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The role of signaling in the external financing of nascent firms

Luís Miguel Nunes Barbosa

PhD in Management

Supervisor:
PhD Azzim Gulamhussen, Full Professor, Iscte – Instituto

January, 2022



BUSINESS
SCHOOL

Department of Marketing, Operations and General Management

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This thesis is dedicated to my wife Alexandra, to my sons: Artur, João P., Luís and João L., and also to my grandmother Leonilde and to my parents-in-law Florentino and Carmo.

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Acknowledgements

This thesis was the result of a lot of personal and professional sacrifices and resilience along all its phases, nevertheless the thesis would never be possible without the guidance, encouragement and support of several people.

First and foremost, I want to express all my gratitude to my supervisor, Professor Mohamed Azzim Gulamhussen, for all his guidance, encouragement and support. I have no words for his unsurpassable dedication and commitment to ISCTE, as well as for his sharpness and profound knowledge and experience. More than a supervisor, I see him now as a reference.

I am grateful to Professor Joseph Farhat and Kauffman Foundation, for its initial sponsorship for one enclave seat at NORC at the University of Chicago.

At ISCTE, I want to acknowledge the former director of the Doctoral Program, Professor Nelson António, and the current director, Professor Elizabeth Reis, for all their availability and support, as well as to Professor Álvaro Rosa, for his particular presence during all the phases of Program. I want to acknowledge Professor José Paulo Esperança, for his initial supervision and guidance on crowdfunding, a topic that I turned out not pursuing. I would like also to thank Andreia from the Business Research Unit for all her assistance during the Doctoral Program.

I want to acknowledge Professor Hermínio Ferreira for his encouragement. I want to thank Professor Guilherme Carmona for his support and encouragement, and Dr. Rachel Evans for her suggestions and comments. In the professional field, I want to thank Dr. Carlos Salgado for his support and encouragement and all my colleagues from Sanfil Medicina Group, for all their encouragement. To all my friends, particularly to Paulo and Martine, thank you for their encouragement.

The final acknowledgements are to Professor Miguel Pina e Cunha (NOVA School of Business and Economics) and Professor João Luís César das Neves (Católica Lisbon School of Business and Economics), for their initial encouragement.

To my family, I did not find words to express all my profound gratitude, so I dedicated this thesis to them.

Resumo

Nesta tese são avaliadas as decisões de financiamento externo de empresas emergentes com base na teoria da sinalização, dada a sua opacidade, intangibilidade e historial creditício. Mais especificamente, a tese dá o seu contributo académico através da avaliação do papel do património dos proprietários na hierarquização das fontes de financiamento externo, e se o crédito comercial e as patentes atraem e determinam o montante do investimento externo. As principais hipóteses são desenvolvidas com base em revisões detalhadas da literatura e as são testadas usando a base dados da Fundação Kauffman, que acompanhou essas empresas durante diversos anos. Os resultados estatisticamente significativos indicam que o património e as garantias dos proprietários alteram a hierarquização das fontes de financiamento e a alavancagem comumente atribuídas a essas empresas, e que tanto o crédito comercial quanto as patentes não apenas atraem, mas também podem determinar o valor do investimento. Em termos económicos, 100.000 dólares adicionais de património dos proprietários aumentam a alavancagem das empresas em 4,2%; 100.000 dólares adicionais de crédito comercial aumentam a probabilidade de investimento em 4,4% (para 8%); e um aumento de 5% na média das patentes (para 11%) aumenta a probabilidade de atrair investimento em 4,1% (para 7%), e o montante médio em 580.000 dólares (para 2,7 milhões). Estes resultados apontam para os papéis relevantes do património dos proprietários, do crédito comercial e das patentes na redução das assimetrias de informação e nos atritos no financiamento destas empresas. A tese discute as implicações ao nível académico, empresarial e de políticas.

Classificação JEL: D82; G32, M13, O32, O34

Palavras-chave: Assimétrias de informação; Sinalização; Empresas emergentes; Garantia pessoal; Crédito comercial; Patentes.

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Abstract

This thesis assesses the external financing decisions of nascent firms (henceforth firms) and builds on signaling theory, given the strong opacity, intangibility, and absence of credit histories of these firms. More specifically, the thesis adds to the literature by evaluating the extent to which the owners' net worth alters their pecking order and external financing, and the extent to which trade credit and patents attract and determine the amount of external financing. The thesis develops the main hypotheses building on detailed literature reviews and tests these hypotheses using the Kauffman Foundation Survey data that tracks these firms over several years. The statistically significant findings indicate that the net worth and collateral of owners alters the pecking order and leverage commonly attributed to these firms, and that both trade credit and patents not only attract but may also determine the amount of external equity. In economic terms, an additional 100,000 dollars of owners' net worth increases firm leverage by 4.2%; an additional 100,000 dollars of trade credit increases the probability of attracting external equity by 4.4% (to 8%); and a rise of 5% in the average possession of patents (to 11%) increases the probability of attracting external equity by 4.1% (to 7%) and average amount of investment in 580,000 dollars (to 2.7 million dollars). These findings point towards the relevant roles of owners' net worth, trade credit and patents in reducing information asymmetries, and thus in reducing the financing frictions of these firms. The thesis discusses the academic, entrepreneurial and policy implications.

JEL classification: D82; G32, M13, O32, O34

Keywords: Information asymmetries; Signaling; Nascent firms; Personal collateral; Trade credit; Patents.

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Acronyms

2SLS – Two Stage Least Squares.

AP – Accounts Payable.

CEO – Chief Executive Officer

D&B – Dun & Bradstreet.

KFS – Kauffman Firm Survey.

HHI - Herfindahl-Hirschman Index.

IPO – Initial Public Offering.

LLC - Limited Liability Companies.

MSA - Metropolitan Statistical Area.

NAISCS - North American Industry Classification System.

NF – Nascent Firms.

NSSBF – National Survey of Small Business Finances.

NORC - National Opinion Research Center, at the University of Chicago.

NSF – National Survey Foundation.

OLS - Ordinary Least Squares

ROA – Return On Assets.

R&D – Research and Development.

SBCS - Small Business Credit Scoring

SBSS - Sorting by Signaling and Self-Selection

SIC - Standard Industrial Classification.

SME – Small and Medium Enterprise.

STATA – Software for Statistics and Data Science.

Std. Dev. – Standard Deviation.

TC – Trade Credit.

UK – United Kingdom.

US – United States of America.

USD – United States of America Dollars.

VC – Venture Capital.

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CHAPTER 1: Introduction

The emergence of nascent (micro and small entrepreneurial¹) firms (henceforth firms) is now considered to be of crucial relevance to solving not only entrepreneurial but also societal challenges including those related to the digital and green transitions, and consequently to unlocking growth and employment in ailing economies (The Economist Events, 2014).

Despite their critical role in the economy, nascent firms face significant external financing frictions due to their opacity, intangibility and newness. Understanding the mechanisms through which these firms alleviate these drawbacks is crucial for both firms and the financial services industry, namely banks that extend credit and venture capitalists and private equities that provide capital to these firms (Bhimani et al., 2014).

In many countries, these firms represent a substantial component of the economic structure in addition to employing a considerable proportion of the employable workforce. Policy makers thus devote significant attention to the design of policies aimed at facilitating their emergence through incubators, accelerators, and other infrastructures such as ecosystems; and at reducing their financing frictions by easing access to finance and financing terms. Academic research findings that can feed the design of the aforementioned policies is thus crucial for policy-makers (Duarte et al., 2018).

This thesis applies mainstream corporate finance theories, in particular the pecking order of external financing alternatives, asymmetric information and the signaling of nascent firms whose academic, economic and policy relevance has gained widespread acceptance.

The academic literature to date provides solid answers to similar external financing problems in the case of listed firms (Gulamhussen, 2018, 2019). Pecking order theory of financing alternatives indicates that firms prefer to fund their projects first with retained earnings, then with debt and lastly with equity. In this setting, firms prefer to retain cash to fund future growth opportunities to shield themselves against future distress and issuance costs, as long as the classical agency costs (Jensen & Meckling, 1976) do not

¹ At least 98.5% of our firm-year observations from our samples of nascent firms are from micro and small firms - with less than 50 employees, or less than 10 million euros (11.8 million USDs) of total assets or revenues. The nascent firms from our samples have, on average, 0.5 million USDs of total assets, 1.1 million of revenues, 4 employees and firm-year observations with, on average, 3.6 years. Small and Medium Enterprises are firms with less than 250 employees or less than 43 million euros (50.6million USDs) of total assets or less than 50 million euros (58.8million USDs) of revenues.

exceed the former costs. In terms of external financing, they prefer debt rather than equity as debt generates tax shields, providing that debt serving costs do not exceed earnings before interest and tax and distress costs. Still in this setting, equity can not only be costly to issue but also suffer from investor skepticism over its true value; in other words, investors believe that it is being issued due to its “lemon feature” (Akerlof, 1970). Equity is thus issued when firms are able to reduce information asymmetries between firms and markets through positive signaling (Spence, 1973) such as earnings announcements. Whilst the theory is grounded on solid assumptions, the question of whether firms follow the pecking order remains for empirical analysis. Indeed, findings show mixed results which depend largely on individual firm, industry and market conditions (Berger & Udell, 1998; Bharath et al., 2009; Cosh et al., 2009; Fama & French, 2002; Frank & Goyal, 2003; Lemmon & Zender, 2010; Mac an Bhaird, 2010; Robb & Robinson, 2014; Shyam-Sunder & C. Myers, 1999).

Besides the pecking order of alternative sources of external financing, firms also need to decide on their level of leverage, the (Modigliani & Miller, 1958, 1963) theory on the relevance of leverage in the presence of imperfections, notably taxes, is thus essential. Nascent firms typically do not generate sufficient earnings before interest and taxes to service debt costs. Even when this latter relation is positive, distress and agency costs may need to be traded off against the benefits that these firms can derive from tax shields.

The second chapter tests the well-established theory of the pecking order of financing alternatives in the context of nascent firms. While, on one hand, these firms may be well suited to following pecking order theory due to the high information asymmetry between them and external financing providers, in particular equity providers (Bharath et al., 2009; Cosh et al., 2009; Fama & French, 2002; Myers, 2003), on the other hand, they may not be so well suited to following the pecking order due to their reliance on their owners’ creditworthiness and on the demand and supply of financing sources (Berger & Udell, 1998; Fulghieri et al., 2020; Lemmon & Zender, 2010; Mac an Bhaird, 2010; Robb & Robinson, 2014). These opposing views of forces compel an empirical answer that is addressed in this chapter. The level of leverage is also of particular interest. Given the opacity, intangibility and absence of the credit record of nascent firms, the chapter also assesses the impact of these features on the determination of leverage and the mechanisms these firms and their owners can deploy to reduce information asymmetries and increase leverage when required.

The third and fourth chapters test the signaling mechanisms through which nascent firms can reduce information asymmetries with respect to professional external equity providers. There is particular interest in addressing the topic of nascent firms' growth potential, i.e. why trade credit² and patents are used as signaling mechanisms in reducing information asymmetries and thus attracting and determining the levels of financing from professional external investors. Moreover, the study explores possible variations in the strength of the signaling role from trade credit, in a sub-sample of credit constrained firms with positive sales growth, and from patents, in sub-samples of manufacturing nascent firms with different technological patterns.

The fifth chapter concludes by drawing academic, entrepreneurial and policy implications and drafting a future research agenda based on the novel findings from the thesis. In terms of implications, particular emphasis is placed on the applicability of mainstream corporate finance theories to nascent firms, notably the role of signaling in attracting and determining the levels of external financing. In terms of the agenda, special emphasis is placed on other signaling mechanisms that entrepreneurs can use to reduce information asymmetries when securing external financing.

² Measured by accounts payable.

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CHAPTER 2: Nascent firms' external financing: the role of the entrepreneurs' signals

Abstract

We use Kaufman Foundation Survey data on 4,928 nascent firms to assess their main financing sources. Building on the well-established pecking order theory, our findings show that these firms are financed mainly through external equity. Owners' net worth positively influences the level of leverage in nascent firms, and high net worth owners pledge more personal collateral and their firms have less delinquency risk, which points towards the potential of this collateral to act as a signal of creditworthiness, thus easing access to external finance, notably, debt. This finding adds to the existing literature that demonstrates the relevant role of personal collateral in reducing interest rates and default and extending maturities in very similar firms.

JEL classification: D82; G32; M13

Keywords: Information asymmetries; Pecking order; Financing policy; Nascent firms; Personal collateral; Entrepreneurship

2.1. Introduction

Nascent firms are crucial for development because successful new entrepreneurs will bring innovation and play an important role in economic performance (Haltiwanger, 2021). In Price Waterhouse and Coopers' list of the top companies by market capitalization (Price Waterhouse Coopers, 2021), as of March 31st 2021, eight³ out of the nine largest companies are innovative and relatively recent firms that, with the exception of Microsoft and Apple, have been in existence less than twenty-six years; they all have more than \$600 billion of market value and had their origins in successful entrepreneurs.

Entrepreneurs need to finance their investments using internal and external sources of financing in order to succeed, in the early stages of their entrepreneurships, external sources of financing face high information asymmetries problems, due to the opacity, intangibility and absence of credit history of their nascent firms.

It is commonly accepted that nascent firms' capital structure differs from that of older firms. More research and information are required regarding nascent firms' financing structure due not only to their potential relevance and value, but also to the prevalence of information asymmetries problems in these firms. The questions on the preferences for the mix of financing sources and its determinants are not clear and raise contrasting views; moreover, the existing research into this issues is mostly based on public firms while studies on nascent firms and entrepreneurship are lacking (Stewart, 2021).

Notwithstanding, problems concerning information asymmetries are the base of one of the most popular theories: the pecking order (Myers, 1984; Myers & Majluf, 1984). Pecking order theory defends that, in contexts of high information asymmetries, firms prefer internal to external sources of funding, and debt to equity as this minimizes the adverse selection problems related to external sources of funding. Therefore, firms start by choosing internal sources of funding and risk-free debt issues, such as short-term debt. When they have investment opportunities and their internal cash does not cover their financing deficit, they then issue long-term debt and finally equity⁴.

Robust tests have been conducted to verify pecking order theory (Frank & Goyal, 2003; Shyam-Sunder & C. Myers, 1999); however, these have only been applied to US public firms and concluded that they do not follow pecking order theory.

³ Apple, Microsoft, Google, Amazon, Facebook, Tencent, Tesla and Alibaba.

⁴ Equity issues are rare.

Nascent firms are known to have high information asymmetries, and thus could be expected to follow pecking order theory (Bharath et al., 2009). Nevertheless, some authors defend that nascent firms do not follow this theory, claiming that their external financing is essentially driven by demand and supply of these sources and by their entrepreneurs' creditworthiness (Berger & Udell, 1998; Fulghieri et al., 2020; Robb & Robinson, 2014).

In high uncertainty environments, such as that of nascent firms, the external sources of financing, notably debt, usually base their decisions on the available signs (Akerlof, 1970; Spence, 1973), namely the entrepreneurs' creditworthiness.

We have summarized the literature on explaining the capital structure of firms in table 2.1. Berger and Udell (Berger & Udell, 1998) defend that nascent firms have high information asymmetries, few business assets that can be pledged as collateral, and little track record upon which external financing sources can rely. These sources of financing therefore rely on the creditworthiness and reputation of the entrepreneur, who may have pledgeable assets, and also on personal data, thus making an evaluation easier than when using the firm's records.

As nascent firms do not usually have tangible assets to pledge, they must rely on their owners' net worth and personal collateral to obtain external financing, going against traditional leverage models, which consider only the firms' tangible assets (Mac an Bhaird, 2010). It is important to underline that when the firm has personal collateral, the owner is increasing his/her risk by pledging personal assets in addition to his/her risk in the firm – equity and debt; this contradicts the common assumption that the owner's risk is limited to his/her equity share and loans to the firm (Bhimani et al., 2014).

Furthermore, entrepreneurs in nascent firms may have a signaling role in their firms' financing; more specifically, entrepreneurs with high net worth are more likely to pledge personal collaterals as a signal to lenders and to benefit from better financing conditions (Han et al., 2009). To the best of our knowledge, the signaling role of entrepreneurs' net worth and personal collateral in nascent firms has never previously been tested.

Firstly, we use robust tests from Frank and Goyal (Frank & Goyal, 2003) to address the issue of whether or not the nascent firms follow pecking order theory, applying them to these firms for the first time. The data for our pecking order tests was obtained from the more detailed and confidential version of Kauffman Firm Survey database on nascent firms of the United States, between 2004 and 2011.

Secondly, we examine the role of the nascent firm's owner in obtaining external financing by replacing the tangibility⁵ variable in a leverage model with the variable: entrepreneurs' net worth.

Lastly, we test the signaling role of entrepreneurs' net worth and personal collateral to nascent firms' lenders.

In chapter 2.2., we develop the theoretical framework and the hypothesis. Chapter 2.3. sets out the data, the sample and the sub-samples before discussing the method in chapter 2.4.. In chapter 2.5., we report the findings. Lastly, chapter 2.6. summarizes, concludes and draws implications.

2.2. Theoretical framework and hypothesis

Capital structure

Modigliani and Miller (Modigliani & Miller, 1958) proved that under the hypotheses of perfect information and nonexistence of taxes, the capital structure is irrelevant for a firm's market value. Some years later, the same authors (Modigliani & Miller, 1963) reviewed their initial position and considered tax benefits originated by debt interest; this allowed them to demonstrate that higher debt can increase the firm's value, but can also increase the risk of bankruptcy. Moreover, the authors proposed that firms' leverage could be explained by the trade-off theory, which states that firms search for an optimal leverage ratio, conditioned to measuring costs, e.g. bankruptcy risks and agency conflicts between shareholders and managers, and benefits, e.g. tax benefits and mitigation of agency costs between shareholders and managers.

In contrast, Myers and Myers & Majluf (Myers, 1984; Myers & Majluf, 1984) proposed pecking order theory. The authors defend that firms have a hierarchy of financing sources ranging from the least to the most expensive. Due to information asymmetries between managers and external investors, equity issues are very expensive due to adverse selection problems; long-term debt financing also has a risk premium, albeit less than equity. Indeed, equity issues can have such a risk premium that managers may overlook good investment opportunities. Therefore, firms start by choosing internal sources of funding and risk-free debt issues, such as short-term debt. When they have

⁵ Weight of tangible assets in the book value of total assets.

investment opportunities and their internal cash does not cover their deficit, they then issue long-term debt and finally equity⁶.

There are several competing theories addressing the capital structure topic, Harris and Raviv (Harris & Raviv, 1991) surveyed a selection of theories based on agency costs, asymmetric information, product/input market interactions and corporate control considerations. From the review of these models, they collected a set of common variables that can explain leverage and drew conclusion on their expected relationship.

Rajan and Zingales (Rajan & Zingales, 1995) used data from public firms of G-7 countries⁷ from 1987 to 1991 to study the capital structure of these countries' firms and their determinants based on four variables⁸ which they found could determine leverage and support the following results: (i) tangibility of assets has a positive relationship with leverage, i.e. firms with more tangible assets are able to provide more collateral and obtain more debt; (ii) market-to-book ratio, as a proxy of future growth opportunities, has a negative relationship with leverage⁹, i.e. firms with more future growth opportunities have less leverage in order to avoid difficulties in financing them in the future ; (iii) As a proxy of firm size, logarithm of sales has a positive relationship with leverage, i.e. larger firms have less probability of default so they can obtain more debt; and (iv) profitability with an inverse relationship to leverage, i.e. as firms have more internal funding, external sources of funding are less interesting to them – following pecking order theory. Although one of the most traditional models, the Rajan and Zingales leverage model remains a reference.

Pecking order theory has been tested by a number of authors with Shyam-Sunder and Myers (Shyam-Sunder & C. Myers, 1999) and Frank and Goyal (Frank & Goyal, 2003) presenting an empirical robust test using the relationship between long-term debt variations and financing deficit. Moreover, Frank and Goyal set out a process to explain firms' financing structure through a first differences leverage model; using Kaplan and Zingales' variables, they tested their signs according to pecking order theory. Additionally, they analyzed the impact of including the financing deficit variable in their first differences model.

⁶ Equity issues are rare.

⁷ The United States, Japan, Germany, France, Italy, the United Kingdom and Canada.

⁸ from Harris and Raviv (Harris & Raviv, 1991) set of variables.

⁹ This relationship is mostly due to large equity issuers and is not in line with Harris and Raviv's conclusions.

Shyam-Sunder and Myers and Frank and Goyal used data from a sample of listed firms from the United States from Compustat database between 1971 and 1998 and concluded that these firms did not follow pecking order theory. Nonetheless, Frank and Goyal found that some variables from the conventional leverage model, namely profitability, had a negative relationship with leverage, in line with pecking order theory. Fama and French (Fama & French, 2002) used the same data as Shyam-Sunder and Myers to test pecking order theory and found evidence of a negative relationship between profitability and leverage¹⁰, which they proved to be consistent with pecking order theory. Bharath et al (Bharath et al., 2009) included a variable that measured information asymmetries in Shyam-Sunder and Myers' test and proved that this variable enhances the coefficient of the relationship between long-term debt variations and financing deficit.

The role of collateral

Stiglitz and Weiss (Stiglitz & Weiss, 1981) developed a theoretical model where there are information asymmetries, namely the lender does not have perfect information on the borrowers' risk. This may, in turn, lead to adverse selection and credit rationing: a disequilibrium between demand and supply in the loan market. The pledging of collateral may allow lenders to sort observationally equivalent loan applicants and mitigate these inefficiencies.

Avery et al. (Avery et al., 1998) suggested that personal commitments are important for small firms seeking credit and their results evidenced that unincorporated firms are more likely to have loans with personal collateral and that there is no consistent relationship between personal commitments and owner's wealth.

There is evidence on reducing asymmetric information problems through collaterals (Berger et al., 2016; Berger, Espinosa-Vega, et al., 2011; Berger, Frame, et al., 2011; Berger & Udell, 1995; Degryse & Van Cayseele, 2000; Steijvers & Voordeckers, 2009; Voordeckers & Steijvers, 2006); and this is especially relevant in the presence of personal collateral (Brick & Palia, 2007; Duarte et al., 2018, 2020; Ortiz-Molina & Penas, 2008).

In highly uncertain environments, such as that of nascent firms, the market players usually read the available signals to make their decisions (Akerlof, 1970; Spence, 1973); therefore, entrepreneurs with higher net worth and creditworthiness may pledge personal collateral as a signal to lenders, to benefit from lower interest rates (Han et al., 2009).

¹⁰ The negative relationship between profitability and leverage, has been also used to test pecking order theory by other scholars (Cosh et al., 2009; la Rocca et al., 2011; Rajan & Zingales, 1995).

Nascent firms and entrepreneurship financing

Most of the research regarding firms' external financing is based on listed firms or privately held firms but with track records and historical information. Similarly, several theories and models of firms' capital structure and leverage determinants have been proposed and tested that have been applied mainly to public firms.

Knowledge about nascent firms' capital structure is not so rich and, as yet, little is known about either their capital structure or financing sources. The preferences for the mix of financing sources and its determinants may change if firms are nascent or mature firms; some authors have developed theories on firms' financing mix during their financial growth life cycle.

Berger and Udell (Berger & Udell, 1998) addressed the firms' life cycle by examining SMEs' financing preferences for sources and capital structure; they considered that these firms' preferences evolve during their financial growth cycle phases – start-up, growth, mature and decline -, with firms' size and age, and information availability. They use a database of US SMEs from 1993 and detail several financial sources and preferences through the firms' financial growth cycle phases. The authors concluded that young, small firms, with high information asymmetries¹¹ essentially need to consider internal financing sources and external debt financing based on the entrepreneurs' creditworthiness; as firms become older, bigger and more informationally transparent, they are able to achieve other sources of financing, such as: long-term bank finance, public debt and equity. Using a sample of 275 Irish SMEs from a 2005 survey, Mac an Bhaird (Mac an Bhaird, 2010; Mac an Bhaird & Lucey, 2010) also concluded that firms' financing preferences evolve during their financial growth cycle and that they prefer internal sources and external debt and to use external equity as a last resort; they also found that nascent firms rely on personal collateral from their owners to finance their debt. It is important to highlight that collateral, and particularly personal collateral, is used to reduce information asymmetries.

Although data on firms' early-stages is difficult to obtain, some surveys and empirical studies can shed light on the preferences and determinants of these firms' financing sources. A study by Cosh et al. (Cosh et al., 2009) uses a detailed database of 2,520 UK entrepreneurial firms between 1996 and 1997 from a Survey of the Centre for Business Research of the University of Cambridge. It applies a two-stage Heckman selection model: in the first stage, the firm seeks outside capital, such as, bank finance,

¹¹ With no collaterals, no track record and informationally opaque.

VC funds, leasing firms, factoring firms, trade credit partners, other private individuals and other sources; if this is received, the amount is then set. They find that firms with a higher capital expenditure to profit ratio and stronger growth objectives are more likely to seek external finance and that the amount of external finance is essentially driven by the ratio between capital expenditures and profits. Moreover, the authors evidence that: (i) nascent, high-growth and innovative firms without significant pledgeable assets or profits seek equity from venture capital; however, rejection rates are quite high; (ii) high profits do not necessarily help obtain venture capital; and (iii) UK entrepreneurship firms nearly always receive all the desired external capital, although they do not always obtain the type wanted.

Lemmon and Zender (Lemmon & Zender, 2010) demonstrate small and high-growth firms' preference for equity finance based on a sample of US listed firms between 1971 and 2002, attributing this to their growth levels and restrictive debt capacity constraints. When this type of firm seeks equity financing, they will actually experience a smaller price drop at the announcement of their offering despite their high asymmetric information on its value.

The study by Robb and Robinson (Robb & Robinson, 2014), using the 2004 Kauffman Firm Survey database of 4,928 nascent firms in the United States and descriptive statistics, finds that these firms rely on external debt nearly fifty per cent of the time. The three top sources for nascent firms are, in order of average prevalence, external debt, equity and trade credit. Moreover, they evidenced that many entrepreneurs hold highly leveraged equity claims in their firms and that the entrepreneurs' net worth influences the "scale of operations" of the nascent firms. The data also show that these nascent firms seldom rely on family and friends' financing. The authors do not consider these findings to be a new "entrepreneurial pecking order" theory because they believe the levels reflect the supply and demand of the different financing sources more than the entrepreneurial preferences per se.

In a theoretical model, Fulghieri et al. (Fulghieri et al., 2020) suggest that equity is more likely to dominate debt for younger firms with larger investments and higher growth opportunities; this model explains why high-growth firms may prefer equity over debt, and then switch to debt financing as they mature.

As evidenced by Robb and Robinson (Robb & Robinson, 2014), nascent firms may not follow pecking order theory because the financing sources of these firms are essentially driven by demand and supply issues.

H1: In nascent firms, financing deficit that is not covered by internal cash¹² is not financed entirely by long-term debt variations.

The KFS firms seem to contradict some of the principles of financing structure theories; it is probably not simply a question of the firms' actual financing structure, but also of the owners' and firms' joint financing structures because these are sometimes very difficult to distinguish in nascent firms (Bhimani et al., 2014). Nascent firms financing sources are essentially driven by the entrepreneur's net worth or creditworthiness, especially in young and smaller firms (Berger & Udell, 1998; Mac an Bhaird, 2010).

H2: Nascent firms, especially smaller firms, rely more on their owners' net worth than on their tangible assets to obtain external financing.

When owners pledge their personal collateral, their firms reduce information asymmetries to the financing market and therefore enhance their financing possibilities and sources; on the other hand, the owners increase their investment risk in the firms to their personal net worth. This goes beyond the traditional assumption that the owners' investment responsibilities are limited to firms' equity and debt (Bhimani et al., 2014).

Entrepreneurs that have high net worth and creditworthiness may be more likely to pledge collateral as a signal to lenders and to benefit from lower interest rates (Han et al., 2009); there should therefore be a positive relationship between their net worth and their firms' leverage and, on average, their firms should have a higher percentage of personal collateral and a lower percentage of delinquency than the firms of entrepreneurs with lower net worth.

H3: Entrepreneurs with high net worth use personal collateral as a signal to lenders.

2.3. Data and sample

Data

We use the more detailed and confidential version of the Kauffman Firm Survey (KFS) database. This data set is only available to researchers using a secure, remote access data enclave provided by the National Opinion Research Center (NORC) at the University of Chicago. The survey tracks 4,928 nascent firms that started in 2004 through seven follow-up years until 2011, and it contains information on industry, location, financials and financing sources, as well as detailed information about the entrepreneurs. The detailed KFS data allows the inclusion of short-term and long-term debt from the

¹² Internal sources of funding and risk-free debt, such as short-term debt.

entrepreneurs and bank business debt, as well as debt from family and friends and other external sources.

The target population for the survey was all new businesses that were set up in 2004 in the United States. The Kauffman Foundation based the survey on firms that were reported by the Dun & Bradstreet (D&B) database as starting in 2004 because there was no national registry of startups in the United States. This D&B database combines data from various sources that are involved in registering new businesses data, such as credit bureaus, state offices, credit card and shipping companies, and that are likely to be used by all businesses. This is not the same database as the D&B business registry available on the Internet; the sample from which the KFS data are drawn contains far greater coverage of firms in the United States.

Robb et al. (Robb et al., 2009), Desroches et al. (DesRoches et al., 2008) and Farhart et al. (Farhat & Robb, 2014) provide detailed descriptions of the sampling process used to construct the initial sample and the survey's inquiries, how the data was treated during the seven follow up surveys and how the final survey data is organized for researchers.

Survey data can potentially have several errors and generate outliers. We address this issue by applying a winsorization procedure to the final sample. Following Frank and Goyal (Frank & Goyal, 2008), who consider it common to winsorize each tail of the observations at 0.5% or 1%, the data was winsorized at 1%.

Sample and sub-samples

The utilities and financial firms – NAISCS codes 22, 52 and 53 – were excluded from the initial cross-section database from KFS, following Frank and Goyal (Frank & Goyal, 2003).

The models used do not imply continuous data; however, they require changes in variables in two consecutive years, namely strictly positive values for the book value of total assets variable and the sales variable, and the exclusion of zero values for the net book value of total assets variable¹³. Therefore, the observations for 2004 were excluded because some variables have variations between years, and firms from KFS did not exist in 2003.

The final sample has 7,297 firm-year observations and includes firms that have no gaps in data for all the variables used. We also use sub-samples of nascent firms that: (i) do not have collateral; (ii) have personal collateral; (iii) are smaller firms with owners'

¹³ Book value of total assets minus book value of current liabilities.

collateral information; (iv) are larger firms with owners' collateral information; (v) have owners with low net worth; (vi) have owners with high net worth; (vii) have owners with low net worth that pledged personal collateral; (viii) have owners with high net worth that pledged personal collateral. The firm-year observations of the sample and sub-samples of nascent firms used are shown in figures 2.1 and 2.2.

In figures 2.3 and 2.4, we represent the difference between the weights of external and owners' debt in the total external financing in our sample and sub-samples of nascent firms. There is a greater difference between the weights of external and owners' debt in the total external financing in nascent firms that have owners with higher net worth, especially when they pledge personal collateral. Although few owners provide personal collateral, this collateral is very important to lenders. The difference between the weights of external and owners' debt in the total external financing is also greater in larger firms.

Sample of nascent firms

Table 2.2 represents the equity and debt of owners, family and friends and external sources of financing, as well as accounts payable, between 2004 and 2011. KFS firms were financed mainly by debt in their first year; this result is in line with Robb and Robinson (Robb & Robinson, 2014), who used the complete KFS database and found that debt was the principal source of external finance in 2004. Trade credit from suppliers, measured by accounts payable, is the third source of credit in 2004.

In contrast, the main source of financing in 2005 is equity, followed by debt. The change in the main source of financing is due on one hand to an increase in the average equity operations from the owners, family and friends and external investors, namely business angels and companies, and on the other hand to a decrease in owners' personal loans from banks and family and friends, non-bank loans and long-term bank loans. The data from KFS firms suggests that owners use part of the amount of personal and non-bank loans in their first year in equity increases in the following years. In subsequent years, equity holds as the main financing source. The main source of equity is the owners' accrued equity followed by external accrued equity; the accrued equity of family and friends is insignificant. Notwithstanding, after the initial owners' equity, external equity from professional investors is the main source of equity. The external investors make the most operations in the KFS firms' first year.

Debt weight in the total financing structure decreases during the first years of these firms, while trade credit weight increases. From 2009, trade credit becomes the second source of financing, followed by debt. The maturity of debt declines in the KFS firms'

first years, as long-term debt decreases and short-term debt and trade credit increase their weights in total financing.

Although the KFS data is obtained from a survey and not from a balance sheet¹⁴, we follow the data presentation format of Frank and Goyal (Frank & Goyal, 2003), making the necessary adjustments. The main balance sheet items of our sample of nascent firms are presented in table 2.3. While the asset structure is quite stable over time, external financing evolves in the first years of the nascent firms. The weight of trade credit on book value of total assets grows during the first years, while the weight of long-term debt decreases. The most important source of external financing, as a percentage of the book value of total assets, is equity, followed by debt in the first three years, 2005 to 2007, and by trade credit in the last four years, 2008 to 2011. We would like to highlight that trade credit weight on book value of total assets increases during the financial crisis of 2007 and 2008. Several authors have already demonstrated this and evidenced the important role of trade credit during the financial crisis (Santiago Carbó-Valverde et al., 2016; McGuinness & Hogan, 2014). Additionally, the weight of equity on book value of total assets has a downward trend over the years of the survey.

The financing deficit¹⁵ has two external financing sources: debt and equity, table 2.4 allows us to analyze the evolution of the financing deficit and its components, debt and equity, as a percentage of the book value of total assets, during the firms' early-stages. The financing deficit is positive during the first two years and negative in the following years, due mainly to strong internal cash flow generation and to reductions in the weight of tangible assets in the book value of total assets. In the first year of these nascent firms, part of the initial long-term debt seems to be used in equity increases.

On average, nascent firms are essentially financed by equity and long-term debt in their first year; when they become profitable in the following years, they have negative financing deficits and start to reduce the long-term debt, increase trade credit and pay dividends. Nevertheless, equity remains the main financing source. This is contrary to pecking order theory, where asymmetric information problems mean that firms are essentially financed by internal sources and long-term debt, equity increases are rarely used.

¹⁴ e.g. the value of the tangible assets is estimated by the entrepreneur.

¹⁵ Financing deficit is: dividends plus investment plus change in working capital minus net profits. Investment is the variation of tangible assets. Working capital is: cash and deposits plus accounts receivable plus inventories minus short-term debt minus accounts payable.

Net equity or long-term debt variations do not seem to track financing deficit in nascent firms, as we can see in figure 2.5. Therefore, the variations of these external financing sources are probably not explained by the financing deficit.

Further information on our sample and relationships of variables is provided in tables 2.15 to 2.17.

Sub-sample of firms with collateral information

As KFS only has information about collaterals between 2009 and 2011, it was necessary to use a sub-sample. This sub-sample with collateral information has 2,086 firm-year observations. Table 2.5 provides information about the business and personal collateral and the types of collateral used in each class. The data show that most types of business collateral are related to accounts receivable, inventories, equipment and vehicles, whereas real estate and other assets are the most used type of personal collateral. Firms usually have either business or personal collateral, with 25% of firms committing to both types of collateral.

We explore potential differences in owners' net worth and collateral patterns in two sub-samples of incorporated and unincorporated¹⁶ firms that pledge collateral in table 2.6. We conclude that incorporated firms that pledge collateral have owners with higher net worth that provide on average more personal collateral than owners of unincorporated firms. These conclusions are not in line with Avery et al. (Avery et al., 1998).

In appendix B to F, we analyze the characteristics of nascent firms without collateral and firms with personal collateral, recurring to two sub-samples of nascent firms for which there is collateral information. Appendix B represents the items equity and debt of owners, family and friends and external sources of financing, as well as accounts payable, between 2009 and 2011. Firms with personal collateral have a lower percentage of equity in the total external financing¹⁷, a higher percentage of debt and trade credit, and higher debt maturity, than firms with without collateral. Firms without collateral have a higher percentage of suppliers and lenders that do not finance them. In appendix C, we present the main balance sheet items of the firms without collateral and firms with personal collateral. Firms with personal collateral have more than twice the weight of debt as a percentage of the book value of total assets.

¹⁶ Unincorporated firms are sole proprietorships and partnerships.

¹⁷ Close to half, on average.

We can analyze the evolution of the financing deficit and its components, debt and equity, as a percentage of the book value of total assets in firms without collateral and firms with personal collateral in appendices D to F. The data demonstrates that firms with personal collateral have, on average and as a percentage of the book value of total assets, lower dividends and invest much more; they also have, on average, positive investment, more debt and lower profitability. This last characteristic must be analyzed given that these firms invest more and have positive investment, unlike firms with no collateral that have negative investment and negative financing deficits. As can be seen in appendix F, firms with personal collateral are on average more than three times larger considering the book value of total assets, and almost four times larger if sales are considered.

When we consider sub-samples of firms without collateral or with personal collateral, we find that: (i) net equity and long-term debt variations do not seem to track financing deficit in nascent firms without collateral, although these firms invest less and finance their investments essentially through internal cash flows – as shown in figure 2.6; (ii) net equity and long-term debt variations do not seem to track financing or even have an inverse relationship with financing deficit in nascent firms with personal collateral, and these firms do not need to rely on internal cash flows to finance their investments – as shown in figure 2.7.

Sub-samples of firms with information on entrepreneurs' net worth

As the KFS only included information about entrepreneurs' net worth between 2008 and 2011, it was necessary to use a sub-sample. This sub-sample with collateral information has 3,663 firm-year observations.

We explore potential differences between entrepreneurs with low and high net worth¹⁸ as regards their collateral pledges and their firms' probability of delinquency in tables 2.7 and 2.8. The results confirm that entrepreneurs with high net worth, on average, provide more personal collateral and their firms have less probability of delinquency, in line with several authors (Bhimani et al., 2014; Han et al., 2009).

2.4. Method

Myers and Myers & Majluf (Myers, 1984; Myers & Majluf, 1984) defend pecking order theory: firms have a hierarchy of financing sources - first firms choose internal sources

¹⁸ Owners with low net worth: less than 50,000 USD; Owners with high net worth: more than 100,000 USD.

of funding and risk free debt, such as short-term debt, then they choose long-term debt and finally equity. Firms rarely use equity, thus the financing deficit will be a complete match with the net long-term debt variations.

Shyam-Sunder and Myers (Shyam-Sunder & C. Myers, 1999) and Frank and Goyal (Frank & Goyal, 2003) presented empirical tests of the pecking order theory. The Frank and Goyal tests are applied in the present paper.

We use the following notation:

DIV_t	Cash dividends in year t
I_t	Change in tangible assets ¹⁹ (excluding other tangible assets) in year t
ΔW_t	Change in working capital (i.e. change in accounts receivable + change in inventories + change in cash and deposits – change in accounts payable - change in short-term debt) in year t
C_t	Net profits in year t
R_t	Current portion of long-term debt in year t
ΔD_t	Net long-term debt variations in year t (i.e. long-term debt increases – long-term debt reductions)
ΔE_t	Net equity variations in year t (i.e. equity increases – equity reductions)

We can then define the financing deficit as a function of a firm's investment decisions and operating variables, as

$$DEF_t = DIV_t + I_t + \Delta W_t - C_t = \Delta D_t + \Delta E_t \quad (2.1)$$

This financing deficit, if positive, must be covered by long-term debt or equity increases; if negative, long-term debt or equity can be reduced.

According to pecking order theory, firms rarely issue equity and, following Frank and Goyal, the financing deficit is entirely explained by variations in net long-term debt.

The specification for the pecking order test is given as,

$$\Delta D_{it} = \alpha + \beta_{DEF} DEF_{it} + \varepsilon_{it} \quad (2.2)$$

The pecking order hypothesis is that $\alpha=0$ and $\beta_{DEF} = 1$. Using this test, Shyam-Sunder & Myers and Frank & Goyal statistically rejected pecking order theory in a sample of public firms from the United States.

Shyam-Sunder and Myers use an alternative specification of financing deficit, including the current portion of long-term debt as a component of the financing deficit.

$$DEF_t^{SSM} = DIV_t + I_t + \Delta W_t + R_t - C_t \quad (2.3)$$

¹⁹ The value of tangible assets is obtained from the Kauffman Firm Survey; this value is estimated by the entrepreneurs.

Although Frank and Goyal showed that the current portion of long-term debt should not be included in the financing deficit definition, we also use this specification further, substituting DEF_{it} by DEF_t^{SSM} in Equation (2.2), and report both results.

Variables are conventionally scaled in estimations by assets or sales, to overcome hypothetical bias problems of firm size differences. This issue is especially important for the nascent firms of our sample due to their extreme variance in size. Pecking order theory test does not require scaling; however, to prevent firm size problems in estimations, we scaled the variables in Equation (2.2) by the net book value of total assets²⁰ following Frank and Goyal.

Like Frank and Goyal, we use simple ordinary least squares regressions rather than panel regressions with fixed or random effects, given that year-firm data combinations are equally important independent observations. All our estimates are performed in STATA software, version sixteen.

We present the results of the estimations in Equation (2.2) separately for net long-term debt variations, gross long-term debt variations and changes in long-term debt ratio, similarly to Frank and Goyal. However, the debt ratio change variable has potential bias problems towards negative values in our sample of nascent firms due to the high growth levels in the first years of these firms; this is not so frequent in listed firms.

Disaggregating the net financing deficit

The pecking order theory test considers the net financing deficit variable, which results from the aggregation of four variables. It is important to verify if this aggregation step is justified to determine, firstly, whether the variables included in the financing deficit contribute to different explanations for the long-term debt variations and, secondly, whether their signs follow pecking order theory.

Therefore, we run Equation (2.2) on a disaggregating basis,

$$\Delta D_{it} = \alpha + \beta_{DIV} DIV_t + \beta_I I_t + \beta_W \Delta W_t - \beta_C C_t + \epsilon_{it} \quad (2.4)$$

The pecking order theory hypothesis for this disaggregated model is thus $\beta_{DIV} = \beta_I = \beta_W = \beta_C = 1$. If that hypothesis occurs, then the aggregation in Equation 2.1 is justified; otherwise we can conclude that the model significance is driven by individual components of financing deficit and we should analyze the relationship between the individual coefficient's signs and values and pecking order theory.

Leverage regression models

²⁰ Book value of total assets minus book value of current liabilities.

Pecking order theory seeks to explain the firms' financing decisions between internal and external financing sources, namely how firms' long-term leverage changes with financing deficit variations. Some authors have strived to explain the firm's level of leverage using leverage models. The conventional leverage models include a set of variables which seek to explain leverage; these variables are well tested and do not include the financing deficit variable.

To capture the changes in leverage and, thus, test the pecking order through these models, we follow Frank and Goyal and use a model of first differences with the variables from the traditional leverage models. The traditional variables which explain leverage from the Rajan and Zingales model (Rajan & Zingales, 1995) are: (i) tangibility of assets²¹ (T); (ii) market-to-book, as a proxy for future growth opportunities, substituted by sales growth (SG) in our model as we have only non-listed firms in our sample; (iii) logarithm of sales (LS), as a proxy for firm size; and (iv) profitability²² (P). As we run the model in first differences, Δ denotes the changes in variables in two consecutive years and ΔD change in leverage in two consecutive years²³. Additionally, we include financing deficit to the traditional leverage variables to analyze the impact of adding this variable in the traditional leverage model in first differences; the complete model is,

$$\Delta D_i = \alpha + \beta_T \Delta T_i + \beta_{SG} SG_i + \beta_{LS} \Delta LS_i + \beta_P \Delta P_i + \beta_{DEF} DEF_i + \varepsilon_i \quad (2.5)$$

In nascent firms, bias problems may be found in the changes in leverage variable – ΔD –, measured by leverage at year t minus the previous year, as mentioned previously. Thus, we have also measured changes in leverage by changes in total debt²⁴.

Given that our aim is to test pecking order theory by using a derivation of a conventional leverage model, we must verify the expected sign of each variable, according to this theory.

Under pecking order theory and in light of Harris and Raviv's (Harris & Raviv, 1991) conclusions, the increase in the tangibility of assets - is expected to reduce information asymmetry problems, and thus decrease leverage. Consequently, the coefficient of tangibility should be negative $\beta_T < 0$. In contrast, tangible assets are commonly associated with more collateral, and more collateral with more debt (Rajan & Zingales,

²¹ The value of tangible assets obtained from the Kauffman Firm Survey database, excluding other tangible assets, scaled by the book value of total assets.

²² Net profits to the book value of total assets.

²³ Debt to the book value of total assets in the current year minus the previous year.

²⁴ Total debt in year t minus total debt in the year before, divided by the book value of total assets at year t .

1995). As in Frank and Goyal (Frank & Goyal, 2003), we expect the second relationship to be more probable: $\beta_T > 0$.

Pecking order theory is concerned that an increase in debt may limit future growth opportunities (Myers & Majluf, 1984). Similarly, firms which have more future growth opportunities have less leverage to avoid difficulties in financing them in the future (Rajan & Zingales, 1995). In contrast, pecking order theory also predicts that firms with more investments - holding profitability fixed - should accumulate more debt over time. Thus, growth opportunities and leverage are expected to be positively related (Frank & Goyal, 2008). Future growth opportunities, proxied by sales growth, are expected to have a negative relationship with leverage, $\beta_{SG} < 0$, following Frank and Goyal (Frank & Goyal, 2003).

In line with pecking order, larger firms²⁵ are expected on one hand to have fewer information asymmetries and thus are predicted to have less leverage and to increase equity more easily; on the other hand, they have more assets, which can increase the base of the adverse selection problems (Frank & Goyal, 2008). Thus, the pecking order prediction based on information asymmetries is ambiguous. Moreover, larger firms are less likely to default so they can obtain more debt (Rajan & Zingales, 1995). Like Frank and Goyal (Frank & Goyal, 2003), we expect a positive relationship between larger firms and leverage, $\beta_{LS} > 0$.

Myers and Maluf (Myers & Majluf, 1984) predicted a negative relationship between leverage and free cash flows and Fama and French (Fama & French, 2002) confirmed that pecking order theory is consistent with a negative relationship between leverage and profitability and found empirical evidence for that. As firms have more internal funding, they have less need for external sources of funding (Rajan & Zingales, 1995). Therefore, more profitable firms are expected to have less leverage, $\beta_P < 0$.

Entrepreneur's net worth

Public firms rely on their tangible assets to obtain external financing, whereas nascent firms usually do not have robust tangible assets and therefore probably rely on their entrepreneur's net worth (Berger & Udell, 1998; Mac an Bhaird, 2010). Moreover, entrepreneurs' net worth and collateral may act as a signal to lenders (Han et al., 2009). Consequently, in Equation (2.5) we substitute the tangibility of assets variable with a proxy of the entrepreneur's net worth; the final equation is:

²⁵ Measured by the logarithm of sales.

$$\Delta D_{it} = \alpha + \beta_{NW}NW_i + \beta_{SG}\Delta SG_i + \beta_{LS}\Delta LS_i - \beta_P\Delta P_i + \beta_{DEF}DEF_i + \varepsilon_{it} \quad (2.6)$$

The entrepreneurs' net worth²⁶ (NW) variable is measured in Kauffman Firm Survey by an index from one to five²⁷.

The role played by the entrepreneurs' net worth variable for nascent firms should be similar to that of tangible assets for listed firms. Moreover, higher net worth entrepreneurs may provide a signal to lenders through pledging personal collateral, and lead to the benefit of more leverage and lower interest rates in their firms.

