2.258	-2.540
	(-2.15)	(-5.98)	(-3.44)	(-2.50)	(-2.12)	(-2.01)	(-2.51)	(-2.47)	(-1.04)	(-1.09)
Positive_WC	0.681	0.666	0.0749	0.0157	0.00410	0.177	-0.202	0.204	-0.639	-0.799
	(0.62)	(0.52)	(0.07)	(0.01)	(0.00)	(0.14)	(-0.17)	(0.15)	(-0.51)	(-0.83)
_cons	49.80*	60.06***	32.21***	37.06	31.54***	32.94***	34.51	32.85***	34.02	26.93***
	(2.59)	(4.48)	(6.98)	(0.00)	(9.67)	(6.00)	.	(5.31)	(0.00)	(5.06)
N	103509	116968	115610	112260	109835	110056	109520	104666	99421	94340

Notes: Results based on a cross-sectional analysis based on firms having a certain age (from firms at the 1st year of age to firms at the 10th year of age) across the period 2008-2015. For the description of the variables, see Table 1. Robust standard errors clustered by countries, are reported in brackets. ***: denotes significance at the 1% level; **: denotes significance at the 5% level; *: denotes significance at the 10% level.

Table 11 Panel (A) – Results concerning the relationship between **Long Term Debt** and Sales Growth$_{t+1}$ in the early stage (from 1st to 10th year of age).

	(1) Firms in the 1st year of age	(2) Firms in the 2nd year of age	(3) Firms in the 3rd year of age	(4) Firms in the 4th year of age	(5) Firms in the 5th year of age	(6) Firms in the 6th year of age	(7) Firms in the 7th year of age	(8) Firms in the 8th year of age	(9) Firms in the 9th year of age	(10) Firms in the 10th year of age
Long term Debt / Tot. Asset	**10.617***** (2.531)	**7.945***** (1.509)	**6.518***** (1.623)	**4.977***** (1.686)	**4.974***** (1.659)	**4.457**** (2.031)	**3.643*** (1.832)	**3.597**** (1.662)	**3.250*** (1.808)	2.111 (1.894)
Control variables	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
R^2	0.066	0.073	0.072	0.076	0.078	0.078	0.074	0.077	0.080	0.076
Observations	103509	116968	115610	112260	109835	110056	109520	104666	99421	94340

Table 11 Panel (B) – Results concerning the relationship between **Short Term Debt** and firm growth t+1 in the early stage (from 1st to 10th year of age).

	(1) Firms in the 1st year of age	(2) Firms in the 2nd year of age	(3) Firms in the 3rd year of age	(4) Firms in the 4th year of age	(5) Firms in the 5th year of age	(6) Firms in the 6th year of age	(7) Firms in the 7th year of age	(8) Firms in the 8th year of age	(9) Firms in the 9th year of age	(10) Firms in the 10th year of age
Short term Debt / Tot. Asset	**8.161***** (0.916)	**6.863***** (1.498)	**6.434***** (1.518)	**5.935**** (2.276)	**5.979**** (2.846)	2.574 (1.685)	**3.756*** (2.116)	3.823 (3.050)	2.053 (2.085)	1.933 (2.826)
Control variables	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
R^2	0.065	0.072	0.072	0.076	0.078	0.077	0.074	0.077	0.080	0.076
Observations	103509	116968	115610	112260	109835	110056	109520	104666	99421	94340

Notes: Results based on a cross-sectional analysis based on firms having a certain age across the period 2008-2015. Description of the variables in Table 1. Robust standard errors clustered by countries, are reported in brackets. ***: denotes significance at the 1% level; **: denotes significance at the 5% level; *: denotes significance at the 10% level.

Figure 1 – Trend in Debt and Sales Growth $_{t+1}$, based on the mean value.