2.5. Findings

The financing deficit model

Shyam-Sunder and Myers (Shyam-Sunder & C. Myers, 1999) and Frank and Goyal (Frank & Goyal, 2003) presented empirical tests on pecking order theory and applied them to a sample of US listed firms. In the present paper, we follow Frank and Goyal's empirical tests and apply them to nascent firms for the first time. These firms are commonly known to have higher information asymmetries because, as startups, they do not usually provide their shareholders and lenders with as much information as public firms, for example.

We have regressed three dependent variables – net and gross long-term debt variations and changes in long-term debt ratio - against net financing deficit and Shyam-Sunder and Myers' financing deficit variable, the regressions are presented in table 2.9. The results of the regression of net long-term debt as a function of net financing deficit present a positive, but very small, coefficient. The other dependent variables have negative and very small coefficients. Gross long-term debt does not seem to be explained by net financing deficit; it is better explained by the Shyam-Sunder and Myers' financing deficit variable. Whereas the variable of change in debt ratio in the presence of fast-growing firms, as in this case, can be biased towards negative values, the net long-term debt variable is not; following (Frank & Goyal, 2003) and Lemmon and Zender (Lemmon & Zender, 2010) we also consider that the model using the net long-term debt variations and net financing deficit variables is the most suitable and least biased. As we suspected from the previous data analysis, the pecking order test conclude that the net financing deficit in the nascent firms from KFS has a statistically significant and small coefficient

²⁶ Entrepreneurs' assets minus debts, in home and businesses.

²⁷ One: zero or negative net worth; Two: 1 to 50,000 USD; Three: 50,001 to 100,000 USD; Four: 100,001 to 250,000 USD and Five: more than 250,000 USD.

and thus does not entirely explain the net long-term debt variations; a full explanation would imply a coefficient of one and a constant of zero. Therefore, *H1* is not rejected with a confidence level of 1%.

These results are consistent with Robb and Robinson's (Robb & Robinson, 2014) descriptive statistics evidencing that the empirical data did not support pecking order theory in nascent firms.

The disaggregated net financing deficit

Although we have already concluded that KFS firms' financing deficit does not entirely explain the long-term debt variations, it remains important to disaggregate the financing deficit variable in its components to determine whether their coefficients' signs follow pecking order theory. Additionally, the question of whether or not the empirical evidence supports the aggregated model remains, although this is less relevant in light of the previous results.

We have explained net and gross long-term debt and change in debt ratio by the disaggregated variables of the net financing deficit, following Frank and Goyal, and the results are shown in table 2.10. Following Frank and Goyal (Frank & Goyal, 2003) and Lemmon and Zender (Lemmon & Zender, 2010), it was concluded previously that the model using the net long-term debt variations and net financing deficit variables is the most suitable and least biased.

Using a sample of public firms, the results from Frank and Goyal confirm a positive sign for the dividends' coefficient. As we find this variable has a negative sign, this may show that nascent firms, unlike public firms, want to grow quickly and are more committed to having funds to invest than to distributing dividends. Pecking order theory defends a positive sign for investments and variation of working capital; our results follow the theory regarding investments, but the working capital coefficient is not statistically significant. Nonetheless, a negative sign for working capital could be expected given that in the first years these firms are able to significantly expand their short-term debt and trade credit as they become more credible. In line with pecking order theory and the results of several authors (Fama & French, 2002; Frank & Goyal, 2003; Rajan & Zingales, 1995), the net profits coefficient is negative. The results do not support the aggregation of the net financing deficit variable.

Selection of sub-samples to test pecking order theory

Frank and Goyal's pecking order test not only confirms whether a sample of firms' financing deficit entirely explains the long-term debt variations, but can also be used to

verify how close it is to doing so. Although financing deficit does not entirely explain the long-term debt variations in KFS firms, this does not exclude the possibility of it having some relevance in some sub-samples of firms. It is commonly accepted that smaller and high growth firms are more prone to having adverse selection problems (Frank & Goyal, 2003).

Following Frank and Goyal, we test pecking order theory in sub-samples of high-growth, positive dividends, moderate leverage and smaller, medium and larger firms. The results of the tests in the sub-samples are presented in table 2.11. The coefficient related to the explanation of the net long-term debt variations by net financing deficit clearly increases in high-growth and smaller firms, although the financing deficit does not entirely explain the long-term debt variations. However, this is also verified in larger firms. It is important to underline that as these firms are not public, their average size is much smaller, the average book value of total assets in our sample is 0.27 million USDs vis-a-vis 657.18 million USDs in Frank and Goyal's sample. The results from other sub-samples are neither conclusive nor statistically significant.

Regression of leverage models

In addition to the financing deficit model, other models can be used to test the pecking order, including those based on leverage regression. The leverage regression models have several variables that explain the level of leverage²⁸ and, unlike the financing deficit model, the test is centered on the sign of the coefficient and not on its values.

In line with Frank and Goyal, we use a first differences leverage model based on Rajan and Zingales' leverage model using book values of variables because KFS firms are not listed. The expected signs of the coefficients of the variables of leverage models in equation 2.5 are identified in table 2.12, according to Rajan and Zingales (Rajan & Zingales, 1995) and pecking order theory²⁹. To analyze the extent to which the first differences leverage model can either provide a better explanation than or complement the financing deficit model, we follow Frank and Goyal and include the net financing deficit variable in the traditional leverage regression model. As noted above, the variable change in debt ratio may be biased as our data is obtained from nascent firms. We have therefore included another dependent variable - change in total debt in year t^{30} to the book value of total assets in year t ; we believe that this variable can overcome the bias

²⁸ The first differences leverage model explains the change in leverage.

²⁹ Considering different authors.

³⁰ Book value of total debt in year t minus book value of total debt in the previous year.

originated from high growth rates of the book value of total assets. Additionally, we have regressed our models in sub-samples of smaller and larger firms to examine potential differences in behavior.

The results from the regressions of the first differences leverage model are presented in tables 2.13. The coefficients³¹ of the variation of profitability variable has the predicted sign of pecking order theory; however, the logarithm of sales and sales growth may or not have the signs of pecking order because they are ambiguous, and tangibility does not seem to influence leverage as it is not statistically significant. When we introduce the net financing deficit variable, the coefficients of the other variables do not change significantly, and the new variable is not statistically significant. This confirms that the net financing deficit variable does not complement the first differences leverage regression model, in line with Frank and Goyal (Frank & Goyal, 2003) results.

The conclusions drawn with the sub-sample of smaller firms are in line with those of the initial sample; however, larger firms present a positive and statistically significant coefficient for the variation of tangibility, and the coefficients of the logarithm of sales and profitability have no statistical significance.

Entrepreneurs' net worth

The previous results may suggest that while larger nascent firms have assets to use as collateral, smaller nascent firms do not have business collateral and must rely on their owners' net worth to use as collateral. We have introduced a new variable from KFS to substitute variation of tangibility in the first differences leverage model. As this new variable is not present in all years of the KFS, we had to reduce our initial sample by almost half to 3,663 firm-year observations, and increase the winsorizing percentage to 2% in each tail of the observations in order to prevent the emergence of outliers. We also explore sub-samples of smaller and larger firms.

The results in tables 2.14³² support the idea that the leverage of nascent firms relies on the owners' net worth, with a positive sign³³, rather than on tangible assets and that this effect is stronger in smaller firms. This is in line with the findings of Berger and Udell (Berger & Udell, 1998). Therefore, *H2* is not rejected with a confidence level of 1%.

³¹ From the regression of the dependent variable - change in total debt to the book value of total assets -, which is expected to be less biased.

³² Using as dependent variable: change in total debt in year *t* to the book value of total assets in year *t*.

³³ Owners' net worth is measured by an index from one to five, which increases with the net worth of owners.

Entrepreneurs signaling role

A positive and statically significant relationship between entrepreneurs' net worth and leverage has already been confirmed by results in tables 2.14. We know that in very uncertain environments, such as that of nascent firms, lenders may read the available signs to make their decisions and that entrepreneurs with high net worth may therefore be more willing to provide collateral to lenders in order to signal their firms' quality and receive better financing conditions (Han et al., 2009).

The results from tables 2.7, 2.8 and 2.14 confirm that entrepreneurs with higher net worth have, on average, firms with less probability of delinquency and which present more personal collateral than the firms of entrepreneurs with lower net worth. Consequently, in line with several authors (Bhimani et al., 2014; Han et al., 2009), we conclude that high net worth entrepreneurs in nascent firms send a signal to lenders through personal collateral. Therefore, *H3* is not rejected with a confidence level of 1%.

Economic significance of findings

The interpretation of coefficients in regression models with dummy and logarithmic variables have some specificities that are identified in Appendix A.

In terms of the financing deficit model, pecking order theory implies that 100% of the net financing deficit should be explained by the net long-term debt variations. In table 2.9, the results from our sample of nascent firms show that only 0.8% of net financing deficit is explained by net long-term debt variations, which means that almost 99% of the net financing deficit of these firms is explained by other variables.

The results from the first differences leverage model regression on the sample of KFS firms used presented in tables 2.13 show that variations in the tangibility³⁴ variable does not influence variations in leverage³⁵ because it is not statistically significant; however, the other variables of the model are statistically significant and: (i) each percentage point increase in sales growth³⁶ has a negative impact of 0.007 percentage points in the variation of firms' leverage; (ii) an increase of 1% in firms' size variation³⁷ leads to an increase of 0.068 percentage points in the variation of firms' leverage; and (iii) a percentage point

³⁴ Tangibility in t minus tangibility in t-1. Tangibility is assets to the book value of total assets.

³⁵ Measured by change in total debt – total debt in t minus total debt in t-1 – to the book value of total assets in t.

³⁶ Sales in t to sales in t-1.

³⁷ Measured by variations in the logarithm of sales.

increase in the variation of firms' profitability³⁸ has a negative impact of 0.028 percentage points in the variation of firms' leverage. Although the sub sample of smaller firms maintains the same signs and significance levels as the initial sample, the impacts of each variable in the variation of firms' leverage are greater; on the other hand, the variations in the tangibility variable in the sample of larger firms influences variations in firms' leverage with statistical significance: each percentage point increase in variations in tangibility has a positive impact of 0.067 percentage points in the variation of firms' leverage.

Information from tables 2.14 shows that the entrepreneur's net worth³⁹ variable has a positive and statistically significant positive impact on variations in firms' leverage variable in the sub-sample of nascent firms with owners' net worth information: each percentage point increase in the first variable leads to an increase of 0.042 percentage points in the second. On the other hand, the positive impact on the variations of firms' leverage is higher and achieves 0.063 percentage points in the sub sample of smaller firms, while the entrepreneurs' net worth variable ceases to be statistically significant in explaining the variations of firms' leverage in the sub sample of larger firms.

Firms with owners of high net worth⁴⁰ from our sub-sample of nascent firms with owners' net worth information have, on average, a 10% probability of pledging personal collateral and a delinquency score⁴¹ of 2.61, while firms of owners with low net worth⁴² have only 6% probability of pledging personal collateral and a delinquency score of 3.05. These results can be found in table 2.7. In a sub sample of nascent firms with information on the net worth of owners that pledge collateral (in table 2.8), we conclude that owners with high net worth⁴³ have, on average, a delinquency score of 2.71, while firms of owners with low net worth have a delinquency score of 4.00.

2.6. Conclusions

To verify if nascent firms follow pecking order theory we used two robust tests from Frank and Goyal, the financing deficit and the leverage model tests. These tests had

³⁸ Profitability in t minus profitability in t-1. Profitability is net profits to the book value of total assets.

³⁹ A value between one and five, from lower to higher net worth entrepreneurs.

⁴⁰ Owners with more than 100,000 USD of net worth.

⁴¹ Score of delinquency risk with values from 1 to 5, where five is the highest probability of delinquency.

⁴² Owners with less than 50,000 USD of net worth.

⁴³ Owners with more than 100,000 USD of net worth.

already been applied in public firms, but never on nascent firms. Authors have analyzed pecking order theory in nascent and entrepreneurial firms based either on descriptive statistics analysis (Robb & Robinson, 2014) or on the negative relation between external finance and profits (Cosh et al., 2009), but never using the robust pecking order tests of Frank and Goyal⁴⁴.

The financing deficit robust test concludes that nascent firms' net financing deficit does not entirely explain the net long-term debt variations. However, we conclude these firms have some characteristics of pecking order theory, using a first differences leverage model, namely a negative relation between leverage and profits.

We conclude that nascent firms' tangible assets only explain the leverage⁴⁵ in larger nascent firms. Following previous conclusions of research on young and small firms financing (Berger & Udell, 1998; Mac an Bhaird, 2010), we should also expect that in nascent firms, and especially in smaller firms, their financing structure would instead rely on their owners' net worth. Therefore, we substitute the firms' tangible assets variable by the entrepreneurs' net worth in the first differences leverage model used. The entrepreneurs' net worth⁴⁶ explains the nascent firms' leverage and has a positive and statically significant sign, especially in smaller firms, supporting that these firms rely on their entrepreneurs' creditworthiness to obtain external finance, alternatively to firms' tangible assets.

Furthermore, we conclude that entrepreneurs with high net worth pledge more collateral, have firms with lower delinquency risk and have a signaling role to lenders through personal collateral, in order to obtain better financing conditions. To the best of our knowledge, the signaling role of entrepreneurs' net worth and personal collateral in nascent firms has not been previously tested.

In tests on collateral and owners' net worth, we had to use sub-samples of firms with collateral information, only from year 2009 to 2011, and firms with owners' net worth information, only from year 2008 to 2011, since this information was not available in the initial KFS questionnaires. The data from our sample of nascent firms show a residual weight of non-bank financial institutions financing in the total external financing, with

⁴⁴ Additionally other authors have tested the pecking order theory through the negative relation between external finance and profits in public firms and non listed Italian SMEs (Fama & French, 2002; la Rocca et al., 2011; Rajan & Zingales, 1995).

⁴⁵ Measured by change in total debt – total debt in t minus total debt in t-1 – to the book value of total assets in t.

⁴⁶ Measured by an index between one and five, from lower to higher net worth entrepreneurs.

the exception of year 2004, the signaling role of owners' net worth and personal collateral may be affected with the emerge of these lenders.

Our study applies and reconciles consolidated corporate finance theories: pecking order, information asymmetries and signaling theories in nascent firms. The pecking order theory of financing alternatives proposes that due to information asymmetries⁴⁷ firms prefer to fund their projects through internal sources of funding, then with debt and lastly with equity. Firms prefer to retain cash to fund future growth opportunities to protect themselves against future distress and issuance costs as long as the agency costs do not exceed them. Debt is the preferable external financing source because it generates tax shields, as long as the debt servicing costs do not exceed the firms' internal cash flow and distress costs. Equity is the last preferred external source, because it can have high financing costs due to the skepticism of investors relatively to firms' true value; the only way to reduce these costs is to reduce information asymmetries by signaling quality in the market (Akerlof, 1970; Spence, 1973).

Besides the pecking order of alternative sources of external financing, firms also need to decide on their level of leverage, the trade off theory of leverage (Modigliani & Miller, 1958, 1963) is thus essential. Nascent firms typically do not generate sufficient internal cash flows to service debt costs. Even when this latter relation is positive, distress and agency costs may need to be traded off against the benefits that these firms can derive from tax shields.

In our study we demonstrated that as nascent firms are different from mature and public firms, traditional models can be applied, but with adjustments for the specificities of these firms. Alternatively, new models could be developed considering the special role of owners in nascent firms' financing. Further research on these firms is very important to provide insights for future policies towards strengthening nascent firms' and their entrepreneurs' possibilities of success.

Personal collateral, seems to enhance nascent firms' investment, since they do not have to wait for internal cash flow generation to finance new investments. Policies that provide government guarantees or grants to nascent firms could incentivize the investment and entrepreneurship of these firms, especially for entrepreneurs that have good projects and are not able to provide personal collateral. Notwithstanding, adverse selection and moral hazard problems must be considered in these policies. Moreover, it

⁴⁷ Agency costs can also originate a pecking order of financing alternatives (Myers, 2003).

would be interesting to confirm if whether or not banks follow “lazy bank hypothesis” when financing nascent firms (Manove et al., 2018), to avoid inefficient collateral allocation and to enhance nascent’s firms investment. However, our conclusions seem to suggest that the “lazy bank hypothesis” does not apply to our sample of KFS nascent firms.

In environments of high information asymmetries, nascent firms are able to attract professional external investors, such as venture capital funds and business angels, in the first years of their existence, without any track record and with little financial information. Future research paths should address the nature of the fundamentals of these investment decisions from professional investors in nascent firms.

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CHAPTER 3: Trade credit as a signal to professional external investors in nascent firms

Abstract

We use the Kauffman Foundation Firm Survey on 4,928 nascent firms to assess the signaling role of trade credit in attracting and determining external equity from professional external investors. Our findings based on the Heckman two-stage model indicate that trade credit, measured by accounts payable, attracts external equity and attracts and determines the amount of external equity in non-profitable firms with positive sales growth. Trade credit thus exhibits the potential to reduce information asymmetries in the external financing of nascent firms, due to suppliers' information advantages.

JEL classification: D82; G32; M13

Keywords: Asymmetric information; Signaling; Nascent firms; Trade credit; Entrepreneurship; Capital Structure

3.1. Introduction

Deal activity for early and late-stage Seed, Angels and Venture Capital in 3Q 21 already reached at least the 2020 values for all segments considered. The overall activity in 3Q21 reached \$ 238.4 billion, almost fifty per cent higher than the 2020 value: \$ 166.4 billion. However, the 2021 value has been influenced by the rise in the mega deals which are responsible for 50% of deal activity and 5% of the number of deals (Pitchbook & National Venture Capital Association, 2021). The increasing activity of these professional investors following eighteen months of the COVID-19 pandemic and the amounts of investment involved demonstrate that, even in the presence of high information asymmetries, these investors are able to make their investment decisions in nascent firms.

Nascent firms have no track record, little financial information and no robust balance sheets to obtain external financing for their investments. Suppliers, lenders, such as banks, and investors face severe informational asymmetries when financing or investing in these firms; however, they do not have the same informational level or capacity to collect information. It is investors that should face the most serious informational asymmetries, followed by lenders. Due to their closer relationship with their clients, suppliers should have informational and monitoring advantages vis-a-vis other creditors, such as banks, and are able to develop price discrimination strategies, they are thus able to have fewer information asymmetries (Petersen & Rajan, 1997). Moreover, suppliers usually lend goods and other creditors lend cash, and it is easier to divert cash than goods, hence, suppliers may have a role in reducing possible moral hazard problems (Burkart & Ellingsen, 2004) and salvaging advantages.

In highly uncertain environments, such as that of nascent firms, the market players usually read the available signs to make their decisions (Akerlof, 1970; Spence, 1973). Furthermore, players that are less efficient in collecting information from nascent firms may try to read the signs of the parties that are more efficient. Suppliers may, through trade credit, send a signal to equity investors, because they collect valuable information from their clients (Biais & Gollier, 1997). The information content of suppliers goes beyond the financial information and may give investors insights into the operational activity of nascent firms.

Although there is research on the signaling role of trade credit to banks (Agostino & Trivieri, 2014; Alphonse et al., 2004; Atanasova, 2007; Cook, 1999; Del Gaudio et al., 2021; Kling et al., 2014; Petersen & Rajan, 1997; Voordeckers & Steijvers, 2006) and trade credit signaling firm value (Goto et al., 2015; Martínez-Sola et al., 2017) and quality

of investments (Aktas et al., 2012), the signaling role of trade credit to professional external investors in nascent firms has never been tested.

Moreover, suppliers and other creditors, such as banks, have diverse rationales and objectives; banks may not be willing to finance nascent firms, while suppliers continue to finance them, particularly when these firms are non-profitable but have positive sales growth (Petersen & Rajan, 1997), this can, in turn, lead us to speculate that the signaling role of suppliers is reinforced in these firms (Goto et al., 2015), while other creditors, such as banks, have no signaling role.

We have summarized the literature on trade credit signaling role in table 3.1.

In this paper, we first test whether trade credit, measured by accounts payable, attracts professional external investors in nascent firms. The data for our tests is obtained from the Kauffman Firm Survey database on nascent firms of the United States between 2004 and 2011.

Secondly, we test whether trade credit influences the amount of external investment.

Thirdly, we explore how trade credit signals behave in a sub-sample of firms with a greater probability of experiencing financing constraints from lenders, such as banks, but not from suppliers: non-profitable firms with positive sales growth.

In chapter 3.2., we develop the theoretical framework and hypotheses. The data and the sample are described in chapter 3.3., before explaining the method in chapter 3.4.. In chapter 3.5., we report the findings and robustness tests. The final chapter summarizes, concludes and draws implications.

3.2. Theoretical framework and hypotheses

Nascent firms' capital structure

Pecking order theory is one of the most popular theories regarding firms' capital structure. Myers and Myers & Majluf (Myers, 1984; Myers & Majluf, 1984) defend that firms have a hierarchy of financing sources from the lowest to the most expensive sources. As a result of information asymmetries between managers and shareholders, equity issues are very expensive due to adverse selection problems; debt has also a risk premium, albeit less than equity.

In chapter 2.6. it was concluded that nascent firms do not follow pecking order theory, and that equity financing is the main external financing source during their first

years. The data show that equity from professional external investors⁴⁸, supposedly where firms should face the highest information asymmetries, is more important than equity from owners⁴⁹ and family and friends, and provide evidence that nascent firms can receive equity investments, namely from professional external investors, even in environments of high information asymmetries, following Gregory et al. (Gregory et al., 2005). Notwithstanding, nascent firms do not have a track record or historical information that professional external investors can analyze in their investment decisions, which must therefore be based on other sources of information. Moreover, the data show that trade credit, measured by accounts payable, is always more important for these firms than bank credit, and its importance as a financing source grows in their first years as they become more credible (Cuña, 2006), becoming more important than total debt in the last years of the survey.

Trade credit signaling role

Smith (Smith, 1987) concluded that trade credit terms emerge from the choice of sellers to offer trade credit; this choice reveals valuable information concerning buyer default risk to the seller, and will thereby alert to this risk earlier if offering trade credit than if selling in cash and relying exclusively on information generated by the financial markets.

Moreover, a theoretical study by Biais and Goulier (Biais & Gollier, 1997) proves that asymmetric information between banks and firms originates credit rationing and that trade credit can alleviate this as it includes the private information about customers held by suppliers in the bank lending relationship, reducing the adverse selection problems. Additionally, several scholars showed in empirical studies that suppliers' closer relationship with clients gives them some advantages in obtaining information which can act as a screening device for credit quality (Atanasova, 2007; Kling et al., 2014; Petersen & Rajan, 1997; Voordeckers & Steijvers, 2006). This role of trade credit is confirmed in the presence of high information asymmetries in the financing of Russian SMEs (Cook, 1999), of US SMEs (Alphonse et al., 2004) and of Italian SMEs (Agostino & Trivieri, 2014; Del Gaudio et al., 2021).

Burkart and Ellingsen (Burkart & Ellingsen, 2004) use a theoretical model with wealthy and poor entrepreneurs and where suppliers lend goods and banks lend cash, and

⁴⁸ Business angels, companies, government agencies and venture capital funds.

⁴⁹ After the initial equity from owners.

conclude that it is easier to divert cash than inputs, giving the supplier the advantage of reducing moral hazard problems, and that input transaction gives the suppliers an advantage when collecting information against banks. Additionally, the authors defend that suppliers can have an advantage over banks in a liquidation scenario because they can extract higher value from their collateral than banks.

Although suppliers have informational and other advantages over other creditors, such as banks, Epure and Guasch (Epure & Guasch, 2020) demonstrated that debt has a governance role and is thus can act as a signal to external investors in nascent firms.

Suppliers collect important information about their clients and are probably very well positioned to have a clear perspective of the operational activity of nascent firms and evolution of their business. The suppliers' information about the good prospects of their client's business must be relevant for investors in environments of strong information asymmetries, such as that of nascent firms. Therefore, we expect that trade credit can act as a signal to external investors.

H1: Trade Credit attracts professional external investors in nascent firms.

Moreover, trade credit may also signal value (Aktas et al., 2012; Martínez-Sola et al., 2017) or stock returns (Goto et al., 2015).

H2: Trade credit has a positive influence in setting the amount of investment of professional external investors in nascent firms.

As in Burkart and Ellingsen's (2004) theoretical model, Fabbri and Menichini (Fabbri & Menichini, 2010) propose a theoretical model with wealthy and poor entrepreneurs, input liquidity, collateral value of inputs and credit constraints. Two trade credit motives are considered: (i) liquidation: liquidation advantage of suppliers (suppliers lend inputs, not cash, and can recover more value than banks in the case of a firm's liquidation) and (ii) incentive: the informational advantage of suppliers (depending on the borrowing constraints and input liquidity). The authors show that while trade credit and bank credit can both be complementary for unconstrained and less constrained firms; they can be substitutes for more constrained firms with bank credit constraints but that continue to receive trade credit. Hence, suppliers might not share the bank's lack of interest in financing firms, namely when they are non-profitable but have positive sales growth (Petersen & Rajan, 1997), and we can expect the strengthening of the signaling role from trade credit (Goto et al., 2015) whereas no signal role from debt to professional external investors in this case.

H3: In non-profitable firms with positive sales growth, trade credit signaling role is stronger and debt does not serve as a signal to professional external investors.

3.3. Data and sample

Data

We use the more detailed and confidential version of the Kauffman Firm Survey (KFS) database. This data set is only available to researchers using a secure, remote access data enclave provided by the National Opinion Research Center (NORC) at the University of Chicago. The survey tracks 4,928 nascent firms that started in 2004 and through the seven following years until 2011, and contains information on industry, location, financials, financing sources, as well as detailed information about the entrepreneurs.

The target population for the survey was all new businesses that were started in 2004 in the United States. As there was no national registry of startups in the United States, Kauffman Foundation based the survey on firms that the Dun & Bradstreet (D&B) database reported as starting in 2004. This D&B database combines data from various sources that are involved in registering data on new businesses, such as credit bureaus, state offices, credit card and shipping companies, and that are likely to be used by these businesses. This is not the same database as the D&B business registry available on the Internet; the sample from which KFS survey data are drawn contains much greater coverage of firms in the United States.

Robb et al. (Robb et al., 2009), Desroches et al. (DesRoches et al., 2008) and Farhart et al. (Farhat & Robb, 2014) provide detailed descriptions of the sampling process used to construct the initial sample and the survey's inquiries, how the data was treated during the seven follow up surveys and how the final survey data is organized for researchers.

Sample and sub-samples

The firm's legal form is a key feature for potential outside equity injections. The KFS includes sole proprietorships, limited liability companies (LLC), corporations and partnerships. Following Epure and Guash (Epure & Guasch, 2020), we excluded sole proprietorships and partnerships given that, by definition, sole proprietorships⁵⁰ have no outside investors and partnerships are a specific type of business in which an agreement establishes key corporate decisions (e.g. on profits or ownership), especially in the firms'

⁵⁰ Sole proprietorships are unincorporated businesses owned by an individual and do not distinguish between the business and the owner's personal income or wealth filings.

early-stages; these specific conditions can distort arm's length private equity transactions that are the focus of our study.

The utilities and financial firms – NAISCS codes 22, 52 and 53 – were excluded from the KFS cross-section initial data, in line with several authors (Farre-Mensa & Ljungqvist, 2016; Frank & Goyal, 2003; Kling et al., 2014; Shyam-Sunder & C. Myers, 1999).

Although the models used do not imply continuous data, they require variables in two consecutive years and strictly positive values for the variable book value of total assets.

The final sample has 5,822 firm-year observations and includes firms that have no gaps in data on all the variables used. Furthermore, we use sub-samples of nascent firms that: (i) received external equity; (ii) are non-profitable with positive sales growth; and (iii) are non-profitable with positive sales growth and received external equity. The firm-year observations of the sample and sub-samples of nascent firms used are shown in figure 3.1.

Although few nascent firms receive external equity from professional external investors, this investment is very important for the total yearly external financing mix of our sample and sub-samples of nascent firms. Figure 3.2 shows the difference between the weights of external and owners' equity in the total yearly external financing in our sample and sub-samples of nascent firms. In our sample of nascent firms, the weight of yearly external equity increases is, on average, higher than the weight of owners' equity. For nascent firms that received external investment and non-profitable firms with positive sales growth, a greater difference is found between the weights of external and owners' equity in the total yearly external financing than for the nascent firms in our sample.

Sample of nascent firms and sub-sample of nascent firms that receive external equity

Table 3.2 presents the descriptive statistics of our sample of nascent firms; it should be noted that only three per cent of these firms receive external equity, they have a medium score of delinquency risk⁵¹ – 3 - and they are on average profitable. These firms' owners are, on average, forty-six years old, have fifteen years of industry experience, work forty-six hours per week, have less than one experience in a startup firm, eighty-nine per cent are US born and eighty per cent are male. The average nascent firm has revenues of about one million USDs and total assets of about six hundred thousand USD.

⁵¹ Delinquency score index varies from one (lowest probability of delinquency) to five (highest probability of delinquency).

The descriptive statistics of the sub-sample of nascent firms that received external investments are also set out in table 3.2. Compared to the firms of the sample, these firms are more than nine times larger in terms of total assets and more than fifty per cent in terms of revenues. The owners' characteristics are similar, the main difference being that firms that received external equity are generally non-profitable.

We analyze the differences between the percentage of firms that have accounts payable in our sample of nascent firms and in the sub-sample of firms that received external equity investments in table 3.3. The data show that there is a higher percentage of firms with accounts payable⁵² among the firms that received external investment.

Furthermore, table 3.4 analyzes the differences between the average amount of external equity operation of firms in our sub-sample that received external equity investments which have and do not have accounts payable. We conclude that, on average, firms that received external equity and have accounts payable have larger external equity operations.

Appendix G represents the yearly gross financing items of equity, debt and trade credit⁵³ for our sample of firms. After the KFS firms' initial financing in 2004, the yearly financing needs in their first years is obtained mainly from debt; trade credit, measured by accounts payable, is the second yearly financing source, with the exception of year 2005. Nevertheless, trade credit is a more important financing source than bank debt.

After the initial equity in 2004, yearly equity increases in the firms' first years are obtained mainly⁵⁴ from professional external investors – business angels, companies, government agencies and venture capital funds – while equity from family and friends is residual. However, as the number of equity increases from owners is higher than from external investors, the average equity operations from external investors, about one million USDs, is much larger than that of owners, about sixty thousand USD. The importance of yearly equity financing declines during the years of the sample compared to debt and accounts payable' financing, whereas short-term financing increases their weight in the total yearly external financing.

⁵² On average, suppliers receive within 52 days in our sample of nascent firms, while they receive within 48 days in our sub-sample of nascent firms that received external equity. The payment days are obtained multiplying the number of days in the year by the value of accounts payable divided by the value of total expenses minus wage expenses, in firms that have strictly positive values for accounts payable and total expenses minus wage expenses.

⁵³ Measured by accounts payable.

⁵⁴ More than half.

To capture possible differences between the firms from our sample and firms that received external investments, appendix G also presents the yearly gross financing items of equity, debt, and trade credit for the sub-sample of nascent firms that received external equity investments. After the initial financing in 2004, the yearly funding in the first years of firms that received external financing comes mainly from equity; external equity investment is responsible for more than three quarters of the total equity financing. Although venture capital is the most important source of external equity in terms of investment amounts, business angels are the most important source in terms of number of equity increase operations. There is no pattern for the second and third yearly financing source.

Pair-wise correlations among key variables are presented in table 3.5.

3.4. Method

Heckman two-stage model

Nascent firms do not raise equity from external investors either because managers believe that external investment has a high risk premium or they are not able to attract external investment. In this context, sample selection models are particularly useful.

In our paper, we draw on Epure and Guash’s model of signaling to external investors (Epure & Guasch, 2020). Epure and Guash’s model considered the investment decision of external investors in nascent firms to be a two-stage process in which: (i) the firm either receives external equity or does not; and (ii) the investment amount is set conditional upon receiving outside equity. In the investment decisions of nascent firms, the first-stage “selection equation” may not be independent from the “outcome equation” where the amount is set.

The Heckman selection model is the regression model used as it addresses all the conditions of the theoretical model considered⁵⁵. The selection (Equation 3.1) and outcome (Equation 3.2) equations are:

$$\text{Ext_Eq_Dum}_{i,t} = \alpha + \beta_1 \text{Ln}(\text{Accounts payable})_{i,t} + \beta_2 \text{Ext_Eq_Dum}_{i,t-1} + \beta_3 \text{Crisis}_{i,t} + \beta_4 X_{i,t} + \beta_5 Z_{i,t} + \delta_{i,t} + \gamma_{i,t} + \theta_{i,t} + \varepsilon_{i,t} \quad (3.1)$$

⁵⁵ The probit regression model could also be used for the investment decision if it were possible to exclude the firms that do not receive external investment because they do not want to. This is because it assumes the same mechanism to generate positive or negative investment decisions.

$$\begin{aligned} \text{Ln}(\text{Ext_Eq})_{i,t} = & \alpha + \beta_1 \text{Ln}(\text{Accounts payable})_{i,t} + \beta_2 \text{Crisis}_{i,t} + \beta_3 X_{i,t} + \quad (3.2) \\ & \beta_4 Z_{i,t} + \delta_{i,t} + \gamma_{i,t} + \theta_{i,t} + \varepsilon_{i,t} \end{aligned}$$

We use the following notation:

$\text{Ext_Eq_Dum}_{i,t}$	Dummy variable that assumes one if firm <i>i</i> receives external equity in year <i>t</i> , and zero otherwise.
$\text{Ln}(\text{Ext_Eq})_{i,t}$	Logarithm of one plus the amount in USD of external equity received by firm <i>i</i> in year <i>t</i> .
$\text{Ln}(\text{Accounts payable})_{i,t}$	Logarithm of one plus the amount in USD of accounts payable of firm <i>i</i> in year <i>t</i> .
$\text{Crisis}_{i,t}$	Dummy variable that assumes the value of one between years 2007 and 2009, and zero otherwise.
$X_{i,t}$	Vector of variables with characteristics of firm <i>i</i> in year <i>t</i> (see appendix H).
$Z_{i,t}$	Vector of variables with characteristics of the principal owner of firm <i>i</i> in year <i>t</i> (see appendix H).
$\delta_{i,t}$	Control variable for year.
$\gamma_{i,t}$	Control variable for industry.
$\theta_{i,t}$	Control variable for legal status.

In the Heckman selection model, an exclusion restriction is usually recommended (Cameron & Trivedi, 2009). This requires the selection equation to have an exogenous variable that is excluded from the outcome equation. The excluded variable should have a substantial impact on the probability of selection and not directly affect the outcome. We have followed Epure and Guash, and assumed that the variable - $\text{Ext_Eq_Dum}_{i,t-1}$ - fulfills the exclusion restriction; therefore, it is included only in the selection equation. Consequently, the authors considered that it is significant in the selection equation (probability of being invested) but not in the amount equation (having received outside equity does not drive the amount to invest).

The selection equation is estimated using a probit regression, and the outcome equation is estimated by a OLS regression. All our estimates are performed in version sixteen of STATA software. All tables with estimated results include the following information on the regressions: chi square tests for probit and OLS regressions, including statistical significance, log likelihood test for the probit regression, with statistical significance, and the lambda variable coefficient with its statistical significance, as well as the values of rho and sigma⁵⁶.

⁵⁶ Lambda = rho x sigma.

Testing differences in trade credit signaling role in a sub-sample of non-profitable firms with positive sales growth

As bank and trade credit do not follow the same rationale, suppliers might not share the bank's unwillingness to finance firms (Fabbri & Menichini, 2010). Suppliers are willing to finance firms that are non-profitable and with positive sales growth because they have several advantages over other creditors, such as banks, and they can use trade credit in price discrimination strategies. Therefore, we should expect a strengthening of suppliers' signaling role and no signal from other creditors, such as banks, to external investors in non-profitable nascent firms with positive sales growth.

We test the trade credit and debt signaling roles in a sub-sample of firms that do not have profits and that have positive sales growth. To test the debt signaling role, we substitute the variable $\text{Ln}(\text{Accounts payable})_{i,t}$ by $\text{Ln}(\text{Debt})_{i,t}$ ⁵⁷ in equations 3.1 and 3.2.

3.5. Findings

3.5.1. Main findings

Trade credit signaling role

Suppliers collect valuable information about their clients in their close relationship and decide whether or not they are willing to take their credit risk. Although lending and investment decisions are different, external investors can rely on suppliers' lending decisions and consider that they can act as signals to their investment decisions. In the present paper, we draw on Epure and Guash's empirical model, and apply it in testing the signaling role of trade credit⁵⁸ on our sample of nascent firms.

The results are presented in Table 3.6 and show that trade credit, measured by accounts payable, act as a signal to external investors' decision to invest in a nascent firm. Therefore, we do not reject *H1* with a confidence level of 1%.

Furthermore, trade credit does not influence⁵⁹ the amount of investment of professional external investors. Therefore, we reject *H2* with a confidence level of 1%.

Similar to Epure and Guash, we use three different model specifications: a complete model with all the variables from chapter 3.4. and appendix H – column I –, a model without owner characteristics variables – column II - and a reduced model without owner

⁵⁷ Logarithm of one plus the amount in USD of debt of firm *i* in year *t*.

⁵⁸ Measured by accounts payable.

⁵⁹ The coefficient of trade credit variable is not statistically significant.

characteristics and financial information variables – column III. The previous results do not change with the model specifications and are robust, considering the three different model specifications used.

Testing differences in trade credit signaling role in a sub-sample of non-profitable firms with positive sales growth

We selected a sub-sample of nascent firms that are non-profitable and with positive sales growth, where we expect to find an increase in trade credit signaling role on one hand, and no signaling role from debt on the other hand. The results of the sub-sample's regressions are presented in table 3.7. The sub-sample of firms that are non-profitable and with positive sales growth show that trade credit⁶⁰ signaling role is strengthened because trade credit attracts external investors and positively influences the amount of investment of external equity investors, and debt has no signaling role. Consequently, we do not reject *H3*, with a confidence level of 1%.

3.5.2. Other findings

Trade credit signaling role

The revenues, profits and the years of crisis, between 2007 and 2009, negatively affect the investment decision, while cash and accounts receivable make a positive contribution. Moreover, the owner's characteristics influence the investment decision of external investors, this result is in line with several authors (Bernstein et al., 2017; Epure & Guasch, 2020; Hoenig & Henkel, 2015; Hsu, 2007; Wessendorf et al., 2019).

In contrast to the first phase, crisis and revenues variables are not statistically significant; on the other hand, a higher probability of delinquency has a negative influence on the amount of investment, while high tech firms and tangible assets have a positive effect. Similarly to the first phase, cash has a positive and statistically significant influence on the amount of external investment.

Testing differences in trade credit signaling role in a sub-sample of non-profitable firms with positive sales growth

In the sub-sample of nascent firms that are non-profitable and with positive sales growth, the investment decision is only negatively affected by revenues, while cash has a positive contribution. The owner's characteristics have less influence on the investment decision of external investors vis-a-vis the previous results of our sample.

⁶⁰ Measured by accounts payable.

Unlike the first phase, the revenues variable is not statistically significant while: (i) the years of crisis, between 2007 and 2009, have a positive impact (ii) a higher probability of delinquency has a negative influence; and (iii) firms' tangible assets and the number of employees have a positive effect on the amount of investment. Similar to the first phase, cash has a positive and statistically significant influence on the amount of external investment.

3.5.3. Economic significance of findings

The interpretation of coefficients in regression models with dummy and logarithmic variables have some specificities that are identified in Appendix A.

Trade credit⁶¹ has a signaling role in attracting professional external investors in our sample of nascent firms: an increase of 1% in the amount of trade credit, or, on average, of 730 USD, increases the probability of a nascent firm receiving external investment by 0.051 percentage points. These results can be found in the more complete signaling model of table 3.6. Trade credit does not have statistical significance in influencing the amount of external investment.

Moreover, owner characteristics seem to influence the professional investors' decisions, namely: (i) one additional year in the owners' age increases the nascent firms' probability of receiving external investment by 1 percentage point; (ii) one additional year in the owners' experience in the same industry decreases the nascent firms' probability of receiving external investment by 1 percentage point; and (iii) each new business started by the owner increases the nascent firms' probability of receiving external investment by 8 percentage points.

In a sub sample of non-profitable nascent firms with positive sales growth (table 3.7), the signaling role of trade credit⁶² in attracting professional external investors is very close to that of our sample of nascent firms: an increase of 1% in the amount of trade credit, or, on average, by 730 USD, increases the probability of a non-profitable nascent firm with positive sales growth receiving professional external investment by 0.050 percentage points. Additionally, trade credit also signals the amount of investment with statistical significance in this sub sample: an increase of 1% in the amount of trade credit, or, on average, by 3,820 USD, increases the amount of external investment in a non-profitable

⁶¹ Measured by the amount of accounts payable.

⁶² Measured by Accounts payable.

nascent firm with positive sales growth by 0.052%, or, on average, by 1,090 USD. Lastly, total debt does not signal the professional external investment in a sub-sample of non-profitable nascent firms with positive sales.

3.5.4. Robustness tests

While suppliers and other creditors, such as banks, collect different information through their own channels, suppliers have informational advantages. Thus, there should be differences between debt and trade credit information content, and their signaling role to external investors may also diverge. To the best of our knowledge, the possible differences in the information content of trade credit and debt signaling roles have never previously been tested.

Petersen and Rajan (Petersen & Rajan, 1997) used US SME data to study the determinants of the demand and offer of trade credit. They find that the offer of trade credit does not follow the same rationale as banks' credit decisions because suppliers have advantages in collecting information, monitoring and salvaging value from existing assets. To test the possible differences between the information content of the signaling role of trade credit and debt, we add the variables $\text{Ln(Debt)}_{i,t}$ and $\text{Ln(Accounts payable)}_{i,t} \times \text{Ln(Debt)}_{i,t}$ ⁶³ to the initial selection (Equation 3.1) and outcome (Equation 3.2) equations; the new equations are:

$$\begin{aligned} \text{Ext_Eq_Dum}_{i,t} = & \alpha + \beta_1 \text{Ln(Accounts payable)}_{i,t} + \beta_2 \text{Ln(Debt)}_{i,t} + & (3.3) \\ & \beta_3 \text{Ext_Eq_Dum}_{i,t-1} + \beta_4 \text{Crisis}_{i,t} + \beta_5 X_{i,t} + \beta_6 Z_{i,t} + \\ & \beta_7 \text{Ln(Accounts payable)}_{i,t} \times \text{Ln(Debt)}_{i,t} + \delta_{i,t} + \gamma_{i,t} + \varepsilon_{i,t} \end{aligned}$$

$$\begin{aligned} \text{Ln(Ext_Eq)}_{i,t} = & \alpha + \beta_1 \text{Ln(Accounts payable)}_{i,t} + \beta_2 \text{Ln(Debt)}_{i,t} + & (3.4) \\ & \beta_3 \text{Crisis}_{i,t} + \beta_4 X_{i,t} + \beta_5 Z_{i,t} + \beta_6 \text{Ln(Accounts payable)}_{i,t} \times \text{Ln(Debt)}_{i,t} + \\ & \delta_{i,t} + \gamma_{i,t} + \theta_{i,t} + \varepsilon_{i,t} \end{aligned}$$

We have already concluded that trade credit, as well as debt (Epure & Guasch, 2020), can act as a signal to external equity investors in nascent firms. Nevertheless, it is important to analyze whether there is any interaction between the trade credit and debt

⁶³ Logarithm of one plus the amount in USD of accounts payable of firm *i* in year *t* times logarithm of one plus the amount in USD of debt received by firm *i* in year *t*.

signaling roles, and whether their joint signaling enhances or diminishes the external equity investment decision and amount.

Table 3.8 sets out the results of regressions with the trade credit, measured by accounts payable, and debt variables and their interaction. The results show a statistically significant interaction between trade credit and debt; whereas there is negative interaction between trade credit and debt in the investment decision phase, the interaction is positive in the phase of setting the investment amount.

3.6. Conclusions

We have followed a two-stage signaling model and proved for the first time that trade credit⁶⁴ act as a signal to external investment decisions in nascent firms. Although the literature demonstrated different signaling roles of trade credit due to the information advantages of suppliers, this paper confirmed for the first time the signaling role of trade credit in attracting external investors in nascent firms. Although trade credit attracts external investors, it does not influence the amount of their investments in nascent firms.

Although suppliers have informational, monitoring, salvaging and other advantages⁶⁵ and thus may reduce the information asymmetries, namely adverse selection and moral hazard problems, of external investors in nascent firms more effectively than other creditors, such as banks, we have explored potential differences between the rationales and objectives of suppliers and other creditors. Therefore, we tested the trade credit and debt signaling roles in a sub-sample of nascent non-profitable firms with positive sales growth, and found that suppliers enhance their signaling role, while other creditors, such as banks, are not signals for external investors. Theoretical and empirical literature in public firms has already addressed this topic, but never in nascent firms or in a signaling model.

The investment decision in nascent firms seems to be procyclical and focused on non-profitable and smaller firms in terms of revenues. Moreover, it is found that the owners' characteristics also influence the external investors' decisions. In the second phase of the investment decision, the investment amount seems to be increased in firms with a low probability of delinquency and in high-tech sectors. These results are robust, given the three different model specifications used.

⁶⁴ Measured by accounts payable.

⁶⁵ Such as: (i) price discrimination strategies (Petersen & Rajan, 1997); and (ii) the fact that they lend goods and not cash, which can reduce moral hazard problems (Burkart & Ellingsen, 2004).

Additionally, we found a statistically significant interaction between debt and trade credit signals: (i) negative in the phase of the investors' decision – probably meaning that the signals from trade credit and debt have some common information content; and (ii) positive in the phase of setting the investment amount – probably meaning that when investors decide the investment amount, they understand that the nature of trade credit and debt information content are different. These conclusions enhance the research on trade credit and debt information contents.

These results highlight that although the suppliers' signaling role is focused on operational activity of nascent firms, they worry about their credit risk⁶⁶ (Petersen & Rajan, 1997); on the other hand, the signaling of other creditors, such as banks, is focused on the financial (Mason & Stark, 2004) and governance issues (Epure & Guasch, 2020) of these firms.

The signaling role of trade credit and suppliers informational and monitoring advantages may be affected when suppliers contract trade credit insurance, in this case suppliers and banks rationales may be closer.

Further research on nascent firms is required to provide insights for future policies to boost the possibility of success for nascent firms and entrepreneurs (Stewart, 2021).

The signaling role of trade credit in nascent firms should justify the emphasis these firms place on their relationship with suppliers, ultimately through developing alliances or partnerships with them (Hoenig & Henkel, 2015; Wessendorf et al., 2019).

External investors in nascent firms mitigate the high information asymmetries of these firms by reading the available signals of trade credit. These signals provide external investors with additional information about the firms' operational activity and future development. Future research paths should address how nascent firms can signal their innovation and future growth opportunities to external professional investors.

⁶⁶ This is probably the common information content between suppliers and other creditors.

CHAPTER 4: Patent as a signal to professional external investors in nascent firms

Abstract

We use the Kauffman Foundation Firm Survey on 4,928 nascent firms to assess the extent to which their patents have the potential to attract and determine the amount of external equity from professional external investors. The Heckman two-stage models used show that patents attract and determine the amount of external equity, particularly in the case of simple technologies in the manufacturing sector. These patents, however, do not attract trade credit or external debt, indicating the distinct information content required by providers of external finance. Mechanisms that ally information asymmetries in nascent firms are critical for reducing their financing frictions.

***JEL classification:** D82; M13; O34; O32*

***Keywords:** Asymmetric information; Signaling; Nascent firms; Patents; Entrepreneurship; Capital Structure*

4.1. Introduction

Entrepreneurship of small ventures has declined since 2000; this change has been accompanied by an increase in the share of activity of mega firms i.e. those with more than 10,000 employees, see chapter 3.1.. This has had negative impacts on job creation, innovation and productivity growth as well as on business dynamism indicators (Haltiwanger, 2021). President Biden's "American Jobs Plan" seeks to increase innovation activity, which will entail the active participation of innovative nascent firms, business angels and venture capital funds (Pitchbook & National Venture Capital Association, 2021).

Given that nascent firms have no track record, sparse financial information and no robust balance sheets to finance their investments, investors in nascent firms face serious informational asymmetries in their investment decisions. Empirical data show that in this context of high informational asymmetries, professional investors manage to make investment decisions of, on average, one million USDs per year in the first years of nascent firms; this external investment represents, on average, more than 50% of these firms' yearly equity increases, see chapter 3.3.

In environments of high uncertainty, as in the case of nascent firms, the market players usually read the available signs before taking their decisions (Akerlof, 1970; Spence, 1973). Although investors can read the signals from trade credit, see chapter 3.6, these may not signal firms' innovation and future growth opportunities correctly to investors.

We have summarized the literature on patent signaling role in table 4.1.

Some authors defend that patents have a positive influence on external investors' decisions (Hellmann & Puri, 2000; Hoenig & Henkel, 2015; Vo, 2019), while others have demonstrated that patents may act as a signal to professional external investors (Audretsch et al., 2012; Engel & Keilbach, 2007; Hoenen et al., 2014; Kolympiris et al., 2018; Lahr & Mina, 2016) and even to crowdfunding investors (Ahlers et al., 2015), but never using a signaling model. Moreover, patents may influence the investors' valuation of nascent firms (Farre-Mensa et al., 2020; Hsu & Ziedonis, 2013; Useche, 2014; Wessendorf et al., 2019).

Although patents may play a signaling role in external investors' decisions, they seem to have different roles in manufacturing industries, depending on their technological complexity (Cohen et al., 2000). Similarly, based on a sample of US public firms, Heeley et al. (Heeley et al., 2007) suggested that when the technologies of these firms are

complex, patents play a weaker role in reducing information asymmetries, and thus the discount in the IPOs of these firms must be higher in order to compensate investors for more severe information asymmetries. To the best of our knowledge, the effect of the technological complexity on the patents' signaling role to external investors in manufacturing nascent firms has not been addressed by other authors, although it has already been identified by Audretsch et al. (Audretsch et al., 2012).

Additionally, there are contrasting views on patents' signaling to lenders: (i) positive signal to venture debt and bank financing (Farre-Mensa et al., 2020; Gaétan de Rassenfosse & Fischer, 2016); and (ii) no signal to banks' financing (Audretsch et al., 2012).

In this paper, we start by using a signaling model to test whether patents may act as a signal to professional external investors.

Secondly, we test whether patents influence the amount of external investment.

Thirdly, we explore how patent signaling role behave in two sub-samples of manufacturing firms with simple and complex technologies.

Chapter 4.2. sets out the theoretical framework and the hypotheses. Chapter 4.3. describes the data and the sample before discussing the method in chapter 4.4.. In chapter 4.5., we report the findings and robustness tests. Lastly, chapter 4.6. summarizes, concludes and draws implications.

4.2. Literature and hypotheses

Nascent firms' capital structure

In chapter 2.3. it was shown that equity is the main external financing source during nascent firms' first years. The data evidences that equity from professional external investors⁶⁷, supposedly where firms should face the highest information asymmetries, is more important than equity from owners⁶⁸ and family and friends, and provide evidence that nascent firms can receive equity investments, namely from professional external investors, even in environments of high information asymmetries, following Gregory et al. (Gregory et al., 2005). Notwithstanding, nascent firms do not have a track record or historical information that professional external investors can analyze in their investment decisions, which must therefore be based on other sources of information.

⁶⁷ Business angels, companies, government agencies and venture capital funds.

⁶⁸ After the initial equity from owners.

Patent as a signal to external investors

Successful entrepreneurs must be able to finance their projects but, given the high information asymmetries in nascent firms, obtaining external financing may be challenging, notably for entrepreneurs without an established reputation (Hsu, 2004).

Nascent firms are particularly affected by information asymmetries because they do not usually have a track record of revenues or results; moreover, although they have intangible assets in the form of intellectual property rights, such as patents, they do not have tangible assets. While these resources can provide nascent firms with competitive advantage and value (Hsu & Ziedonis, 2013), they are not usually valued or pledgeable (Audretsch et al., 2012), see also chapter 2.3..

Patents are usually associated with innovation, and innovator firms are more likely to receive external equity than imitator firms (Hellmann & Puri, 2000). Patents can also have a positive effect on venture capital decisions (Hoenig & Henkel, 2015), although they may not affect business angels' decisions (Vo, 2019).

As in Akerlof's market for "lemons" (Akerlof, 1970), nascent firms are in a context of high uncertainty and have to signal (Spence, 1973) their innovation and future growth opportunities to reduce information asymmetries and receive external equity.

Audretsch et al. (Audretsch et al., 2012) identify the signaling effect of patents and the importance of combining patents with the entrepreneurs' experience and developing prototypes to increase the feasibility of patents. Moreover, and in line with our conclusions in chapter 2.6., the authors defend that patents do not serve as a signal to banks which are essentially interested in collateral.

Patents seem to serve as a signal for both professional investors and equity crowdfunding investors (Ahlers et al., 2015). This signaling role seems to be more effective when combined with the founding team's characteristics, namely entrepreneurial experience, and in the case of greater geographical distance between entrepreneurs and external investors, as information asymmetries increase (Kolympiris et al., 2018); and the signaling role seems to decline over the various rounds of VC financing as information asymmetries are reduced (Hoenen et al., 2014). Additionally, patents seem to serve as a signal for VC financing, but this financing does not seem to increase patents' performance (Engel & Keilbach, 2007; Lahr & Mina, 2016).

H1: Patents act as a signal to professional external investors.

Patents may attract professional external equity investors, but may also influence the value of nascent firms (Farre-Mensa et al., 2020; Hsu & Ziedonis, 2013; Wessendorf et al., 2019), and thus influence the amount of their future IPO investment (Useche, 2014).

H2: Patents have a positive influence in setting the amount of investment of professional external investors.

Patents as a signal in manufacturing firms

The role played by patents in manufacturing industries with simple technologies⁶⁹ seems to be different from the role played when they have complex technologies⁷⁰ - (Cohen et al., 2000). Using a sample of US manufacturing firms' IPOs between 1981 and 1988, Heeley et al. (Heeley et al., 2007) concluded that when these firms' technologies are complex⁷¹ and, consequently, the link between patents and the inventive value generation is less clear, patents play a weaker role in reducing information asymmetries, and the underpricing of IPOs⁷² is therefore greater to compensate investors for the higher information asymmetries. Audretsch et al. (Audretsch et al., 2012) also identified this problem but did not analyze it further.

H3: The influence of patents in the amount of investment is weaker in manufacturing firms with complex technologies.

4.3. Data and descriptive statistics

Data

We use the more detailed and confidential version of the Kauffman Firm Survey (KFS) database. This data set is only available to researchers using a secure, remote access data enclave provided by the National Opinion Research Center (NORC) at the University of Chicago. The survey tracks 4,928 nascent firms that started in 2004 and over seven follow-up years until 2011, and contains information on industry, location, financials, financing sources, as well as detailed information of the entrepreneurs.

The target population for the survey was all new businesses set up in 2004 in the United States. As there was no national registry of startups in the United States, Kauffman Foundation based the survey on firms that the Dun & Bradstreet (D&B) database reported

⁶⁹ e.g. chemicals, pharmaceuticals and metals.

⁷⁰ e.g. machinery, computers and electronic equipment.

⁷¹ ISIC codes of US firms 2900 and higher.

⁷² Underpricing occurs when the initial offer price of an IPO is lower than the closing price at the end of the first day of trading, meaning that the value at which the firm sells shares to the investment community is lower than their actual market value.

as starting in 2004. This D&B database combines data from various sources that are involved in registering data on new businesses, such as credit bureaus, state offices, credit card and shipping companies, and that are likely to be used by these businesses. This is not the same database as the D&B business registry available on the Internet; the sample from which KFS survey data are drawn contains much greater coverage of firms in the United States.

Robb et al. (Robb et al., 2009), Desroches et al. (DesRoches et al., 2008) and Farhart et al. (Farhat & Robb, 2014) provide detailed descriptions of the sampling process used to construct the initial sample and the survey inquiries, how the data was treated during the seven follow up surveys and how the final survey data is organized for researchers.

Sample and sub-samples

The firm's legal form is a key feature for potential outside equity injections. The KFS includes sole proprietorships, limited liability companies (LLC), corporations and partnerships. Following Epure and Guash (Epure & Guasch, 2020), we excluded sole proprietorships and partnerships because, by definition, sole proprietorships have no outside investors⁷³, and partnerships are a specific type of business in which an agreement establishes key corporate decisions (e.g. on profits or ownership), especially in the firms' early-stages; these particular conditions can distort arm's length private equity transactions that are within the focus of our study.

Drawing on several authors (Farre-Mensa & Ljungqvist, 2016; Frank & Goyal, 2003; Kling et al., 2014; Shyam-Sunder & C. Myers, 1999), the utilities and financial firms – NAISCS codes 22, 52 and 53 – were excluded from the initial KFS cross-section data.

Although the models used do not imply continuous data, they require variables in two consecutive years and strictly positive values for the variable book value of total assets.

Our final sample has 5,822 firm-year observations and includes firms that have no gaps in data on all the variables used. We also use sub-samples of nascent firms that: (i) received external equity; (ii) have patents; (iii) are in non-manufacturing industries; (iv) are in manufacturing industries; (v) are in manufacturing industries with simple technologies; (vi) are in manufacturing industries with complex technologies; (vii) are in manufacturing industries with simple technologies and received external investment; and

⁷³ Sole proprietorships are unincorporated businesses owned by an individual and do not distinguish between the business and the owner's personal income or wealth filings.

(viii) are in manufacturing industries with complex technologies and received external investment. The firm-year observations of the sample and sub-samples of nascent firms used are shown by year in figures 4.1 and 4.2.

In table 4.2 we present the firm-year observations of sub samples of nascent firms: with or without patents, non manufacturing and manufacturing firms⁷⁴ with different technology complexity, organized by sources of financing, namely firms that have external financing, such as equity, debt and trade credit⁷⁵, and firms that do not have external sources of financing. It is found that patents, manufacturing firms and manufacturing firms with simple technologies foster equity financing from professional external investors.

Although few nascent firms receive external equity from professional external investors, this investment is very important for the total yearly external financing mix of our sample and sub-samples of nascent firms. Figures 4.3 and 4.4 show the difference between the weights of external and owners' equity in the total yearly external financing in our sample and sub-samples of nascent firms by year. There is a greater difference between the weights of external and owners' equity in the total yearly external financing in nascent firms that receive external investment, in firms with patents and in manufacturing firms. The difference between the weights of external and owners' equity in the total yearly external financing is greater in manufacturing firms with simple technologies than in those with complex technologies.

Sample of nascent firms and sub-sample of nascent firms with patents: descriptive statistics

Table 4.3 presents the descriptive statistics of our sample of nascent firms. It should be noted that only three per cent of these firms receive external equity, they have a medium delinquency risk score⁷⁶ – 3 - and are on average profitable. On average, the owners of these firms are forty-six years old, have fifteen years of industry experience, work forty-six hours per week, have experience of less than one startup firm, eighty-nine per cent are US born and eighty per cent are male. The average nascent firm has revenues of about one million USDs and total assets of about six hundred thousand USD.

⁷⁴ NAICS codes from 31 to 33.

⁷⁵ Measured by accounts payable.

⁷⁶ Delinquency score index varies from one (lowest probability of delinquency) to five (highest probability of delinquency).

The descriptive statistics of nascent firms with patents are also presented in table 4.3. Compared to the firms of the total sample, the revenues of these firms are thirty per cent larger and total assets are almost double. The owners have similar characteristics and the main difference is that firms with patents are generally non-profitable.

We analyzed the differences between the percentage of firms with patents in our sample of nascent firms and in the sub-sample of firms that received external equity investments in table 4.4. The data show that, on average, the percentage of patents in firms that received external equity is almost five times higher⁷⁷.

We also analyzed the differences between the average external equity operation of firms that have and do not have patents in our sub-sample of firms that received external equity investments, in table 4.5. We conclude that, on average, firms with patents have larger external equity operations.

Pair-wise correlations among key variables are presented in table 4.6 and appendix I represents the yearly gross financing items of equity, debt, and trade credit⁷⁸ for our sample of nascent firms and for the sub-sample of firms that have patents.

Sub-samples of manufacturing nascent firms with simple and complex technologies: descriptive statistics

The role of patents seems to differ depending on whether nascent firms are from manufacturing industries with simple or complex technologies. Drawing on Heeley et al. (Heeley et al., 2007)⁷⁹, we have considered two sub-samples of manufacturing firms with simple technologies – NAISCS codes 3100 to 3321 – and with complex technologies – NAISCS code 3322 to 3399. The sub-samples of manufacturing firms with simple and complex technologies have 245 and 795 firm-year observations, respectively.

Table 4.7 presents the descriptive statistics of our sub-sample of manufacturing firms with simple technology; it should be noted that thirteen per cent of these firms receive external equity and twenty-three per cent have patents, they have on average six employees and a medium delinquency risk score of – 3 - and are generally non profitable. The owners of these firms are typically forty-seven years old, have thirteen years of industry experience, work forty-seven hours per week, have experience of more than one

⁷⁷ The percentage of patents in firms that received equity from venture capital funds and from business angels is very similar, about fifty percent; this is not in line with the results of Vo from the analysis of 468 Canadian early-stage ventures financing between 1995 and 2009 (Vo, 2019)

⁷⁸ Measured by accounts payable.

⁷⁹ Heeley et al, used SIC codes 2000 to 2900, instead of NAISCS codes 3100 to 3321, and SIC codes 2900 to 3900, instead of NAISCS code 3322 to 3399.

startup firm, seventy-seven per cent are US born and eighty-one per cent are male. The average firm has revenues of about one million and five hundred thousand USD and total assets of about eight hundred thousand USD. Table 4.8 presents the descriptive statistics of the sub-sample of manufacturing firms with simple technology that received external investments. Compared to the sub-sample of manufacturing firms with simple technology, the percentage of patents is on average, more than three times higher, their total assets are more than two times larger and revenues almost seventy per cent smaller, the owners' characteristics are similar and the main difference is that these firms are generally less profitable. The average external equity operation is close to 2 million USDs.

The descriptive statistics of our sub-sample of manufacturing firms with complex technology are also presented in table 4.7. It should be noted that only six per cent of these firms receive external equity and seventeen per cent have patents, they have on average twelve employees and a medium delinquency risk score – 3 - and they are, in general, almost profitable. The characteristics of the owners of these firms are generally similar to those of the owners of manufacturing firms with simple technology. The average firm has revenues of about one million and six hundred thousand USD and total assets of about one million USDs. The descriptive statistics of the sub-sample of manufacturing firms with complex technology that received external investments are also presented in table 4.8. Compared to the sub-sample of manufacturing firms with complex technology, the percentage of patents is, on average, more than four times higher, total assets more than three times larger and revenues are almost twenty-five per cent smaller, the characteristics of the owners are similar and the main difference is that these firms are typically less profitable. The average external equity operation is close to 2 million USDs.

We would like to underline that manufacturing firms with complex technology that received external investments are, on average, almost sixty per cent larger in terms of total assets and more than two times larger in terms of revenues; however, the average equity operation is very similar to that of manufacturing firms with simple technology that received external investments. In table 4.9, we analyze the differences between the average external equity operation of firms that have and do not have patents in our sub-samples of manufacturing firms with simple and complex technologies that received external investment. We conclude that the external equity operations in manufacturing firms with simple technology and which have patents are, on average, at least 5 times larger than in those that do not have patents; on the other hand, manufacturing firms with

complex technology and with patents typically have similar external equity operations to firms without patents.

4.4. The model

Heckman two-stage model

Nascent firms do not raise equity from external investors either because managers believe that external investment has a high risk premium or because they are not able to attract external investment. In this context, sample selection models are particularly useful.

We draw on the Epure and Guash model of signaling to professional external investors (Epure & Guash, 2020). Epure and Guash's model considered that the investment decision of external investors in nascent firms is a two-stage process: first, the firm either receives or not external equity and, second, conditional upon receiving outside equity, the investment amount is set. In nascent firms' investment decisions, the first-stage "selection equation" may not be independent from the "outcome equation" when the amount is set.

The Heckman selection model is the regression model used as it addresses all the conditions of the theoretical model considered⁸⁰. The selection (Equation 4.1) and outcome (Equation 4.2) equations are:

$$\begin{aligned} \text{Ext_Eq_Dum}_{i,t} = & \alpha + \beta_1 \text{Patents}_{i,t} + \beta_2 \text{Ext_Eq_Dum}_{i,t-1} + \beta_3 \text{Crisis}_{i,t} \\ & + \beta_4 X_{i,t} + \beta_5 Z_{i,t} + \delta_{i,t} + \gamma_{i,t} + \theta_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (4.1)$$

$$\begin{aligned} \text{Ln}(\text{Ext_Eq})_{i,t} = & \alpha + \beta_1 \text{Patents}_{i,t} + \beta_2 \text{Crisis}_{i,t} + \beta_3 X_{i,t} + \beta_4 Z_{i,t} \\ & + \delta_{i,t} + \gamma_{i,t} + \theta_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (4.2)$$

We use the following notation:

$\text{Ext_Eq_Dum}_{i,t}$	Dummy variable that assumes one if firm <i>i</i> receives external equity in year <i>t</i> , and zero otherwise.
$\text{Ln}(\text{Ext_Eq})_{i,t}$	Logarithm of one plus the amount in USD of external equity received by firm <i>i</i> in year <i>t</i> .
$\text{Patents}_{i,t}$	Dummy variable that assumes one if firm <i>i</i> has at least one patent in year <i>t</i> , and zero otherwise.

⁸⁰ Probit regression model could also be used for the investment decision if it were possible to exclude the firms that choose not to receive external equity, because this model assumes the same mechanism to generate positive or negative investment decisions.

$Crisis_{i,t}$	Dummy variable that assumes one between years 2007 and 2009, and zero otherwise.
$X_{i,t}$	Vector of variables with characteristics of firm i in year t (see appendix H).
$Z_{i,t}$	Vector of variables with characteristics of principal owner of firm i in year t (see appendix H).
$\delta_{i,t}$	Control variable for year.
$\gamma_{i,t}$	Control variable for industry.
$\theta_{i,t}$	Control variable for legal status.

In the Heckman selection model, an exclusion restriction is usually recommended (Cameron & Trivedi, 2009). This requires the selection equation to have an exogenous variable that is excluded from the outcome equation. The excluded variable should have a substantial impact on the probability of selection and not directly affect the outcome. We have followed Epure and Guash, and assumed that the variable - $Ext_Eq_Dum_{i,t-1}$ - fulfills the exclusion restriction; therefore, it is included only in the selection equation. Consequently, the authors considered that it is significant in the selection equation (probability of being invested) but not in the amount equation (having received outside equity does not drive the amount to invest).

The selection equation is estimated by a probit regression, and the outcome equation is estimated by an OLS regression. All our estimates are performed in version sixteen of STATA software. All tables with estimates results include the following information regarding the regressions: chi square tests for probit and OLS regressions, including statistical significance, log likelihood test for the probit regression, with statistical significance, and the lambda variable coefficient with its statistical significance, as well as the values of rho and sigma⁸¹.

Patents signaling role in manufacturing firms with simple and complex technologies

The percentage of manufacturing firms with patents – nineteen per cent – is more than six times that of non-manufacturing firms – three per cent. Moreover, the percentage of external investments in manufacturing firms – seven per cent – is more than three times that of non-manufacturing firms – two per cent. Therefore, we could expect the signaling role of patents to external investors to be stronger in manufacturing firms.

The role played by patents (Cohen et al., 2000) and links to the value generation seem to be different in manufacturing firms with either simple or complex technologies. Patents

⁸¹ Lambda = rho x sigma.

seem to be more effective in reducing external investors' informational asymmetries in manufacturing firms with simple technologies (Heeley et al., 2007).

To verify potential differences in patents' signaling, we test two sub-samples of manufacturing nascent firms with simple and complex technologies, in the selection (Equation 4.1) and outcome (Equation 4.2) equations of the signaling model.

4.5. Findings

4.5.1. Main findings

Patents as a signal to external investors

Several authors have demonstrated the role of patents in signaling professional external investors, such as venture capitalists and business angels. In the present paper, we follow a two-stage signaling model, and apply it in testing the signaling role of patents in our sample of nascent firms.

The results are presented in Table 4.10 and evidence that patents act as a signal to external investors both in attracting investors and setting the amount of investment. Therefore, we do not reject *H1 and H2*, with a confidence level of 1%.

Patents signaling role in manufacturing firms with simple and complex technologies

The role played by patents (Cohen et al., 2000) and links to the value generation seem to be different in manufacturing firms with either simple or complex technologies. Furthermore, patents seem to be more effective in reducing external investors' informational asymmetries in manufacturing firms with simple technologies (Heeley et al., 2007).

Therefore, we test the patents' signaling in two sub-samples of manufacturing firms with simple and complex technologies. The results, presented in columns I and II of Table 4.12, confirm that patents act as a signal to external investors in both sub-samples, but that they only seem to influence the amount of investment of external investors in the sub-sample of manufacturing firms with simple technologies. Consequently, we do not reject *H3*, with a confidence level of 1%.

4.5.2. Other findings

Patents as a signal to external investors

Whereas the revenues, profits and the years of crisis, between 2007 and 2009, have a negative effect on the investment decision, cash has a positive effect. The owner's characteristics seem to influence the investment decision of external investors. This result

is in line with the findings of several authors (Bernstein et al., 2017; Hoenig & Henkel, 2015; Hsu, 2007; Wessendorf et al., 2019), and conclusions from chapter 3.6..

Unlike the first phase, crisis and revenues signals are not statistically significant when setting the amount; a higher risk of delinquency has a negative influence on the amount while being a high tech firm has a positive effect. Similarly to the first phase, cash maintains a positive statistically significant influence on the amount of external investment.

All these results are in line with the findings from chapter 3.5..

Patents signaling role in manufacturing firms

On average, the percentage of manufacturing nascent firms with patents and which receive external equity is higher than in non-manufacturing nascent firms. This could, in turn, lead to the expectation that patents' signaling is stronger in manufacturing firms. We test the patents' signaling in two sub-samples of manufacturing and non-manufacturing nascent firms. The results, presented in the columns I and II of table 4.11, demonstrate that although patents act as a signal to external investors in both sub-samples, they do not influence the amount of investment made by external investors in the sub-sample of manufacturing firms.

Moreover, results confirm that manufacturing firms are more procyclical and their owners' characteristics seem to have less influence in the investment decisions of external investors than non-manufacturing firms.

4.5.3. Economic significance of findings

The interpretation of coefficients in regression models with dummy and logarithmic variables have some specificities that are identified in Appendix A.

Patents have a signaling role in attracting professional external investors and setting the amount of investment phases in our sample of nascent firms, see table 4.10, namely: (i) a 1 percentage point increase in the probability of a nascent firm having patent raises the probability of a nascent firm receiving professional external investment by 0.811 percentage points; and (ii) a 1 percentage point increase in the probability of a nascent firm having patents raises the amount of investment in a nascent firm by 5.05%, or, on average, by 106 thousand USD, to 2.20 million USDs. Additionally, owner's characteristics seem to influence the professional investors' decisions, namely: (i) one additional year in the owners' age increases the nascent firms' probability of receiving external investment by 1 percentage point; (ii) one additional year in the owners'

experience in the same industry decreases the nascent firms' probability of receiving external investment by 1 percentage point; and (iii) each new business started by the owner increases the nascent firms' probability of receiving external investment by 8 percentage points.

In a sub-sample of manufacturing firms with simple technologies, see table 4.12, the patents play a stronger signaling role in attracting professional external investors and setting the amount of investment phases: (i) a 1 percentage point increase in the probability of nascent firms having patents raises their probability of receiving professional external investment by 0.828 percentage points; and (ii) a 1 percentage point increase in the probability of nascent firms having patents raises the amount of investment in nascent firms by 7.08%, or, on average, 148 thousand USD, to 2.24 million USDs.

In a sub-sample of manufacturing firms with complex technologies, see table 4.12, the signaling role of patents in attracting professional external investors declines from 0.828 to 0.704 percentage points, and patents do not have a statistically significant influence in setting the amount of investment.

4.5.4 Robustness tests

Investors in nascent firms do not have historical information or a track record of these companies and they typically invest in non-profitable firms; they therefore have to consider business plans to analyze these investments. Banks and investors are different and do not focus on the same aspects of the business plans; whereas banks focus mainly on the financial aspects of the proposal, external investors give additional emphasis to market, entrepreneurs' characteristics and other non-financial issues (Mason & Stark, 2004).

Ueda (Ueda, 2004) proposed a theoretical model in which external investors evaluate the nascent firms' investments more accurately than banks; however, they can also be a greater threat when it comes to stealing the projects from the entrepreneurs. Ueda proves that external investors' financing is favored in environments of high information asymmetries and strong protection of property rights, such as patents.

Using a sample of US nascent ventures in 2005, Audretsch et al. (Audretsch et al., 2012) concluded that although patents may act as a signal to external investors, they do not serve as a signal to banks; this is because banks are interested in collateral and nascent firms' financing seldom includes collateral of property rights, see chapter 2.3.. In contrast, Gaétan de Rassefosse and Fischer (Gaétan de Rassenfosse & Fischer, 2016) find a

positive signaling of patents to venture debt financing in their survey to venture debt lender companies in 2010; and, using a unique database of US firms between 2001 and 2011, Farre-Mensa et al. (Farre-Mensa et al., 2020) demonstrate that patents facilitate access to funding from venture capitalists and banks.

Petersen and Rajan (Petersen & Rajan, 1997) find that the offer of trade credit does not follow the same rationale as banks' credit decisions, because suppliers have advantages of information, monitoring and salvaging value from existing assets. However, it was proved that debt and trade credit have similar information content to attract external investors, see chapter 3.6..

We also follow Epure and Guash's signaling model to test the patents signaling role to debt and trade credit⁸². We considered that financing through debt and trade credit in nascent firms is a two-stage process in which the firm either receives or not debt or trade credit, and then, conditional upon receiving debt or trade credit, the amount is set⁸³.

As in the signaling model to external investors, it is assumed that the variables – Debt_Dum_{*i,t-1*} and AP_Dum_{*i,t-1*} - like the variable Ext_Eq_Dum_{*i,t-1*} - fulfill the exclusion restrictions; thus, they are included only in the selection equations. Consequently, it is also considered that these variables are significant in the selection equation (probability of receiving debt or trade credit) but not in the amount equation (the amount is not driven by the receipt of debt or trade credit).

To test the patents signaling role to debt, the variables related to external investment are substituted by debt in equation 4.1 and 4.2. The new selection (Equation 4.3) and outcome (Equation 4.4) equations are:

$$\begin{aligned} \text{Debt_Dum}_{i,t} = & \alpha + \beta_1 \text{Patents}_{i,t} + \beta_2 \text{Debt_Dum}_{i,t-1} + \beta_3 \text{Crisis}_{i,t} & (4.3) \\ & + \beta_4 X_{i,t} + \beta_5 Z_{i,t} + \delta_{i,t} + \gamma_{i,t} + \theta_{i,t} + \varepsilon_{i,t} \end{aligned}$$

$$\begin{aligned} \text{Ln(Debt)}_{i,t} = & \alpha + \beta_1 \text{Patents}_{i,t} + \beta_2 \text{Crisis}_{i,t} + \beta_3 X_{i,t} + \beta_4 Z_{i,t} & (4.4) \\ & + \delta_{i,t} + \gamma_{i,t} + \theta_{i,t} + \varepsilon_{i,t} \end{aligned}$$

⁸² Measured by Accounts payable.

⁸³ Other authors have considered the credit decision to be a one stage process, with simultaneous decisions (Alphonse et al., 2004; S Carbó-Valverde et al., 2016; Petersen & Rajan, 1997)

To test the patents signaling role to trade credit, the variables related to external investment are substituted by trade credit in equation 4.1 and 4.2. The new selection (Equation 4.5) and outcome (Equation 4.6) equations are:

$$AP_Dum_{i,t} = \alpha + \beta_1 Patents_{i,t} + \beta_2 AP_Dum_{i,t-1} + \beta_3 Crisis_{i,t} + \beta_4 X_{i,t} + \beta_5 Z_{i,t} + \delta_{i,t} + \gamma_{i,t} + \theta_{i,t} + \varepsilon_{i,t} \quad (4.5)$$

$$\ln(AP)_{i,t} = \alpha + \beta_1 Patents_{i,t} + \beta_2 Crisis_{i,t} + \beta_3 X_{i,t} + \beta_4 Z_{i,t} + \delta_{i,t} + \gamma_{i,t} + \theta_{i,t} + \varepsilon_{i,t} \quad (4.6)$$

We use the following notation:

Debt_Dum _{<i>i,t</i>}	Dummy variable that assumes one if firm <i>i</i> receives debt in year <i>t</i> , and zero otherwise.
AP_Dum _{<i>i,t</i>}	Dummy variable that assumes one if firm <i>i</i> receives accounts payable in year <i>t</i> , and zero otherwise.
Ln(Debt) _{<i>i,t</i>}	Logarithm of one plus the amount in USD of debt received by firm <i>i</i> in year <i>t</i> .
Ln(AP) _{<i>i,t</i>}	Logarithm of one plus the amount in USD of accounts payable of firm <i>i</i> in year <i>t</i> .

The results are presented in columns I and II of Table 4.13 and show that patents do not signal debt or trade credit; nevertheless, they seem to have a positive influence on the amount of debt and trade credit.

The revenues, tangible assets, number of employees, accounts receivable and inventories have a positive effect on the debt and trade credit decision, while cash has a negative effect but only on debt. Moreover, owner's characteristics also seem to influence debt and trade credit.

Unlike the first phase, cash signal has a positive contribution in the setting the amount phase but only for trade credit, while a higher risk of delinquency has a negative influence only on the amount of debt. Similarly to the first phase, the variables of the first phase maintain their signal and relevance. Moreover, owner's characteristics seem to have more influence on the amount of trade credit than on debt.

4.6. Conclusions

We used a two-stage signaling model and proved that patents act as a signal for professional external investment decisions in nascent firms. Although the existing literature demonstrates different signaling roles of patents, this paper proves the signaling role of patents to external investors in nascent firms through a two-stage signaling model in a multi-industry database with observations from the nascent firms' first seven years. Moreover, we confirm that patents influence the amount of investment made by these investors. Our findings also reveal that owners' characteristics influence the external investors' decisions; this is in line with other authors (Hoenig & Henkel, 2015; Hsu, 2007; Kolympiris et al., 2018) and our conclusions from chapter 3.6..

Furthermore, we tested the signaling role of patents in two sub-samples of manufacturing firms with simple and complex technologies and found that patents only influence the amount of investment of external investors in manufacturing firms with simple technologies. Theoretical and empirical literature in public firms has already addressed this topic in relation to public firms but never in nascent firms or through a signaling model; although Audretsch et al. (Audretsch et al., 2012) identified the topic, they did not analyze it further.

Despite the different rationales of debt and trade credit, we conclude that patents do not signal debt or trade credit⁸⁴, although patents seem to influence the amount of debt and trade credit. These results shed some light on the existing contrasting views. The results concerning debt are in line with the conclusions of Audretsch et al. (Audretsch et al., 2012). Moreover, owner's characteristics seem to influence debt and trade credit, although less than in the external equity investment decisions. To the best of our knowledge, the signaling role of patents to trade credit in nascent firms has never been addressed by other authors.

Our sub-samples of manufacturing firms with simple and complex technologies reduce our sample of 5,822 firm-year observations, with 186 firm-year observations of external equity operations, to: (i) 795 firm-year observations, with 44 firm-year observations of external equity operations in the sub-sample of manufacturing firms with simple technologies; and (ii) 245 firm-year observations, with 31 firm-year observations of external equity operations in the sub-sample of manufacturing firms with complex technologies.

⁸⁴ Measured by accounts payable.

Policies towards the protection of intellectual rights, patents, are of great importance due to their ability to: (i) strengthen the signaling role of patents to external investors in nascent firms; and (ii) contribute to providing collateral for banks. Intellectual property right collateral is residual in nascent firms, see chapter 2.3., future research is required on the value of these rights to banks.

Nascent firms should disclose as much information on patents as possible, and could use prototypes to communicate their innovations and technologies to external investors more effectively, to reduce information asymmetries and the discount in their value. This issue is particularly relevant in manufacturing firms with complex technologies.

Future research paths should address how nascent firms can reduce their information asymmetries to external investors, concerning their property rights, technology and innovation.

CHAPTER 5: Conclusions

This thesis applies mainstream corporate finance theories, notably the pecking order of external financing alternatives, asymmetric information and signaling of nascent firms, whose academic, economic and policy relevance has gained widespread acceptance.

The second chapter analyzes the applicability of these theories to nascent firms, using pecking order, leverage and signaling models. The findings from this chapter indicate that nascent firms follow only some features of the pecking order of listed firms, namely a negative relation between leverage and profits. Tangible assets in listed firms that heighten leverage are not prevalent in nascent firms. The net worth of owners, however, enhances the leverage of nascent firms. Thus, corporate finance theories originally developed to explain the financing and capital structure decisions of listed firms can be extended to study the financing and capital structure decisions of nascent firms as long as their specificities are adequately incorporated in the analysis. The analysis in the thesis considers one specificity, namely the owners' net worth which signals the potential to constitute personal collateral that is not common in listed firms. This contribution is in line with recent research pioneered by (Bhimani et al., 2014) showing that such personal collateral is a critically differentiating feature of small and medium entrepreneurial firms which reduces the incentive to default in their analysis. Building on this latter research, (Duarte et al., 2018) show that such personal collateral signals the creditworthiness of low-risk small and medium entrepreneurial firms and reduces incentives to post-loan default in the ones that have high-risk.

The third and fourth chapters build on the findings from chapter two, more specifically the preference for external equity, by analyzing the applicability of the signaling theory to reducing the information asymmetry between nascent firms and external equity providers. These two chapters focus on the roles of trade credit, measured by accounts payable, i.e. trade liabilities, and patents, namely intangible assets, in attracting and determining the amount of external equity funding. While trade credit attracts external equity funding, patents not only attract this funding but also determine the amount. Trade credit signals quality through the external scrutiny of suppliers that possess greater insights into the operational activity of nascent firms. This is in line with recent research by (Epure & Guasch, 2020) who show that debt, namely bank debt, attracts and may determine external equity funding on the grounds that it signals quality through the governance role of debt and the external monitoring of banks that have a greater understanding of the financial standing of nascent firms. The sharp distinction

between trade and bank credit previously observed also by Petersen and Rajan (Petersen & Rajan, 1997) in the context of small and medium enterprises is also evident in the additional findings of chapter three, which show the higher propensity of non-profitable but growing nascent firms to attract external funding from suppliers contrary to what happens with bank debt.

The signaling role of trade credit in nascent firms should incentive these firms to emphasize their relationship with suppliers, possibly through developing alliances or partnerships with them (Hoenig & Henkel, 2015; Wessendorf et al., 2019), particularly in non-profitable firms with positive sales growth.

Patents signal future growth opportunities more in manufacturing firms with simple technologies; this is in line with the seminal research pioneered by Lahr and Mina (Lahr & Mina, 2016) who show that nascent firms possessing patents are more likely to attract external funding from business angels and venture capitalists.

The signaling role of patents to professional external investors is not extended to lenders, in the same way of Audretsch et al. (Audretsch et al., 2012), as these creditors are essentially signaled by collaterals, especially personal collateral, as concluded in the second chapter. Nascent firms should disclosure as much information as possible regarding patents, and possibly use prototypes, to better communicate their innovations and technologies to external investors, in order to reduce information asymmetries and have less discount in their value. This issue is particularly relevant in manufacturing firms with complex technologies.

The findings of this thesis can be used by entrepreneurs to structure their external financing and by policy-makers to design infrastructures that reduce frictions in the contracting of external funding. Future research that identifies different mechanisms that reduce information asymmetries between nascent firms and external financing entities is likely to contribute to the academic literature, provide guidance to entrepreneurs interested in structuring their external financing and policy-makers interested in designing infrastructures that reduce financing frictions of nascent firms.

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Tables

Table 2.1 - Selected literature on explaining the capital structure of firms.
The table synthesizes the selected literature on explaining the capital structure of firms.

Author(s) (year of publication)	Sample	Analysis period	Methodology	Model(s)	Dependent variables	Independent variables	Relevant Findings
Rajan and Zingales (1995)	8,000 public non-financial companies from G-7 countries ⁸⁵	1987-1991	Censored tobit model	Leverage model	Leverage (book value and market leverage).	Tangibility, market-to-book ratio, logarithm of sales and profitability.	Tangibility of assets has a positive relation with leverage; market-to-book ratio, as proxy for future growth opportunities, has a negative sign; logarithm of sales has a positive relation and profitability has an inverse relation to leverage – following the pecking order theory.
Berger and Udell (1998)	SMEs ⁸⁶ from US, surveyed in the NSSBF ⁸⁷ of 1993	1993	Descriptive statistics analysis	n.a.	n.a.	n.a.	Young and small firms will need to consider essentially internal financing sources and external debt financing based on the entrepreneurs' creditworthiness.
Shyam-Sunder and Myers (1999)	157 public non-financial firms from US	1971-1989	OLS	Financing deficit model	Net and gross long-term debt leverage variation and change in the long-term debt ratio.	Financing deficit	The pecking order theory is tested and it is concluded that the US public firms from the sample do not follow the pecking order.
Frank and Goyal (2003)	768 public non-financial firms from US	1971-1998	OLS	1. Financing deficit model 2. Leverage model	1. Net and gross long-term debt leverage variation and change in the long-term debt ratio 2. Leverage	1. Financing deficit 2. Tangibility, market-to-book ratio, logarithm of sales and profitability.	The pecking order theory is tested and it is concluded that the US public firms from the sample do not follow the pecking order. Nevertheless, the firms from the sample have some characteristics of the pecking order theory based on information asymmetries, namely an inverse relation between profitability and leverage.
Brick and Palia (2007)	SMEs from US, surveyed in the NSSBF of 1993	1994-1995	3 SLS	n.a.	1- Loan rate premium; 2- firm collateral; and 3- personal collateral	Loan rate premium, firm collateral, personal collateral and control and instrumental variables ⁸⁸ .	Using a simultaneous equation approach, it is found that collateral has a statistically significant positive effect on loan interest rates. This positive association is stronger for personal collateral than for collateral provided by the firm's assets.
Han et al. (2009)	SMEs from US surveyed in the NSSBF of 1998	1998	Probit model	Sorting by Signaling and Self-Selection (SBSS) model	Dummy for collateral	Loan characteristics ⁸⁹ ; business characteristics and owner characteristics ⁹⁰	The SBSS model incorporates a signaling process (sorting by observed risk) into the design of an incentive-compatible menu of loan contracts which works as a self-selection mechanism (sorting by private information). It reports that high type entrepreneurs are more likely to pledge collateral and pay a lower interest rate, and entrepreneurs who transfer good signals enjoy better contracts than those transferring bad signals.

⁸⁵ United States, Japan, Germany, France, Italy, United Kingdom and Canada.

⁸⁶ Small and Medium enterprises with fewer than 500 full-time equivalent employees, nonfarm, non-financial and non real estate companies and from all ages.

⁸⁷ NSSBF – National Survey of Small Business Finances.

⁸⁸ Control variables: total debt, EBIT, cash holdings, sales, spread between the five-year treasury note and the three-month treasury bill, difference between Baa and Aaa bond yields, years of relationship with the lending institution, number of lending sources available, number of months the line of credit is outstanding and dummies for: limited liability company, credit agreement requires compensating balance and fixed coupon rate; and instrumental variables: firm age; CEO age, ownership percentage and experience at the firm; and dummies for: HHI for deposits in the MSA of the firm and previous default of the firm and the owner.

⁸⁹ Prime rate, capital markets concentration, loan size, maturity and type.

⁹⁰ Business characteristics: employees, dummy for delinquency and profit and owner characteristics: age, experience in business and dummy for male.

Table 2.1 - Selected literature on explaining the capital structure of firms (cont.)

Author(s) (year of publication)	Sample	Analysis period	Methodology	Model(s)	Dependent variables	Independent variables	Relevant Findings
Cosh et al. (2009)	2,520 entrepreneurial firms from UK from a survey ⁹¹	1996-1997	Two stage heckman selection model, tobit and OLS	n.a.	(i) Dummy for external finance sought; (ii) Dummy for external finance obtained.	Profits, capital expenditures, turnover, long-term debt, total assets, dummies for firm, owner and managers' characteristics ⁹² .	Firms with higher capital expenditures to profits ratio and stronger growth objectives are more likely to seek external finance. The amount of external finance is driven by the capital expenditures to profits ratio and differences among sectors. The authors find support for the pecking order theory. Only a few firms did not obtain their desired external capital; however, they do not always receive the type of capital wanted.
Berger et al. (2011)	Federal Reserve's Survey of Terms of Bank Lending and 1998 Survey of Small Business Credit Scoring	1993-1997	Logit regressions	n.a.	Dummy for collateral.	Loan size, and dummies for: bank uses credit scoring and floating interest rate and bank variables ⁹³ .	The use of collateral falls when banks adopt a small business credit scoring (SBCS) to supplement information from other lending technologies. The results suggest that banks used the new technology to reduce information gaps and lessened their need for collateral. The findings further imply that the employment of SBCS may have reduced lender and borrower costs and improved the efficiency of a segment of the small business lending market.
Bhimani et al. (2014)	16,029 non-listed Portuguese firms	1997-2003	Mixed logit model	n.a.	Dummy for default.	Firm liability; non accounting, financial accounting and instruments and control variables ⁹⁴ ; and volatility of cash flows.	The authors examine the effects of owner liability and non-accounting and financial accounting information on the probability of default as defined in Basel II in bank loan contracted by non listed firms. Their estimations based on mixed logistic regressions with random parameters show that the predicted default probability of full-liability firms is 0.72 times that of limited liability firms.
Robb and Robinson (2014)	4,928 nascent firms from US from Kauffman Firm Survey	2004-2007	Descriptive statistics analysis	n.a.	n.a.	n.a.	The three top sources for nascent firms are, in order of average prevalence, bank debt, personal equity and trade credit. These findings are not considered as a new "entrepreneurial pecking order" theory, because the levels reflect the equilibrium of supply and demand of capital of different forms, more than entrepreneurial preferences per se.
This study	4,928 nascent firms from US from Kauffman Firm Survey	2004-2011	OLS	1. Financing deficit model 2- Leverage model	1. Net and gross long-term debt leverage variation and change in the long-term debt ratio 2. Leverage	1. Financing deficit 2. Tangibility, sales growth, logarithm of sales, profitability and owners' net worth.	Nascent firms do not follow pecking order theory, although have some characteristics of this theory: a negative relationship between profitability and leverage. These firms rely on their entrepreneurs' creditworthiness to obtain external finance. Furthermore, we conclude that high net worth entrepreneurs signal lenders, through personal collateral, in order to benefit from better financing conditions.

⁹¹ From the Centre for Business Research of the University of Cambridge.

⁹² Age, growth objectives and total competitors Innovation, professional directors, gender, CEO shares, board shares, corporation, partnership, sole proprietorship, largest owner shares, completely new firm, founded to avoid unemployment, run own business, implement an invention, ambition of owners, high-tech, manufacturing, conventional manufacturing, high-tech services and conventional services.

⁹³ Bank variables: gross total assets, age, nonperforming loans, to gross total assets, average market HHI and dummy for merged last year.

⁹⁴ Firm liability: dummy for full or limited liability firm; Non accounting variables: age and size; Financing accounting variables: cash to debt, financial coverage, liquidity, solidity, asset coverage, debt ratio, days of payables and days of receivables; Instruments variables: sales, earnings and employees; and Control variables: industry and geographic region controls.

Table 2.2 - Evolution of equity, debt⁹⁵ and accounts payable in our sample of Kauffman Firm Survey firms, from 2004 to 2011⁹⁶. All variables represent the accrued value surveyed at the end of each year. All variables are non winsorized. Short-term debt includes credit cards and credit line balances, while long-term debt includes the other items of debt. Owners' equity is the equity financed with owners' net worth, it does not include equity financed by owners' debt. Owners' debt is all the debt financed in the owners' name and used in the firms' financing. All values are in thousands of USDs.

Year	Value		Count		Mean
	2004		2004		2004
Owners' equity	39.9	28.4%	1,121	83.6%	47.73
Family and friends' equity	1.64	1.2%	47	3.5%	46.79
Spouse's Equity	0.34	0.2%	12	0.9%	38.00
Parents' Equity	1.30	0.9%	37	2.8%	47.12
External equity	16.72	11.9%	68	5.1%	329.73
Angels' equity	3.96	2.8%	40	3.0%	132.76
Companies' equity	5.45	3.9%	17	1.3%	429.91
Government's equity	1.28	0.9%	9	0.7%	190.72
Venture Capital's equity	2.18	1.6%	8	0.6%	365.42
Others' equity	3.85	2.7%	5	0.4%	1,032.57
Total equity:	58.26	41.5%	1,142	85.2%	68.41
Owners' debt	21.24	15.1%	656	48.9%	43.42
Personal credit card	3.17	2.3%	453	33.8%	9.38
Business credit card	1.92	1.4%	222	16.6%	11.60
Personal bank loans	16.15	11.5%	252	18.8%	85.94
Family and friends' debt	7.78	5.5%	168	12.5%	62.10
Family loan to owners	3.34	2.4%	114	8.5%	39.29
Personal loan to owners	2.24	1.6%	29	2.2%	103.58
Business loan from families	1.01	0.7%	35	2.6%	38.70
Business loan from owners	1.14	0.8%	21	1.6%	72.80
Business loan from employees	0.05	0.0%	3	0.2%	22.35
External debt	38.28	27.3%	309	23.0%	166.13
Bank business credit card	0.76	0.5%	161	12.0%	6.33
Bank credit line	6.12	4.4%	84	6.3%	97.70
Bank loan	16.72	11.9%	96	7.2%	233.56
Non bank loan	11.09	7.9%	30	2.2%	495.72
Government loan	1.38	1.0%	11	0.8%	168.23
Other business loan	0.41	0.3%	9	0.7%	61.09
Other individuals' loan	1.42	1.0%	10	0.7%	190.42
Other loans	0.38	0.3%	7	0.5%	72.80
Total debt:	67.30	48.0%	815	60.8%	110.74
Short-term debt	11.97	8.5%	624	46.5%	25.72
Long-term debt	55.33	39.4%	459	34.2%	161.65
Accounts payable:	14.70	10.5%	456	34.0%	43.23
Total external financing:	140.26	100.0%	1 255	93.6%	149.87
#	1,341				

⁹⁵ Equity and debt are from owners, family and friends and external investors and lenders.

⁹⁶ Two observations, in 2007 and in 2008, were excluded from the current table because they involved two large equity increases from business angels, superior to 90 million USDs, which could distort the analysis of the weights between equity and debt. Nevertheless, these two observations are included in table 2.2.B year 2007 and year 2008.