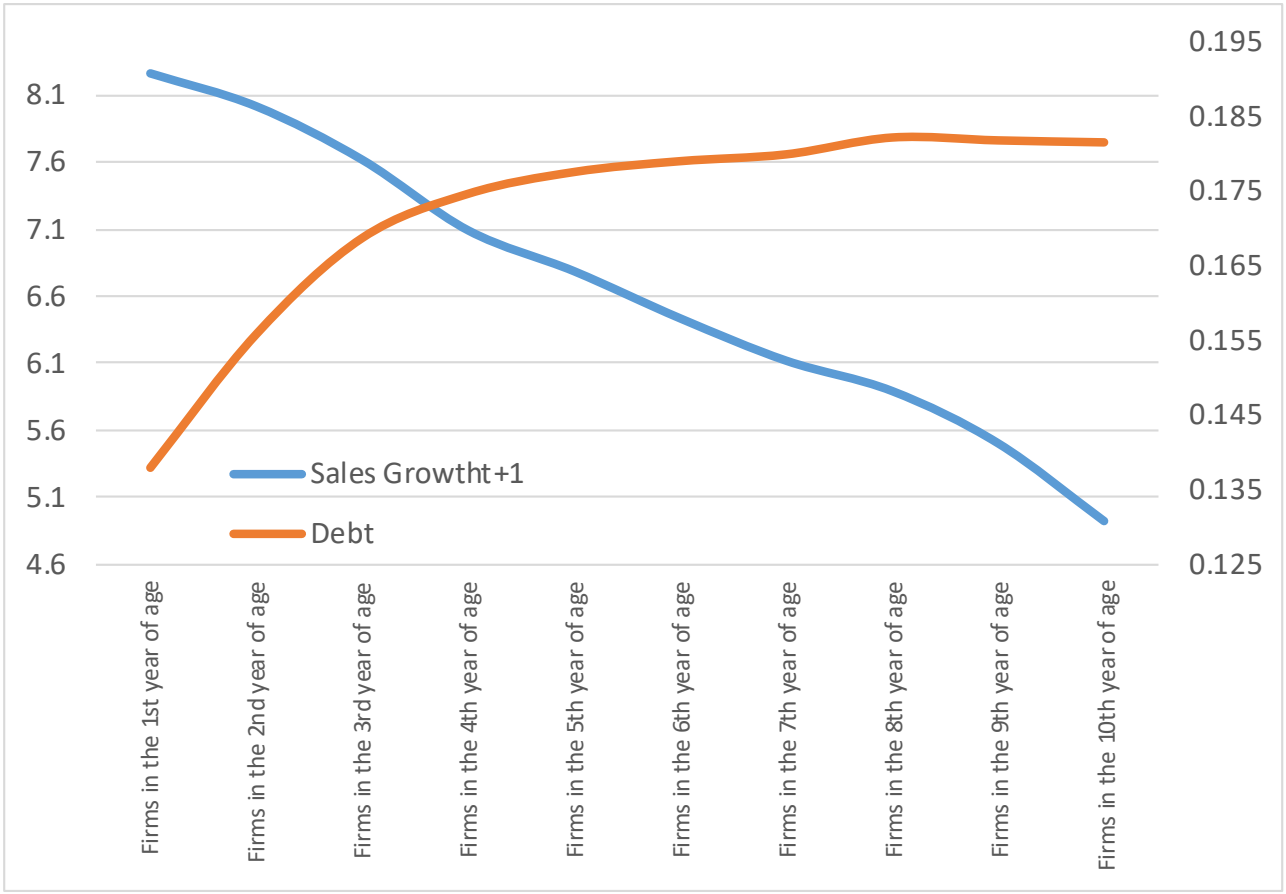

Figure 2 – Correlation between Debt and Sales Growth $_{t+1}$.