Table 2.2 (cont.)

Year	Value		Count		Mean
	2005	2005	2005	2005	2005
Owners' equity	53.28	36.6%	1,173	87.1%	61.18
Family and friends' equity	1.51	1.0%	31	2.3%	65.61
Spouse's Equity	0.61	0.4%	10	0.7%	82.17
Parents' Equity	0.90	0.6%	22	1.6%	55.10
External equity	15.74	10.8%	27	2.0%	785.25
Angels' equity	6.77	4.6%	19	1.4%	479.96
Companies' equity	8.17	5.6%	6	0.4%	1,834.17
Government's equity	0.00	0.0%	0	0.0%	n.a.
Venture Capital's equity	0.79	0.5%	3	0.2%	354.71
Others' equity	0.01	0.0%	1	0.1%	13.47
Total equity:	70.53	48.4%	1,174	87.2%	80.92
Owners' debt	14.65	10.1%	572	42.5%	34.50
Personal credit card	3.37	2.3%	363	26.9%	12.51
Business credit card	2.61	1.8%	308	22.9%	11.41
Personal bank loans	8.67	6.0%	133	9.9%	87.81
Family and friends' debt	4.29	2.9%	74	5.5%	78.09
Family loan to owners	2.12	1.5%	48	3.6%	59.49
Personal loan to owners	0.59	0.4%	16	1.2%	49.67
Business loan from families	1.45	1.0%	20	1.5%	97.66
Business loan from owners	0.12	0.1%	7	0.5%	23.09
Business loan from employees	0.01	0.0%	2	0.1%	6.74
External debt	20.87	14.3%	342	25.4%	82.20
Bank business credit card	1.58	1.1%	220	16.3%	9.67
Bank credit line	7.29	5.0%	115	8.5%	85.39
Bank loan	9.88	6.8%	68	5.0%	195.71
Non bank loan	0.73	0.5%	16	1.2%	61.46
Government loan	0.62	0.4%	5	0.4%	167.03
Other business loan	0.32	0.2%	3	0.2%	143.68
Other individuals' loan	0.11	0.1%	3	0.2%	49.39
Other loans	0.34	0.2%	6	0.4%	76.33
Total debt:	39.81	27.3%	692	51.4%	77.49
Short-term debt	14.85	10.2%	609	45.2%	32.85
Long-term debt	24.96	17.1%	257	19.1%	130.82
Accounts payable:	35.27	24.2%	533	39.6%	89.13
Total external financing:	145.61	100.0%	1 223	90.8%	160.37
#	1,347				

Table 2.2 (cont.)

Year	Value		Count		Mean
	2006		2006		2006
Owners' equity	76.48	37.6%	1,060	86.5%	88.46
Family and friends' equity	1.68	0.8%	27	2.2%	76.28
Spouse's Equity	0.66	0.3%	11	0.9%	73.56
Parents' Equity	1.02	0.5%	20	1.6%	62.53
External equity	22.06	10.9%	35	2.9%	772.73
Angels' equity	15.12	7.4%	20	1.6%	926.86
Companies' equity	4.23	2.1%	11	0.9%	471.45
Government's equity	0.89	0.4%	3	0.2%	363.71
Venture Capital's equity	1.82	0.9%	4	0.3%	557.83
Others' equity	0.00	0.0%	0	0.0%	n.a.
Total equity:	100.22	49.3%	1,063	86.7%	115.59
Owners' debt	14.37	7.1%	499	40.7%	35.31
Personal credit card	2.99	1.5%	299	24.4%	12.26
Business credit card	3.33	1.6%	317	25.9%	12.88
Personal bank loans	8.05	4.0%	130	10.6%	75.92
Family and friends' debt	2.29	1.1%	77	6.3%	36.46
Family loan to owners	1.33	0.7%	51	4.2%	31.97
Personal loan to owners	0.09	0.0%	8	0.7%	13.79
Business loan from families	0.40	0.2%	17	1.4%	28.85
Business loan from owners	0.44	0.2%	6	0.5%	89.91
Business loan from employees	0.03	0.0%	4	0.3%	9.20
Outsider debt	29.44	14.5%	338	27.6%	106.79
Bank business credit card	2.16	1.1%	211	17.2%	12.55
Bank credit line	11.73	5.8%	143	11.7%	100.57
Bank loan	10.22	5.0%	64	5.2%	195.78
Non bank loan	2.97	1.5%	20	1.6%	182.06
Government loan	0.62	0.3%	5	0.4%	152.02
Other business loan	0.14	0.1%	3	0.2%	57.21
Other individuals' loan	0.00	0.0%	0	0.0%	n.a.
Other loans	1.60	0.8%	4	0.3%	490.40
Total debt:	46.10	22.7%	635	51.8%	89.01
Short-term debt	20.21	9.9%	559	45.6%	44.32
Long-term debt	25.89	12.7%	250	20.4%	126.96
Accounts payable:	56.88	28.0%	505	41.2%	138.09
Total external financing:	203.20	100.0%	1 133	92.4%	219.88
#	1,226				

Table 2.2 (cont.)

Year	Value		Count		Mean
	2007		2007		2007
Owners' equity	91.91	41.2%	921	87.3%	105.28
Family and friends' equity	1.50	0.7%	14	1.3%	113.04
Spouse's Equity	0.52	0.2%	3	0.3%	182.87
Parents' Equity	0.98	0.4%	12	1.1%	86.16
Outsiders' equity	30.37	13.6%	14	1.3%	2,288.60
Angels' equity	8.29	3.7%	8	0.8%	1,093.24
Companies' equity	0.30	0.1%	6	0.6%	52.75
Government's equity	0.00	0.0%	0	0.0%	n.a.
Venture Capital's equity	21.78	9.8%	1	0.1%	22,977.90
Others' equity	0.00	0.0%	0	0.0%	n.a.
Total equity:	123.78	55.4%	922	87.4%	141.64
Owners' debt	13.17	5.9%	418	39.6%	33.24
Personal credit card	2.72	1.2%	213	20.2%	13.47
Business credit card	3.82	1.7%	273	25.9%	14.76
Personal bank loans	6.63	3.0%	85	8.1%	82.29
Family and friends' debt	2.47	1.1%	47	4.5%	55.44
Family loan to owners	0.67	0.3%	37	3.5%	19.10
Personal loan to owners	0.25	0.1%	4	0.4%	65.94
Business loan from families	0.68	0.3%	10	0.9%	71.74
Business loan from owners	0.83	0.4%	4	0.4%	218.91
Business loan from employees	0.04	0.0%	2	0.2%	21.10
External debt	37.53	16.8%	325	30.8%	121.83
Bank business credit card	2.30	1.0%	182	17.3%	13.33
Bank credit line	13.38	6.0%	161	15.3%	87.68
Bank loan	13.40	6.0%	62	5.9%	228.02
Non bank loan	4.27	1.9%	18	1.7%	250.27
Government loan	0.85	0.4%	2	0.2%	448.38
Other business loan	0.12	0.1%	2	0.2%	63.30
Other individuals' loan	0.01	0.0%	1	0.1%	10.55
Other loans	3.20	1.4%	2	0.2%	1,688.00
Total debt:	53.17	23.8%	562	53.3%	99.81
Short-term debt	22.22	9.9%	503	47.7%	46.60
Long-term debt	30.95	13.9%	185	17.5%	176.50
Accounts payable:	46.37	20.8%	472	44.7%	103.64
Total external financing:	223.32	100.0%	992	94.0%	237.50
#	1,055				

Table 2.2 (cont.)

Year	Value		Count		Mean
	2008		2008		2008
Owners' equity	95.73	34.5%	860	89.9%	106.53
Family and friends' equity	1.28	0.5%	14	1.5%	87.50
Spouse's Equity	0.08	0.0%	3	0.3%	25.52
Parents' Equity	1.20	0.4%	11	1.1%	104.40
External equity	39.45	14.2%	16	1.7%	2,359.60
Angels' equity	18.81	6.8%	10	1.0%	1,800.12
Companies' equity	20.43	7.4%	5	0.5%	3,910.30
Government's equity	0.00	0.0%	0	0.0%	n.a.
Venture Capital's equity	0.21	0.1%	2	0.2%	100.49
Others' equity	0.00	0.0%	0	0.0%	n.a.
Total equity:	136.46	49.2%	860	89.9%	151.85
Owners' debt	12.47	4.5%	393	41.1%	30.37
Personal credit card	3.13	1.1%	189	19.7%	15.85
Business credit card	3.41	1.2%	270	28.2%	12.09
Personal bank loans	5.93	2.1%	78	8.2%	72.76
Family and friends' debt	8.04	2.9%	53	5.5%	145.18
Family loan to owners	1.36	0.5%	35	3.7%	37.19
Personal loan to owners	1.84	0.7%	8	0.8%	220.11
Business loan from families	0.38	0.1%	10	1.0%	36.37
Business loan from owners	4.46	1.6%	6	0.6%	711.37
Business loan from employees	0.00	0.0%	0	0.0%	n.a.
External debt	53.88	19.4%	286	29.9%	180.29
Bank business credit card	2.17	0.8%	149	15.6%	13.94
Bank credit line	26.67	9.6%	162	16.9%	157.55
Bank loan	22.64	8.2%	51	5.3%	424.83
Non bank loan	1.58	0.6%	13	1.4%	116.31
Government loan	0.52	0.2%	5	0.5%	99.53
Other business loan	0.04	0.0%	2	0.2%	19.14
Other individuals' loan	0.24	0.1%	2	0.2%	114.84
Other loans	0.02	0.0%	1	0.1%	19.14
Total debt:	74.39	26.8%	514	53.7%	138.50
Short-term debt	35.38	12.8%	458	47.9%	73.93
Long-term debt	39.01	14.1%	177	18.5%	210.92
Accounts payable:	66.58	24.0%	455	47.5%	140.04
Total external financing:	277.43	100.0%	905	94.6%	293.37
#	957				

Table 2.2 (cont.)

Year	Value		Count		Mean
	2009		2009		2009
Owners' equity	82.89	40.4%	802	87.7%	94.57
Family and friends' equity	0.69	0.3%	5	0.5%	126.27
Spouse's Equity	0.64	0.3%	3	0.3%	195.20
Parents' Equity	0.05	0.0%	2	0.2%	22.88
External equity	33.51	16.3%	10	1.1%	3,066.17
Angels' equity	26.18	12.8%	5	0.5%	4,790.94
Companies' equity	1.80	0.9%	3	0.3%	549.00
Government's equity	0.02	0.0%	1	0.1%	18.30
Venture Capital's equity	5.47	2.7%	2	0.2%	2,502.53
Others' equity	0.04	0.0%	1	0.1%	36.60
Total equity:	117.09	57.0%	802	87.7%	133.59
Owners' debt	11.42	5.6%	354	38.7%	29.52
Personal credit card	2.38	1.2%	196	21.4%	11.11
Business credit card	3.04	1.5%	238	26.0%	11.69
Personal bank loans	6.00	2.9%	56	6.1%	98.04
Family and friends' debt	2.23	1.1%	46	5.0%	44.36
Family loan to owners	1.27	0.6%	35	3.8%	33.20
Personal loan to owners	0.07	0.0%	6	0.7%	10.68
Business loan from families	0.11	0.1%	8	0.9%	12.58
Business loan from owners	0.77	0.4%	5	0.5%	140.91
Business loan from employees	0.01	0.0%	2	0.2%	4.58
External debt	25.45	12.4%	256	28.0%	90.96
Bank business credit card	2.32	1.1%	155	16.9%	13.70
Bank credit line	9.01	4.4%	114	12.5%	72.32
Bank loan	10.87	5.3%	54	5.9%	184.19
Non bank loan	2.90	1.4%	10	1.1%	265.35
Government loan	0.18	0.1%	1	0.1%	164.70
Other business loan	0.00	0.0%	0	0.0%	n.a.
Other individuals' loan	0.01	0.0%	2	0.2%	4.58
Other loans	0.16	0.1%	3	0.3%	48.80
Total debt:	39.10	19.0%	468	51.1%	76.45
Short-term debt	16.75	8.2%	427	46.7%	35.89
Long-term debt	22.35	10.9%	134	14.6%	152.61
Accounts payable:	49.08	23.9%	394	43.1%	113.98
Total external financing:	205.27	100.0%	848	92.7%	221.49
#	915				

Table 2.2 (cont.)

Year	Value		Count		Mean
	2010		2010		2010
Owners' equity	124.78	48.8%	825	88.8%	140.51
Family and friends' equity	0.74	0.3%	5	0.5%	137.49
Spouse's Equity	0.16	0.1%	2	0.2%	74.32
Parents' Equity	0.58	0.2%	4	0.4%	134.71
External equity	27.82	10.9%	10	1.1%	2,584.48
Angels' equity	24.01	9.4%	9	1.0%	2,478.37
Companies' equity	2.69	1.1%	2	0.2%	1,249.51
Government's equity	1.12	0.4%	3	0.3%	346.83
Venture Capital's equity	0.00	0.0%	0	0.0%	n.a.
Others' equity	0.00	0.0%	0	0.0%	n.a.
Total equity:	153.34	60.0%	826	88.9%	172.46
Owners' debt	8.69	3.4%	343	36.9%	23.54
Personal credit card	2.14	0.8%	175	18.8%	11.36
Business credit card	3.51	1.4%	225	24.2%	14.49
Personal bank loans	3.04	1.2%	45	4.8%	62.76
Family and friends' debt	4.26	1.7%	34	3.7%	116.40
Family loan to owners	1.33	0.5%	22	2.4%	56.16
Personal loan to owners	1.22	0.5%	8	0.9%	141.67
Business loan from families	1.51	0.6%	5	0.5%	280.56
Business loan from owners	0.07	0.0%	4	0.4%	16.26
Business loan from employees	0.13	0.1%	1	0.1%	120.77
External debt	28.23	11.0%	226	24.3%	116.04
Bank business credit card	2.57	1.0%	148	15.9%	16.13
Bank credit line	10.18	4.0%	97	10.4%	97.50
Bank loan	14.11	5.5%	49	5.3%	267.51
Non bank loan	1.10	0.4%	2	0.2%	510.95
Government loan	0.24	0.1%	1	0.1%	222.96
Other business loan	0.03	0.0%	3	0.3%	9.29
Other individuals' loan	0.00	0.0%	0	0.0%	n.a.
Other loans	0.00	0.0%	0	0.0%	n.a.
Total debt:	41.18	16.1%	441	47.5%	86.75
Short-term debt	18.4	7.2%	401	43.2%	42.63
Long-term debt	22.78	8.9%	122	13.1%	173.46
Accounts payable:	61.06	23.9%	398	42.8%	142.52
Total external financing:	255.58	100.0%	862	92.8%	275.45
#	929				

Table 2.2 (cont.)

Year	Value		Count		Mean
	2011		2011		2011
Owners' equity	110.67	45.5%	764	88.2%	125.45
Family and friends' equity	0.57	0.2%	7	0.8%	70.52
Spouse's Equity	0.13	0.1%	4	0.5%	28.15
Parents' Equity	0.44	0.2%	4	0.5%	95.26
External equity	20.84	8.6%	10	1.2%	1,804.74
Angels' equity	10.58	4.3%	6	0.7%	1,527.05
Companies' equity	8.08	3.3%	3	0.3%	2,332.43
Government's equity	2.15	0.9%	1	0.1%	1,861.90
Venture Capital's equity	0.00	0.0%	0	0.0%	n.a.
Others' equity	0.03	0.0%	1	0.1%	25.98
Total equity:	132.08	54.3%	764	88.2%	149.71
Owners' debt	8.02	3.3%	299	34.5%	23.23
Personal credit card	1.92	0.8%	154	17.8%	10.80
Business credit card	2.60	1.1%	208	24.0%	10.83
Personal bank loans	3.50	1.4%	27	3.1%	112.26
Family and friends' debt	1.55	0.6%	23	2.7%	58.36
Family loan to owners	0.61	0.3%	19	2.2%	27.80
Personal loan to owners	0.33	0.1%	5	0.6%	57.16
Business loan from families	0.60	0.2%	4	0.5%	129.90
Business loan from owners	0.01	0.0%	1	0.1%	8.66
Business loan from employees	0.00	0.0%	0	0.0%	n.a.
External debt	39.7	16.3%	218	25.2%	157.71
Bank business credit card	3.41	1.4%	134	15.5%	22.04
Bank credit line	21.05	8.7%	113	13.0%	161.32
Bank loan	15.10	6.2%	40	4.6%	326.92
Non bank loan	0.05	0.0%	3	0.3%	14.43
Government loan	0.03	0.0%	1	0.1%	25.98
Other business loan	0.00	0.0%	0	0.0%	n.a.
Other individuals' loan	0.00	0.0%	0	0.0%	n.a.
Other loans	0.06	0.0%	1	0.1%	51.96
Total debt:	49.27	20.3%	391	45.2%	109.12
Short-term debt	28.98	11.9%	370	42.7%	67.83
Long-term debt	20.29	8.3%	88	10.2%	199.67
Accounts payable:	61.91	25.5%	357	41.2%	150.18
Total external financing:	243.26	100.0%	795	91.8%	264.99
#	866				

Table 2.2.B

Year	Value		Count		Mean
	2007		2007		2007
Owners' equity	93.57	29.4%	922	87.3%	107.17
Family and friends' equity	1.50	0.5%	14	1.3%	113.14
Spouse's Equity	0.52	0.2%	3	0.3%	183.04
Parents' Equity	0.98	0.3%	12	1.1%	86.24
External equity	120.33	37.9%	14	1.3%	9 076.32
Angels' equity	98.25	30.9%	9	0.9%	11,528.00
Companies' equity	0.30	0.1%	6	0.6%	52.80
Government's equity	0.00	0.0%	0	0.0%	n.a.
Venture Capital's equity	21.78	6.9%	1	0.1%	22,999.68
Others' equity	0.00	0.0%	0	0.0%	n.a.
Total equity:	215.40	67.8%	923	87.4%	246.44
Owners' debt	13.17	4.1%	418	39.6%	33.27
Personal credit card	2.72	0.9%	213	20.2%	13.49
Business credit card	3.82	1.2%	273	25.9%	14.78
Personal bank loans	6.63	2.1%	85	8.0%	82.37
Family and friends' debt	2.47	0.8%	47	4.5%	55.50
Family loan to owners	0.67	0.2%	37	3.5%	19.12
Personal loan to owners	0.25	0.1%	4	0.4%	66.00
Business loan from families	0.68	0.2%	10	0.9%	71.81
Business loan from owners	0.83	0.3%	4	0.4%	219.12
Business loan from employees	0.04	0.0%	2	0.2%	21.12
External debt	37.53	11.8%	325	30.8%	121.94
Bank business credit card	2.30	0.7%	182	17.2%	13.35
Bank credit line	13.38	4.2%	161	15.2%	87.76
Bank loan	13.40	4.2%	62	5.9%	228.23
Non bank loan	4.27	1.3%	18	1.7%	250.51
Government loan	0.85	0.3%	2	0.2%	448.80
Other business loan	0.12	0.0%	2	0.2%	63.36
Other individuals' loan	0.01	0.0%	1	0.1%	10.56
Other loans	3.20	1.0%	2	0.2%	1,689.60
Total debt:	53.17	16.7%	562	53.2%	99.91
Short-term debt	22.22	7.0%	503	47.6%	46.65
Long-term debt	30.95	9.7%	185	17.5%	176.67
Accounts payable:	49.29	15.5%	473	44.8%	110.04
Total external financing:	317.86	100.0%	993	94.0%	338.03
#	1,056				

Table 2.2.B (cont.)

Year	Value		Count		Mean
	2008		2008		2008
Owners' equity	97.25	24.7%	861	89.9%	108.21
Family and friends' equity	1.28	0.3%	14	1.5%	87.59
Spouse's Equity	0.08	0.0%	3	0.3%	25.55
Parents' Equity	1.20	0.3%	11	1.1%	104.51
External equity	134.71	34.2%	16	1.7%	8,065.76
Angels' equity	114.07	28.9%	11	1.1%	9,934.46
Companies' equity	20.43	5.2%	5	0.5%	3,914.39
Government's equity	0.00	0.0%	0	0.0%	n.a.
Venture Capital's equity	0.21	0.1%	2	0.2%	100.59
Others' equity	0.00	0.0%	0	0.0%	n.a.
Total equity:	233.24	59.2%	861	89.9%	259.52
Owners' debt	12.47	3.2%	393	41.0%	30.40
Personal credit card	3.13	0.8%	189	19.7%	15.87
Business credit card	3.41	0.9%	270	28.2%	12.10
Personal bank loans	5.93	1.5%	78	8.1%	72.83
Family and friends' debt	19.53	5.0%	53	5.5%	353.01
Family loan to owners	1.36	0.3%	35	3.7%	37.23
Personal loan to owners	1.84	0.5%	8	0.8%	220.34
Business loan from families	0.38	0.1%	10	1.0%	36.40
Business loan from owners	15.95	4.0%	7	0.7%	2,182.87
Business loan from employees	0.00	0.0%	0	0.0%	n.a.
External debt	55.97	14.2%	286	29.9%	187.48
Bank business credit card	2.17	0.6%	150	15.7%	13.86
Bank credit line	28.76	7.3%	163	17.0%	169.03
Bank loan	22.64	5.7%	51	5.3%	425.28
Non bank loan	1.58	0.4%	13	1.4%	116.43
Government loan	0.52	0.1%	5	0.5%	99.63
Other business loan	0.04	0.0%	2	0.2%	19.16
Other individuals' loan	0.24	0.1%	2	0.2%	114.96
Other loans	0.02	0.0%	1	0.1%	19.16
Total debt:	87.97	22.3%	514	53.7%	163.96
Short-term debt	37.47	9.5%	458	47.8%	78.38
Long-term debt	50.50	12.8%	177	18.5%	273.33
Accounts payable:	72.95	18.5%	456	47.6%	153.26
Total external financing:	394.16	100.0%	906	94.6%	416.78
#	958				

Table 2.3 - Average items of the balance sheet as a percentage of the book value of total assets.

This table represents items of the balance sheet winsorized at 1% on each tail of the distribution and then averaged. All variables are presented as a percentage of the book value of total assets surveyed and represent the accrued value surveyed at the end of each year. Debt includes loans from entrepreneurs, banks, non-bank financial institution, family and friends, employees, government agencies, other businesses, other individuals and other sources.

Year	2005	2006	2007	2008	2009	2010	2011
Cash and deposits/total assets	0.15	0.16	0.14	0.15	0.18	0.19	0.18
Accounts receivable/total assets	0.23	0.28	0.26	0.28	0.27	0.28	0.27
Inventories/total assets	0.14	0.15	0.17	0.14	0.13	0.12	0.16
Tangible assets/total assets	0.48	0.41	0.42	0.43	0.42	0.41	0.39
Equipment/total assets	0.21	0.20	0.21	0.24	0.20	0.22	0.23
Land and buildings/total assets	0.20	0.14	0.14	0.14	0.16	0.13	0.11
Vehicles/total assets	0.06	0.06	0.05	0.04	0.05	0.05	0.05
Other business properties/total assets	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other assets/total assets	0.00	0.01	0.01	0.01	0.01	0.00	0.00
Total	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Accounts payable/total assets	0.10	0.16	0.17	0.18	0.20	0.24	0.20
Long-term debt/total assets	0.14	0.09	0.10	0.08	0.05	0.06	0.04
Short-term debt/total assets	0.07	0.07	0.08	0.08	0.07	0.06	0.06
Total debt/total assets	0.21	0.17	0.18	0.16	0.12	0.12	0.10
Equity/total assets	0.41	0.42	0.37	0.39	0.38	0.39	0.31
Total external finance/total assets	0.62	0.59	0.55	0.55	0.50	0.52	0.41
#	1,347	1,226	1,056	958	915	929	866

Table 2.4 - Average items of financing deficit and external financing as a percentage of the book value of total assets.

This table represents items of financing deficit and external financing winsorized at 1% on each tail of the distribution and then averaged. All variables are presented as a percentage of the book value of total assets surveyed and represent the accrued value surveyed at the end of each year. The investments variable is the variation of the value of tangible assets obtained from the survey, excluding other tangible assets. Working capital includes the following items: cash and deposits + accounts receivable + inventories - short-term debt - accounts payable. Internal cash flow is measured by net profits. Long-term debt includes loans from entrepreneurs, banks, non-bank financial institution, family and friends, employees, government agencies, other businesses, other individuals and other sources. Debt and equity variations are obtained by the change in the variables from the current to the previous year. Net long-term debt variations are long-term debt increases minus long-term debt reductions. Net equity variations are equity increases minus equity reductions.

Year	2005	2006	2007	2008	2009	2010	2011
Dividends ¹	0.04	0.04	0.05	0.03	0.05	0.06	0.05
Investments ²	0.16	0.11	0.06	0.01	-0.03	0.05	-0.01
Δ working capital ³	0.08	0.09	-0.02	-0.08	0.03	-0.04	0.15
Internal cash flow ⁴	0.14	0.22	0.20	0.11	0.22	0.24	0.21
Net financing deficit¹⁺²⁺³⁻⁴	0.14	0.02	-0.11	-0.15	-0.16	-0.17	-0.01
Net long-term debt variation ^a	-0.12	-0.03	0.00	-0.03	-0.02	0.00	-0.02
Net equity variation ^b	0.12	0.08	0.02	0.08	0.04	0.04	0.01
Net external financing variation^{a+b}	0.00	0.05	0.02	0.05	0.02	0.04	-0.01
#	1,347	1,226	1,056	958	915	929	866

Table 2.5 – Observations and types of collateral in the sub-sample of firms with collateral information.

Year	2009	2010	2011	Total
<i>Observations</i>				
Sub-sample of firms with collateral information	719	723	644	2,086
Firms with no collateral	611	606	549	1,766
Firms with collateral ⁹⁷	108	117	95	320
Firms with business collateral	74	88	75	237
Firms with personal collateral	55	59	42	156
<i>Types of business collateral</i>				
Inventories or accounts receivable	50	61	49	160
Equipment or vehicles	49	61	51	161
Securities or deposits	16	22	17	55
Intellectual property	1	5	2	8
Real estate	17	19	15	51
Total	133	168	134	435
<i>Types of personal collateral</i>				
Real estate	44	41	31	116
Assets	18	31	20	69
Other	2	2	2	6
Total	64	74	53	191

⁹⁷ Firms can have simultaneously business and personal collateral.

Table 2.6 – Average net worth of owners and percentage of firms with collateral in sub-samples of incorporated and unincorporated⁹⁸ firms that pledge collateral.

Variables	Incorporated firms	Unincorporated firms
<i>Main</i>		
Owners' net worth ⁹⁹	4.43	3.67
Firms with business collateral	0.73	0.79
Firms with personal collateral	0.50	0.40
<i>Types of business collateral</i>		
Inventories or accounts receivable	0.51	0.47
Equipment or vehicles	0.50	0.53
Securities or deposits	0.18	0.12
Intellectual property	0.03	0.00
Real estate	0.15	0.21
<i>Types of personal collateral</i>		
Real estate	0.38	0.31
Assets	0.23	0.12
Other	0.01	0.05
#	277	43

⁹⁸ Unincorporated firms are sole proprietorships and partnerships.

⁹⁹ Measured by an index from one to five: One: zero or negative net worth; Two: between 1 and 50,000 USD; Three: Between 50,001 and 100,000 USD; Four: Between 100,001 and 250,000 USD; and Five: more than 250,000 USD.

Table 2.7 – Percentage of firms with collateral and firms’ delinquency risk score in sub-samples of firms with owners with low and high net worth¹⁰⁰.

Variables	Owners with low net worth	Owners with high net worth
<i>Main</i>		
Firms with collateral	0.09	0.17
Firms with business colateral	0.10	0.24
Firms with personal collateral	0.06	0.10
<i>Firm delinquency</i>		
Score of delinquency risk ¹⁰¹	3.05	2.61
#	325	1,517

¹⁰⁰ Owners with low net worth: less than 50,000 USD; Owners with high net worth: more than 100,000 USD.

¹⁰¹ Dun & Bradstreet score of delinquency risk: from one (lowest probability of delinquency) to five (highest probability of delinquency).

Table 2.8 – Percentage of firms with collateral and firms’ delinquency risk score in sub-samples of firms with owners with low and high net worth, that have pledged personal collateral¹⁰².

Variables	Owners with low net worth	Owners with high net worth
<i>Types of personal collateral</i>		
Real estate	0.58	0.77
Assets	0.64	0.45
Other	0.15	0.02
<i>Firm delinquency</i>		
Score of delinquency risk ¹⁰³	4.00	2.71
#	14	128

¹⁰² Owners with low net worth: less than 50,000 USD; Owners with high net worth: more than 100,000 USD.

¹⁰³ Dun & Bradstreet score of delinquency risk: from one (lowest probability of delinquency) to five (highest probability of delinquency).

Table 2.9 - Pecking order tests.

The following regression is estimated by ordinary least squares: $\Delta D_{it} = \alpha + \beta_{DEF} DEF_{it} + \varepsilon_{it}$; where ΔD is the net or gross amount of long-term debt variation or the change in long-term debt ratio; and DEF is the net financing deficit: dividends plus investments plus change in working capital minus net profits; or the SSM - Shyam-Sunder and Myers - financing deficit: dividends plus investment plus change in working capital minus net profits plus current portion of long-term debt. Debt includes loans from entrepreneurs, banks, non-bank financial institution, family and friends, employees, government agencies, other businesses, other individuals and other sources. Net long-term debt variations are long-term debt increases minus long-term debt reductions. Gross long-term debt variations are long-term debt increases. All variables are scaled by the net book value of total assets - book value of total assets minus book value of current liabilities - at the current year. Change in long-term debt ratio is: long-term debt to net assets ratio in the current year minus the previous year. The investments variable is the variation of the estimated value of tangible assets obtained in the survey, excluding other tangible assets. Working capital includes the following items: cash and deposits + accounts receivable + inventories - short-term debt - accounts payable. All variables represent the accrued value surveyed at the end of each year. Standard errors in parenthesis. ***, ** and * denote, respectively, significance at the 1%, 5% and 10% confidence levels.

	Column I	Column II	Column III
<i>Dependent</i>	Net long-term debt variation	Gross long-term debt variation	Changes in long-term debt ratio
Net financing deficit	0.008*** (0.002)	-0.011*** (0.001)	-0.017*** (0.002)
Intercept	-0.094*** (0.010)	0.089*** (0.007)	-0.096*** (0.014)
#	7,297	7,297	7,297
R-square	0.003	0.008	0.007
F-statistic	19.96***	61.46***	48.11***

	Column IV	Column V	Column VI
<i>Dependent</i>	Net long-term debt variation	Gross long-term debt variation	Changes in long-term debt ratio
SSM financing deficit	-0.022*** (0.002)	0.008*** (0.001)	-0.015*** (0.002)
Intercept	-0.110*** (0.010)	0.101*** (0.007)	-0.091*** (0.013)
#	7,297	7,297	7,297
R-square	0.020	0.005	0.005
F-statistic	145.37***	38.35***	36.09***

Table 2.10 - The disaggregated net financing deficit.

The following regression is estimated by ordinary least squares: $\Delta D_{it} = \alpha + \beta_{DIV} DIV_t + \beta_I I_t + \beta_W \Delta W_t - \beta_C C_t + \epsilon_{it}$; where ΔD is the net or gross amount of long-term debt variations or the change in long-term debt ratio; DIV is dividends; I is investments; ΔW is change in working capital and C is net profits. Debt includes loans from entrepreneurs, banks, non-bank financial institution, family and friends, employees, government agencies, other businesses, other individuals and other sources. Net long-term debt variations are long-term debt increases minus long-term debt reductions. Gross long-term debt variations are long-term debt increases. All variables are scaled by the net book value of total assets - book value of total assets minus book value of current liabilities - at the current year. Change in long-term debt ratio is: long-term debt to net assets ratio in the current year minus the previous year. The investments variable is the variation of the estimated value of tangible assets obtained in the survey, excluding other tangible assets. Working capital includes the following items: cash and deposits + accounts receivable + inventories - short-term debt - accounts payable. All variables represent the accrued value surveyed at the end of each year. Robust standard errors in parenthesis. ***, ** and * denote, respectively, significance at the 1%, 5% and 10% confidence levels.

<i>Dependent</i>	Column I	Column II	Column III
	Net long-term debt variation	Gross long-term debt variation	Changes in long-term debt ratio
Dividends	-0.034** (0.011)	0.040** (0.008)	0.033** (0.014)
Investments	0.058** (0.006)	-0.013*** (0.004)	-0.019*** (0.008)
Change in Working Capital	-0.006 (0.004)	-0.027*** (0.003)	-0.033*** (0.005)
Net profits	-0.008** (0.003)	-0.001 (0.002)	0.003 (0.005)
Intercept	-0.074*** (0.010)	0.086*** (0.008)	-0.098*** (0.014)
#	7,297	7,297	7,297
R-square	0.018	0.020	0.009
F-statistic	33.15***	37.51***	16.42***

Table 2.11 - Pecking order tests for sub-samples of firms.

The table presents pecking order tests (from table 2.9), using net long-term debt variation as dependent variable, on sub-samples of high growth firms (Column I); firms that pay strictly positive dividends (Column II); and firms with moderate leverage (Column III). High growth firms are those with a sales growth in excess of the 75th percentile of the distribution. Moderate leverage is defined by the omission of the top two and bottom two deciles. Firms are sorted into quartiles based on book value of total assets in columns IV to VII. The following regression is estimated by ordinary least squares: $\Delta D_{it} = \alpha + \beta_{DEF} DEF_{it} + \varepsilon_{it}$; where ΔD is the net amount of long-term debt variation and DEF is the net financing deficit – dividends plus investments plus change in working capital minus net profits. Debt includes loans from entrepreneurs, banks, non-bank financial institution, family and friends, employees, government agencies, other businesses, other individuals and other sources. Net long-term debt variations are long-term debt increases minus long-term debt reductions. All variables are scaled by the net book value of total assets - book value of total assets minus book value of current liabilities - at the current year. The investments variable is the variation of the estimated value of tangible assets obtained in the survey, excluding other tangible assets. Working capital includes the following items surveyed: cash and deposits + accounts receivable + inventories - short-term debt - accounts payable. All variables represent the accrued value surveyed at the end of each year. Robust standard errors in parenthesis. ***, ** and * denote, respectively, significance at the 1%, 5% and 10% confidence levels.

	Column I	Column II	Column III
	High Growth	Positive dividends	Moderate leverage
<i>Dependent</i>	Net long-term debt variation	Net long-term debt variation	Net long-term debt variation
Net financing deficit	0.020*** (0.005)	-0.002 (0.004)	0.009*** (0.002)
Intercept	-0.132*** (0.023)	-0.117*** (0.020)	-0.051*** (0.007)
#	1,816	1,805	4,379
R-square	0.009	0.000	0.006
F-statistic	16.56***	0.30	25.91***

	Column IV	Column V	Column VI	Column VII
	Smaller firms	Smaller and medium firms	Medium and larger firms	Larger firms
<i>Dependent</i>	Net long-term debt variation	Net long-term debt variation	Net long-term debt variation	Net long-term debt variation
Net financing deficit	0.019*** (0.003)	-0.005 (0.005)	-0.009 (0.007)	0.015** (0.006)
Intercept	-0.138*** (0.036)	-0.101*** (0.025)	-0.128*** (0.019)	-0.061*** (0.011)
#	1,849	1,828	1,796	1,824
R-square	0.020	0.001	0.001	0.003
F-statistic	37.79***	1.17	1.70	6.12**

Table 2.12 - The expected signs of the coefficients of the variables of leverage models, according to Rajan and Zingales (Rajan & Zingales, 1995) and pecking order theory.

Variable	Rajan and Zingales (1995)	Pecking order	Pecking order: Author(s) (year of publication)
Tangibility of assets	$\beta_T > 0$	$\beta_T < 0$	Harris and Raviv (1991)
Sales growth	$\beta_{SG} < 0$	$\beta_{SG} < 0$ or $\beta_{SG} > 0$	Myers and Majluf (1984) or Frank and Goyal (2008)
Logarithm of sales	$\beta_{LS} > 0$	$\beta_{LS} < 0$ or $\beta_{LS} > 0$	Frank and Goyal (2008)
Profitability	$\beta_P < 0$	$\beta_P < 0$	Myers and Majluf (1984) and Fama and French (2002)

Tables 2.13 - Leverage regressions with conventional variables and net financing deficit.

The following basic regression is estimated by ordinary least squares: $\Delta D_i = \alpha + \beta_T \Delta T_i + \beta_{SG} SG_i + \beta_{LS} \Delta LS_i - \beta_P \Delta P_i + \beta_{DEF} DEF_{it} + \varepsilon_{it}$; where ΔD is the change in total debt ratio or change in debt scaled by the book value of total assets at the current year; T - tangibility - is defined as the ratio of the value of tangible assets obtained in the survey, excluding other assets, to the book value of total assets; SG is sales growth; LS is the logarithm of sales and P is profitability, net profits scaled by the book value of total assets. The basic regression is also estimated including the variable DEF , which is the net financing deficit: dividends plus investment plus change in working capital minus net profits -, and is scaled by net the book value of total assets - book value of total assets minus book value of current liabilities - at the current year. Debt includes loans from entrepreneurs, banks, non-bank financial institution, family and friends, employees, government agencies, other businesses, other individuals and other sources. The investments variable is the variation of the estimated value of tangible assets obtained in the survey, excluding other tangible assets. Working capital includes the following items: cash and deposits + accounts receivable + inventories - short-term debt - accounts payable. Additionally, firms are sorted into two sub-samples: smaller and larger firms. Smaller firms are those with book value of total assets less than the 25th percentile of the distribution. Larger firms are those with book value of total assets greater than the 75th percentile of the distribution. All variables represent the accrued value surveyed at the end of each year. Change in debt ratio is: debt to total assets ratio in the current year minus the previous year. Standard errors in parenthesis. ***, ** and * denote, respectively, significance at the 1%, 5% and 10% confidence levels.

<i>Dependent</i>	Column I Changes in debt ratio	Column II Changes in debt ratio	Column III Changes in debt / total assets	Column IV Changes in debt / total assets
Variation of tangibility	-0.290*** (0.058)	-0.267*** (0.058)	-0.004 (0.050)	-0.008 (0.050)
Sales growth	-0.001 (0.004)	-0.001 (0.004)	-0.007** (0.003)	-0.007** (0.003)
Logarithm of sales	-0.075*** (0.022)	-0.069*** (0.022)	0.068*** (0.019)	0.067*** (0.019)
Variation of profitability	-0.034*** (0.007)	-0.039*** (0.007)	-0.028*** (0.006)	-0.027*** (0.006)
Net financing deficit		-0.014*** (0.003)		0.002 (0.003)
Intercept	-0.039** (0.017)	-0.049*** (0.017)	-0.101*** (0.014)	-0.099*** (0.014)
#	7,297	7,297	7,297	7,297
R-square	0.011	0.014	0.004	0.005
F-statistic	19.96***	19.99***	7.95***	6.52***

<i>Dependent</i>	Column I	Column II	Column III	Column IV
	Smaller firms Changes in debt ratio	Smaller firms Changes in debt ratio	Smaller firms Changes in debt / total assets	Smaller firms Changes in debt / total assets
Variation of tangibility	-0.882*** (0.325)	-0.864** (0.326)	-0.243 (0.274)	-0.237 (0.274)
Sales growth	-0.023 (0.039)	-0.024 (0.040)	-0.084** (0.033)	-0.084** (0.033)
Logarithm of sales	-0.006 (0.155)	0.001 (0.156)	0.384*** (0.131)	0.386*** (0.131)
Variation of profitability	-0.081*** (0.015)	-0.084*** (0.016)	-0.047*** (0.013)	-0.047*** (0.013)
Net financing deficit		-0.007 (0.010)		-0.003 (0.009)
Intercept	0.648*** (0.125)	0.636*** (0.126)	-0.028 (0.105)	-0.032 (0.106)
#	1,849	1,849	1,849	1,849
R-square	0.020	0.020	0.011	0.011
F-statistic	9.39***	7.61***	5.04***	4.05**

<i>Dependent</i>	Column I	Column II	Column III	Column IV
	Larger firms Changes in debt ratio	Larger firms Changes in debt ratio	Larger firms Changes in debt / total assets	Larger firms Changes in debt / total assets
Variation of tangibility	-0.218*** (0.068)	-0.195*** (0.068)	0.067** (0.034)	0.069** (0.034)
Sales growth	-0.003 (0.002)	-0.003 (0.002)	-0.003*** (0.001)	-0.003*** (0.001)
Logarithm of sales	-0.047** (0.020)	-0.043** (0.020)	0.012 (0.010)	0.012 (0.010)
Variation of profitability	-0.100*** (0.021)	-0.115*** (0.021)	-0.013 (0.011)	-0.014 (0.011)
Net financing deficit		-0.039*** (0.008)		-0.004 (0.004)
Intercept	-0.117*** (0.015)	-0.121*** (0.015)	-0.027*** (0.008)	-0.028*** (0.008)
#	1,824	1,824	1,824	1,824
R-square	0.032	0.045	0.009	0.009
F-statistic	14.81***	16.92***	3.89**	3.30**

Tables 2.14 - Leverage regressions with conventional variables, with the exception of tangibility which is substituted by the entrepreneurs' net worth variable, and net financing deficit.

The following basic regression is estimated: $\Delta D_i = \alpha + \beta_T \Delta T_i + \beta_{SG} \Delta SG_i + \beta_{LS} \Delta LS_i - \beta_P \Delta P_i + \beta_{DEF} DEF_{it} + \varepsilon_{it}$; where ΔD is the change in debt – debt from year t minus debt from previous year - scaled by the book value of total assets at the current year; T – tangibility - is defined as the ratio of the value of tangible assets obtained in the survey, excluding other assets, to the book value of total assets; SG is sales growth; LS is the logarithm of sales and P is profitability, net profits scaled by the book value of total assets. The regression is also estimated by substituting the variable T - tangibility - by the variable NW which is the entrepreneurs' net worth, measured by an index from 1 to 5¹⁰⁴. Additionally, the basic regression is also estimated including the variable DEF , which is the net financing deficit: dividends plus investment plus change in working capital minus net profits -, and is scaled by the net book value of total assets - book value of total assets minus book value of current liabilities - at the current year. The investments variable is the variation of the estimated value of tangible assets obtained in the survey, excluding other tangible assets. Debt includes loans from entrepreneurs, banks, non-bank financial institution, family and friends, employees, government agencies, other businesses, other individuals and other sources. Working capital includes the following items: cash and deposits + accounts receivable + inventories - short-term debt - accounts payable. Additionally, firms are sorted into two sub-samples: smaller and medium firms and medium and larger firms. Smaller and medium firms are those with sales less than the 50th percentile of the distribution. Medium and larger firms are those with sales greater than the 50th percentile of the distribution. All variables represent the accrued value surveyed at the end of each year. Robust standard errors in parenthesis. ***, ** and * denote significance at the 1%, 5% and 10% confidence levels.

<i>Dependent</i>	Column I Changes in debt / total assets	Column II Changes in debt / total assets	Column III Changes in debt / total assets	Column IV Changes in debt / total assets
Variation of tangibility	-0.004 (0.054)	-0.005 (0.055)		
Entrepreneurs' net worth			0.042*** (0.012)	0.042*** (0.012)
Sales growth	-0.024 (0.014)	-0.024 (0.014)	-0.020 (0.014)	-0.020 (0.014)
Logarithm of sales	-0.075** (0.030)	-0.075** (0.030)	0.070** (0.030)	0.069** (0.030)
Variation of profitability	-0.016** (0.008)	-0.016** (0.008)	-0.016** (0.008)	-0.015** (0.008)
Net financing deficit		-0.000 (0.004)		0.001 (0.004)
Intercept	-0.096*** (0.016)	-0.096*** (0.016)	-0.264*** (0.048)	-0.264*** (0.049)
#	3,663	3,663	3,663	3,663
R-square	0.003	0.003	0.006	0.006
F-statistic	2.44**	1.95*	5.76***	4.62***

¹⁰⁴ One: zero or negative net worth; Two: between 1 and 50,000 USD; Three: Between 50,001 and 100,000 USD; Four: Between 100,001 and 250,000 USD; and Five: more than 250,000 USD.

<i>Dependent</i>	Column I	Column II	Column III	Column IV
	Smaller and medium firms Changes in debt / total assets	Smaller firms Changes in debt / total assets	Smaller and medium firms Changes in debt / total assets	Smaller and medium firms Changes in debt / total assets
Variation of tangibility	-0.053 (0.131)	-0.036 (0.131)		
Entrepreneurs' net worth			0.063** (0.032)	0.060* (0.032)
Sales growth	-0.054 (0.040)	-0.054 (0.040)	-0.051 (0.040)	-0.051 (0.040)
Logarithm of sales	0.182** (0.080)	0.187** (0.080)	0.180** (0.080)	0.185** (0.080)
Variation of profitability	-0.019 (0.014)	-0.009 (0.014)	-0.019 (0.014)	-0.023 (0.014)
Net financing deficit		-0.009 (0.007)		-0.009 (0.007)
Intercept	-0.199*** (0.047)	-0.209*** (0.047)	-0.431*** (0.126)	-0.430*** (0.126)
#	1,838	1,838	1,838	1,838
R-square	0.004	0.005	0.006	0.007
F-statistic	1.65	1.70	2.59**	2.41**

<i>Dependent</i>	Column I	Column II	Column III	Column IV
	Medium and larger firms Changes in debt / total assets	Medium and larger firms Changes in debt / total assets	Medium and larger firms Changes in debt / total assets	Medium and larger firms Changes in debt / total assets
Variation of tangibility	0.019 (0.031)	0.021 (0.032)		
Entrepreneurs' net worth			0.006 (0.006)	0.006 (0.006)
Sales growth	-0.008 (0.007)	-0.009 (0.007)	-0.008 (0.007)	0.008 (0.007)
Logarithm of sales	0.013 (0.014)	0.014 (0.014)	0.013 (0.014)	0.014 (0.014)
Variation of profitability	-0.031*** (0.010)	-0.033*** (0.014)	-0.031*** (0.009)	-0.033*** (0.014)
Net financing deficit		-0.004 (0.003)		-0.004 (0.003)
Intercept	-0.028*** (0.007)	-0.029*** (0.007)	-0.053** (0.026)	-0.053** (0.026)
#	1,825	1,825	1,825	1,825
R-square	0.007	0.008	0.007	0.008
F-statistic	3.19**	2.85**	3.36***	2.95**

Table 2.15 - Average items of disaggregated corporate cash-flows as a percentage of the book value of total assets.

This table represents items of disaggregated corporate cash-flows winsorized at 1% on each tail of the distribution and then averaged. All variables are presented as a percentage of the book value of total assets surveyed and represent the accrued value surveyed at the end of each year. The investments variable is the variation of the value of tangible assets obtained in the survey, excluding other tangible assets. Debt includes loans from entrepreneurs, banks, non-bank financial institution, family and friends, employees, government agencies, other businesses, other individuals and other sources. Debt and equity variations are obtained by the change in the variables from the current to the previous year. Net debt variations are debt increases minus debt reductions. Net equity variations are equity increases minus equity reductions.

Year	2005	2006	2007	2008	2009	2010	2011
<i>Income</i>							
Sales	2.18	2.28	3.27	2.51	3.01	3.17	3.40
Personnel expenses	0.47	0.56	0.62	0.57	0.66	0.67	0.75
Total expenses	1.39	1.48	1.86	1.76	2.09	2.08	2.23
Net income	0.14	0.22	0.20	0.12	0.22	0.24	0.21
<i>Operating activities</i>							
Change in accounts receivable	0.06	0.07	0.01	-0.02	0.00	0.00	0.03
Change in inventories	0.03	0.03	0.01	0.02	-0.02	0.01	0.01
Change in accounts payable	0.04	0.07	0.03	0.04	0.01	0.02	-0.02
Cash flow from operating activities	0.05	0.02	-0.01	-0.03	-0.03	-0.01	0.06
<i>Investing activities</i>							
Investment in tangible assets	0.16	0.11	0.06	0.01	-0.03	0.05	-0.01
Cash flow from investment in tangible assets	0.16	0.11	0.06	0.01	-0.03	0.05	-0.01
<i>Financing activities</i>							
Net variation of equity	0.12	0.08	0.02	0.08	0.04	0.03	0.01
Dividends	0.04	0.04	0.05	0.03	0.05	0.06	0.05
Net variation of long-term debt	-0.12	-0.03	0.00	-0.03	-0.02	0.00	-0.02
Net variation of short-term debt	0.02	0.02	0.01	0.01	-0.01	-0.01	0.00
Cash flow from financing activities	-0.01	0.04	-0.02	0.03	-0.04	-0.03	-0.06
Change in cash and deposits	0.04	0.03	0.01	0.01	0.01	-0.01	0.04

Table 2.16 - Descriptive statistics of variables used.

The values of the variables are winsorized at 1% on each tail of the distribution and the descriptive statistics is then obtained. All variables represent the accrued value surveyed at the end of each year. The investments variable is the variation of the value of tangible assets obtained in the survey, excluding other tangible assets. Working capital includes the following items: cash and deposits + accounts receivable + inventories - short-term debt - accounts payable. Internal cash flow is measured by net profits. Debt includes loans from entrepreneurs, banks, non-bank financial institution, family and friends, partners, employees, government agencies, other businesses, other individuals and other sources. Debt and equity variations are obtained by the change in the variables from the current to the previous year. Net debt variations are debt increases minus debt reductions. Net equity variations are equity increases minus equity reductions. The Net financing deficit is: dividends plus investment plus change in working capital minus net profits – and the gross financing deficit. Variables are scaled by the net book value of total assets - book value of total assets minus book value of current liabilities - at the current year, with the exception of sales and the book value of total assets which are in thousands of USDs.

Variables	Observations	Mean	Standard deviation	Minimum	Maximum
Book value of total assets	7,297	265.91	732.79	0.40	5 519.30
Sales	7,297	618.00	1,714.90	0.26	13,058.44
Long-term debt	7,297	16.93	74.20	0.00	570.10
Short-term debt	7,297	15.23	41.77	0.00	288.00
Dividends	7,297	9.46	32.21	0.00	225.00
Investments	7,297	10.98	144.65	-600.00	905.20
Change in working capital	7,297	5.85	186.78	-891.38	999.57
Net profits	7,297	40.64	144.13	-380.64	960.03
Net financing deficit	7,297	-12.01	309.60	-1,553.11	1,550.22
Net debt variation	7,297	-6.98	67.79	-460.04	250.25
Net equity variation	7,297	9.96	119.57	-500.00	700.00

Table 2.17 - Pair-wise correlations among key variables.

The values of the variables are winsorized at 1% on each tail of the distribution. All variables represent the accrued value surveyed at the end of each year. Investments variable is the variation of the value of tangible assets obtained in the survey, excluding other tangible assets. Working capital includes the following items: cash and deposits + accounts receivable + inventories - short-term debt - accounts payable. Internal cash flow is measured by net profits. Debt includes loans from entrepreneurs, commercial banks, non-bank financial institution, family and friends, partners, employees, government agencies, other businesses, other individuals and other sources. Debt and equity variations are obtained by the change in the variables from the current to the previous year. Debt variations are debt increases minus debt reductions. Net equity variations are equity increases minus equity reductions. Net financing deficit is: dividends plus investment plus change in working capital minus net profits. Net book value of total assets is book value of total assets minus book value of total liabilities. Variation in debt ratio is: debt to book value of total assets ratio in the current year minus the previous year. Variation of total debt is: total debt in t minus total debt in t-1.

		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Dividends/net book value of total assets	A	1															
Investments/net book value of total assets	B	-0.08	1														
Variation of working capital/net book value of total assets	C	-0.10	0.02	1													
Net income/net book value of total assets	D	0.29	-0.02	-0.15	1												
Gross financing deficit/net book value of total assets	E	0.08	0.38	0.55	-0.51	1											
Net financing deficit/net book value of total assets	F	0.03	0.42	0.61	-0.56	0.91	1										
Gross long-term debt variation/net book value of total assets	G	0.08	-0.04	-0.12	0.03	0.07	-0.09	1									
Net long-term debt variation/net book value of total assets	H	-0.05	0.12	-0.01	-0.04	-0.14	0.05	0.19	1								
Change in Long-term debt/net book value of total assets	I	0.04	-0.03	-0.08	0.03	-0.07	-0.08	0.45	0.38	1							
Net equity variation/net book value of total assets	J	0.03	0.06	-0.04	0.03	0.02	0.00	0.04	-0.01	0.03	1						
Variation in debt ratio	K	-0.05	-0.02	-0.07	-0.03	-0.10	-0.05	-0.03	0.21	0.13	0.01	1					
Variation of total debt/book value of total assets in t	L	-0.06	0.12	-0.08	-0.05	-0.09	0.02	-0.01	0.34	0.12	0.01	0.62	1				
Variation in Tangible assets/book value of total assets	M	0.00	0.30	-0.10	-0.03	0.08	0.09	0.01	0.03	0.02	0.01	-0.05	0.00	1			
Logarithm of sales variation	N	-0.01	0.04	0.01	0.02	0.02	0.00	0.06	-0.01	0.00	0.03	-0.04	0.00	-0.02	1		
Sales Growth	O	0.00	0.08	0.03	0.06	0.03	0.02	0.05	-0.02	-0.02	0.05	-0.07	0.02	-0.03	0.69	1	
Variation in net income/book value of total assets	P	0.06	-0.05	-0.03	0.28	-0.14	-0.16	0.01	-0.05	0.00	0.00	-0.07	-0.05	-0.04	0.08	0.16	1

Table 3.1 - Selected literature on trade credit signaling role.

The table synthesizes the selected literature on explaining debt and trade credit signaling role.

Author(s) (year of publication)	Sample	Analysis period	Methodology	Topic(s)	Dependent variables	Independent variables	Relevant Findings
Petersen and Rajan (1997)	3,404 SMEs ¹⁰⁵ from US surveyed in the NSSBF – National Survey of Small Business Finances - of 1987	1987	OLS	Differences between trade credit and bank loans	Model 1: accounts receivable/sales; model 2: trade credit supply/assets; and model 3: accounts payable/assets	Model 1 ¹⁰⁶ ; model 2 ¹⁰⁷ ; and model 3 ¹⁰⁸	Trade credit does not follow the same rationale as bank credit, because suppliers have informational, monitoring and salvaging value from existing assets advantages. Additionally, suppliers can use trade credit in price discrimination strategies, and they might not follow banks' unavailability to finance firms, namely when they are non-profitable with positive sales growth. However, there is evidence that suppliers do worry about their clients' capacity to repay the trade credit
Cook (1999)	352 Russian Small Firms ¹⁰⁹ from a survey of the Institute for the study of Reforms in Moscow	1995	Probit	Trade credit signaling bank credit	Dummy for Current Bank Loan	Dummies: trade credit; variations in revenues; former state or state owned firms; trade, manufacturing or services sector; and beginning loan.	Trade credit works as a signal; firms using trade credit are shown to have a higher probability of acquiring bank credit. Non-financial firms, suppliers of credit to other firms, support the role of financial intermediaries in helping to surmount problems of information asymmetries.
Alphonse et al. (2004)	3,561 SMEs from US surveyed in the NSSBF – National Survey of Small Business Finances - of 1998	1998	Simultaneous equations model: 2 SLS method	Trade credit signaling bank credit	Equation 1: accounts payable/total assets; Equation 2: bank debt/total assets.	Equation 1 ¹¹⁰ and Equation 2 ¹¹¹	Trade Credit can signal firm quality and thus facilitate access to bank debt, except for firms with long banking relationships. The substitution hypothesis of trade and bank credit cannot be rejected, firms that are credit constrained have to use trade credit when suffering from restrained access to bank finance.

¹⁰⁵ With fewer than 500 employees. Medium book value of assets \$ 130,000 and \$ 300,000 of sales. 90% are owner managed.

¹⁰⁶ Assets, age, line of credit, net profit, sales growth, gross profit margin, and two dummies for location and goods produced characteristics

¹⁰⁷ Employees, assets, age, net profit, dummies for firm incorporation and denied request for loan, longest relationship with lender and risk premium in most recent loan.

¹⁰⁸ Predicted trade credit supply, sales growth, assets, age, current assets, net profit, longest relationship with lender, purchases with early discounts and early payments discounts missing and dummies for firm applied to loan, denied request for loan the previous year and located in MSA (Metropolitan Statistical Area).

¹⁰⁹ Between 1 and 200 employees.

¹¹⁰ Total loans, unused lines of credit, current assets, sales growth, income, assets, age, earnings, ownership share of principal owner, dummies for: manager is a hired employee, firm industry and firm legal form.

¹¹¹ Accounts payable, the longest duration of relationship with a bank, assets, age, depreciable assets, earnings, ownership share of principal owner, dummies for: loans from stockholders, firm uses capital lease, firm located in urban area, manager is hired employee, firm industry and firm legal form.

Table 3.1 - Selected literature on trade credit signaling role (cont.)

Author(s) (year of publication)	Sample	Analysis period	Methodology	Topic(s)	Dependent variables	Independent variables	Relevant Findings
Goto et al. (2015)	US listed firms	1971-2009	Fama–MacBeth OLS cross-sectional regressions	Trade credit signaling value and sales growth	Model 1: Sales growth; and Model 2: stock returns	Model 1; and Model 2 ¹¹²	Suppliers have superior information about their customers' prospects, and extend trade credit to capture future profitable business. This information advantage also generates significant return predictability. Firms that rely more on trade credit relative to debt have higher subsequent stock returns. The return predictability by trade credit is stronger among firms with lower borrowing capacity or profitability, and is more significant for firms with a higher degree of information asymmetry. The suppliers' information advantage extends from credit markets to well-developed stock markets. Trade credit predicts sales growth significantly beyond the stock market's valuation in the US stock market.
This study	4,928 nascent firms from US from Kauffman Firm Survey	2004-2011	Heckman two stage selection model	Debt and trade credit signaling external investors	(i) Dummy for receiving external equity (first stage) in year t and ii) amount of outside equity (second stage)	Total debt, personal, business, bank and non-bank debt, firms ¹¹³ and owners ¹¹⁴ characteristics and dummies for crisis, receiving equity the previous year, industry, year and legal status	Professional external investors read the signals from nascent firms' trade credit. Owners' characteristics also influence the investors' decisions. Furthermore, it is evidenced that debt and trade credit have different rationales, in non-profitable firms with positive sales growth, trade credit increases its signaling role to external investors, while debt has no signaling role.

¹¹² Trade credit ratio (trade credit/total borrowing), lagged sales growth, sales, prior stock returns, market value, book value of equity to market value, non cash components of earnings and industry dummies.

¹¹³ Revenues, profits, credit risk, employees, dummy for high tech, cash, accounts receivable, inventory, fixed assets and ROA.

¹¹⁴ Owner age, years of industry experience, week hours, startup experience, education, male and US born.

Tables 3.2 and 3.2.B - Descriptive statistics of the variables, described in chapter 3.4 and appendix H, of our sample of nascent firms and a sub-sample of nascent firms that received external equity. All variables represent the value of each variable surveyed at the end of each year. External equity, is the equity financed by external investors: business angels, companies, governmental agencies and venture capital funds. The amount of external equity represents its yearly value. In variable ROA, some observations were excluded - because they involved outliers that could distort the analysis of the variable. Nevertheless, we have included the variable with all observations in table 3.2.B.

Variables	Type	Sample of nascent firms					Sub-sample of nascent firms that received external equity				
		#	Mean	Std. Dev.	Minimum	Maximum	#	Average	Std. Dev.	Minimum	Maximum
<i>Dependent</i>											
External equity - dummy	Yes=1; No=0	5,822	0.03	0.18	0.00	1.00	186	1.00	0.00	1.00	1.00
External equity – amount	Ln(1+value in USD)	5,822	0.38	2.12	0.00	19.11	186	11.79	2.49	3.09	19.11
<i>Independent</i>											
<i>Main</i>											
Accounts payable	Ln(1+value in USD)	5,822	4.82	5.17	0.00	17.15	186	7.75	5.42	0.00	17.15
<i>Firm's characteristics</i>											
Revenues	Ln(1+value in USD)	5,822	10.64	4.34	0.00	20.09	186	9.58	5.73	0.00	19.06
Profits	value in thousands of USDs	5,822	22.47	956.60	-54,000.00	28,342.32	186	-841.20	4 845.80	-54,000.00	28,342.32
Score of delinquency risk	1 to 5	5,822	2.88	0.98	1.00	5.00	186	3.00	1.05	1.00	5.00
Employees	number	5,822	6.28	15.47	0.00	476.00	186	11.54	15.12	0.00	102.00
High tech	Yes=1; No=0	5,822	0.19	0.39	0.00	1.00	186	0.27	0.45	0.00	1.00
Cash	Ln(1+value in USD)	5,822	8.25	3.45	0.00	20.37	186	9.61	4.14	0.00	20.37
Accounts receivable	Ln(1+value in USD)	5,822	6.56	5.08	0.00	16.77	186	6.73	5.57	0.00	14.51
Inventories	Ln(1+value in USD)	5,822	4.10	5.02	0.00	17.62	186	5.52	5.64	0.00	17.62
Fixed assets	Ln(1+value in USD)	5,822	8.18	4.49	0.00	18.42	186	8.40	5.17	0.00	18.42
ROA	Percentage	5,820	16%	1,114%	-40,000%	21,429%	183	-87%	207%	-1,375%	1,003%

Table 3.2 (cont.)

Variables	Type	Sample of nascent firms					Sub-sample of nascent firms that received external equity				
		#	Mean	Std. Dev.	Minimum	Maximum	#	Average	Std. Dev.	Minimum	Maximum
<i>Independent (cont.)</i>											
<i>Owner's characteristics</i>											
Owner age	number	5,822	45.61	10.37	20.00	90.00	186	48.21	10.45	26.00	87.00
Years of industry experience	number	5,822	14.55	10.81	0.00	60.00	186	13.96	10.41	0.00	40.00
Week hours	number	5,822	45.97	23.10	0.00	120.00	186	50.55	22.98	0.00	120.00
Startup experience	number	5,822	0.88	1.30	0.00	5.00	186	1.50	1.73	0.00	5.00
Education	number	5,822	6.77	2.03	1.00	10.00	186	7.41	2.03	2.00	10.00
Male	Yes=1; No=0	5,822	0.80	0.40	0.00	1.00	186	0.86	0.35	0.00	1.00
US born	Yes=1; No=0	5,822	0.89	0.31	0.00	1.00	186	0.81	0.39	0.00	1.00
<i>Other variables</i>											
Revenues	value in thousands of USDs	5,822	1,142.76	9,742.93	0.00	530,150.00	186	1,718.19	13,498.28	0.00	190,000.00
Total assets	value in thousands of USDs	5,822	620.14	9,880.69	0.00	701,524.99	186	5,802.16	51,976.55	0.00	701,524.99
External equity – amount	value in thousands of USDs	5,822	66.82	2,659.89	0.00	200,000.00	186	2,091.55	14,776.92	0.00	200,000.00
Accounts payable	value in thousands of USDs	5,822	73.11	595.24	0.00	28,000.00	186	381.97	2,254.73	0.00	28,000.00
Cash	value in thousands of USDs	5,822	226.07	9,481.78	0.00	700,000.00	186	4,280.44	51,310.89	0.00	700,000.00
Accounts receivable	value in thousands of USDs	5,822	97.74	492.69	0.00	19,250.35	186	121.44	307.04	0.00	2,000.00
Inventories	value in thousands of USDs	5,822	70.14	855.50	0.00	45,000.00	186	343.73	3,311.62	0.00	45,000.00
Fixed assets	value in thousands of USDs	5,822	208.79	2,202.06	0.00	100,350.00	186	953.88	7,530.79	0.00	100,025.00

Table 3.2.B

Variables	Type	Sample of nascent firms					Sub-sample of nascent firms with patents				
		#	Mean	Std. Dev.	Minimum	Maximum	#	Average	Std. Dev.	Minimum	Maximum
ROA	Percentage	5,822	516%	27,011%	-40,000%	1,500,000%	186	-198%	1,012%	-12,000%	1,003%

Table 3.3 - Percentage of firms with accounts payable in our sample of nascent firms and in a sub-sample of firms that received external equity.

Percentage of firms with account payable in a sample of 5,822 firm-year observations of nascent firms and in a sub-sample of 186 firm-year observations of firms that received external equity. All variables represent the value of each variable surveyed at the end of each year. External equity is the equity financed by external investors: business angels, companies, governmental agencies and venture capital funds.

Year	2005	2006	2007	2008	2009	2010	2011	Mean
<i>Sample of nascent firms</i>								
Accounts payable	45%	48%	50%	54%	51%	49%	45%	49%
#	1,400	1,028	823	758	654	616	543	5,822
<i>Sub-sample of nascent firms that received external equity</i>								
Accounts payable	59%	65%	82%	83%	88%	80%	89%	70%
#	70	48	22	18	9	10	9	186

Table 3.4 - Average equity operation in thousands of USDs in firms with and without accounts payable in a sub-sample of firms that received external equity¹¹⁵.

All variables represent the value of each variable surveyed at the end of each year. The average equity operations are in thousands of USDs. External equity is the equity financed by external investors: business angels, companies, governmental agencies and venture capital funds.

Year	2005	2006	2007	2008	2009	2010	2011	Mean
Firms with Accounts payable	1,436	1,442	959	1,022	1,464	352	396	1,191
#	41	31	18	15	7	8	8	128
Firms without Accounts payable	315	988	71	149	1,150	4,025	725	642
#	29	17	4	3	1	2	1	57

¹¹⁵ One observation in 2009 was excluded from the current table because it involved one large equity increase from a venture capital fund, of 200 million USDs, which could distort the analysis of the average equity operations.

Table 3.5 - Pair-wise correlations among key variables.

All variables represent the value of each variable surveyed at the end of each year. External equity is the equity financed by external investors: business angels, companies, governmental agencies and venture capital funds. The amount of external equity represents its yearly value. ***, ** and * denote, respectively, significance at the 1%, 5% and 10% confidence levels

Variables		1	2	3	4	5	6	7	8	9	10	11
<i>Dependent</i>												
External equity – dummy	1	1										
External equity - amount	2	0.98***	1									
<i>Independent</i>												
<i>Main</i>												
Accounts payable	3	0.10***	0.11***	1								
Crisis	4	-0.05***	-0.04***	0.06***	1							
<i>Firm's characteristics</i>												
Revenues	5	-0.04***	-0.04***	0.29***	0.07***	1						
Profits	6	-0.16***	-0.21***	-0.01	-0.01	0.07***	1					
Score of delinquency risk	7	0.02*	0.01	-0.04***	-0.12***	-0.11***	0.02*	1				
Employees	8	0.06***	0.07***	0.27***	0.01	0.21***	0.04***	-0.01	1			
Hightec	9	0.04***	0.06***	0.01	0.02	0.06***	-0.05***	-0.08***	0.02	1		
Cash	10	0.07***	0.09***	0.18***	0.02	0.28***	0.01	-0.15***	0.20***	0.08***	1	
Accounts receivable	11	0.01	0.02	0.48***	0.06***	0.39***	0.06***	-0.09***	0.26***	0.11***	0.30***	1
Inventories	12	0.05***	0.06***	0.31***	0.01	0.18***	0.02	0.02*	0.16***	-0.07***	0.09***	0.17***
Fixed assets	13	0.01	0.02	0.24***	0.03**	0.19***	0.01	-0.06***	0.20***	-0.03**	0.13***	0.23***
ROA	14	-0.00	-0.00	-0.02	0.02*	0.02	0.00	0.01	0.00	0.01	-0.04**	-0.02
<i>Owner's characteristics</i>												
Owner age	15	0.05***	0.05***	-0.03**	0.02	-0.01	0.00	-0.09***	-0.00	0.02*	0.02	-0.05***
Years of industry experience	16	-0.01	-0.00	-0.00	0.03**	0.03*	-0.01	-0.08***	0.04***	0.13***	0.07***	0.07***
Week hours	17	0.04***	0.04***	0.20***	0.01	0.14***	0.02	-0.01	0.10***	-0.05***	0.10***	0.20***
Startup experience	18	0.09***	0.09***	0.07***	0.01	0.08***	-0.00	0.01	0.08***	0.06***	0.05***	0.04***
Education	19	0.06***	0.07***	-0.06***	0.01	0.02	-0.03**	-0.08***	0.02	0.18***	0.10***	0.01
Male	20	0.03**	0.03***	0.06***	0.03*	0.07***	0.03*	-0.01	0.02	0.08***	0.07***	0.09***
US born	21	-0.05***	-0.05***	-0.01	-0.01	0.02*	0.01	-0.01	-0.01	-0.05***	0.01	0.02

Table 3.5 (cont.)

Variables		12	13	14	15	16	17	18	19	20	21
<i>Dependent</i>											
External equity – dummy	1										
Esternal equity - amount	2										
<i>Independent</i>											
<i>Main</i>											
Accounts payable	3										
Crisis	4										
<i>Firm's characteristics</i>											
Revenues	5										
Profits	6										
Score of delinquency risk	7										
Employees	8										
Hightec	9										
Cash	10										
Accounts receivable	11										
Inventories	12	1									
Fixed assets	13	0.25***	1								
ROA	14	-0.01	-0.03**	1							
<i>Owner's characteristics</i>											
Owner age	15	-0.00	-0.04***	0.00	1						
Years of industry experience	16	-0.10***	-0.01	-0.00	0.43***	1					
Week hours	17	0.12***	0.16***	-0.01	-0.11***	0.03***	1				
Startup experience	18	0.12***	0.02	0.01	0.22***	0.06***	0.03**	1			
Education	19	-0.13***	-0.15***	0.01	0.11***	0.03***	-0.07***	0.04***	1		
Male	20	0.04***	0.06***	0.01	-0.01	0.19***	0.13***	0.09***	-0.03**	1	
US born	21	-0.03**	0.05***	0.01	0.04***	0.09***	-0.04***	-0.00	-0.10***	-0.03**	1

Tables 3.6 - Heckman two-stage model regressions.

The table presents Heckman two stage model regressions on a sample of nascent firms. All variables represent the value of each variable surveyed at the end of each year. All variables are described in Chapter 3.4 and appendix H. External equity is the equity financed by external investors: business angels, companies, governmental agencies and venture capital funds. The amount of external equity represents its yearly value. The results of the first stage of Heckman two-stage model: Probit regressions, are presented in Equation 3.1, while the results of the second stage: OLS (Ordinary Least Squares) regressions, are presented in Equation 3.2. Standard errors in parenthesis. ***, ** and * denote, respectively, significance at the 1%, 5% and 10% confidence levels.

<i>Dependent</i>	Column I		Column II		Column III	
	Equation 3.1 External equity – dummy (t)	Equation 3.2 External equity – amount	Equation 3.1 External equity – dummy (t)	Equation 3.2 External equity – amount	Equation 3.1 External equity – dummy (t)	Equation 3.2 External equity – amount
<i>Independent</i>						
<i>Main</i>						
Accounts payable	0.051*** (0.009)	0.034 (0.029)	0.051*** (0.009)	0.032 (0.031)	0.044*** (0.008)	0.047 (0.031)
External equity – dummy (t-1)	1.320*** (0.102)		1.407*** (0.100)		1.489*** (0.098)	
Crisis	-0.200** (0.091)	0.184 (0.304)	-0.171* (0.089)	0.443 (0.316)	-0.174** (0.087)	0.637 (0.343)
<i>Firm's characteristics</i>						
Revenues	-0.026*** (0.009)	-0.014 (0.027)	-0.024*** (0.008)	-0.005 (0.029)	-0.031*** (0.008)	0.018 (0.027)
Score of delinquency risk	0.049 (0.042)	-0.406*** (0.133)	0.044 (0.041)	-0.442*** (0.140)	0.015 (0.039)	-0.633*** (0.146)
Employees	0.002 (0.002)	0.011 (0.009)	0.002 (0.002)	0.020** (0.010)	0.002 (0.002)	0.035*** (0.010)
High tech	0.101 (0.099)	0.966*** (0.302)	0.127 (0.094)	0.892*** (0.308)	0.156* (0.090)	1.163*** (0.333)
<i>Financial information</i>						
Cash	0.038*** (0.012)	0.183*** (0.033)	0.039*** (0.012)	0.180*** (0.035)		
Accounts receivable	-0.027*** (0.009)	0.027 (0.030)	-0.028*** (0.009)	0.031 (0.031)		
Inventories	0.004 (0.008)	0.034 (0.026)	0.008 (0.008)	0.026 (0.027)		
Tangible assets	-0.005 (0.009)	0.054** (0.026)	-0.007 (0.009)	0.029 (0.027)		
Profits	-0.000*** (0.000)	-0.000 (0.000)	-0.000** (0.000)	-0.000 (0.000)		
ROA	-0.003 (0.002)	0.005 (0.012)	-0.004* (0.002)	0.003 (0.013)		
<i>Owner's characteristics</i>						
Owner age	0.011*** (0.004)	-0.013 (0.014)				
Years of industry experience	-0.008** (0.004)	-0.008 (0.014)				
Week hours	0.003* (0.002)	0.003 (0.005)				
Startup experience	0.079*** (0.026)	0.135 (0.084)				
Education	0.032 (0.020)	0.146** (0.068)				
Male	0.057 (0.107)	1.004*** (0.377)				
US born	-0.161 (0.107)	-0.012 (0.338)				
<i>Fixed effects</i>						
Legal status fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Intercept	127.579*** (45.141)	59.801 (158.016)	131.102*** (44.352)	-7.632 (167.486)	120.799*** (43.572)	-31.060 (184.213)
#	5,822	186	5,822	186	5,822	186
Chi2	437.68***	161.49***	405.51***	127.01***	372.10***	91,41***
Pseudo R2	0.266		0.246		0.226	
Log likelihood	-604.68		-620.76		-637.46	
Lambda		-0.705*** (0.241)		-0.830*** (0.238)		-0,919*** (0.248)
Rho		-0.425		-0.460		-0,458
Sigma		1.660		1.805		2.005

Table 3.7 - Heckman two-stage model regressions.

The table presents Heckman two stage model regressions on a sub-sample of nascent firms that have losses and positive sales growths. All variables represent the value of each variable surveyed at the end of each year. All variables are described in Chapter 3.4 and appendix H. External equity is the equity financed by external investors: business angels, companies, governmental agencies and venture capital funds. The amount of external equity represents its yearly value. Total debt includes personal and business debt. Personal debt is all the debt financed in the owners' name and used in the firms' financing. Business debt is the debt registered in the firms' name. The results of the first stage of Heckman two-stage model: Probit regressions, are presented in Equation 1, while the results of the second stage: OLS (Ordinary Least Squares) regressions, are presented in Equation 2. Standard errors in parenthesis. ***, ** and * denote, respectively, significance at the 1%, 5% and 10% confidence levels.

<i>Dependent</i>	Column I		Column II	
	Losses and pos. growth Equation 3.1 External equity – dummy (t)	Losses and pos. growth Equation 3.2 External equity - amount	Losses and pos. growth Equation 3.1 External equity – dummy (t)	Losses and pos. growth Equation 3.2 External equity - amount
<i>Independent</i>				
<i>Main</i>				
Accounts payable	0.050*** (0,016)	0.052* (0,029)		
Total Debt			0.022 (0,014)	-0.013 (0,025)
External equity – dummy (t-1)	1.263*** (0,161)		1.246*** (0,158)	
Crisis	0.005 (0,168)	0.561* (0,320)	0.019 (0,166)	0.673** (0,330)
<i>Firm's characteristics</i>				
Revenues	-0.045*** (0,015)	0.016 (0,033)	-0.045*** (0,015)	0.005 (0,033)
Score of delinquency risk	-0.021 (0,073)	-0.292** (0,141)	-0.008 (0,074)	-0.329** (0,146)
Employees	0.003 (0,005)	0.020* (0,011)	0.004 (0,005)	0.021* (0,011)
High tech	0.264 (0,159)	0.070 (0,302)	0.276* (0,157)	0.108* (0,311)
<i>Financial information</i>				
Cash	0.066*** (0,020)	0.195*** (0,038)	0.070*** (0,020)	0.190*** (0,040)
Accounts receivable	-0.001 (0,017)	-0.045 (0,037)	0.017 (0,016)	-0.013 (0,036)
Inventories	0.003 (0,014)	-0.010 (0,027)	0.008 (0,014)	-0.002 (0,027)
Tangible assets	-0.012 (0,015)	0.067** (0,026)	-0.010 (0,014)	0.076*** (0,027)
Profits	-0.000 (0,000)	-0.000 (0,000)	-0.000 (0,000)	-0.000** (0,000)
ROA	-0.003 (0,012)	-0.033 (0,042)	-0.004 (0,012)	-0.016 (0,043)
<i>Owner's characteristics</i>				
Owner age	0.007 (0,007)	0.002 (0,016)	0.007 (0,007)	0.001 (0,016)
Years of industry experience	-0.018*** (0,007)	0.025 (0,017)	-0.018*** (0,007)	0.028 (0,017)
Week hours	0.001 (0,002)	0.003 (0,005)	0.002 (0,002)	0.004 (0,006)
Startup experience	0.081* (0,045)	0.041 (0,087)	0.074* (0,045)	0.049 (0,089)
Education	0.050 (0,036)	0.049 (0,079)	0.057 (0,036)	0.057 (0,082)
Male	0.013 (0,167)	1.468*** (0,394)	-0.006 (0,166)	1.490*** (0,407)
US born	-0.126 (0,177)	0.139 (0,352)	-0.147 (0,174)	-0.024 (0,357)
<i>Fixed effects</i>				
Legal status fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Intercept	105.857 (93.382)	-3.188 (186.688)	88.533 (93.549)	51.500 (191.962)
#	1,132	105	1,132	105
Chi2	230.09***	163.66***	222.17***	160.70***
Pseudo R2	0.329		0.318	
Log likelihood	-234.59		-238.55	
Lambda		-0.716** (0,281)		-0.587** (0,286)
Rho		-0.566		-0.468
Sigma		1.265		1.256

Table 3.8 - Heckman two-stage model regressions.

The table presents Heckman two stage model regressions on a sample of nascent firms. All variables represent the value of each variable surveyed at the end of each year. All variables are described in Chapter 3.4 and appendix H. External equity is the equity financed by external investors: business angels, companies, governmental agencies and venture capital funds. The amount of external equity represents its yearly value. Total debt includes personal and business debt. Personal debt is all the debt financed in the owners' name and used in the firms' financing. Business debt is the debt registered in the firms' name. The results of the first stage of Heckman two-stage model: Probit regressions, are presented in Equation 3.3, while the results of the second stage: OLS (Ordinary Least Squares) regressions, are presented in Equation 3.4. Standard errors in parenthesis. ***, ** and * denote, respectively, significance at the 1%, 5% and 10% confidence levels.

<i>Dependent</i> <i>Independent</i>	Column I		Column II	
	Equation 3.3 External equity –	Equation 3.4 External equity - amount	Equation 3.3 External equity –	Equation 3.4 External equity - amount
<i>Main</i>				
Accounts payable (1)	0.041*** (0.009)	0.038 (0.029)	0.064*** (0.014)	-0.036 (0.045)
Total debt (2)	0.040*** (0.009)	-0.012 (0.026)	0.059*** (0.013)	-0.089** (0.044)
(1)x(2)			-0.003* (0.002)	0.010** (0.005)
External equity – dummy (t-1)	1.313*** (0.102)		1.321*** (0.103)	
Crisis	-0.211** (0.093)	0.186 (0.305)	-0.210** (0.093)	0.203 (0.301)
<i>Firm's characteristics</i>				
Revenues	-0.029*** (0.009)	-0.014 (0.028)	-0.029*** (0.009)	-0.015 (0.027)
Score of delinquency risk	0.056 (0.043)	-0.406** (0.133)	0.059 (0.043)	-0.427*** (0.132)
Employees	0.001 (0.002)	0.011 (0.009)	0.002 (0.002)	0.010 (0.009)
High tech	0.123 (0.100)	0.968*** (0.306)	0.125 (0.100)	0.940*** (0.301)
<i>Financial information</i>				
Cash	0.045*** (0.013)	0.181*** (0.034)	0.045*** (0.013)	0.179*** (0.033)
Accounts receivable	-0.029*** (0.009)	0.027 (0.030)	-0.030** (0.009)	0.034 (0.030)
Inventories	-0.002 (0.008)	0.036 (0.026)	-0.001 (0.008)	0.029 (0.026)
Tangible assets	-0.008 (0.008)	0.056* (0.027)	-0.009 (0.009)	0.051* (0.026)
Profits	-0.000*** (0.000)	-0.000 (0.000)	-0.000** (0.000)	-0.000 (0.000)
ROA	-0.004 (0.002)	0.006 (0.012)	-0.004* (0.002)	0.006 (0.012)
<i>Owner's characteristics</i>				
Owner age	0.011** (0.004)	-0.013 (0.014)	0.011** (0.004)	-0.013 (0.014)
Years of industry experience	-0.008* (0.004)	-0.008 (0.014)	-0.008* (0.004)	-0.009 (0.014)
Week hours	0.003* (0.002)	0.004 (0.005)	0.003 (0.002)	0.003 (0.005)
Startup experience	0.077*** (0.027)	0.136 (0.084)	0.078*** (0.027)	0.128 (0.083)
Education	0.037* (0.021)	0.146** (0.069)	0.041** (0.021)	0.128* (0.069)
Male	0.046 (0.109)	1.010*** (0.377)	0.053 (0.110)	0.920** (0.376)
US born	-0.176 (0.108)	-0.018 (0.339)	-0.182* (0.108)	0.047 (0.337)
<i>Fixed effects</i>				
Legal status fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Intercept	111.352** (46.099)	-49.407 (157.465)	109.759** (46.304)	-52.689 (155.646)
#	5,822	186	5,822	186
Chi2	460.92***	163.33***	464.73***	177.02***
Pseudo R2	0.280		0.282	
Log likelihood	-593.06		-591.15	
Lambda		-0.713*** (0.245)		-0.652*** (0.242)
Rho		-0.429		-0.400
Sigma		1.662		1.629

Table 4.1 - Selected literature on patents signaling role.

The table synthesizes the selected literature on explaining patents signaling role.

Author(s) (year of publication)	Sample	Analysis period	Methodology	Topic(s)	Dependent variables	Independent variables	Relevant Findings
Heeley et al. (2007)	1,413 listed US manufacturing firms' IPOs	1981-1998	OLS	Patents reducing information asymmetries	First day stock returns of an IPO.	Dummy for less and more complex technology, number of patents, IPO and financial markets' characteristics ¹¹⁶	Patents reduce information asymmetries in manufacturing firms with less complex technologies, where the link between patents and inventive returns is transparent, thereby reducing IPO underpricing. Conversely, patents reflect increased information asymmetries and underpricing in firms with more complex technologies, where the link is not transparent.
Audretsch et al. (2012)	906 nascent ventures from US: 426 in the planning stage and 480 in the early startup stage ¹¹⁷	2005	Probit and multinomial logit estimations	Patents signaling external investors	External finance characteristics: no external finance, debt, venture capital, business angels and equity	Entrepreneurship characteristics ¹¹⁸	Innovative nascent ventures possessing patents as well as prototypes have a higher probability of obtaining equity finance from business angels and venture capitalists. However, we find that the signal matters to investors only if the nascent ventures are in the early stage of the startup rather than the planning stage. Bank finance, however, does not seem to value any of the signals and is based only on collateral.
Lahr and Mina (2016)	940 firms (513 in the US and 427 in the UK) from all manufacturing and business service sectors	2004-2005	Two sets of simultaneous equations	Patents signaling external investors	(i) dummy for patent application and grants (ii) receiving VC investment; Second equations: (iii) number of patent applications and grants	Dependent variables and firm and owner characteristics ¹¹⁹ .	Venture capitalists follow patent signals to invest in companies with commercially viable know-how; results also suggest that they are more likely to rationalize, rather than increase, the patenting output of portfolio firms.

¹¹⁶ Firms' age and assets, R&D expenditures to sales, market lagged returns, and dummies for: venture capital and prestigious underwriter backing, low, stable or high technology firms.

¹¹⁷ From a survey in US of 4122 entrepreneurs, investors and others. The data set was created for the Ewing Marion Kauffman Foundation by the Center for Innovative Entrepreneurship (CIE), and consists of a web-based survey of potential entrepreneurs.

¹¹⁸ Dummies for patent, prototype, startup operation, concept developed, product or service, business plan, serial entrepreneur, team, house (that can be used as a collateral), international links and team.

¹¹⁹ Firms' age, number of employees, number of competitors, product development time and dummies for: US firm, medium-low tech manufacturing firm, R&D service or software firm, the firm is a service firm other than R&D or software, the firm has R&D expenditures, full-time R&D staff as a proportion of total staff, the firm's CEO has a degree, and size of the firm's market.

Table 4.1 - Selected literature on patents signaling role (cont.)

Author(s) (year of publication)	Sample	Analysis period	Methodology	Topic(s)	Dependent variables	Independent variables	Relevant Findings
Farre-Mensa et al. (2020)	34,215 US firms first-time patent applicants	2001-2011	2SLS	Patents' role in employment, growth, innovation capital access	Dummy for patent approval; examiner approval rate; and capital access	Dummy for patent approval; examiner approval rate; age, employees, sales, employment and sales growth variables concerning capital access ¹²⁰	Startups that win the patent "lottery" by drawing lenient examiners have, on average, 55% higher employment growth and 80% higher sales growth five years later. Patent winners also pursue more, and higher quality, follow-on innovation. Winning a first patent boosts a startup's subsequent growth and innovation by facilitating access to funding from venture capitalists, banks, and public investors.
This study	4,928 nascent firms from US from Kauffman Firm Survey	2004-2011	Heckman two stage selection model	Patents signaling external investors	Dummy for receiving external equity, debt and accounts payable (first stage) and ii) amount of external equity, debt and accounts payable (second stage)	Accounts payable, total debt, personal, business, bank and non-bank debt, firms ¹⁶ and owners ¹⁷ characteristics and dummies for crisis, receiving external equity the previous year, industry, year and legal status	Patents have a signaling role to external investors. Contrastingly, debt and trade credit are not signaled by patents, because they have other rationales and collect different information. The signaling role of patents is different in manufacturing firms with less and more complex technologies. Patents' signaling is stronger in manufacturing firms with more less complex technologies, because patents are more effective in reducing information asymmetries to external investors in these firms.

¹²⁰ Percentage of startups that: receive VC funding, go public and pledge patent as collateral.

Table 4.2 – Descriptive statistics: sources of finance in sub-samples of nascent firms.

The table represents number of firm-year observations by sources of funding in a sample and in six sub-samples of nascent firms: (i) nascent firms with patents; (ii) nascent firms without patents; (iii) non manufacturing nascent firms; (iii) manufacturing nascent firms; (iv) manufacturing nascent firms with simple technologies; and (vi) manufacturing nascent firms with complex technologies.

	No external sources	External sources of financing				Total
		Only Equity	Only Debt	Only Trade Credit ¹²¹	More than two sources	
<i>Patents</i>						
Nascent firms without patents	2,214	26	622	1,307	1,319	5,488
	96%	59%	96%	95%	91%	94%
Nascent firms with patents	90	18	27	74	125	334
	4%	41%	4%	5%	9%	6%
Nascent firms	2,304	44	649	1,381	1,444	5,822
	100%	100%	100%	100%	100%	100%
<i>Manufacturing</i>						
Non manufacturing nascent firms	2,062	25	578	1,078	1,039	4,782
	89%	57%	89%	78%	72%	82%
Manufacturing nascent firms	242	19	71	303	405	1,040
	11%	43%	11%	22%	28%	18%
Nascent firms	2,304	44	649	1,381	1,444	5,822
	100%	100%	100%	100%	100%	100%
<i>Technologies</i>						
Manufacturing nascent firms with complex technologies	170	10	51	231	333	795
	70%	53%	72%	76%	82%	76%
Manufacturing nascent firms with simple technologies	72	9	20	72	72	245
	30%	47%	28%	24%	18%	24%
Manufacturing nascent firms	242	19	71	303	405	1,040
	100%	100%	100%	100%	100%	100%

¹²¹ Measured by accounts payable.

Tables 4.3 and 4.3.B - Descriptive statistics of the variables, described in chapter 4.4 and appendix H, of our sample of nascent firms and sub-sample of nascent firms with patents.

All variables represent the value of each variable surveyed at the end of each year. External equity is the equity financed by external investors: business angels, companies, governmental agencies and venture capital funds. The amount of external equity represents its yearly value. Total debt includes personal and business debt. Personal debt is all the debt financed in the owners' name and used in the firms' financing. Business debt is the debt registered in the firms' name. In variable ROA, some observations were excluded - because they involved outliers that could distort the analysis of the variable. Nevertheless, we have included the variable with all observations in table 4.3.B.

Variables	Type	Sample of nascent firms					Sub-sample of nascent firms with patents				
		#	Mean	Std. Dev.	Minimum	Maximum	#	Mean	Std. Dev.	Minimum	Maximum
<i>Dependent</i>											
External equity dummy	Yes=1; No=0	5,822	0.03	0.18	0.00	1.00	334	0.20	0.40	0.00	1.00
External equity – amount	Ln(1+value in USD)	5,822	0.38	2.12	0.00	19.11	334	2.70	5.45	0.00	16.62
<i>Independent</i>											
<i>Main</i>											
Patents	Yes=1; No=0	5,822	0.06	0.23	0.00	1.00	334	1.00	0.00	1.00	1.00
Crisis	2007 to 2009=1; Other=0	5,822	0.38	0.49	0.00	1.00	334	0.40	0.49	0.00	1.00
<i>Firm's characteristics</i>											
Revenues	Ln(1+value in USD)	5,822	10.64	4.34	0.00	20.09	334	10.21	5.40	0.00	17.99
Profits	value in thousands of USDs	5,822	22.47	956.60	-54,000.00	28,342.32	334	-492.48	3,280.20	-54,000.00	4,000.00
Score of delinquency risk	1 to 5	5,822	2.88	0.98	1.00	5.00	334	2.68	0.95	1.00	5.00
Employees	Number	5,822	6.28	15.47	0.00	476.00	334	11.22	23.23	0.00	207.00
High tech	Yes=1; No=0	5,822	0.19	0.39	0.00	1.00	334	0.40	0.49	0.00	1.00
Cash	Ln(1+value in USD)	5,822	8.25	3.45	0.00	20.37	334	9.05	4.36	0.00	16.30
Accounts receivable	Ln(1+value in USD)	5,822	6.56	5.08	0.00	16.77	334	7.22	5.45	0.00	16.21
Inventories	Ln(1+value in USD)	5,822	4.10	5.02	0.00	17.62	334	6.34	5.40	0.00	15.25
Fixed assets	Ln(1+value in USD)	5,822	8.18	4.49	0.00	18.42	334	8.59	4.66	0.00	16.86
ROA	Percentage	5,820	16%	1,114%	-40,000%	21,429%	332	-98%	451%	-3,973%	1,000%

Table 4.3 (cont.)

Variables	Type	Sample of nascent firms					Sub-sample of nascent firms with patents				
		#	Mean	Std. Dev.	Minimum	Maximum	#	Mean	Std. Dev.	Minimum	Maximum
<i>Independent (cont.)</i>											
<i>Owner's characteristics</i>											
Owner age	number	5,822	45.61	10.37	20.00	90.00	334	47.35	11.15	20.00	90.00
Years of industry experience	number	5,822	14.55	10.81	0.00	60.00	334	15.51	10.57	0.00	60.00
Week hours	number	5,822	45.97	23.10	0.00	120.00	334	47.20	24.34	3.00	120.00
Startup experience	number	5,822	0.88	1.30	0.00	5.00	334	1.26	1.65	0.00	5.00
Education	number	5,822	6.77	2.03	1.00	10.00	334	8.04	1.81	2.00	10.00
Male	Yes=1; No=0	5,822	0.80	0.40	0.00	1.00	334	0.86	0.35	0.00	1.00
US born	Yes=1; No=0	5,822	0.89	0.31	0.00	1.00	334	0.83	0.38	0.00	1.00
<i>Other variables</i>											
Revenues	value in thousands of USDs	5,822	1,142.76	9,742.93	0.00	530,150.00	334	1,483.16	5,254.35	0.00	65,000.00
Total assets	value in thousands of USDs	5,822	620.14	9,880.69	0.00	701,524.99	334	1,242.24	2,875.13	0.35	21,981.00
External equity – amount	value in thousands of USDs	5,822	66.82	2,659.89	0.00	200,000.00	334	398.40	1,545.68	0.00	16,500.00
Total debt – amount	value in thousands of USDs	5,822	92.47	774.70	0.00	45,000.00	334	222.03	919.55	0.00	10,000.00
Accounts payable – amount	value in thousands of USDs	5,822	73.11	595.24	0.00	28,000.00	334	280.98	1,739.65	0.00	28,000.00
Cash	value in thousands of USDs	5,822	226.07	9,481.78	0.00	700,000.00	334	377.68	1,308.03	0.00	12,000.00
Accounts receivable	value in thousands of USDs	5,822	97.74	492.69	0.00	19,250.35	334	190.66	771.31	0.00	11,000.00
Inventories	value in thousands of USDs	5,822	70.14	855.50	0.00	45,000.00	334	114.46	393.50	0.00	4,200.00
Fixed assets	value in thousands of USDs	5,822	208.79	2,202.06	0.00	100,350.00	334	384.49	1,852.32	0.00	21,042.00

Table 4.3.B

Variables	Type	Sample of nascent firms					Sub-sample of nascent firms with patents				
		#	Mean	Std. Dev.	Minimum	Maximum	#	Mean	Std. Dev.	Minimum	Maximum
ROA	Percentage	5,822	516%	27,011%	-40,000%	1,500,000%	334	-149%	811%	-10,957%	1,000%

Table 4.4 - Percentage of firms with patents in our sample of nascent firms and in a sub-sample of nascent firms that received external equity. Percentage of firms with patents in a sample of 5,822 firm-year observations of nascent firms and in a sub-sample of 334 firm-year observations of firms that received external equity. All variables represent the value of each variable surveyed at the end of each year. External equity is the equity financed by external investors: business angels, companies, governmental agencies and venture capital funds.

Year	2005	2006	2007	2008	2009	2010	2011
Nascent firms	5%	7%	7%	6%	5%	6%	5%
#	1,400	1,028	823	758	654	616	543
Nascent firms that received external investment	29%	38%	45%	56%	38%	40%	22%
#	70	48	22	18	9	10	9

Tables 4.5 and 4.5.B - Average equity operation in thousands of USDs in firms with and without patents, in a sub-sample of firms that received external equity.

All variables represent the value of each variable surveyed at the end of each year. The average equity operation is measured in thousands of USDs. External equity is the equity financed by external investors: business angels, companies, governmental agencies and venture capital funds. The amount of external equity represents its yearly value.