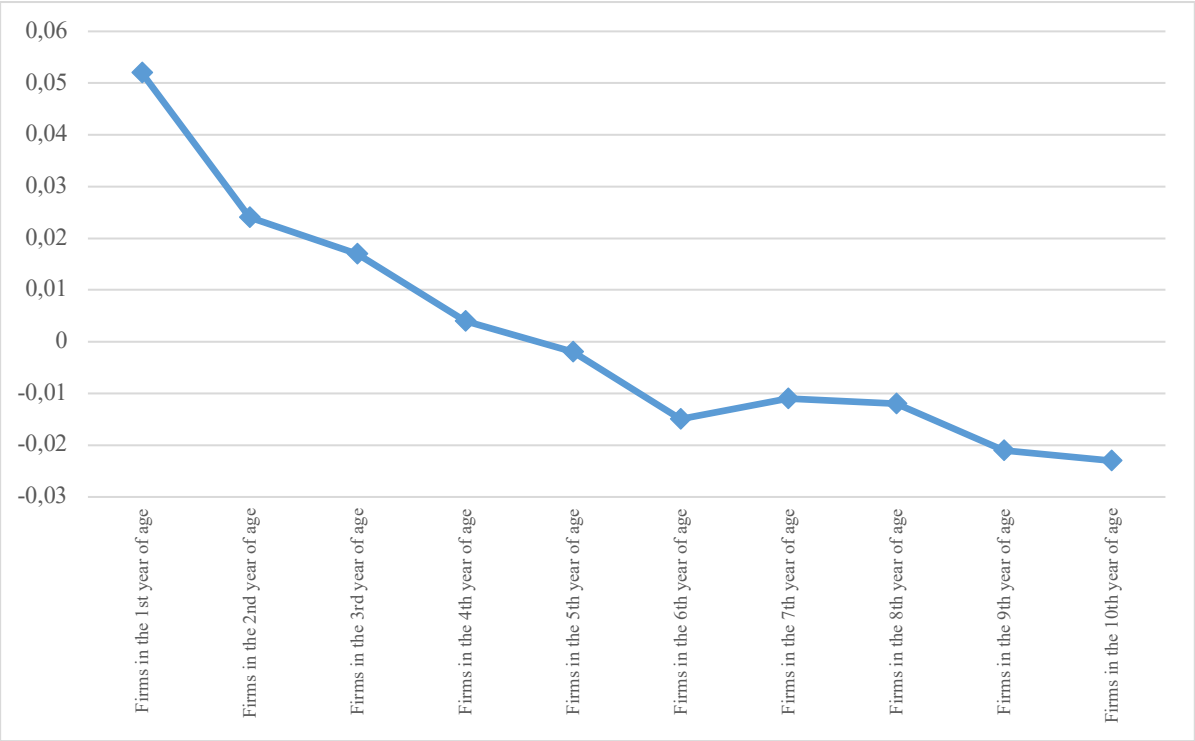

Figure 3 – Magnitude of the debt's regression coefficients on Sales Growth$_{t+1}$ from the baseline model (Table 5).