Year	2005	2006	2007	2008	2009	2010	2011	Mean
Nascent firms with patents	1,406	3,106	1,595	1,332	2,440	2,523	1,175	1,986
#	20	18	10	10	3	4	2	67
Nascent firms without patents	798	187	133	308	816	129	220	474
#	50	30	12	8	5	6	7	118
Nascent firms that received external equity ¹²²	972	1,281	798	877	1,425	1,087	432	1,022
#	70	48	22	18	8	10	9	185

Table 4.5.B

Year	2005	2006	2007	2008	2009	2010	2011	Mean
Nascent firms with patents	1,406	3,106	1,595	1,332	2,440	2,523	1,175	1,986
#	20	18	10	10	3	4	2	67
Nascent firms without patents	798	187	133	308	51,830	129	220	2,151
#	50	30	12	8	6	6	7	118
Nascent firms that received external equity	972	1,281	798	877	35,367	1,087	432	2,014
#	70	48	22	18	9	10	9	186

¹²² One observation in 2009 was excluded from the current table because it involved one large equity increase from a venture capital fund, of 200 million USDs, which could distort the analysis. Nevertheless, this observation is included in in table 4.5.B.

Table 4.6 - Pair-wise correlations among key variables.

All variables represent the value of each variable surveyed at the end of each year. External equity is the equity financed by external investors: business angels, companies, governmental agencies and venture capital funds. The amount of external equity represents its yearly value. ***, ** and * denote, respectively, significance at the 1%, 5% and 10% confidence levels

Variables		1	2	3	4	5	6	7	8	9	10	11
<i>Dependent</i>												
External equity - dummy	1	1										
External equity – amount	2	0.98***	1									
<i>Independent</i>												
<i>Main</i>												
Patents	3	0.24***	0.27***	1								
Crisis	4	-0.05***	-0.04***	0.01	1							
<i>Firm's characteristics</i>												
Revenues	5	-0.04***	-0.04***	-0.02*	0.07***	1						
Profits	6	-0.16***	-0.21***	-0.13***	-0.01	0.07***	1					
Score of delinquency risk	7	0.02*	0.01	-0.05***	-0.12***	-0.11***	0.02*	1				
Employees	8	0.06***	0.07***	0.08***	0.01	0.21***	0.04***	-0.01	1			
High tech	9	0.04***	0.06***	0.14***	0.02	0.06***	-0.05***	-0.08**	0.02	1		
Cash	10	0.07***	0.09***	0.06***	0.02	0.28***	0.01	-0.15***	0.20***	0.08***	1	
Accounts receivable	11	0.01	0.02	0.03**	0.06***	0.39***	0.06***	-0.09***	0.26***	0.11***	0.30***	1
Inventories	12	0.05***	0.06***	0.11***	0.01	0.18***	0.02	0.02*	0.16***	-0.07***	0.09***	0.17***
Fixed assets	13	0.01	0.02	0.02*	0.03**	0.19***	0.01	-0.06***	0.20***	-0.03**	0.13***	0.23***
ROA	14	-0.00	-0.00	-0.01	0.02*	0.02	0.00	0.01	0.00	0.01	-0.04**	-0.02
<i>Owner's characteristics</i>												
Owner age	15	0.05***	0.05***	0.04***	0.02	-0.01	0.00	-0.09***	-0.00	0.02*	0.02	-0.05***
Years of industry experience	16	-0.01	-0.00	0.02*	0.03**	0.03*	-0.01	-0.08***	0.04**	0.13***	0.07***	0.07***
Week hours	17	0.04***	0.04***	0.01	0.01	0.14***	0.02	-0.01	0.10***	-0.05***	0.10***	0.20***
Startup experience	18	0.09***	0.09***	0.07***	0.01	0.08***	-0.00	0.01	0.08***	0.06***	0.05***	0.04***
Education	19	0.06***	0.07***	0.15***	0.01	0.02	-0.03**	-0.08***	0.02	0.18***	0.10***	0.01
Male	20	0.03**	0.03***	0.04***	0.03*	0.07***	0.03*	-0.01	0.02	0.08***	0.07***	0.09***
US born	21	-0.05***	-0.05***	-0.05***	-0.01	0.02*	0.01	-0.01	-0.01	-0.05***	0.01	0.02

Table 4.6 (cont.)

Variables		12	13	14	15	16	17	18	19	20	21
<i>Dependent</i>											
External equity - dummy	1										
External equity – amount	2										
<i>Independent</i>											
<i>Main</i>											
Patents	3										
Crisis	4										
<i>Firm's characteristics</i>											
Revenues	5										
Profits	6										
Score of delinquency risk	7										
Employees	8										
High tech	9										
Cash	10										
Accounts receivable	11										
Inventories	12	1									
Fixed assets	13	0.25***	1								
ROA	14	-0.01	-0.03**	1							
<i>Owner's characteristics</i>											
Owner age	15	-0.00	-0.04***	0.00	1						
Years of industry experience	16	-0.10***	-0.01	-0.00	0.43***	1					
Week hours	17	0.12***	0.16***	-0.01	-0.11***	0.03***	1				
Startup experience	18	0.12***	0.02	0.01	0.22***	0.06***	0.03**	1			
Education	19	-0.13***	-0.15***	0.01	0.11***	0.03***	-0.07***	0.04***	1		
Male	20	0.04***	0.06***	0.01	-0.01	0.19***	0.13***	0.09***	-0.03**	1	
US born	21	-0.03**	0.05***	0.01	0.04***	0.09***	-0.04***	-0.00	-0.10***	-0.03**	1

Tables 4.7 and 4.7.B - Descriptive statistics of the variables, described in chapter 4.4 and appendix H, of the sub-samples of manufacturing firms with simple and complex technology.

All variables represent the value of each variable surveyed at the end of each year. External equity is the equity financed by external investors: business angels, companies, governmental agencies and venture capital funds. The amount of external equity represents its yearly value. In variable ROA, some observations were excluded - because they involved outliers that could distort the analysis of the variable. Nevertheless, we have included the variable with all observations in table 4.7.B.

Variables	Type	Sub-sample of manufacturing firms with less complex technology					Sub-sample of manufacturing firms with more complex technology				
		#	Mean	Std. Dev.	Minimum	Maximum	#	Mean	Std. Dev.	Minimum	Maximum
<i>Dependent</i>											
External equity – dummy	Yes=1; No=0	245	0.13	0.33	0.00	1.00	795	0.06	0.23	0.00	1.00
External equity – amount	Ln(1+value in USD)	245	1.70	4.50	0.00	16.62	795	0.72	3.03	0.00	16.52
<i>Independent</i>											
<i>Main</i>											
Patents	Yes=1; No=0	245	0.23	0.42	0.00	1.00	795	0.17	0.38	0.00	1.00
Crisis	2007 to 2009=1; Other=0	245	0.36	0.49	0.00	1.00	795	0.38	0.48	0.00	1.00
<i>Firm's characteristics</i>											
Revenues	Ln(1+value in USD)	245	10.50	4.48	0.00	19.11	795	11.65	4.17	0.00	18.37
Profits	value in thousands of USDs	245	-409.55	3,641.41	-54,000.00	1,000.00	795	-15.85	921.98	-12,000.00	5,000.00
Score of delinquency risk	1 to 5	245	2.97	1.06	1.00	5.00	795	2.80	1.02	1.00	5.00
Employees	number	245	6.03	7.85	0.00	47.00	795	11.50	22.41	0.00	224.00
High tech	Yes=1; No=0	245	0.25	0.43	0.00	1.00	795	0.37	0.48	0.00	1.00
Cash	Ln(1+value in USD)	245	8.29	3.95	0.00	16.12	795	9.03	3.51	0.00	16.01
Accounts receivable	Ln(1+value in USD)	245	7.35	4.93	0.00	15.20	795	9.07	4.42	0.00	16.10
Inventories	Ln(1+value in USD)	245	7.23	4.45	0.00	15.07	795	6.78	5.32	0.00	17.62
Fixed assets	Ln(1+value in USD)	245	8.69	4.65	0.00	15.78	795	9.79	4.19	0.00	16.65
ROA	Percentage	242	-17%	111%	-520%	714%	793	-1%	125%	-1,410%	1,050%

Table 4.7 (cont.)

Variables	Type	Sub-sample of manufacturing firms with less complex technology					Sub-sample of manufacturing firms with more complex technology				
		#	Mean	Std. Dev.	Minimum	Maximum	#	Mean	Std. Dev.	Minimum	Maximum
<i>Independent (cont.)</i>											
<i>Owner's characteristics</i>											
Owner age	number	245	47.38	9.95	23.00	71.00	795	46.96	10.27	25.00	90.00
Years of industry experience	number	245	12.52	11.00	0.00	40.00	795	16.25	11.10	0.00	60.00
Week hours	number	245	47.20	25.24	0.00	120.00	795	47.47	22.19	0.00	112.00
Startup experience	number	245	1.22	1.53	0.00	5.00	795	0.98	1.37	0.00	5.00
Education	number	245	6.88	2.20	2.00	10.00	795	6.48	2.08	2.00	10.00
Male	Yes=1; No=0	245	0.77	0.42	0.00	1.00	795	0.88	0.32	0.00	1.00
US born	Yes=1; No=0	245	0.81	0.39	0.00	1.00	795	0.88	0.32	0.00	1.00
<i>Other variables</i>											
Revenues	value in thousands of USDs	245	1,522.35	12,873.87	0.00	200,050.00	795	1,598.51	5,303.34	0.00	95,000.00
Total assets	value in thousands of USDs	245	790.58	1,979.87	0.20	11,680.00	795	987.64	2,630.42	0.00	48,300.00
External equity – amount	value in thousands of USDs	245	242.13	1,329.07	0.00	16,500.00	795	112.18	871.88	0.00	15,000.00
Cash	value in thousands of USDs	245	181.20	850.27	0.00	10,000.00	795	158.82	652.01	0.00	9,000.00
Accounts receivable	value in thousands of USDs	245	103.64	377.93	0.00	4,000.00	795	226.73	703.66	0.00	9,800.00
Inventories	value in thousands of USDs	245	60.24	242.55	0.00	3,500.00	795	198.34	1,653.51	0.00	45,000.00
Fixed assets	value in thousands of USDs	245	33.10	1,119.55	0.00	7,100.00	795	367.86	1,122.58	0.00	17,000.00

Table 4.7.B

Variables	Type	Sub-sample of manufacturing firms with less complex technology					Sub-sample of manufacturing firms with more complex technology				
		#	Mean	Std. Dev.	Minimum	Maximum	#	Mean	Std. Dev.	Minimum	Maximum
ROA	Percentage	245	-88%	784%	-11,429%	714%	795	-23%	544%	-14,671%	1,050%

Tables 4.8 and 4.8.B - Descriptive statistics of the variables, described in chapter 4.4 and appendix H, of the sub-samples of manufacturing firms with simple and complex technology, that received external equity. All variables represent the value of each variable surveyed at the end of each year. External equity is the equity financed by external investors: business angels, companies, governmental agencies and venture capital funds. The amount of external equity represents its yearly value. In variable ROA, some observations were excluded - because they involved outliers that could distort the analysis of the variable. Nevertheless, we have included the variable with all observations in table 4.8.B.

Variables	Type	Sub-sample of manufacturing firms that received external investment with less complex technology					Sub-sample of manufacturing firms that received external investment with more complex technology				
		#	Mean	Std. Dev.	Minimum	Maximum	#	Mean	Std. Dev.	Minimum	Maximum
<i>Dependent</i>											
External equity – dummy	Yes=1; No=0	31	1.00	0.00	0.00	1.00	44	1.00	0.00	0.00	1.00
External equity – amount	Ln(1+value in USD)	31	13.42	1.59	9.62	16.62	44	13.06	2.22	6.91	16.52
<i>Independent</i>											
<i>Main</i>											
Patents	Yes=1; No=0	31	0.77	0.43	0.00	1.00	44	0.55	0.50	0.00	1.00
Crisis	2007 to 2009=1; Other=0	31	0.39	0.50	0.00	1.00	44	0.18	0.39	0.00	1.00
<i>Firm's characteristics</i>											
Revenues	Ln(1+value in USD)	31	9.46	5.77	0.00	15.12	44	9.62	6.13	0.00	16.12
Profits	value in thousands of USDs	31	-3,058.67	9,891.19	-54,000.00	0.00	44	-1,360.94	2,400.15	-12,000.00	990.00
Score of delinquency risk	1 to 5	31	3.06	1.12	1.00	5.00	44	2.75	0.97	1.00	5.00
Employees	number	31	9.23	6.95	0.00	23.00	44	18.05	19.91	0.00	73.00
High tech	Yes=1; No=0	31	0.39	0.50	0.00	1.00	44	0.48	0.51	0.00	1.00
Cash	Ln(1+value in USD)	31	10.24	4.95	0.00	16.12	44	11.33	3.42	0.00	16.01
Accounts receivable	Ln(1+value in USD)	31	7.42	5.27	0.00	12.43	44	7.74	5.56	0.00	14.51
Inventories	Ln(1+value in USD)	31	7.47	5.41	0.00	13.12	44	7.24	6.07	0.00	17.62
Fixed assets	Ln(1+value in USD)	31	9.20	5.49	0.00	125.77	44	8.68	5.59	0.00	15.23
ROA	Percentage	30	-127%	140%	-472%	0%	44	-83%	142%	-576%	114%

Table 4.8 (cont.)

Variables	Type	Sub-sample of manufacturing firms that received external investment with less complex technology					Sub-sample of manufacturing firms that received external investment with more complex technology				
		#	Mean	Std. Dev.	Minimum	Maximum	#	Mean	Std. Dev.	Minimum	Maximum
<i>Independent (cont.)</i>											
<i>Owner's characteristics</i>											
Owner age	number	31	51.81	9.10	32.00	68.00	44	45.61	10.41	30.00	70.00
Years of industry experience	number	31	13.42	10.61	0.00	35.00	44	16.43	10.87	0.00	38.00
Week hours	number	31	48.87	23.67	0.00	90.00	44	50.68	20.84	0.00	100.00
Startup experience	number	31	1.65	1.60	0.00	5.00	44	1.45	1.90	0.00	5.00
Education	number	31	9.00	1.29	5.00	10.00	44	7.73	1.93	3.00	10.00
Male	Yes=1; No=0	31	0.90	0.30	0.00	1.00	44	0.91	0.29	0.00	1.00
US bom	Yes=1; No=0	31	0.77	0.43	0.00	1.00	44	0.77	0.42	0.00	1.00
<i>Other variables</i>											
Revenues	value in thousands of USDs	31	517.06	946.09	0.00	3,700.00	44	1,209.49	2,241.45	0.00	10,000.00
Total assets	value in thousands of USDs	31	2,058.96	2,904.41	0.00	11,440.00	44	3,296.94	7,487.97	0.00	48,300.00
External equity – amount	value in thousands of USDs	31	1,913.65	3,325.91	15.00	16,500.00	44	2,026.96	3,172.57	1.00	15,000.00
Cash	value in thousands of USDs	31	917.97	2,060.72	0.00	10,000.00	44	1,074.80	2,169.39	0.00	9,000.00
Accounts receivable	value in thousands of USDs	31	57.37	68.30	0.00	250.00	44	306.45	526.25	0.00	9,000.00
Inventories	value in thousands of USDs	31	86.64	118.86	0.00	500.00	44	1,306.13	6,775.95	0.00	45,000.00
Fixed assets	value in thousands of USDs	31	1,000.48	2,242.68	0.00	7,030.00	44	357.80	715.17	0.00	4,115.00

Table 4.8.B

Variables	Type	Sub-sample of manufacturing firms that received external investment with less complex technology					Sub-sample of manufacturing firms that received external investment with more complex technology				
		#	Mean	Std. Dev.	Minimum	Maximum	#	Mean	Std. Dev.	Minimum	Maximum
ROA	Percentage	31	-212%	495%	2,771%	0%	44	-83%	142%	-576%	114%

Table 4.9 - Average equity operation in thousands of USDs in nascent firms with and without patents, in sub-samples of manufacturing nascent firms with simple and complex technology, that received external equity.
 All variables represent the value of each variable surveyed at the end of each year. The average equity operation in thousands of USDs. External equity is the equity financed by external investors: business angels, companies, governmental agencies and venture capital funds. The amount of external equity represents its yearly value.

Year	2005	2006	2007	2008	2009	2010	2011	Mean
<i>Manufacturing nascent firms with less complex technology</i>								
Firms with patents	1,212	4,117	1,011	1,449	2,440	4,025	0	2,340
#	6	6	3	4	3	2	0	24
Firms without patents	313	358	1,000	500	0	0	0	451
#	3	2	1	1	0	0	0	7
Firms with less complex technology	912	3,177	1,008	1,259	2,440	4,025	0	1,914
#	9	8	4	5	3	2	0	31
<i>Manufacturing nascent firms with more complex technology</i>								
Firms with patents	2,144	2,136	2,645	1,120	0	1,020	1,175	2,130
#	7	7	2	4	0	1	2	24
Firms without patents	2,692	120	20	0	2,500	150	50	1,904
#	13	3	1	0	1	1	1	20
Firms with more complex technology	2,500	2,231	1,770	1,120	2,500	730	800	2,027
#	20	10	3	4	1	3	3	44

Table 4.10 - Heckman two-stage model regressions.

The table presents Heckman two stage model regressions on a sample of nascent firms. All variables represent the value of each variable surveyed at the end of each year. All variables are described in chapter 4.4 and appendix H. External equity is the equity financed by external investors: business angels, companies, governmental agencies and venture capital funds. The amount of external equity represents its yearly value. The results of the first stage of Heckman two-stage model: Probit regressions, are presented in Equation 4.1, while the results of the second stage: OLS (Ordinary Least Squares) regressions, are presented in Equation 4.2. Standard errors in parenthesis. ***, ** and * denote, respectively, significance at the 1%, 5% and 10% confidence levels.

<i>Dependent Independent</i>	Equation 4.1 External equity – dummy (t)	Equation 4.2 External equity - amount
<i>Main</i>		
Patents	0.811*** (0.113)	0.821** (0.372)
External equity - dummy (t-1)	1.244*** (0.104)	
Crisis	-0.201** (0.092)	0.116 (0.295)
<i>Firm's characteristics</i>		
Revenues	-0.018** (0.009)	-0.020 (0.026)
Score of delinquency risk	0.062 (0.042)	-0.350*** (0.130)
Employees	0.003 (0.002)	0.015* (0.009)
High tech	0.005 (0.102)	0.881*** (0.292)
Financial information		
Cash	0.036*** (0.012)	0.183*** (0.032)
Accounts receivable	-0.005 (0.009)	0.053* (0.027)
Inventories	0.006 (0.008)	0.027 (0.025)
Tangible assets	-0.002 (0.009)	0.055** (0.026)
Profits	-0.000** (0.000)	-0.000 (0.000)
ROA	-0.004 (0.002)	0.002 (0.012)
<i>Owner's characteristics</i>		
Owner age	0.010** (0.004)	-0.010 (0.014)
Years of industry experience	-0.009** (0.004)	-0.012 (0.013)
Week hours	0.003* (0.002)	0.002 (0.005)
Startup experience	0.078*** (0.026)	0.145 (0.081)
Education	0.000 (0.021)	0.087 (0.069)
Male	0.046 (0.107)	1.040*** (0.365)
US born	-0.154 (0.109)	-0.031 (0.327)
<i>Fixed effects</i>		
Legal status fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Industry fixed effects	Yes	Yes
Intercept	130.773*** (45.345)	-74.699 (152.549)
#	5,822	186
Chi2	453.19***	162.98***
Pseudo R2	0.275	
Log likelihood	-596.92	
Lambda		-0.548** (0.258)
Rho		-0.348
Sigma		1.573

Table 4.11 - Heckman two-stage model regressions.

The table presents Heckman two stage model regressions on sub-samples of manufacturing and non-manufacturing firms. All variables represent the value of each variable surveyed at the end of each year. All variables are described in chapter 4.4 and appendix H. External equity is the equity financed by external investors: business angels, companies, governmental agencies and venture capital funds. The amount of external equity represents its yearly value. The results of the first stage of Heckman two-stage model: Probit regressions, are presented in Equation 4.1, while the results of the second stage: OLS (Ordinary Least Squares) regressions, are presented in Equation 4.2. Standard errors in parenthesis. ***, ** and * denote, respectively, significance at the 1%, 5% and 10% confidence levels.

<i>Dependent</i>	Column I		Column II	
	Manufacturing firms Equation 4.1 External equity – dummy (t)	Manufacturing firms Equation 4.2 External equity – amount	Non-manufacturing firms Equation 4.1 External equity – dummy (t)	Non-manufacturing firms Equation 4.2 External equity – amount
<i>Independent</i>				
<i>Main</i>				
Patents	0.773*** (0.188)	0.022 (0.490)	0.791*** (0.168)	1.463** (0.610)
External equity – dummy (t-1)	1.139*** (0.191)		1.240*** (0.134)	
Crisis	-0.315* (0.190)	0.696* (0.412)	-0.167 (0.108)	0.076 (0.404)
<i>Firm's characteristics</i>				
Revenues	-0.044** (0.019)	-0.011 (0.039)	-0.008 (0.011)	-0.012 (0.039)
Score of delinquency risk	0.198** (0.094)	-0.323* (0.197)	0.036 (0.049)	-0.459*** (0.174)
Employees	-0.007 (0.007)	0.031** (0.013)	0.005** (0.002)	0.002 (0.013)
High tech	-0.094 (0.184)	-0.026 (0.368)	-0.029 (0.143)	0.921* (0.516)
<i>Financial information</i>				
Cash	0.056** (0.025)	0.147*** (0.050)	0.021 (0.015)	0.157*** (0.044)
Accounts receivable	0.026 (0.021)	-0.016 (0.040)	-0.008 (0.010)	0.090** (0.038)
Inventories	0.025 (0.018)	-0.000 (0.037)	0.001 (0.010)	0.040 (0.036)
Tangible assets	-0.019 (0.019)	0.046 (0.036)	0.003 (0.011)	0.043 (0.036)
Profits	-0.000*** (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
ROA	-0.008 (0.018)	0.029 (0.053)	-0.004* (0.002)	0.000 (0.013)
<i>Owner's characteristics</i>				
Owner age	0.008 (0.009)	0.007 (0.021)	0.012** (0.005)	-0.011 (0.020)
Years of industry experience	-0.008 (0.008)	0.000 (0.020)	-0.009** (0.005)	-0.019 (0.019)
Week hours	0.004 (0.004)	-0.003 (0.007)	0.003* (0.002)	0.003 (0.007)
Startup experience	0.024 (0.056)	0.133 (0.117)	0.097*** (0.031)	0.187 (0.115)
Education	0.087* (0.048)	-0.017 (0.104)	-0.026 (0.024)	0.080 (0.097)
Male	-0.019 (0.251)	0.001 (0.564)	0.085 (0.122)	1.209*** (0.469)
US born	0.054 (0.219)	-0.388 (0.412)	-0.200 (0.131)	0.129 (0.511)
<i>Fixed effects</i>				
Legal status fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Intercept	77.141 (95.484)	183.024 (226.079)	153.523*** (53.757)	-227.560 (215.749)
#	1,040	75	4,782	111
Chi2	224.95***	51.97***	204.85***	105.60***
Pseudo R2	0.417		0.194	
Log likelihood	-156.96		-424.98	
Lambda		-1.237*** (0.393)		-0.242 (0.372)
Rho		-0.851		-0.152
Sigma		1.454		1.598

Table 4.12 - Heckman two-stage model regressions.

The table presents Heckman two stage model regressions on sub-samples of manufacturing firms with simple and complex technologies. All variables represent the value of each variable surveyed at the end of each year. All variables are described in chapter 4.4. and appendix H. External equity is the equity financed by external investors: business angels, companies, governmental agencies and venture capital funds. The results of the first stage of Heckman two-stage model: Probit regressions, are presented in Equation 4.1, while the results of the second stage: OLS (Ordinary Least Squares) regressions, are presented in Equation 4.2. Standard errors in parenthesis. ***, ** and * denote, respectively, significance at the 1%, 5% and 10% confidence levels.

<i>Dependent</i>	Column I		Column II	
	Manufacturing firms – with complex technologies Equation 4.1 External equity – dummy (t)	Manufacturing firms – with complex technologies Equation 4.2 External equity - amount	Manufacturing firms – with simple technologies Equation 4.1 External equity – dummy (t)	Manufacturing firms – with simple technologies Equation 4.2 External equity - amount
<i>Independent</i>				
<i>Main</i>				
Patents	0.704*** (0.221)	0.087 (0.664)	0.828* (0.509)	1.140** (0.531)
External equity – dummy (t-1)	0.756*** (0.252)		1.455*** (0.455)	
Crisis	-0.421* (0.231)	0.952 (0.683)	-0.058 (0.498)	-0.983* (0.519)
<i>Firm's characteristics</i>				
Revenues	-0.039* (0.022)	-0.023 (0.055)	-0.140* (0.074)	-0.035 (0.048)
Score of delinquency risk	0.139 (0.111)	-0.548* (0.290)	0.262 (0.292)	-0.542 (0.476)
Employees	-0.004 (0.006)	0.050* (0.027)	-0.001 (0.038)	0.244*** (0.040)
High tech	0.081 (0.253)	1.123 (0.708)	-0.266 (0.597)	0.091 (0.662)
<i>Financial information</i>				
Cash	0.075** (0.034)	0.183* (0.112)	0.079 (0.053)	0.137*** (0.040)
Accounts receivable	0.021 (0.025)	-0.014 (0.059)	0.133* (0.074)	0.260*** (0.069)
Inventories	0.028 (0.020)	0.026 (0.048)	0.038 (0.065)	-0.049 (0.061)
Tangible assets	-0.030 (0.022)	0.087* (0.051)	-0.001 (0.058)	0.055 (0.046)
Profits	-0.000** (0.000)	0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
ROA	-0.002 (0.027)	-0.053 (0.173)	-0.036 (0.045)	0.060 (0.043)
<i>Owner's characteristics</i>				
Owner age	-0.010 (0.012)	0.047 (0.043)	0.060* (0.032)	-0.084* (0.049)
Years of industry experience	0.005 (0.011)	-0.016 (0.040)	-0.034 (0.024)	-0.073*** (0.027)
Week hours	0.002 (0.005)	0.008 (0.010)	0.002 (0.010)	-0.002 (0.014)
Startup experience	0.070 (0.068)	0.078 (0.172)	-0.304 (0.189)	0.253 (0.169)
Education	0.041 (0.053)	-0.089 (0.132)	0.381* (0.205)	-0.932*** (0.201)
Male	-0.193 (0.299)	-0.212 (0.806)	0.805 (0.749)	0.238 (0.860)
US born	0.145 (0.291)	-0.145 (0.745)	-0.073 (0.535)	-1.850** (0.902)
<i>Fixed effects</i>				
Legal status fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Intercept	81.878 (108.804)	541.608* (321.884)	298.035 (298.070)	-818.551*** (251.993)
#	795	44	245	31
Chi2	118.06***	55.28***	120.16***	232.62***
Pseudo R2	0.347		0.646	
Log likelihood	-111.07		-32.95	
Lambda		-1.006 (0.877)		0.118 (0.556)
Rho		-0.780		0.252
Sigma		1.289		0.466

Table 4.13 - Heckman two-stage model regressions.

The table presents Heckman two stage model regressions on a sample of nascent firms. All variables represent the value of each variable surveyed at the end of each year. All variables are described at Chapter 4.4. and appendix H. External equity is the equity financed by external investors: business angels, companies, governmental agencies and venture capital funds. Total debt includes personal and business debt. Personal debt is all the debt financed in the owners' name and used in the firms' financing. Business debt is the debt registered in the firms' name. The amount of external equity and total debt represents their yearly value. The results of the first stage of Heckman two-stage model: Probit regressions, are presented in Equation 4.3 and 4.5, while the results of the second stage: OLS (Ordinary Least Squares) regressions, are presented in Equation 4.4 and 4.6. Standard errors in parenthesis. ***, ** and * denote, respectively, significance at the 1%, 5% and 10% confidence levels.

<i>Dependent</i> <i>Independent</i>	Column I		Column II	
	Equation 4.3 Total debt – dummy (t)	Equation 4.4 Total debt - amount	Equation 4.5 Accounts payable – dummy (t)	Equation 4.6 Accounts payable - amount
<i>Main</i>				
Patents	0.131 (0.083)	0.029* (0.136)	0.081 (0.090)	0.520*** (0.129)
Total debt – dummy (t-1)	1.255*** (0.038)			
Accounts payable - dummy (t-1)			1.133*** (0.041)	
Crisis	0.031 (0.039)	0.027 (0.065)	0.065 (0.041)	0.052 (0.065)
<i>Firm's characteristics</i>				
Revenues	0.014*** (0.005)	0.030*** (0.065)	0.020*** (0.005)	0.030*** (0.009)
Score of delinquency risk	-0.020 (0.020)	-0.145*** (0.032)	-0.013 (0.021)	0.007 (0.032)
Employees	0.002* (0.001)	0.020*** (0.002)	0.006*** (0.002)	0.020*** (0.002)
High tech	-0.091* (0.049)	0.031 (0.086)	-0.038 (0.052)	-0.163* (0.084)
<i>Financial information</i>				
Cash	-0.032*** (0.006)	0.014 (0.010)	-0.002 (0.006)	0.030*** (0.010)
Accounts receivable	0.019*** (0.004)	0.039*** (0.007)	0.078*** (0.004)	0.067*** (0.103)
Inventories	0.022*** (0.004)	0.042*** (0.007)	0.033*** (0.004)	0.039*** (0.007)
Tangible assets	0.018*** (0.004)	0.049*** (0.008)	0.015*** (0.005)	0.015* (0.008)
Profits	-0.000 (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000 (0.000)
ROA	-0.000 (0.000)	0.000 (0.000)	-0.003* (0.002)	-0.010** (0.004)
<i>Owner's characteristics</i>				
Owner age	0.000 (0.002)	0.013*** (0.003)	-0.001 (0.002)	0.010*** (0.004)
Years of industry experience	-0.004* (0.002)	0.001 (0.003)	-0.003 (0.002)	0.009*** (0.003)
Week hours	0.003*** (0.001)	0.002 (0.001)	0.003*** (0.001)	0.003* (0.002)
Startup experience	0.013 (0.015)	0.091*** (0.025)	0.005 (0.016)	0.041* (0.025)
Education	-0.018* (0.010)	0.027* (0.016)	-0.026*** (0.010)	0.048*** (0.017)
Male	0.000 (0.048)	0.055 (0.082)	-0.060 (0.050)	0.169** (0.085)
US born	-0.028 (0.060)	-0.004 (0.098)	-0.025 (0.062)	-0.016 (0.099)
<i>Fixed effects</i>				
Legal status fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Intercept	75.227*** (19.304)	139.610 (33.537)	57.384*** (20.521)	-80.316** (33.494)
#	5,822	3,300	5,822	2,812
Chi2	1,771.21***	620.73***	2,506.18***	523.18***
Pseudo R2	0.222		0.311	
Log likelihood	-3,097.76		-2,779.05	
Lambda		-0.928*** (0.098)		-0.626*** (0.107)
Rho		-0.516		-0.375
Sigma		1.798		1.668

Figures

Figure 2.1 – Number of firm-year observations in the sample of nascent firms used and in sub-samples of nascent firms that: (i) do not have collateral; (ii) have personal collateral; (iii) are smaller firms with owners' collateral information; and (iv) are larger firms with owners' collateral information.

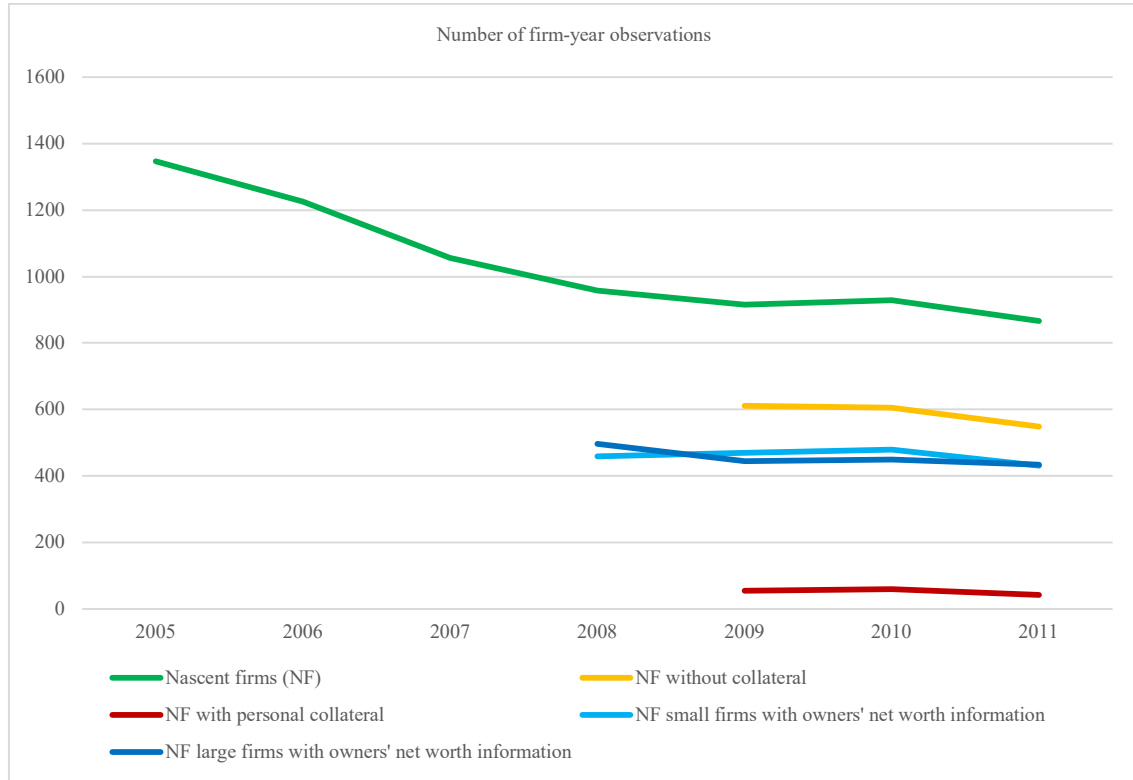


Figure 2.2 – Number of firm-year observations in sub-samples of nascent firms that: (i) have owners with low net worth; (ii) have owners with high net worth; (iii) have owners with low net worth that pledged personal collateral; and (iv) have owners with high net worth that pledged personal collateral.

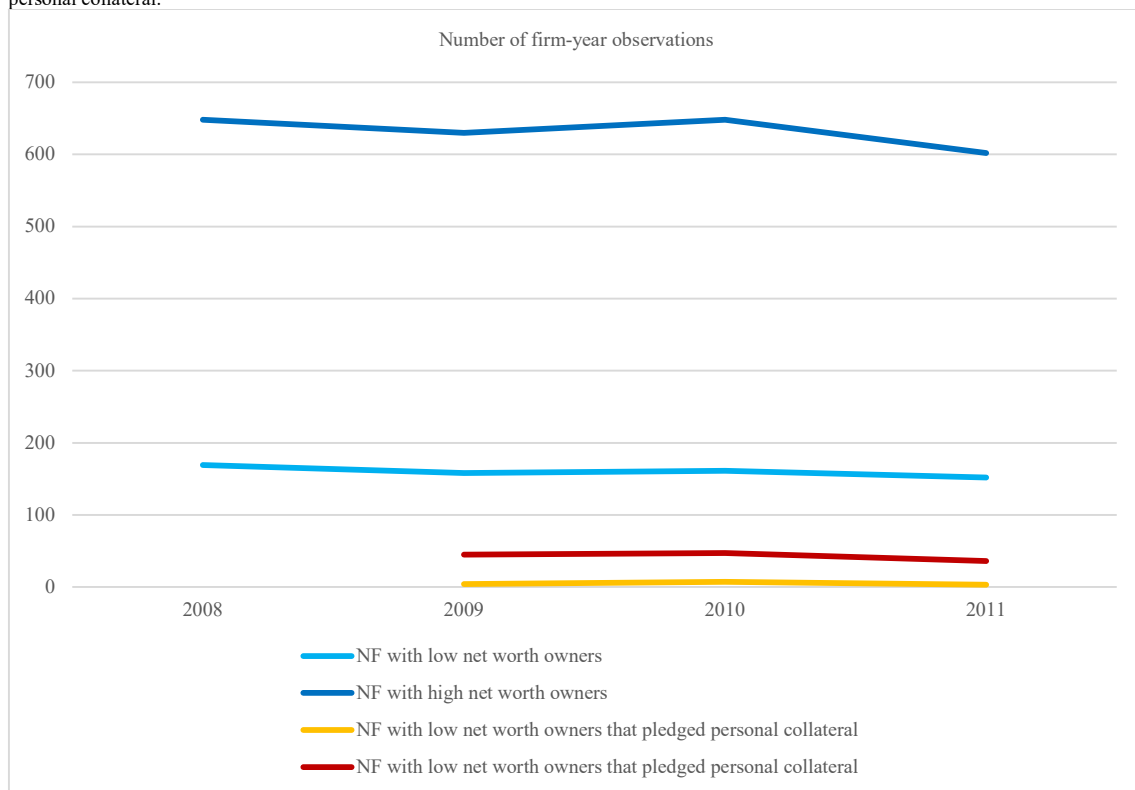


Figure 2.3 – Difference between the weights of external and owners' debt in the yearly total external financing in the sample of nascent firms used and in sub-samples of nascent firms that: (i) do not have collateral; (ii) have personal collateral; (iii) are smaller firms with owners' collateral information; and (iv) are larger firms with owners' collateral information.

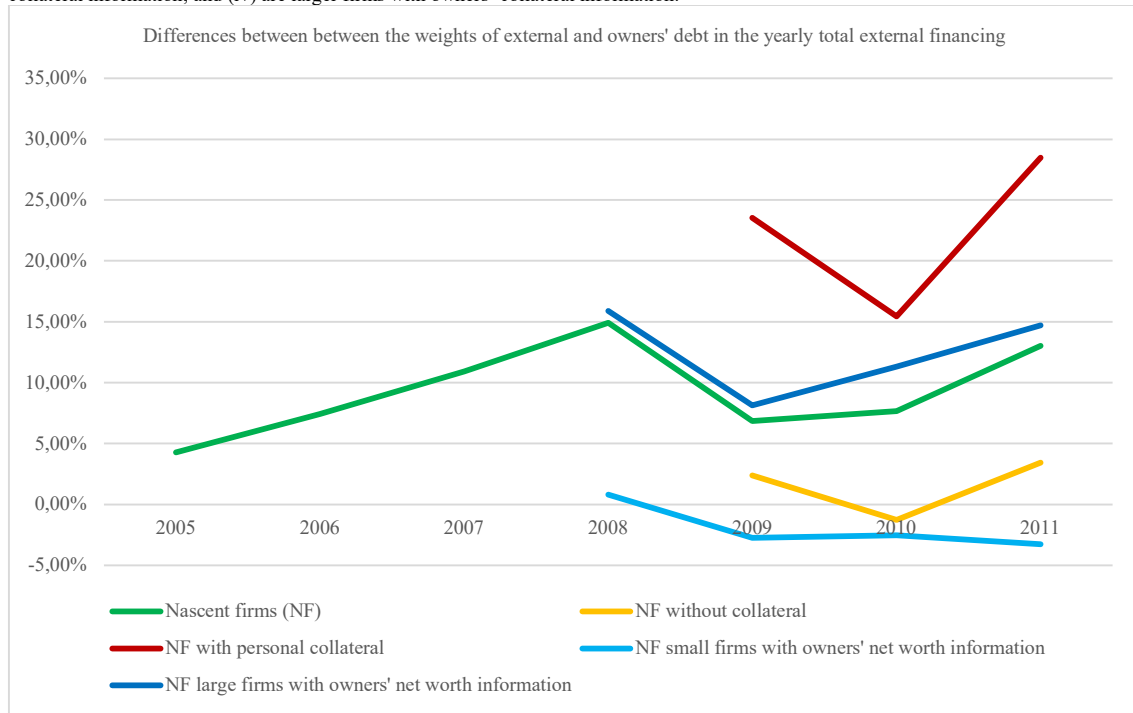
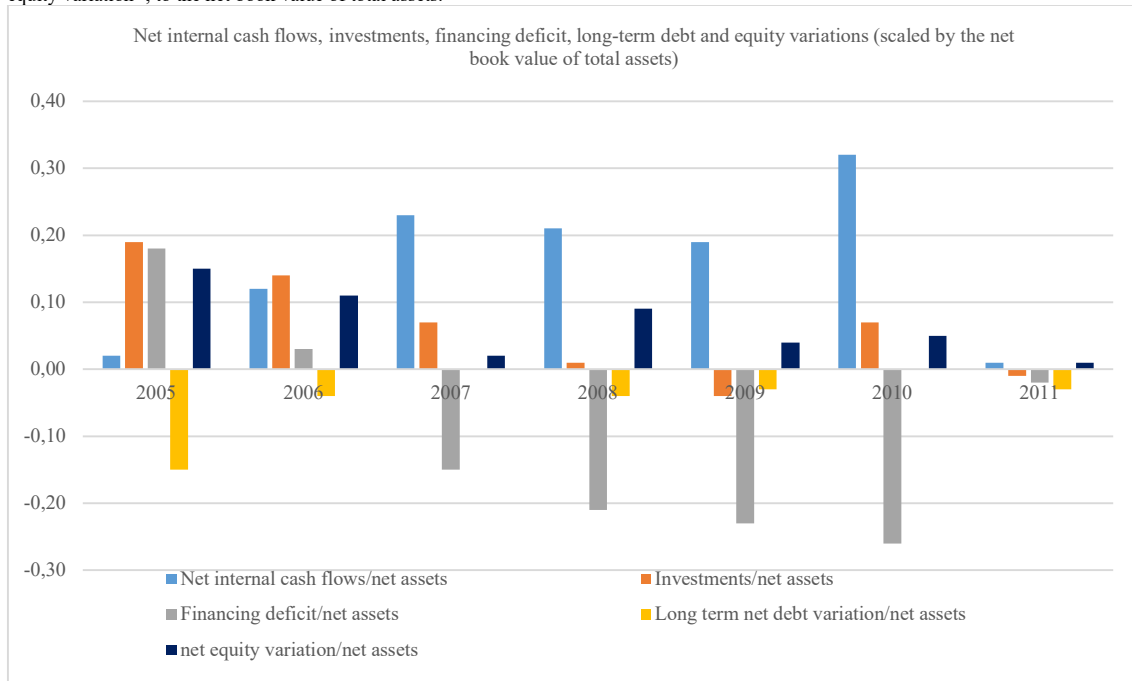


Figure 2.4 – Difference between the weights of external and owners' equity in the yearly total external financing in sub-samples of nascent firms that: (i) have owners with low net worth; (ii) have owners with high net worth; (iii) have owners with low net worth that pledged personal collateral; and (iv) have owners with high net worth that pledged personal collateral.



Figure 2.5 - Average net internal cash flows¹²³, investments, net financing deficit and external financing - net long-term debt variation and net equity variation -, to the net book value of total assets.



¹²³ Net internal cash flows are: net profits minus working capital variations minus dividends.

Figure 2.6 - Average net internal cash flows, investments, net financing deficit and external financing - net long-term debt variation and net equity variation -, to the net book value of total assets in a sub-sample of firms that do not have collateral.

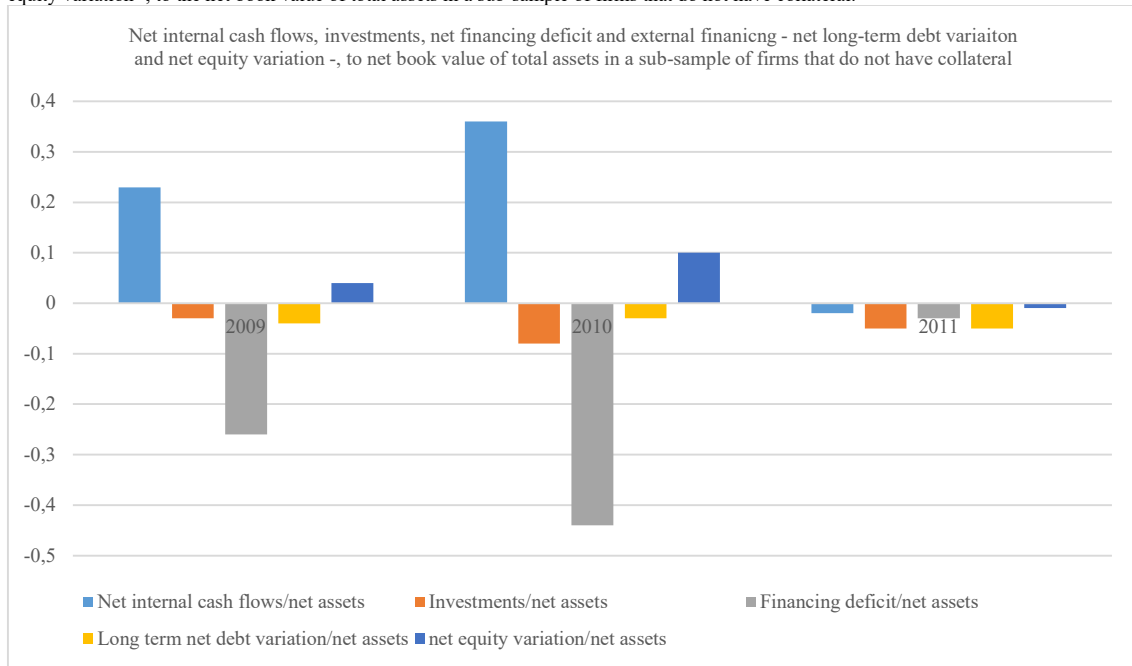


Figure 2.7 - Average net internal cash flows, investments, net financing deficit and external financing - net long-term debt variation and net equity variation -, to the net book value of total assets in a sub-sample of firms that have personal collateral.

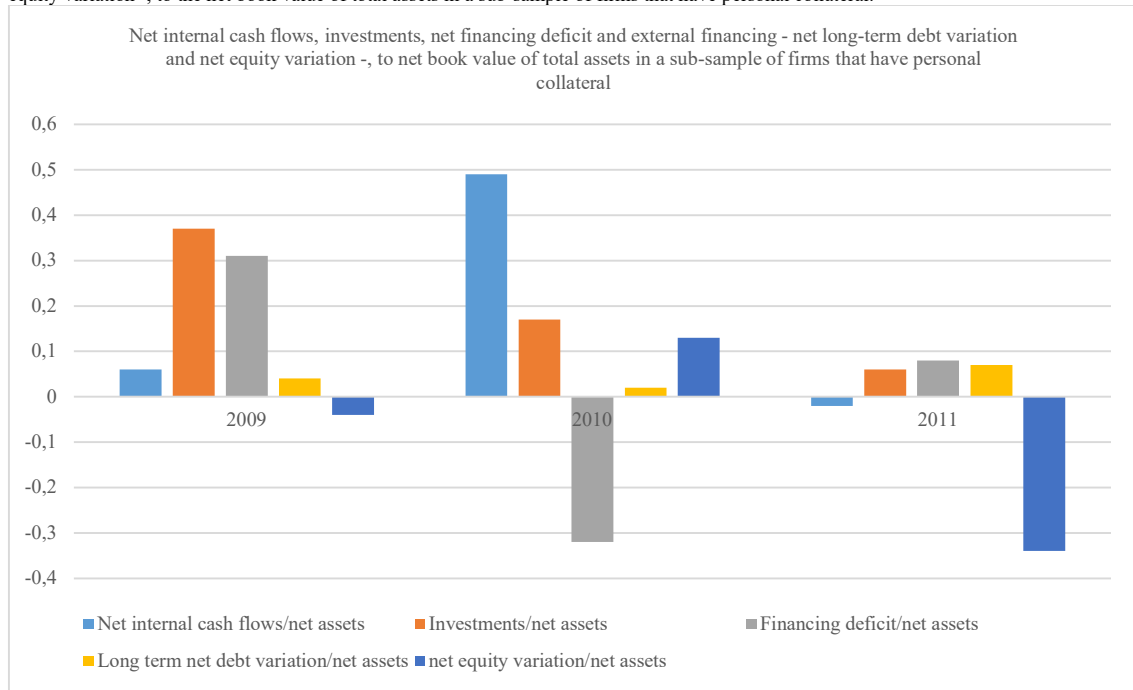


Figure 3.1 – Number of firm-year observations in the sample of nascent firms used and in sub-samples of nascent firms that: (i) received external equity; (ii) are non profitable with positive sales growth; and (iii) are non profitable with positive sales growth and received external equity.

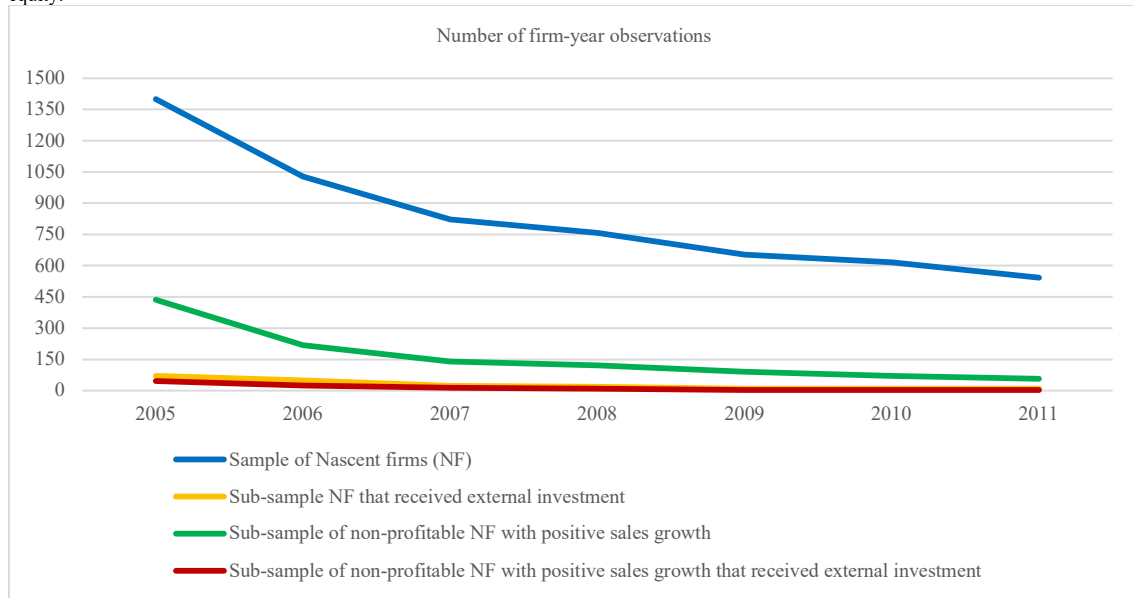


Figure 3.2 – Difference between the weights of external and owners' equity in the yearly total external financing in the sample of nascent firms used and in sub-samples of nascent firms that: (i) received external equity; (ii) are non profitable with positive sales growth; and (iii) are non profitable with positive sales growth and received external equity.

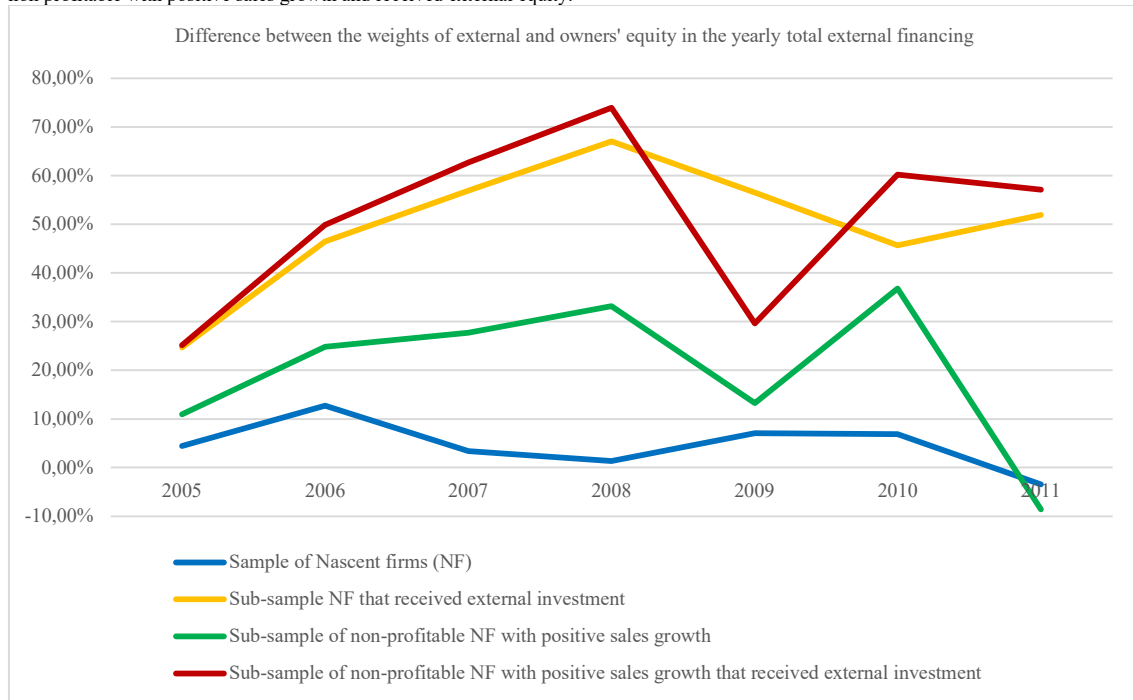
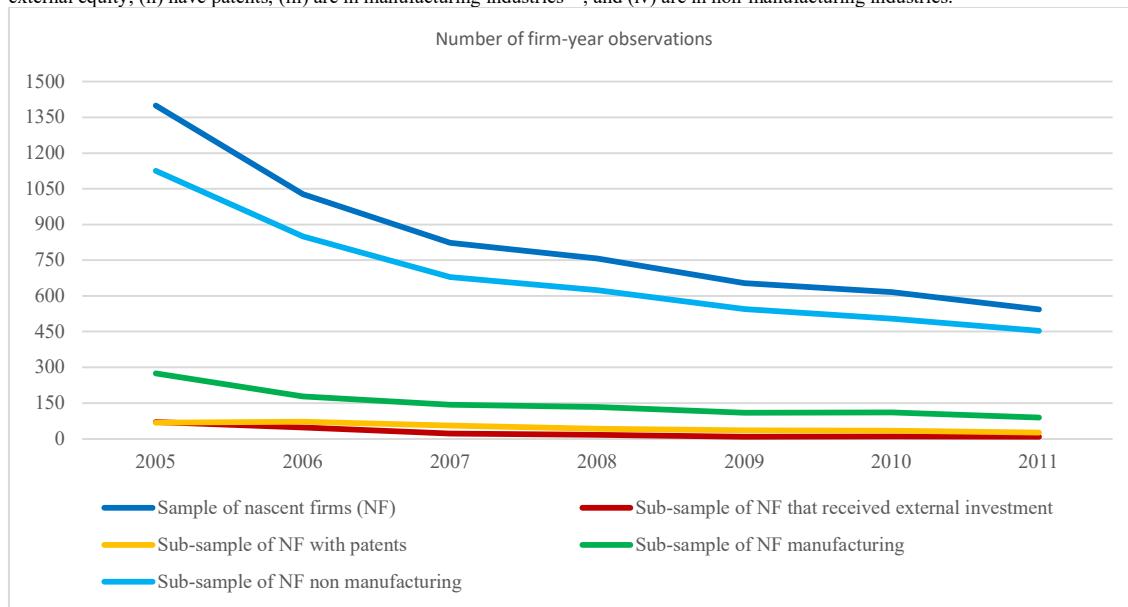


Figure 4.1 – Number of firm-year observations in the sample of nascent firms used and in sub-samples of nascent firms that: (i) received external equity; (ii) have patents; (iii) are in manufacturing industries¹²⁴; and (iv) are in non-manufacturing industries.



¹²⁴ NAICS codes from 31 to 33.

Figure 4.2 – Number of firm-year observations in sub-samples of nascent firms that: (i) are in manufacturing industries; (ii) are in manufacturing industries with less complex technologies; (iii) are in manufacturing industries with more complex technologies; (iv) are in manufacturing industries with less complex technologies and received external investment; and (v) are in manufacturing industries with more complex technologies and received external investment.

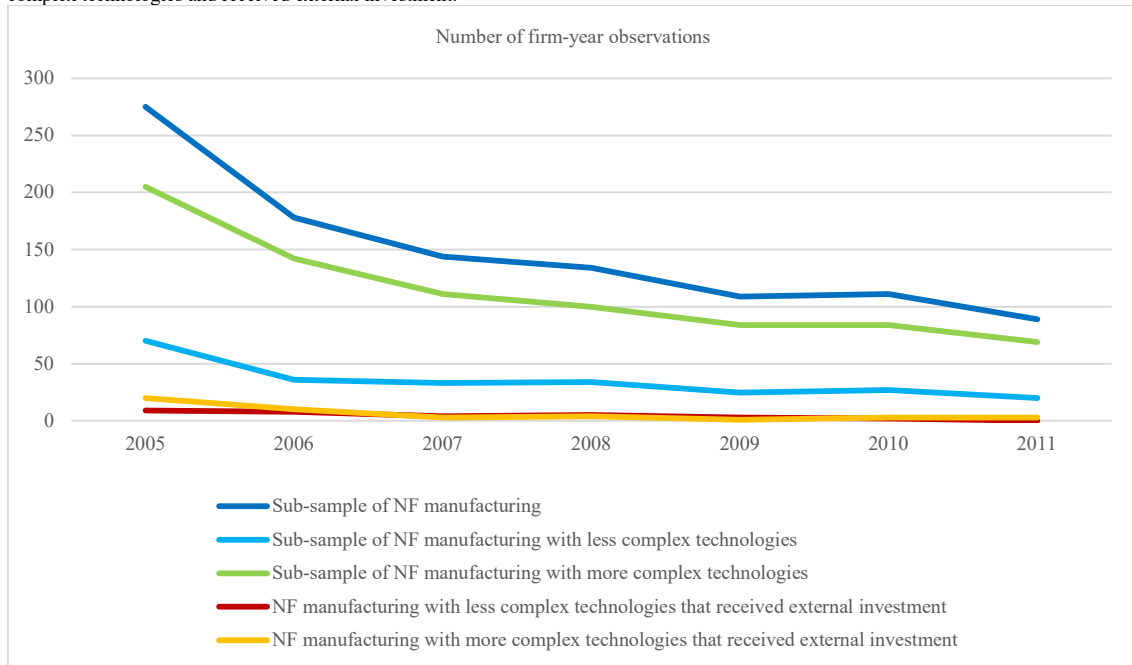
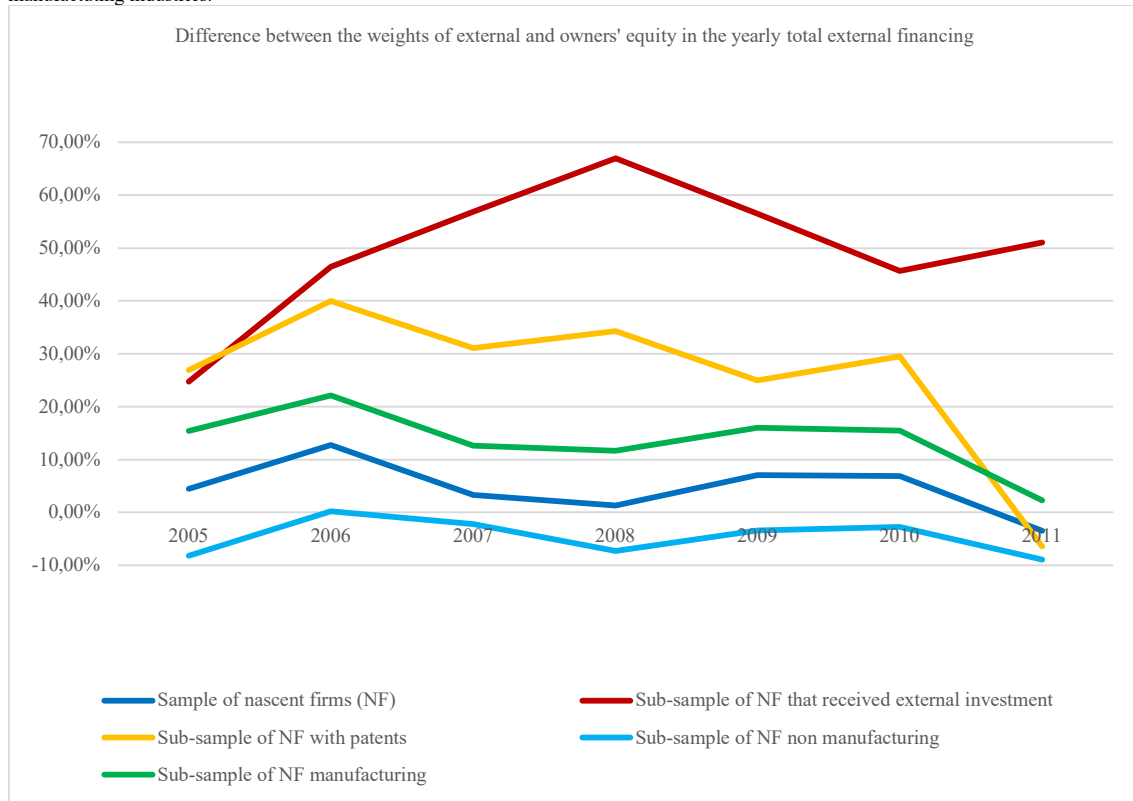
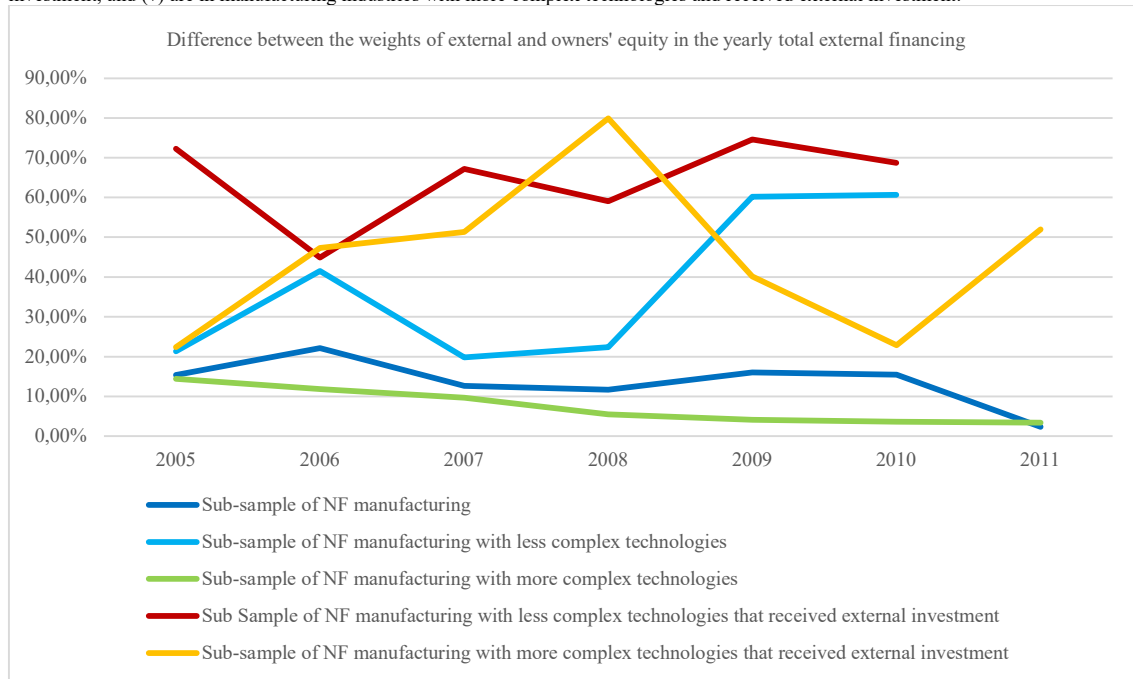


Figure 4.3 – Difference between the weights of external and owners' equity in the yearly total external financing in the sample used and in sub-samples of nascent firms that: (i) received external equity; (ii) have patents; (iii) are in manufacturing industries¹²⁵; and (iv) are in non-manufacturing industries.



¹²⁵ NAICS codes from 31 to 33.

Figure 4.4 – Difference between the weights of external and owners' equity in the yearly total external financing in sub-samples of nascent firms that: (i) are in manufacturing industries; (ii) are in manufacturing industries with less complex technologies; (iii) are in manufacturing industries with more complex technologies; (iv) are in manufacturing industries with less complex technologies and received external investment; and (v) are in manufacturing industries with more complex technologies and received external investment.



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Appendices

Appendix A – Interpretation of coefficients of linear, dummy and logarithm variables.

1. Model with linear or dummy variables: $Y_i = \alpha + \beta X_i + \varepsilon_i$

Interpretation of β coefficient of linear variables: for each unit – or percentage point - of variation in X, Y varies β units – or percentage points.

Interpretation of β coefficient of dummy variables: for each percentage point of variation in the probability of X, the probability of Y varies β percentage points.

2. Model with dummy and logarithm variables: $Y_i = \alpha + \beta \ln(X)_i + \varepsilon_i$

Interpretation of β coefficient: for each one percent variation in the amount of X, the probability of Y varies β percentage points.

3. Model with logarithm and dummy variables: $\ln(Y)_i = \alpha + \beta X_i + \varepsilon_i$

Interpretation of β coefficient: for each percentage point of variation in the probability of X, the amount of Y varies β percent.

4. Model with logarithm variables: $\ln(Y)_i = \alpha + \beta \ln(X)_i + \varepsilon_i$

Interpretation of β coefficient: for each one percent variation in the amount of X, the amount of Y varies β percent.

Appendix B - Evolution of equity, debt¹²⁶ and accounts payable on sub-samples of firms that do not have collateral and have personal collateral, from 2009 to 2011.

All variables represent the accrued value surveyed at the end of each year. All variables are non winsorized. Short-term debt includes credit cards and credit lines balances, while long-term debt includes the other items of debt. Owners' equity is the equity financed with owners' net worth; it does not include equity financed by owners' debt. Owners' debt is all the debt financed in the owners' name and used in the firms' financing. All values are in thousands of USDs.

Year	Sub-sample of nascent firms that do not have collateral					Sub-sample of nascent firms that have personal collateral				
	Value 2009		Count 2009		Mean 2009	Value 2009		Count 2009		Mean 2009
Owners' equity	74.78	41.8%	544	88.5%	84.54	163.81	31.9%	52	94.5%	173.26
Family and friends' equity	0.89	0.5%	1	0.2%	547.35	0.00	0.0%	0	0.0%	n.a.
Spouse's Equity	0.89	0.5%	1	0.2%	547.35	0.00	0.0%	0	0.0%	n.a.
Parents' Equity	0.00	0.0%	0	0.0%	n.a.	0.00	0.0%	0	0.0%	n.a.
External equity	47.56	26.6%	5	0.8%	5,849.88	0.41	0.1%	1	1.8%	22.55
Angels' equity	36.75	20.6%	3	0.5%	7,533.75	0.00	0.0%	0	0.0%	n.a.
Companies' equity	2.68	1.5%	3	0.5%	549.40	0.00	0.0%	0	0.0%	n.a.
Government's equity	0.00	0.0%	0	0.0%	n.a.	0.41	0.1%	1	1.8%	22.55
Venture Capital's equity	8.13	4.5%	1	0.2%	4,999.95	0.00	0.0%	0	0.0%	n.a.
Others' equity	0.00	0.0%	0	0.0%	n.a.	0.00	0.0%	0	0.0%	n.a.
Total equity:	123.23	69.0%	544	88.5%	139.31	164.22	31.9%	52	94.5%	173.69
Owners' debt	8.06	4.5%	297	48.3%	16.69	27.29	5.3%	33	60.0%	45.48
Personal credit card	2.98	1.7%	170	27.6%	10.78	3.96	0.8%	16	29.1%	13.61
Business credit card	3.74	2.1%	202	32.8%	11.39	3.47	0.7%	20	36.4%	9.54
Personal bank loans	1.34	0.7%	31	5.0%	26.58	19.86	3.9%	16	29.1%	68.27
Family and friends' debt	2.66	1.5%	37	6.0%	44.21	3.24	0.6%	3	5.5%	59.40
Family loan to owners	1.47	0.8%	29	4.7%	31.17	0.97	0.2%	2	3.6%	26.68
Personal loan to owners	0.08	0.0%	4	0.7%	12.30	0.00	0.0%	0	0.0%	n.a.
Business loan from families	0.11	0.1%	6	1.0%	11.28	0.45	0.1%	1	1.8%	24.75
Business loan from owners	0.98	0.5%	4	0.7%	150.68	1.82	0.4%	1	1.8%	100.10
Business loan from employees	0.02	0.0%	2	0.3%	6.15	0.00	0.0%	0	0.0%	n.a.
External debt	12.48	7.0%	179	29.1%	42.88	148.34	28.8%	39	70.9%	82.41
Bank business credit card	2.25	1.3%	122	19.8%	11.34	6.64	1.3%	19	34.5%	19.22
Bank credit line	3.25	1.8%	65	10.6%	30.75	72.64	14.1%	29	52.7%	137.77
Bank loan	6.84	3.8%	18	2.9%	233.70	52.19	10.1%	16	29.1%	179.40
Non bank loan	0.13	0.1%	4	0.7%	19.99	13.32	2.6%	2	3.6%	366.30
Government loan	0.00	0.0%	0	0.0%	n.a.	3.00	0.6%	1	1.8%	165.00
Other business loan	0.00	0.0%	0	0.0%	n.a.	0.00	0.0%	0	0.0%	n.a.
Other individuals' loan	0.01	0.0%	2	0.3%	3.08	0.00	0.0%	0	0.0%	n.a.
Other loans	0.00	0.0%	0	0.0%	n.a.	0.55	0.1%	1	1.8%	30.25
Total debt:	23.20	13.0%	371	60.3%	38.46	178.87	34.8%	51	92.7%	192.90
Short-term debt	12.22	6.8%	348	56.6%	21.60	86.71	16.9%	45	81.8%	105.98
Long-term debt	10.98	6.1%	73	11.9%	92.50	92.16	17.9%	30	54.5%	168.96
Accounts payable:	32.28	18.1%	253	41.1%	78.47	171.12	33.3%	46	83.6%	204.60
Total external financing:	178.71	100.0%	583	94.8%	188.52	514.21	100.0%	55	100.0%	514.21
#	615					55				

¹²⁶ Equity and debt are from owners, family and friends and external investors and lenders.

Appendix B (cont.)

Year	Sub-sample of nascent firms that do not have collateral					Sub-sample of nascent firms that have personal collateral				
	Value 2010		Count 2010		Mean 2010	Value 2010		Count 2010		Mean 2010
Owners' equity	137.98	71.1%	546	89.8%	153.65	183.99	25.0%	56	94.9%	193.85
Family and friends' equity	1.14	0.6%	6	1.0%	115.52	0.00	0.0%	0	0.0%	n.a.
Spouse's Equity	0.25	0.1%	2	0.3%	76.00	0.00	0.0%	0	0.0%	n.a.
Parents' Equity	0.89	0.5%	4	0.7%	135.28	0.00	0.0%	0	0.0%	n.a.
External equity	4.82	2.5%	5	0.8%	586.11	130.51	17.7%	3	5.1%	2,566.70
Angels' equity	2.31	1.2%	4	0.7%	351.12	126.27	17.1%	2	3.4%	3,724.97
Companies' equity	2.47	1.3%	1	0.2%	1,501.76	0.00	0.0%	0	0.0%	n.a.
Government's equity	0.04	0.0%	1	0.2%	24.32	4.24	0.6%	1	1.7%	250.16
Venture Capital's equity	0.00	0.0%	0	0.0%	n.a.	0.00	0.0%	0	0.0%	n.a.
Others' equity	0.00	0.0%	0	0.0%	n.a.	0.00	0.0%	0	0.0%	n.a.
Total equity:	143.94	74.2%	547	90.0%	159.99	314.50	42.7%	56	94.9%	331.35
Owners' debt	8.03	4.1%	283	46.5%	17.25	34.92	4.7%	31	52.5%	66.46
Personal credit card	2.30	1.2%	148	24.3%	9.45	8.45	1.1%	16	27.1%	31.16
Business credit card	3.90	2.0%	187	30.8%	12.68	9.07	1.2%	17	28.8%	31.48
Personal bank loans	1.83	0.9%	24	3.9%	46.36	17.4	2.4%	13	22.0%	78.97
Family and friends' debt	1.02	0.5%	25	4.1%	24.81	12.71	1.7%	3	5.1%	249.96
Family loan to owners	0.53	0.3%	18	3.0%	17.90	12.03	1.6%	2	3.4%	354.89
Personal loan to owners	0.44	0.2%	5	0.8%	53.50	0.00	0.0%	0	0.0%	n.a.
Business loan from families	0.01	0.0%	3	0.5%	2.03	0.00	0.0%	0	0.0%	n.a.
Business loan from owners	0.04	0.0%	3	0.5%	8.11	0.68	0.1%	1	1.7%	40.12
Business loan from employees	0.00	0.0%	0	0.0%	n.a.	0.00	0.0%	0	0.0%	n.a.
External debt	5.29	2.7%	151	24.8%	21.30	148.56	20.2%	34	57.6%	257.80
Bank business credit card	1.98	1.0%	114	18.8%	10.56	11.24	1.5%	16	27.1%	41.45
Bank credit line	2.85	1.5%	53	8.7%	32.69	77.81	10.6%	21	35.6%	218.61
Bank loan	0.41	0.2%	15	2.5%	16.62	59.51	8.1%	15	25.4%	234.07
Non bank loan	0.00	0.0%	0	0.0%	n.a.	0.00	0.0%	0	0.0%	n.a.
Government loan	0.00	0.0%	0	0.0%	n.a.	0.00	0.0%	0	0.0%	n.a.
Other business loan	0.05	0.0%	3	0.5%	10.13	0.00	0.0%	0	0.0%	n.a.
Other individuals' loan	0.00	0.0%	0	0.0%	n.a.	0.00	0.0%	0	0.0%	n.a.
Other loans	0.00	0.0%	0	0.0%	n.a.	0.00	0.0%	0	0.0%	n.a.
Total debt:	14.34	7.4%	344	56.6%	25.35	196.19	26.6%	46	78.0%	251.64
Short-term debt	11.03	5.7%	318	52.3%	21.09	106.57	14.5%	40	67.8%	157.19
Long-term debt	3.31	1.7%	61	10.0%	32.99	89.62	12.2%	29	49.2%	182.33
Accounts payable:	35.82	18.5%	253	41.6%	86.08	225.97	30.7%	42	71.2%	317.43
Total external financing:	194.10	100.0%	577	94.9%	204.53	736.66	100.0%	57	96.6%	762.51
#	608					59				

Appendix B (cont.)

Year	Sub-sample of nascent firms that do not have collateral					Sub-sample of nascent firms that have personal collateral				
	Value 2011		Count 2011		Mean 2011	Value 2011		Count 2011		Mean 2011
Owners' equity	114.87	62.8%	486	88.2%	130.23	257.85	29.4%	40	95.2%	270.74
Family and friends' equity	0.78	0.4%	6	1.1%	71.63	0.00	0.0%	0	0.0%	n.a.
Spouse's Equity	0.09	0.0%	3	0.5%	16.53	0.00	0.0%	0	0.0%	n.a.
Parents' Equity	0.69	0.4%	4	0.7%	95.05	0.00	0.0%	0	0.0%	n.a.
External equity	2.95	1.6%	5	0.9%	325.09	21.43	2.4%	1	2.4%	900.06
Angels' equity	2.72	1.5%	3	0.5%	499.57	0.00	0.0%	0	0.0%	n.a.
Companies' equity	0.18	0.1%	1	0.2%	99.18	21.43	2.4%	1	2.4%	900.06
Government's equity	0.00	0.0%	0	0.0%	n.a.	0.00	0.0%	0	0.0%	n.a.
Venture Capital's equity	0.00	0.0%	0	0.0%	n.a.	0.00	0.0%	0	0.0%	n.a.
Others' equity	0.05	0.0%	1	0.2%	27.55	0.00	0.0%	0	0.0%	n.a.
Total equity:	118.60	64.8%	486	88.2%	134.46	279.28	31.9%	40	95.2%	293.24
Owners' debt	10.04	5.5%	256	46.5%	21.61	18.60	2.1%	20	47.6%	39.06
Personal credit card	2.46	1.3%	137	24.9%	9.89	2.46	0.3%	6	14.3%	17.22
Business credit card	3.61	2.0%	179	32.5%	11.11	2.57	0.3%	11	26.2%	9.81
Personal bank loans	3.97	2.2%	13	2.4%	168.27	13.57	1.5%	9	21.4%	63.33
Family and friends' debt	1.02	0.6%	19	3.4%	29.58	12.1	1.4%	2	4.8%	254.10
Family loan to owners	0.91	0.5%	18	3.3%	27.86	0.00	0.0%	0	0.0%	n.a.
Personal loan to owners	0.07	0.0%	4	0.7%	9.64	0.00	0.0%	0	0.0%	n.a.
Business loan from families	0.04	0.0%	3	0.5%	7.35	11.90	1.4%	1	2.4%	499.80
Business loan from owners	0.00	0.0%	0	0.0%	n.a.	0.20	0.0%	1	2.4%	8.40
Business loan from employees	0.00	0.0%	0	0.0%	n.a.	0.00	0.0%	0	0.0%	n.a.
External debt	16.31	8.9%	153	27.8%	58.74	268.09	30.6%	30	71.4%	375.33
Bank business credit card	4.62	2.5%	109	19.8%	23.35	3.49	0.4%	12	28.6%	12.22
Bank credit line	8.46	4.6%	67	12.2%	69.57	75.65	8.6%	22	52.4%	144.42
Bank loan	3.10	1.7%	15	2.7%	113.87	188.95	21.6%	13	31.0%	610.45
Non bank loan	0.04	0.0%	1	0.2%	22.04	0.00	0.0%	0	0.0%	n.a.
Government loan	0.00	0.0%	0	0.0%	n.a.	0.00	0.0%	0	0.0%	n.a.
Other business loan	0.00	0.0%	0	0.0%	n.a.	0.00	0.0%	0	0.0%	n.a.
Other individuals' loan	0.00	0.0%	0	0.0%	n.a.	0.00	0.0%	0	0.0%	n.a.
Other loans	0.09	0.0%	1	0.2%	49.59	0.00	0.0%	0	0.0%	n.a.
Total debt:	27.37	15.0%	310	56.3%	48.65	298.79	34.1%	38	90.5%	330.24
Short-term debt	19.15	10.5%	302	54.8%	34.94	84.17	9.6%	31	73.8%	114.04
Long-term debt	8.22	4.5%	45	8.2%	100.65	214.62	24.5%	23	54.8%	391.91
Accounts payable:	36.98	20.2%	225	40.8%	90.56	298.14	34.0%	33	78.6%	379.45
Total external financing:	182.95	100.0%	513	93.1%	196.50	876.21	100.0%	42	100.0%	876.21
#	551					42				

Appendix C - Average items of balance sheet as a percentage of the book value of total assets, on sub-samples of firms that do not have collateral and have personal collateral.

This table represents items of balance sheet winsorized at 1% on each tail of the distribution and then averaged. All variables are presented as a percentage of the book value of total assets surveyed and represent the accrued value surveyed at the end of each year. Debt includes loans from entrepreneurs, banks, non-bank financial institution, family and friends, employees, government agencies, other businesses, other individuals and other sources.

Year	Sub-sample of nascent firms that do not have collateral			Sub-sample of nascent firms that have personal collateral		
	2009	2010	2011	2009	2010	2011
Cash and deposits/total assets	0.23	0.21	0.23	0.12	0.17	0.10
Accounts receivable/total assets	0.26	0.27	0.23	0.27	0.41	0.36
Inventories/total assets	0.13	0.12	0.15	0.11	0.09	0.15
Tangible assets/total assets	0.38	0.39	0.38	0.50	0.33	0.39
Equipment/total assets	0.19	0.20	0.17	0.34	0.14	0.21
Land and buildings/total assets	0.12	0.13	0.14	0.11	0.13	0.10
Vehicles/total assets	0.07	0.07	0.07	0.02	0.02	0.01
Other business properties/total assets	0.00	0.00	0.00	0.00	0.00	0.00
Other assets/total assets	0.00	0.00	0.00	0.03	0.04	0.06
Total	1.00	1.00	1.00	1.00	1.00	1.00
Accounts payable/total assets	0.15	0.21	0.16	0.19	0.36	0.21
Long-term debt /total assets	0.02	0.02	0.02	0.10	0.14	0.15
Short-term debt/total assets	0.09	0.07	0.07	0.11	0.12	0.06
Total debt/total assets	0.11	0.08	0.09	0.21	0.26	0.20
Equity/total assets	0.52	0.48	0.38	0.21	0.37	0.20
Total external finance/total assets	0.63	0.56	0.47	0.42	0.62	0.40
#	615	608	551	55	59	42

Appendix D - Average items of financing deficit and external financing as a percentage of the book value of total assets, on sub-samples of firms that do not have collateral and have personal collateral.

This table represents items of financing deficit and external financing winsorized at 1% on each tail of the distribution and then averaged. All variables are presented as a percentage of the book value of total assets surveyed and represent the accrued value surveyed at the end of each year. The investments variable is the variation of the value of tangible assets obtained from the survey, excluding other tangible assets. Working capital includes the following items: cash and deposits + accounts receivable + inventories - short-term debt - accounts payable. Internal cash flow is measured by net profits. Long-term debt includes loans from entrepreneurs, banks, non-bank financial institution, family and friends, employees, government agencies, other businesses, other individuals and other sources. Debt and equity variations are obtained by the change in the variables from the current to the previous year. Net long-term debt variations are long-term debt increases minus long-term debt reductions. Net equity variations are equity increases minus equity reductions.

Year	Sub-sample of nascent firms that do not have collateral			Sub-sample of nascent firms that have personal collateral		
	2009	2010	Year	2009	2010	Year
Dividends ¹	0.06	0.08	0.08	0.01	0.03	0.03
Investments ²	-0.02	-0.06	-0.04	0.26	0.08	0.04
Δ working capital ³	0.07	-0.03	0.19	0.08	-0.19	0.13
Internal cash flow ⁴	0.30	0.32	0.24	0.10	0.16	0.10
Net financing deficit¹⁺²⁺³⁺⁴	-0.20	-0.32	-0.02	0.22	-0.15	0.05
Net long-term debt variation ^a	-0.03	-0.02	-0.04	0.03	0.01	0.05
Net equity variation ^b	0.03	0.08	-0.01	-0.03	0.06	-0.24
Net external financing variation^{a+b}	-0.01	0.06	-0.04	0.00	0.07	-0.19
#	615	608	551	55	59	42

Appendix E - Average items of disaggregated corporate cash-flows as a percentage of the book value of total assets, on sub-samples of firms that do not have collateral and have personal collateral. This table represents items of disaggregated corporate cash-flows winsorized at 1% on each tail of the distribution and then averaged. All variables are presented as a percentage of the book value of total assets surveyed and represent the accrued value surveyed at the end of each year. The investments variable is the variation of the value of tangible assets obtained in the survey, excluding other tangible assets. Debt includes loans from entrepreneurs, banks, non-bank financial institution, family and friends, employees, government agencies, other businesses, other individuals and other sources. Debt and equity variations are obtained by the change in the variables from the current to the previous year. Net debt variations are debt increases minus debt reductions. Net equity variations are equity increases minus equity reductions.

Year	Sub-sample of nascent firms that do not have collateral			Sub-sample of nascent firms that have personal collateral		
	2009	2010	2011	2009	2010	2011
<i>Income</i>						
Sales	3.04	3.39	3.58	2.84	3.81	3.12
Personnel expenses	0.86	0.69	0.79	0.67	1.09	0.96
Total expenses	2.08	1.96	2.47	2.21	2.51	2.36
Net income	0.30	0.32	0.24	0.13	0.07	0.16
<i>Operating activities</i>						
Change in accounts receivable	0.00	0.01	0.00	0.02	0.00	0.04
Change in inventories	-0.02	0.02	0.02	-0.02	0.01	0.00
Change in accounts payable	-0.02	0.04	-0.05	0.02	0.04	-0.04
Cash flow from operating activities	0.00	-0.01	0.07	-0.03	-0.04	0.08
<i>Investing activities</i>						
Investment in tangible assets	-0.02	-0.06	-0.04	0.26	0.08	0.04
Cash flow from investment in tangible assets	-0.02	-0.06	-0.04	0.26	0.08	0.04
<i>Financing activities</i>						
Net variation of equity	0.03	0.08	-0.01	-0.03	0.06	-0.24
Dividends	0.06	0.08	0.08	0.01	0.03	0.03
Net variation of long-term debt	-0.03	-0.02	-0.04	0.03	0.01	0.05
Net variation of short-term debt	0.00	-0.01	0.01	-0.06	0.02	-0.03
Cash flow from financing activities	-0.07	-0.04	-0.11	-0.06	0.07	-0.26
Change in cash and deposits	0.02	-0.02	0.04	0.03	-0.06	0.01

Appendix F - Descriptive statistics of variables of sub-samples of firms that do not have collateral and have personal collateral.

The values of the variables are winsorized at 1% on each tail of the distribution and the descriptive statistics are then obtained. All variables represent the accrued value surveyed at the end of each year. The investments variable is the variation of the value of tangible assets obtained in the survey, excluding other tangible assets. Working capital includes the following items: cash and deposits + accounts receivable + inventories - short-term debt - accounts payable. Internal cash flow is measured by net profits. Debt includes loans from entrepreneurs, banks, non-bank financial institution, family and friends, partners, employees, government agencies, other businesses, other individuals and other sources. Debt and equity variations are obtained by the change in the variables from the current to the previous year. Net debt variations are debt increases minus debt reductions. Net equity variations are equity increases minus equity reductions. Net financing deficit is: dividends plus investment plus change in working capital minus net profits – and the gross financing deficit. Variables are scaled by the net book value of total assets - book value of total assets minus book value of current liabilities - at the current year, with the exception of sales and the book value of total assets which are in thousands of USDs.

Variables	Sub-sample of nascent firms that do not have collateral					Sub-sample of nascent firms that have personal collateral				
	Observations	Mean	Standard deviation	Minimum	Maximum	Observations	Mean	Standard deviation	Minimum	Maximum
Book value of total assets	1,766	189.72	408.05	0.29	2,765.00	156	1,018.89	2,061.14	1.31	15,171.81
Sales	1,766	529.41	1,283.09	0.50	9,355.50	156	2,843.43	5,008.13	6.64	26,580.00
Long-term debt	1,766	1.98	13.59	0.00	104.25	156	117.23	297.14	3.50	2,417.00
Short-term debt	1,766	11.43	25.11	0.00	141.13	156	86.23	185.04	0.00	1,710.00
Dividends	1,766	11.83	39.88	0.00	300.00	156	20.47	77.88	0.00	703.14
Investments	1,766	-5.23	108.62	-636.38	448.13	156	126.17	790.98	-746.35	7,971.88
Change in working capital	1,766	10.78	155.35	-635.54	866.65	156	40.56	609.80	-2,866.63	3,127.43
Net profits	1,766	45.64	124.12	-157.20	813.03	156	119.59	374.42	-746.05	2,000.00
Net financing deficit	1,766	-24.04	248.41	-1,341.75	1,057.50	156	68.92	1,024.80	-2,071.41	9,664.21
Net debt variation	1,766	-4.66	28.99	-205.75	55.66	156	29.98	296.93	-1,337.20	2,245.00
Net equity variation	1,766	4.85	106.20	-460.00	606.25	156	-52.95	866.67	-7,282.11	1,278.75

Appendices G and G.B - Evolution of equity, debt¹²⁷ and accounts payable in our sample of firms and in a sub-sample of firms that received external equity investments, from 2005 to 2011.

All variables represent the yearly value surveyed at the end of each year. All variables are non winsorized¹²⁸. Short-term bank debt includes business credit cards and credit lines balances, while long-term bank debt includes the other items of debt. Line of credit financing includes credit lines balances and non-line of credit financing includes the other items of debt. Owners' equity is the equity financed with owners' net worth; it does not include equity financed by owners' debt. Personal debt is all the debt financed in the owners' name and used in the firms' financing. Business debt is the debt registered in the firms' name. All values are in thousands of USDs.

Year	Sample of nascent firms					Sub-sample of nascent firms that received external equity investments				
	Value 2005		Count 2005		Mean 2005	Value 2005		Count 2005		Mean 2005
Owners' equity	37.58	15.1%	640	45.7%	82.21	348.54	13.9%	45	64.3%	542.17
Family and friends' equity	3.66	1.5%	45	3.2%	113.87	16.87	0.7%	13	18.6%	90.84
Spouse's Equity	2.37	1.0%	15	1.1%	221.20	1.23	0.0%	4	5.7%	21.53
Parents' Equity	1.29	0.5%	35	2.5%	51.60	15.64	0.6%	11	15.7%	99.53
External equity	48.6	19.5%	70	5.0%	972.00	971.98	38.7%	70	100.0%	971.98
Angels' equity	11.71	4.7%	43	3.1%	381.26	234.29	9.3%	43	61.4%	381.40
Companies' equity	15.33	6.2%	20	1.4%	1,073.10	306.56	12.2%	20	28.6%	1,072.96
Government's equity	4.36	1.8%	6	0.4%	1,017.33	87.22	3.5%	6	8.6%	1,017.57
Venture Capital's equity	17.2	6.9%	11	0.8%	2,189.09	343.91	13.7%	11	15.7%	2,188.52
Total equity:	89.84	36.1%	669	47.8%	188.01	1,337.39	53.2%	70	100.0%	1,337.39
Personal debt	32.51	13.1%	655	46.8%	69.49	187.81	7.5%	33	47.1%	398.38
Personal credit card	3.79	1.5%	344	24.6%	15.42	4.72	0.2%	16	22.9%	20.65
Business credit card	4.01	1.6%	352	25.1%	15.95	5.71	0.2%	18	25.7%	22.21
Personal bank loans	3.00	1.2%	346	24.7%	12.14	11.43	0.5%	14	20.0%	57.15
Family loan to owners	19.86	8.0%	221	15.8%	125.81	153.66	6.1%	10	14.3%	1,075.62
Personal loan to owners	1.85	0.7%	31	2.2%	83.55	12.29	0.5%	5	7.1%	172.06
Business debt	72.97	29.3%	466	33.3%	219.22	765.99	30.5%	20	28.6%	2,680.97
Bank business credit card	1.76	0.7%	258	18.4%	9.55	3.67	0.1%	8	11.4%	32.11
Bank credit line	10.37	4.2%	157	11.2%	92.47	22.00	0.9%	10	14.3%	154.00
Bank loan	46.46	18.7%	112	8.0%	580.75	677.43	26.9%	8	11.4%	5,927.51
Business loan from families	5.80	2.3%	28	2.0%	290.00	36.86	1.5%	3	4.3%	860.07
Business loan from owners	1.85	0.7%	38	2.7%	68.16	10.00	0.4%	1	1.4%	700.00
Business loan from employees	1.35	0.5%	20	1.4%	94.50	4.29	0.2%	1	1.4%	300.30
Non bank loan	0.03	0.0%	2	0.1%	21.00	0.00	0.0%	0	0.0%	n.a.
Government loan	2.24	0.9%	13	0.9%	241.23	9.60	0.4%	3	4.3%	224.00
Other business loan	0.37	0.1%	4	0.3%	129.50	0.00	0.0%	0	0.0%	n.a.
Other individuals' loan	0.72	0.3%	7	0.5%	144.00	0.00	0.0%	0	0.0%	n.a.
Other loans	2.02	0.8%	7	0.5%	404.00	2.14	0.1%	1	1.4%	149.80
Total debt:	105.48	42.4%	803	57.4%	183.90	953.80	37.9%	42	60.0%	1,589.67
Accounts payable:	53.58	21.5%	624	44.6%	120.21	223.00	8.9%	41	58.6%	380.73
Total external financing:	248.90	100.0%	1,143	81.6%	304.86	2,514.19	100.0%	70	100.0%	2,514.19
Short-term bank debt	12.13	4.9%	360	25.7%	47.17	25.67	1.0%	13	18.6%	138.22
Long-term bank debt	46.46	18.7%	112	8.0%	580.75	677.43	26.9%	8	11.4%	5,927.51
Line of credit	10.37	4.2%	157	11.2%	92.47	22.00	0.9%	10	14.3%	154.00
Non line of credit	48.22	19.4%	336	24.0%	200.92	681.10	27.1%	12	17.1%	3,973.08
#	1,400					70				

¹²⁷ Equity and debt are from owners, family and friends and external investors and lenders.

¹²⁸ One observation in 2009 was excluded from the current table because it involved one large equity increase from a venture capital fund, of 200 million USDs, which could distort the analysis of the weights between equity and debt. Nevertheless, this observation is included in appendix G.B.

Appendix G (cont.)