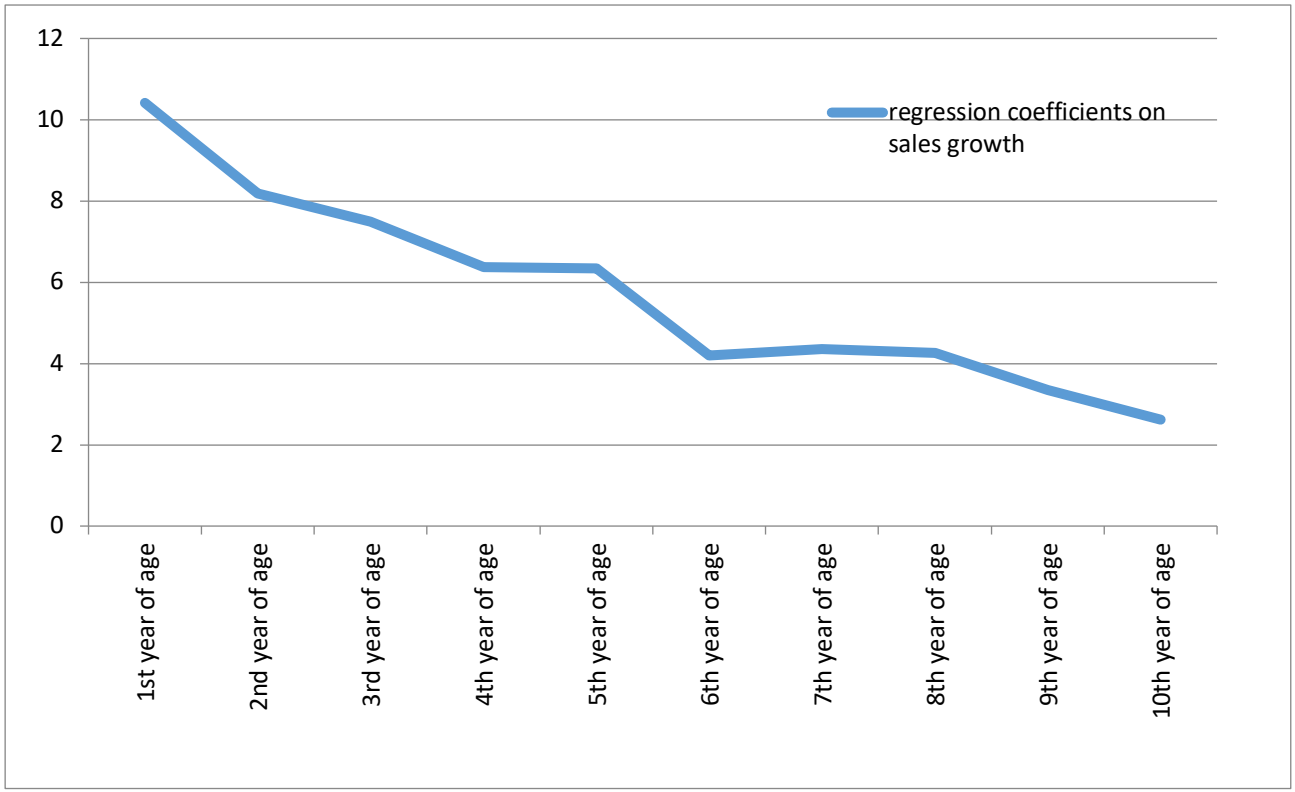

Figure 4 – Predicted effects of different level of debt on sales growth along the early stage phases.

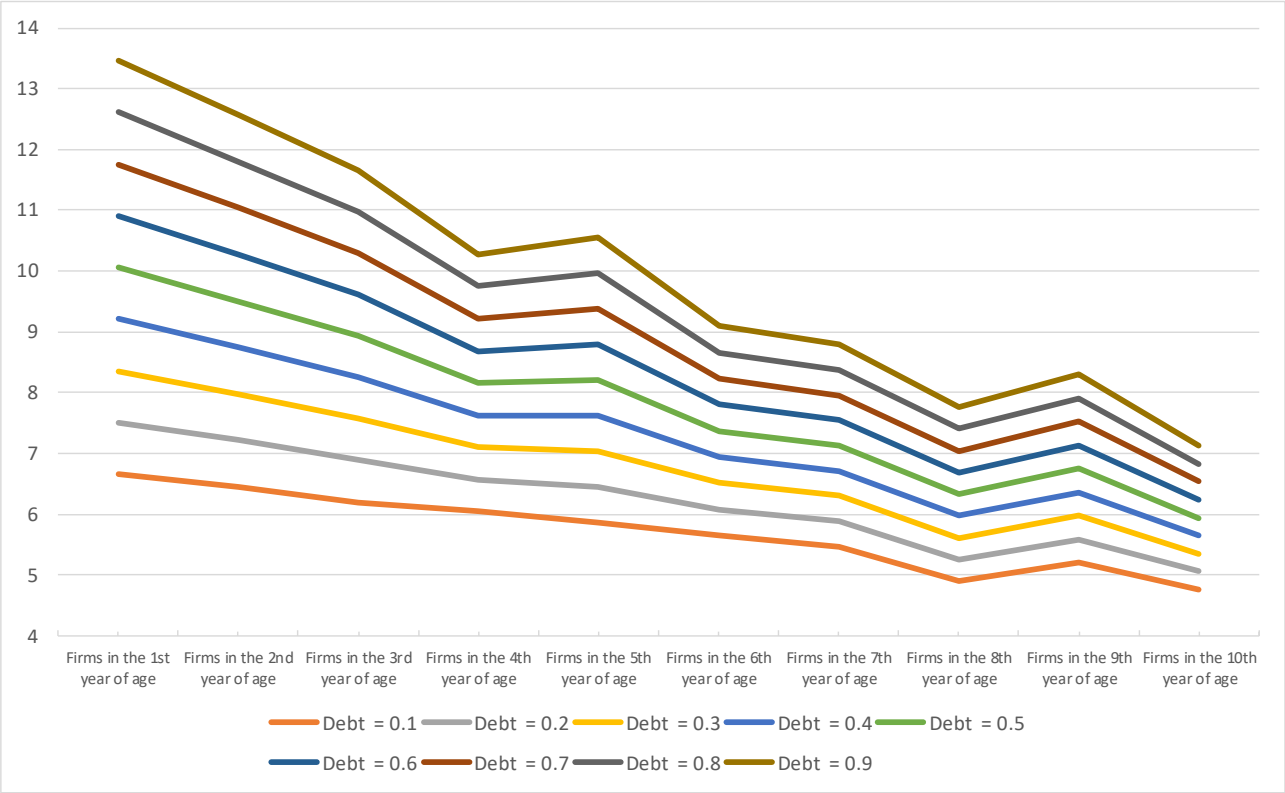

Figure 5 – Trend in sales growth and debt of different maturity (long-term vs short-term), based on the mean value.