Year	Sample of nascent firms					Sub-sample of nascent firms that received external equity investments				
	Value 2006		Count 2006		Mean 2006	Value 2006		Count 2006		Mean 2006
Owners' equity	22.96	7.9%	354	34.4%	66.67	159.16	6.6%	24	50.0%	318.32
Family and friends' equity	2.37	0.8%	32	3.1%	76.14	42.85	1.8%	11	22.9%	186.98
Spouse's Equity	0.21	0.1%	12	1.2%	17.99	0.54	0.0%	2	4.2%	12.96
Parents' Equity	2.16	0.7%	24	2.3%	92.52	42.31	1.8%	10	20.8%	203.09
External equity	59.83	20.5%	48	4.7%	1,281.36	1,281.37	53.0%	48	100.0%	1,281.37
Angels' equity	18.97	6.5%	25	2.4%	780.05	406.32	16.8%	25	52.1%	780.13
Companies' equity	4.82	1.7%	15	1.5%	330.33	103.15	4.3%	15	31.3%	330.08
Government's equity	0.92	0.3%	5	0.5%	189.15	19.71	0.8%	5	10.4%	189.22
Venture Capital's equity	35.12	12.1%	8	0.8%	4,512.92	752.19	31.1%	8	16.7%	4,513.14
Total equity:	85.16	29.2%	382	37.2%	229.17	1,483.38	61.4%	48	100.0%	1,483.38
Personal debt	28.51	9.8%	482	46.9%	60.81	62.91	2.6%	28	58.3%	107.84
Personal credit card	3.86	1.3%	237	23.1%	16.74	8.13	0.3%	13	27.1%	30.02
Business credit card	4.25	1.5%	249	24.2%	17.55	9.52	0.4%	15	31.3%	30.46
Personal bank loans	4.34	1.5%	309	30.1%	14.44	7.16	0.3%	13	27.1%	26.44
Family loan to owners	15.40	5.3%	170	16.5%	93.12	37.35	1.5%	12	25.0%	149.40
Personal loan to owners	0.66	0.2%	19	1.8%	35.71	0.75	0.0%	3	6.3%	11.98
Business debt	74.4	25.5%	395	38.4%	193.63	155.2	6.4%	26	54.2%	286.52
Bank business credit card	3.14	1.1%	213	20.7%	15.15	8.10	0.3%	10	20.8%	38.88
Bank credit line	19.52	6.7%	174	16.9%	115.33	17.07	0.7%	14	29.2%	58.53
Bank loan	27.94	9.6%	77	7.5%	373.02	32.59	1.3%	10	20.8%	156.43
Business loan from families	5.64	1.9%	24	2.3%	241.58	34.58	1.4%	4	8.3%	414.96
Business loan from owners	0.41	0.1%	20	1.9%	21.07	0.93	0.0%	3	6.3%	14.88
Business loan from employees	11.07	3.8%	15	1.5%	758.66	2.71	0.1%	2	4.2%	65.04
Non bank loan	0.10	0.0%	7	0.7%	14.69	0.25	0.0%	1	2.1%	12.00
Government loan	0.96	0.3%	5	0.5%	197.38	12.50	0.5%	2	4.2%	300.00
Other business loan	1.94	0.7%	7	0.7%	284.90	3.13	0.1%	1	2.1%	150.24
Other individuals' loan	2.04	0.7%	2	0.2%	1,048.56	41.67	1.7%	1	2.1%	2,000.16
Other loans	1.64	0.6%	5	0.5%	337.18	1.67	0.1%	1	2.1%	80.16
Total debt:	102.91	35.3%	623	60.6%	169.81	218.11	9.0%	36	75.0%	290.81
Accounts payable:	103.23	35.4%	493	48.0%	215.25	715.47	29.6%	31	64.6%	1,107.82
Total external financing:	291.30	100.0%	828	80.5%	361.66	2,416.96	100.0%	48	100.0%	2,416.96
Short-term bank debt	22.66	7.8%	322	31.3%	72.34	25.17	1.0%	18	37.5%	67.12
Long-term bank debt	27.94	9.6%	77	7.5%	373.02	32.59	1.3%	10	20.8%	156.43
Line of credit	19.52	6.7%	174	16.9%	115.33	17.07	0.7%	14	29.2%	58.53
Non line of credit	31.08	10.7%	271	26.4%	117.90	40.69	1.7%	17	35.4%	114.89
#	1,028					48				

Appendix G (cont.)

Year	Sample of nascent firms					Sub-sample of nascent firms that received external equity investments				
	Value 2007		Count 2007		Mean 2007	Value 2007		Count 2007		Mean 2007
Owners' equity	15.2	8.2%	231	28.1%	54.15	65.32	5.1%	11	50.0%	130.64
Family and friends' equity	0.83	0.4%	16	1.9%	42.69	12.32	1.0%	5	22.7%	54.21
Spouse's Equity	0.10	0.1%	3	0.4%	27.43	1.14	0.1%	1	4.5%	25.08
Parents' Equity	0.73	0.4%	15	1.8%	40.05	11.18	0.9%	5	22.7%	49.19
External equity	21.32	11.5%	22	2.7%	797.56	797.55	61.8%	22	100.0%	797.55
Angels' equity	4.91	2.6%	15	1.8%	269.40	183.68	14.2%	15	68.2%	269.40
Companies' equity	0.67	0.4%	7	0.9%	78.77	25.23	2.0%	7	31.8%	79.29
Government's equity	2.13	1.1%	2	0.2%	876.50	79.55	6.2%	2	9.1%	875.05
Venture Capital's equity	13.61	7.3%	3	0.4%	3,733.68	509.09	39.5%	3	13.6%	3,733.33
Total equity:	37.35	20.1%	246	29.9%	124.96	875.19	67.8%	22	100.0%	875.19
Personal debt	24.35	13.1%	343	41.7%	58.43	32.70	2.5%	10	45.5%	71.94
Personal credit card	3.71	2.0%	157	19.1%	19.45	8.83	0.7%	6	27.3%	32.38
Business credit card	4.02	2.2%	160	19.4%	20.68	9.01	0.7%	6	27.3%	33.04
Personal bank loans	5.11	2.8%	240	29.2%	17.52	6.22	0.5%	10	45.5%	13.68
Family loan to owners	11.26	6.1%	103	12.5%	89.97	8.64	0.7%	2	9.1%	95.04
Personal loan to owners	0.25	0.1%	6	0.7%	34.29	0.00	0.0%	0	0.0%	n.a.
Business debt	60.45	32.6%	313	38.0%	158.95	202.07	15.7%	11	50.0%	404.14
Bank business credit card	2.48	1.3%	157	19.1%	13.00	3.80	0.3%	6	27.3%	13.93
Bank credit line	19.59	10.6%	167	20.3%	96.54	25.00	1.9%	5	22.7%	110.00
Bank loan	23.28	12.6%	84	10.2%	228.09	148.18	11.5%	5	22.7%	651.99
Business loan from families	5.68	3.1%	23	2.8%	203.25	15.45	1.2%	2	9.1%	169.95
Business loan from owners	1.21	0.7%	14	1.7%	71.13	2.37	0.2%	2	9.1%	26.07
Business loan from employees	1.38	0.7%	6	0.7%	189.29	0.00	0.0%	0	0.0%	n.a.
Non bank loan	0.25	0.1%	3	0.4%	68.58	0.00	0.0%	0	0.0%	n.a.
Government loan	2.38	1.3%	3	0.4%	652.91	7.27	0.6%	1	4.5%	159.94
Other business loan	0.19	0.1%	2	0.2%	78.19	0.00	0.0%	0	0.0%	n.a.
Other individuals' loan	0.06	0.0%	3	0.4%	16.46	0.00	0.0%	0	0.0%	n.a.
Other loans	3.95	2.1%	1	0.1%	3,250.85	0.00	0.0%	0	0.0%	n.a.
Total debt:	84.80	45.7%	466	56.6%	149.76	234.77	18.2%	15	68.2%	344.33
Accounts payable:	63.28	34.1%	408	49.6%	127.65	180.00	14.0%	18	81.8%	220.00
Total external financing:	185.43	100.0%	635	77.2%	240.33	1,289.96	100.0%	22	100.0%	1,289.96
Short-term bank debt	22.07	11.9%	256	31.1%	70.95	28.80	2.2%	8	36.4%	79.20
Long-term bank debt	23.28	12.6%	84	10.2%	228.09	148.18	11.5%	5	22.7%	651.99
Line of credit	19.59	10.6%	167	20.3%	96.54	25.00	1.9%	5	22.7%	110.00
Non line of credit	25.76	13.9%	209	25.4%	101.44	151.98	11.8%	8	36.4%	417.95
#	823					22				

Appendix G (cont.)

Year	Sample of nascent firms					Sub-sample of nascent firms that received external equity investments				
	Value 2008		Count 2008		Mean 2008	Value 2008		Count 2008		Mean 2008
Owners' equity	18.09	8.7%	191	25.2%	71.79	38.06	3.1%	10	55.6%	68.51
Family and friends' equity	0.65	0.3%	14	1.8%	35.19	15.28	1.2%	2	11.1%	137.52
Spouse's Equity	0.00	0.0%	1	0.1%	0.00	0.00	0.0%	0	0.0%	n.a.
Parents' Equity	0.65	0.3%	13	1.7%	37.90	15.28	1.2%	2	11.1%	137.52
External equity	20.82	10.0%	18	2.4%	876.75	876.91	70.4%	18	100.0%	876.91
Angels' equity	14.79	7.1%	13	1.7%	862.37	623.02	50.0%	13	72.2%	862.64
Companies' equity	5.76	2.8%	5	0.7%	873.22	242.5	19.5%	5	27.8%	873.00
Government's equity	0.00	0.0%	0	0.0%	n.a.	0.00	0.0%	0	0.0%	n.a.
Venture Capital's equity	0.27	0.1%	2	0.3%	102.33	11.39	0.9%	2	11.1%	102.51
Total equity:	39.56	19.0%	204	26.9%	146.99	930.25	74.6%	18	100.0%	930.25
Personal debt	31.56	15.2%	332	43.8%	72.06	27.55	2.2%	12	66.7%	41.33
Personal credit card	3.16	1.5%	152	20.1%	15.76	6.42	0.5%	7	38.9%	16.51
Business credit card	3.36	1.6%	155	20.4%	16.43	6.42	0.5%	7	38.9%	16.51
Personal bank loans	4.44	2.1%	236	31.1%	14.26	10.54	0.8%	10	55.6%	18.97
Family loan to owners	15.67	7.5%	84	11.1%	141.40	4.17	0.3%	1	5.6%	75.06
Personal loan to owners	4.93	2.4%	12	1.6%	311.41	0.00	0.0%	0	0.0%	n.a.
Business debt	62.17	29.9%	275	36.3%	171.36	147.30	11.8%	10	55.6%	265.14
Bank business credit card	2.75	1.3%	129	17.0%	16.16	0.00	0.0%	0	0.0%	n.a.
Bank credit line	26.22	12.6%	160	21.1%	124.22	31.19	2.5%	4	22.2%	140.36
Bank loan	23.72	11.4%	61	8.0%	294.75	80.56	6.5%	1	5.6%	1,450.08
Business loan from families	2.43	1.2%	15	2.0%	122.80	11.11	0.9%	2	11.1%	99.99
Business loan from owners	0.99	0.5%	10	1.3%	75.04	1.39	0.1%	1	5.6%	25.02
Business loan from employees	1.36	0.7%	7	0.9%	147.27	8.33	0.7%	2	11.1%	74.97
Non bank loan	0.12	0.1%	3	0.4%	30.32	0.00	0.0%	0	0.0%	n.a.
Government loan	0.55	0.3%	3	0.4%	138.97	0.00	0.0%	0	0.0%	n.a.
Other business loan	1.55	0.7%	4	0.5%	293.73	0.00	0.0%	0	0.0%	n.a.
Other individuals' loan	1.98	1.0%	5	0.7%	300.17	0.83	0.1%	1	5.6%	14.94
Other loans	0.50	0.2%	3	0.4%	126.33	13.89	1.1%	1	5.6%	250.02
Total debt:	93.73	45.1%	434	57.3%	163.70	174.85	14.0%	14	77.8%	224.81
Accounts payable:	74.76	35.9%	409	54.0%	138.55	141.19	11.3%	15	83.3%	169.43
Total external financing:	208.05	100.0%	587	77.4%	268.66	1,246.29	100.0%	18	100.0%	1,246.29
Short-term bank debt	28.97	13.9%	232	30.6%	94.65	31.19	2.5%	4	22.2%	140.36
Long-term bank debt	23.72	11.4%	61	8.0%	294.75	80.56	6.5%	1	5.6%	1,450.08
Line of credit	26.22	12.6%	160	21.1%	124.22	31.19	2.5%	4	22.2%	140.36
Non line of credit	26.47	12.7%	170	22.4%	118.03	80.56	6.5%	1	5.6%	1,450.08
#	758					18				

Appendix G (cont.)

Year	Sample of nascent firms					Sub-sample of nascent firms that received external equity investments				
	Value 2009		Count 2009		Mean 2009	Value 2009		Count 2009		Mean 2009
Owners' equity	6.40	4.1%	116	17.8%	36.03	91.33	4.1%	5	62.5%	146.13
Family and friends' equity	0.21	0.1%	8	1.2%	17.14	3.67	0.2%	1	12.5%	29.36
Spouse's Equity	0.07	0.0%	4	0.6%	11.43	0.00	0.0%	0	0.0%	n.a.
Parents' Equity	0.14	0.1%	4	0.6%	22.86	3.67	0.2%	1	12.5%	29.36
External equity	17.43	11.1%	8	1.2%	1,422.72	1,266.56	57.1%	8	100.0%	1,266.56
Angels' equity	6.68	4.3%	5	0.8%	872.41	485.56	21.9%	5	62.5%	776.90
Companies' equity	1.57	1.0%	2	0.3%	512.61	113.89	5.1%	2	25.0%	455.56
Government's equity	3.82	2.4%	1	0.2%	2,494.46	277.78	12.5%	1	12.5%	2,222.24
Venture Capital's equity	5.36	3.4%	2	0.3%	1,750.04	389.33	17.6%	2	25.0%	1,557.32
Total equity:	24.04	15.3%	122	18.7%	128.67	1,361.56	61.4%	8	100.0%	1,361.56
Personal debt	17.98	11.5%	250	38.3%	46.96	71.34	3.2%	5	62.5%	114.14
Personal credit card	2.83	1.8%	128	19.6%	14.44	21.22	1.0%	4	50.0%	42.44
Business credit card	2.93	1.9%	131	20.1%	14.61	24.11	1.1%	5	62.5%	38.58
Personal bank loans	4.09	2.6%	177	27.1%	15.09	13.78	0.6%	4	50.0%	27.56
Family loan to owners	7.90	5.0%	59	9.0%	87.44	5.56	0.3%	2	25.0%	22.24
Personal loan to owners	0.23	0.1%	9	1.4%	16.69	6.67	0.3%	2	25.0%	26.68
Business debt	49.11	31.3%	233	35.7%	137.63	533.00	24.0%	6	75.0%	710.67
Bank business credit card	3.7	2.4%	132	20.2%	18.30	46.33	2.1%	4	50.0%	92.66
Bank credit line	16.1	10.3%	106	16.2%	99.18	68.89	3.1%	3	37.5%	183.71
Bank loan	19.11	12.2%	54	8.3%	231.09	38.89	1.8%	1	12.5%	311.12
Business loan from families	4.96	3.2%	12	1.8%	269.91	100.00	4.5%	2	25.0%	400.00
Business loan from owners	0.33	0.2%	12	1.8%	17.96	0.00	0.0%	0	0.0%	n.a.
Business loan from employees	1.26	0.8%	7	1.1%	117.54	73.33	3.3%	3	37.5%	195.55
Non bank loan	0.46	0.3%	2	0.3%	150.19	0.00	0.0%	0	0.0%	n.a.
Government loan	3.00	1.9%	2	0.3%	979.50	200.00	9.0%	1	12.5%	1,600.00
Other business loan	0.00	0.0%	1	0.2%	0.00	0.00	0.0%	0	0.0%	n.a.
Other individuals' loan	0.01	0.0%	1	0.2%	6.53	0.00	0.0%	0	0.0%	n.a.
Other loans	0.18	0.1%	2	0.3%	58.77	5.56	0.3%	1	12.5%	44.48
Total debt:	67.09	42.8%	349	53.4%	125.53	604.34	27.3%	7	87.5%	690.67
Accounts payable:	65.66	41.9%	330	50.5%	129.93	250.55	11.3%	7	87.5%	286.34
Total external financing:	156.79	100.0%	487	74.6%	210.23	2,216.45	100.0%	8	100.0%	2,216.45
Short-term bank debt	19.80	12.6%	199	30.5%	64.97	115.22	5.2%	4	50.0%	230.44
Long-term bank debt	19.11	12.2%	54	8.3%	231.09	38.89	1.8%	1	12.5%	311.12
Line of credit	16.10	10.3%	106	16.2%	99.18	68.89	3.1%	3	37.5%	183.71
Non line of credit	22.81	14.5%	161	24.7%	92.52	85.22	3.8%	4	50.0%	170.44
#	653					8				

Appendix G (cont.)

Year	Sample of nascent firms					Sub-sample of nascent firms that received external equity investments				
	Value 2010		Count 2010		Mean 2010	Value 2010		Count 2010		Mean 2010
Owners' equity	4.82	2.5%	106	17.2%	28.01	78.30	3.5%	6	60.0%	130.50
Family and friends' equity	0.39	0.2%	5	0.8%	48.05	0.00	0.0%	0	0.0%	n.a.
Spouse's Equity	0.12	0.1%	2	0.3%	36.96	0.00	0.0%	0	0.0%	n.a.
Parents' Equity	0.27	0.1%	3	0.5%	55.44	0.00	0.0%	0	0.0%	n.a.
External equity	17.64	9.3%	10	1.6%	1,086.62	1,086.50	49.1%	10	100.0%	1,086.50
Angels' equity	1.00	0.5%	7	1.1%	88.00	61.50	2.8%	7	70.0%	87.86
Companies' equity	3.41	1.8%	2	0.3%	1,050.28	210.00	9.5%	2	20.0%	1,050.00
Government's equity	0.24	0.1%	1	0.2%	147.84	15.00	0.7%	1	10.0%	150.00
Venture Capital's equity	12.99	6.8%	1	0.2%	8,001.84	800.00	36.2%	1	10.0%	8,000.00
Total equity:	22.85	12.0%	113	18.3%	124.56	1,164.80	52.7%	10	100.0%	1,164.80
Personal debt	30.33	15.9%	233	37.8%	80.19	88.40	4.0%	6	60.0%	147.33
Personal credit card	2.22	1.2%	101	16.4%	13.54	3.25	0.1%	2	20.0%	16.25
Business credit card	2.39	1.3%	103	16.7%	14.29	3.25	0.1%	2	20.0%	16.25
Personal bank loans	4.26	2.2%	166	26.9%	15.81	19.80	0.9%	3	30.0%	66.00
Family loan to owners	19.97	10.5%	42	6.8%	292.89	31.00	1.4%	2	20.0%	155.00
Personal loan to owners	1.49	0.8%	8	1.3%	114.73	31.10	1.4%	3	30.0%	103.67
Business debt	58.55	30.7%	185	30.0%	194.96	45.8	2.1%	5	50.0%	91.60
Bank business credit card	3.47	1.8%	104	16.9%	20.55	4.90	0.2%	3	30.0%	16.33
Bank credit line	15.50	8.1%	88	14.3%	108.50	16.90	0.8%	3	30.0%	56.33
Bank loan	32.70	17.2%	55	8.9%	366.24	20.00	0.9%	2	20.0%	100.00
Business loan from families	0.41	0.2%	5	0.8%	50.51	0.00	0.0%	0	0.0%	n.a.
Business loan from owners	2.46	1.3%	7	1.1%	216.48	0.00	0.0%	0	0.0%	n.a.
Business loan from employees	1.34	0.7%	8	1.3%	103.18	4.00	0.2%	1	10.0%	40.00
Non bank loan	0.19	0.1%	1	0.2%	117.04	0.00	0.0%	0	0.0%	n.a.
Government loan	0.36	0.2%	1	0.2%	221.76	0.00	0.0%	0	0.0%	n.a.
Other business loan	2.12	1.1%	3	0.5%	435.31	0.00	0.0%	0	0.0%	n.a.
Other individuals' loan	0.00	0.0%	3	0.5%	0.00	0.00	0.0%	0	0.0%	n.a.
Other loans	0.00	0.0%	0	0.0%	n.a.	0.00	0.0%	0	0.0%	n.a.
Total debt:	88.88	46.7%	307	49.8%	275.14	134.20	6.1%	8	80.0%	238.93
Accounts payable:	78.74	41.3%	300	48.7%	161.68	912.18	41.3%	8	80.0%	1,140.23
Total external financing:	190.47	100.0%	444	72.1%	264.26	2,211.18	100.0%	10	100.0%	2,211.18
Short-term bank debt	18.97	10.0%	155	25.2%	75.39	21.80	1.0%	4	40.0%	54.50
Long-term bank debt	32.7	17.2%	55	8.9%	366.24	20.00	0.9%	2	20.0%	100.00
Line of credit	15.50	8.1%	88	14.3%	108.50	16.90	0.8%	3	30.0%	56.33
Non line of credit	36.17	19.0%	139	22.6%	160.29	24.90	1.1%	4	40.0%	62.25
#	616					10				

Appendix G (cont.)

Year	Sample of nascent firms					Sub-sample of nascent firms that received external equity investments				
	Value 2011		Count 2011		Mean 2011	Value 2011		Count 2011		Mean 2011
Owners' equity	14.05	7.1%	90	16.6%	84.77	0.78	0.1%	1	11.1%	7.02
Family and friends' equity	0.44	0.2%	6	1.1%	39.82	22.22	2.6%	1	11.1%	199.98
Spouse's Equity	0.05	0.0%	3	0.6%	9.05	0.00	0.0%	0	0.0%	n.a.
Parents' Equity	0.39	0.2%	3	0.6%	70.59	22.22	2.6%	1	11.1%	199.98
External equity	7.17	3.6%	9	1.7%	432.59	432.22	51.3%	9	100.0%	432.22
Angels' equity	2.24	1.1%	6	1.1%	202.72	135.00	16.0%	6	66.7%	202.50
Companies' equity	4.33	2.2%	3	0.6%	783.73	261.11	31.0%	3	33.3%	783.33
Government's equity	0.60	0.3%	1	0.2%	325.80	36.11	4.3%	1	11.1%	324.99
Venture Capital's equity	0.00	0.0%	0	0.0%	n.a.	0.00	0.0%	0	0.0%	n.a.
Total equity:	21.66	10.9%	101	18.6%	116.45	455.22	54.0%	9	100.0%	455.22
Personal debt	32.35	16.3%	191	35.2%	91.97	30.05	3.6%	7	77.8%	38.64
Personal credit card	2.17	1.1%	79	14.5%	14.92	11.17	1.3%	4	44.4%	25.13
Business credit card	2.32	1.2%	84	15.5%	15.00	13.06	1.5%	5	55.6%	23.51
Personal bank loans	3.21	1.6%	143	26.3%	12.19	3.60	0.4%	4	44.4%	8.10
Family loan to owners	24.59	12.4%	33	6.1%	404.62	2.22	0.3%	1	11.1%	19.98
Personal loan to owners	0.06	0.0%	3	0.6%	10.86	0.00	0.0%	0	0.0%	n.a.
Business debt	63.61	32.0%	165	30.4%	209.33	44.53	5.3%	3	33.3%	133.59
Bank business credit card	3.73	1.9%	90	16.6%	22.50	6.56	0.8%	2	22.2%	29.52
Bank credit line	29.91	15.1%	93	17.1%	174.64	35.97	4.3%	2	22.2%	161.87
Bank loan	25.60	12.9%	40	7.4%	347.52	0.00	0.0%	0	0.0%	n.a.
Business loan from families	0.64	0.3%	5	0.9%	69.50	2.00	0.2%	1	11.1%	18.00
Business loan from owners	1.39	0.7%	6	1.1%	125.80	0.00	0.0%	0	0.0%	n.a.
Business loan from employees	0.13	0.1%	2	0.4%	35.30	0.00	0.0%	0	0.0%	n.a.
Non bank loan	0.00	0.0%	0	0.0%	n.a.	0.00	0.0%	0	0.0%	n.a.
Government loan	1.84	0.9%	1	0.2%	999.12	0.00	0.0%	0	0.0%	n.a.
Other business loan	0.00	0.0%	0	0.0%	n.a.	0.00	0.0%	0	0.0%	n.a.
Other individuals' loan	0.00	0.0%	0	0.0%	n.a.	0.00	0.0%	0	0.0%	n.a.
Other loans	0.37	0.2%	1	0.2%	200.91	0.00	0.0%	0	0.0%	n.a.
Total debt:	95.96	48.3%	258	47.5%	201.96	74.58	8.9%	8	88.9%	83.90
Accounts payable:	80.95	40.8%	247	45.5%	177.96	312.83	37.1%	8	88.9%	351.93
Total external financing:	198.57	100.0%	369	68.0%	292.20	842.63	100.0%	9	100.0%	842.63
Short-term bank debt	33.64	16.9%	144	26.5%	126.85	42.53	5.0%	2	22.2%	191.39
Long-term bank debt	25.6	12.9%	40	7.4%	347.52	0.00	0.0%	0	0.0%	n.a.
Line of credit	29.91	15.1%	93	17.1%	174.64	35.97	4.3%	2	22.2%	161.87
Non line of credit	29.33	14.8%	117	21.5%	136.12	6.56	0.8%	2	22.2%	29.52
#	543					9				

Appendix G.B

Year	Sample of nascent firms					Sub-sample of nascent firms that received external equity investments				
	Value 2009		Count 2009		Mean 2009	Value 2009		Count 2009		Mean 2009
Owners' equity	6.40	1.4%	116	17.7%	36.08	91.33	0.4%	5	55.6%	164.39
Family and friends' equity	0.21	0.0%	8	1.2%	17.17	3.67	0.0%	1	11.1%	33.03
Spouse's Equity	0.07	0.0%	4	0.6%	11.45	0.00	0.0%	0	0.0%	n.a.
Parents' Equity	0.14	0.0%	4	0.6%	22.89	3.67	0.0%	1	11.1%	33.03
External equity	323.24	69.6%	9	1.4%	23,488.77	23,488.79	95.6%	9	100.0%	23,488.79
Angels' equity	6.68	1.4%	5	0.8%	873.74	485.56	2.0%	5	55.6%	874.01
Companies' equity	1.57	0.3%	2	0.3%	513.39	113.89	0.5%	2	22.2%	512.51
Government's equity	3.82	0.8%	1	0.2%	2,498.28	277.78	1.1%	1	11.1%	2,500.02
Venture Capital's equity	311.17	67.0%	3	0.5%	67,835.06	22,611.56	92.1%	3	33.3%	67,834.68
Total equity:	329.85	71.0%	123	18.8%	1,753.84	23,583.79	96.0%	9	100.0%	23,583.79
Personal debt	17.98	3.9%	250	38.2%	47.04	71.34	0.3%	5	55.6%	128.41
Personal credit card	2.83	0.6%	128	19.6%	14.46	21.22	0.1%	4	44.4%	47.75
Business credit card	2.93	0.6%	131	20.0%	14.63	24.11	0.1%	5	55.6%	43.40
Personal bank loans	4.09	0.9%	177	27.1%	15.11	13.78	0.1%	4	44.4%	31.01
Family loan to owners	7.90	1.7%	59	9.0%	87.57	5.56	0.0%	2	22.2%	25.02
Personal loan to owners	0.23	0.0%	9	1.4%	16.71	6.67	0.0%	2	22.2%	30.02
Business debt	50.18	10.8%	234	35.8%	140.25	610.78	2.5%	7	77.8%	785.29
Bank business credit card	3.70	0.8%	132	20.2%	18.33	46.33	0.2%	4	44.4%	104.24
Bank credit line	17.17	3.7%	107	16.4%	104.95	146.67	0.6%	4	44.4%	330.01
Bank loan	19.11	4.1%	54	8.3%	231.44	38.89	0.2%	1	11.1%	350.01
Business loan from families	4.96	1.1%	12	1.8%	270.32	100.00	0.4%	2	22.2%	450.00
Business loan from owners	0.33	0.1%	12	1.8%	17.99	0.00	0.0%	0	0.0%	n.a.
Business loan from employees	1.26	0.3%	7	1.1%	117.72	73.33	0.3%	3	33.3%	219.99
Non bank loan	0.46	0.1%	2	0.3%	150.42	0.00	0.0%	0	0.0%	n.a.
Government loan	3.00	0.6%	2	0.3%	981.00	200.00	0.8%	1	11.1%	1,800.00
Other business loan	0.00	0.0%	1	0.2%	0.00	0.00	0.0%	0	0.0%	n.a.
Other individuals' loan	0.01	0.0%	1	0.2%	6.54	0.00	0.0%	0	0.0%	n.a.
Other loans	0.18	0.0%	2	0.3%	58.86	5.56	0.0%	1	11.1%	50.04
Total debt:	68.16	14.7%	350	53.5%	127.36	682.12	2.8%	8	88.9%	767.39
Accounts payable:	66.27	14.3%	331	50.6%	130.94	295.00	1.2%	8	88.9%	331.88
Total external financing:	464.28	100.0%	488	74.6%	622.21	24,560.91	100.0%	9	100.0%	24,560.91
Short-term bank debt	20.87	4.5%	200	30.6%	68.24	193	0.8%	5	55.6%	347.40
Long-term bank debt	19.11	4.1%	54	8.3%	231.44	38.89	0.2%	1	11.1%	350.01
Line of credit	17.17	3.7%	107	16.4%	104.95	146.67	0.6%	4	44.4%	330.01
Non line of credit	22.81	4.9%	161	24.6%	92.66	85.22	0.3%	4	44.4%	191.75
#	654					9				

Appendix H - Definition of variables of firm and owner's characteristics.

Variables	Definition
<i>Firm's characteristics</i>	
$\text{Ln}(\text{Revenues})_{i,t}$	Logarithm of one plus the amount in USD of revenues of firm <i>i</i> in year <i>t</i> .
$\text{Profits}_{i,t}$	The amount in thousands of USDs of profits of firm <i>i</i> in year <i>t</i> .
$\text{Credrisk}_{i,t}$	Dun & Bradstreet credit risk score: from one (lowest probability of delinquency) to five (highest probability of delinquency)
$\text{Employees}_{i,t}$	Number of employees of firm <i>i</i> in year <i>t</i> .
$\text{Hightec}_{i,t}$	Dummy variable that assumes the value of one if firm <i>i</i> in year <i>t</i> is identified as belonging to industries (NAICS) defined as technology employers and generators by the NSF Survey of Industrial Research and Development, and zero otherwise.
$\text{Ln}(\text{Cash})_{i,t}$	Logarithm of one plus the accrued amount in USD of cash and deposits of firm <i>i</i> in year <i>t</i> .
$\text{Ln}(\text{Accounts receivable})_{i,t}$	Logarithm of one plus the accrued amount in USD of accounts receivable of firm <i>i</i> in year <i>t</i> .
$\text{Ln}(\text{Inventories})_{i,t}$	Logarithm of one plus the accrued amount in USD of inventories of firm <i>i</i> in year <i>t</i> .
$\text{Ln}(\text{Fixed assets})_{i,t}$	Logarithm of one plus the accrued amount in USD of fixed assets of firm <i>i</i> in year <i>t</i> .
$\text{Ln}(\text{Total assets})_{i,t}$	Logarithm of one plus the accrued amount in USD of total assets of firm <i>i</i> in year <i>t</i> .
$\text{ROA}_{i,t}$	Return on Assets - profits divided by total assets of firm <i>i</i> in year <i>t</i> .
<i>Owner's characteristics</i>	
$\text{Owner age}_{i,t}$	Age of principal owner of firm <i>i</i> in year <i>t</i> .
$\text{Years of industry experience}_{i,t}$	Years of experience in industry of principal owner of firm <i>i</i> in year <i>t</i> .
$\text{Week hours}_{i,t}$	Average week hours dedicated by principal owner to firm <i>i</i> in year <i>t</i> .
$\text{Startup experience}_{i,t}$	Number of businesses previously created by principal owner of firm <i>i</i> in year <i>t</i> .
$\text{Education}_{i,t}$	Education level of principal owner of firm <i>i</i> in year <i>t</i> : 1: Less than 9th grade, 2: High school not finished, 3: High school, 4: Technical degree, 5: College not finished, 6: Associate degree, 7: Bachelor, 8: Graduate studies not finished, 9: Master, 10: Profess. schools/Doctorate.
$\text{Male}_{i,t}$	Dummy variable that assumes the value of one if the principal owner of firm <i>i</i> in year <i>t</i> is male, and zero otherwise.
$\text{US born}_{i,t}$	Dummy variable that assumes the value of one if the principal owner of firm <i>i</i> in year <i>t</i> is US born, and zero otherwise.

Appendices I and I.B - Evolution of equity, debt¹²⁹ and accounts payable in our sample of firms and in a sub-sample of firms that have patents, from 2005 to 2011.

All variables represent the yearly value surveyed at the end of each year. All variables are non winsorized¹³⁰. Short-term bank debt includes business credit cards and credit lines balances, while long-term bank debt includes the other itmes of debt. Line of credit financing includes credit lines balances and non-line of credit financing includes the other itmes of debt. Owners' equity is the equity financed with owners' net worth; it does not include equity financed by owners' debt. Personal debt is all the debt financed in the owners' name and used in the firms' financing. Business debt is the debt registered in the firms' name. All values are in thousands of USDs.

Year	Sample of nascent firms					Sub-sample of nascent firms that have patents				
	Value 2005		Count 2005		Mean 2005	Value 2005		Count 2005		Mean 2005
Owners' equity	37.58	15.1%	640	45.7%	82.21	128.84	12.2%	44	64.7%	199.12
Family and friends' equity	3.66	1.5%	45	3.2%	113.87	6.69	0.6%	5	7.4%	90.98
Spouse's Equity	2.37	1.0%	15	1.1%	221.20	1.10	0.1%	2	2.9%	37.40
Parents' Equity	1.29	0.5%	35	2.5%	51.60	5.59	0.5%	4	5.9%	95.03
External equity	48.6	19.5%	70	5.0%	972.00	413.59	39.0%	20	29.4%	1,406.21
Angels' equity	11.71	4.7%	43	3.1%	381.26	144.91	13.7%	14	20.6%	703.85
Companies' equity	15.33	6.2%	20	1.4%	1,073.10	51.47	4.9%	4	5.9%	874.99
Government's equity	4.36	1.8%	6	0.4%	1,017.33	89.71	8.5%	5	7.4%	1,220.06
Venture Capital's equity	17.2	6.9%	11	0.8%	2,189.09	127.5	12.0%	4	5.9%	2,167.50
Total equity:	89.84	36.1%	669	47.8%	188.01	549.12	51.8%	51	75.0%	732.16
Personal debt	32.51	13.1%	655	46.8%	69.49	161.47	15.2%	25	36.8%	439.20
Personal credit card	3.79	1.5%	344	24.6%	15.42	3.67	0.3%	16	23.5%	15.60
Business credit card	4.01	1.6%	352	25.1%	15.95	2.83	0.3%	13	19.1%	14.80
Personal bank loans	3.00	1.2%	346	24.7%	12.14	153.75	14.5%	7	10.3%	1,493.57
Family loan to owners	19.86	8.0%	221	15.8%	125.81	0.93	0.1%	4	5.9%	15.81
Personal loan to owners	1.85	0.7%	31	2.2%	83.55	0.29	0.0%	1	1.5%	19.72
Business debt	72.97	29.3%	466	33.3%	219.22	143.84	13.6%	23	33.8%	425.27
Bank business credit card	1.76	0.7%	258	18.4%	9.55	1.12	0.1%	6	8.8%	12.69
Bank credit line	10.37	4.2%	157	11.2%	92.47	10.77	1.0%	7	10.3%	104.62
Bank loan	46.46	18.7%	112	8.0%	580.75	25.46	2.4%	4	5.9%	432.82
Business loan from families	5.80	2.3%	28	2.0%	290.00	53.01	5.0%	3	4.4%	1,201.56
Business loan from owners	1.85	0.7%	38	2.7%	68.16	2.28	0.2%	3	4.4%	51.68
Business loan from employees	1.35	0.5%	20	1.4%	94.50	5.59	0.5%	3	4.4%	126.71
Non bank loan	0.03	0.0%	2	0.1%	21.00	0.07	0.0%	1	1.5%	4.76
Government loan	2.24	0.9%	13	0.9%	241.23	8.04	0.8%	2	2.9%	273.36
Other business loan	0.37	0.1%	4	0.3%	129.50	0.00	0.0%	0	0.0%	n.a.
Other individuals' loan	0.72	0.3%	7	0.5%	144.00	2.21	0.2%	1	1.5%	150.28
Other loans	2.02	0.8%	7	0.5%	404.00	35.29	3.3%	2	2.9%	1,199.86
Total debt:	105.48	42.4%	803	57.4%	183.90	305.31	28.8%	35	51.5%	593.17
Accounts payable:	53.58	21.5%	624	44.6%	120.21	205.27	19.4%	31	45.6%	450.27
Total external financing:	248.90	100.0%	1,143	81.6%	304.86	1,059.70	100.0%	64	94.1%	1,125.93
Short-term bank debt	12.13	4.9%	360	25.7%	47.17	11.89	1.1%	13	19.1%	62.19
Long-term bank debt	46.46	18.7%	112	8.0%	580.75	25.46	2.4%	4	5.9%	432.82
Line of credit	10.37	4.2%	157	11.2%	92.47	10.77	1.0%	7	10.3%	104.62
Non line of credit	48.22	19.4%	336	24.0%	200.92	26.58	2.5%	8	11.8%	225.93
#	1,400					68				

¹²⁹ Equity and debt are from owners, family and friends and external investors and lenders.

¹³⁰ One observation in 2009 was excluded from the current table because it involved one large equity increase from a venture capital fund in the sample of nascent firms, of 200 million USDs, which could distort the analysis of the weights between equity and debt. Nevertheless, this observation is included in appendix I.B.

Appendix I

Year	Sample of nascent firms					Sub-sample of nascent firms that have patents				
	Value 2006		Count 2006		Mean 2006	Value 2006		Count 2006		Mean 2006
Owners' equity	22.96	7.9%	354	34.4%	66.67	127.72	7.9%	35	48.6%	262.74
Family and friends' equity	2.37	0.8%	32	3.1%	76.14	28.02	1.7%	6	8.3%	336.24
Spouse's Equity	0.21	0.1%	12	1.2%	17.99	0.35	0.0%	1	1.4%	25.20
Parents' Equity	2.16	0.7%	24	2.3%	92.52	27.67	1.7%	6	8.3%	332.04
External equity	59.83	20.5%	48	4.7%	1,281.36	776.51	47.8%	18	25.0%	3,106.04
Angels' equity	18.97	6.5%	25	2.4%	780.05	259.85	16.0%	13	18.1%	1,439.17
Companies' equity	4.82	1.7%	15	1.5%	330.33	59.72	3.7%	3	4.2%	1,433.28
Government's equity	0.92	0.3%	5	0.5%	189.15	6.94	0.4%	2	2.8%	249.84
Venture Capital's equity	35.12	12.1%	8	0.8%	4,512.92	450.00	27.7%	5	6.9%	6,480.00
Total equity:	85.16	29.2%	382	37.2%	229.17	932.25	57.4%	45	62.5%	1,491.60
Personal debt	28.51	9.8%	482	46.9%	60.81	34.60	2.1%	34	47.2%	73.27
Personal credit card	3.86	1.3%	237	23.1%	16.74	5.35	0.3%	17	23.6%	22.66
Business credit card	4.25	1.5%	249	24.2%	17.55	2.52	0.2%	22	30.6%	8.25
Personal bank loans	4.34	1.5%	309	30.1%	14.44	19.65	1.2%	15	20.8%	94.32
Family loan to owners	15.40	5.3%	170	16.5%	93.12	3.61	0.2%	2	2.8%	129.96
Personal loan to owners	0.66	0.2%	19	1.8%	35.71	3.47	0.2%	1	1.4%	249.84
Business debt	74.4	25.5%	395	38.4%	193.63	108.34	6.7%	33	45.8%	236.38
Bank business credit card	3.14	1.1%	213	20.7%	15.15	1.97	0.1%	17	23.6%	8.34
Bank credit line	19.52	6.7%	174	16.9%	115.33	11.69	0.7%	11	15.3%	76.52
Bank loan	27.94	9.6%	77	7.5%	373.02	20.40	1.3%	8	11.1%	183.60
Business loan from families	5.64	1.9%	24	2.3%	241.58	35.56	2.2%	4	5.6%	640.08
Business loan from owners	0.41	0.1%	20	1.9%	21.07	0.00	0.0%	0	0.0%	n.a.
Business loan from employees	11.07	3.8%	15	1.5%	758.66	3.54	0.2%	2	2.8%	127.44
Non bank loan	0.10	0.0%	7	0.7%	14.69	0.17	0.0%	1	1.4%	12.24
Government loan	0.96	0.3%	5	0.5%	197.38	5.56	0.3%	2	2.8%	200.16
Other business loan	1.94	0.7%	7	0.7%	284.90	1.67	0.1%	1	1.4%	120.24
Other individuals' loan	2.04	0.7%	2	0.2%	1,048.56	27.78	1.7%	1	1.4%	2,000.16
Other loans	1.64	0.6%	5	0.5%	337.18	0.00	0.0%	0	0.0%	n.a.
Total debt:	102.91	35.3%	623	60.6%	169.81	142.94	8.8%	46	63.9%	223.73
Accounts payable:	103.23	35.4%	493	48.0%	215.25	548.81	33.8%	43	59.7%	918.94
Total external financing:	291.30	100.0%	828	80.5%	361.66	1,624.00	100.0%	66	91.7%	1,771.64
Short-term bank debt	22.66	7.8%	322	31.3%	72.34	13.66	0.8%	25	34.7%	39.34
Long-term bank debt	27.94	9.6%	77	7.5%	373.02	20.40	1.3%	8	11.1%	183.60
Line of credit	19.52	6.7%	174	16.9%	115.33	11.69	0.7%	11	15.3%	76.52
Non line of credit	31.08	10.7%	271	26.4%	117.90	22.37	1.4%	23	31.9%	70.03
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Year	Sample of nascent firms					Sub-sample of nascent firms that have patents				
	Value 2007		Count 2007		Mean 2007	Value 2007		Count 2007		Mean 2007
Owners' equity	15.2	8.2%	231	28.1%	54.15	57.87	7.9%	25	44.6%	129.63
Family and friends' equity	0.83	0.4%	16	1.9%	42.69	4.74	0.6%	4	7.1%	66.36
Spouse's Equity	0.10	0.1%	3	0.4%	27.43	0.45	0.1%	1	1.8%	25.20
Parents' Equity	0.73	0.4%	15	1.8%	40.05	4.29	0.6%	4	7.1%	60.06
External equity	21.32	11.5%	22	2.7%	797.56	284.86	39.0%	10	17.9%	1,595.22
Angels' equity	4.91	2.6%	15	1.8%	269.40	66.11	9.0%	8	14.3%	462.77
Companies' equity	0.67	0.4%	7	0.9%	78.77	5.36	0.7%	2	3.6%	150.08
Government's equity	2.13	1.1%	2	0.2%	876.50	13.39	1.8%	1	1.8%	749.84
Venture Capital's equity	13.61	7.3%	3	0.4%	3,733.68	200.00	27.4%	3	5.4%	3,733.33
Total equity:	37.35	20.1%	246	29.9%	124.96	347.47	47.6%	30	53.6%	648.61
Personal debt	24.35	13.1%	343	41.7%	58.43	63.42	8.7%	31	55.4%	114.57
Personal credit card	3.71	2.0%	157	19.1%	19.45	11.8	1.6%	14	25.0%	47.20
Business credit card	4.02	2.2%	160	19.4%	20.68	3.77	0.5%	19	33.9%	11.11
Personal bank loans	5.11	2.8%	240	29.2%	17.52	45.6	6.2%	46	82.1%	55.51
Family loan to owners	11.26	6.1%	103	12.5%	89.97	2.25	0.3%	5	8.9%	25.20
Personal loan to owners	0.25	0.1%	6	0.7%	34.29	0.00	0.0%	0	0.0%	n.a.
Business debt	60.45	32.6%	313	38.0%	158.95	212.9	29.1%	20	35.7%	596.12
Bank business credit card	2.48	1.3%	157	19.1%	13.00	0.28	0.0%	7	12.5%	2.24
Bank credit line	19.59	10.6%	167	20.3%	96.54	23.42	3.2%	6	10.7%	218.59
Bank loan	23.28	12.6%	84	10.2%	228.09	163.84	22.4%	4	7.1%	2,293.76
Business loan from families	5.68	3.1%	23	2.8%	203.25	20.00	2.7%	5	8.9%	224.00
Business loan from owners	1.21	0.7%	14	1.7%	71.13	0.00	0.0%	0	0.0%	n.a.
Business loan from employees	1.38	0.7%	6	0.7%	189.29	1.79	0.2%	1	1.8%	100.24
Non bank loan	0.25	0.1%	3	0.4%	68.58	0.00	0.0%	0	0.0%	n.a.
Government loan	2.38	1.3%	3	0.4%	652.91	2.86	0.4%	1	1.8%	160.16
Other business loan	0.19	0.1%	2	0.2%	78.19	0.00	0.0%	0	0.0%	n.a.
Other individuals' loan	0.06	0.0%	3	0.4%	16.46	0.71	0.1%	1	1.8%	39.76
Other loans	3.95	2.1%	1	0.1%	3,250.85	0.00	0.0%	0	0.0%	n.a.
Total debt:	84.80	45.7%	466	56.6%	149.76	276.32	37.8%	37	66.1%	418.21
Accounts payable:	63.28	34.1%	408	49.6%	127.65	106.91	14.6%	34	60.7%	176.09
Total external financing:	185.43	100.0%	635	77.2%	240.33	730.70	100.0%	50	89.3%	818.38
Short-term bank debt	22.07	11.9%	256	31.1%	70.95	23.70	3.2%	12	21.4%	110.60
Long-term bank debt	23.28	12.6%	84	10.2%	228.09	163.84	22.4%	4	7.1%	2,293.76
Line of credit	19.59	10.6%	167	20.3%	96.54	23.42	3.2%	6	10.7%	218.59
Non line of credit	25.76	13.9%	209	25.4%	101.44	164.12	22.5%	10	17.9%	919.07
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Year	Sample of nascent firms					Sub-sample of nascent firms that have patents				
	Value 2008		Count 2008		Mean 2008	Value 2008		Count 2008		Mean 2008
Owners' equity	18.09	8.7%	191	25.2%	71.79	64.12	8.9%	18	41.9%	153.18
Family and friends' equity	0.65	0.3%	14	1.8%	35.19	1.16	0.2%	2	4.7%	24.94
Spouse's Equity	0.00	0.0%	1	0.1%	0.00	0.00	0.0%	0	0.0%	n.a.
Parents' Equity	0.65	0.3%	13	1.7%	37.90	1.16	0.2%	2	4.7%	24.94
External equity	20.82	10.0%	18	2.4%	876.75	309.82	43.2%	10	23.3%	1,332.23
Angels' equity	14.79	7.1%	13	1.7%	862.37	235.40	32.9%	9	20.9%	1,124.69
Companies' equity	5.76	2.8%	5	0.7%	873.22	69.77	9.7%	1	2.3%	3,000.11
Government's equity	0.00	0.0%	0	0.0%	n.a.	0.00	0.0%	0	0.0%	n.a.
Venture Capital's equity	0.27	0.1%	2	0.3%	102.33	4.65	0.6%	1	2.3%	199.95
Total equity:	39.56	19.0%	204	26.9%	146.99	375.10	52.3%	22	51.2%	733.15
Personal debt	31.56	15.2%	332	43.8%	72.06	98.03	13.7%	21	48.8%	200.73
Personal credit card	3.16	1.5%	152	20.1%	15.76	4.02	0.6%	7	16.3%	24.69
Business credit card	3.36	1.6%	155	20.4%	16.43	5.55	0.8%	14	32.6%	17.05
Personal bank loans	4.44	2.1%	236	31.1%	14.26	85.65	12.0%	6	14.0%	613.83
Family loan to owners	15.67	7.5%	84	11.1%	141.40	2.60	0.4%	4	9.3%	27.95
Personal loan to owners	4.93	2.4%	12	1.6%	311.41	0.21	0.0%	1	2.3%	9.03
Business debt	62.17	29.9%	275	36.3%	171.36	89.83	12.5%	16	37.2%	241.42
Bank business credit card	2.75	1.3%	129	17.0%	16.16	1.60	0.2%	5	11.6%	13.76
Bank credit line	26.22	12.6%	160	21.1%	124.22	5.67	0.8%	5	11.6%	48.76
Bank loan	23.72	11.4%	61	8.0%	294.75	37.44	5.2%	5	11.6%	321.98
Business loan from families	2.43	1.2%	15	2.0%	122.80	2.33	0.3%	1	2.3%	100.19
Business loan from owners	0.99	0.5%	10	1.3%	75.04	4.19	0.6%	1	2.3%	180.17
Business loan from employees	1.36	0.7%	7	0.9%	147.27	0.00	0.0%	0	0.0%	n.a.
Non bank loan	0.12	0.1%	3	0.4%	30.32	0.70	0.1%	1	2.3%	30.10
Government loan	0.55	0.3%	3	0.4%	138.97	0.00	0.0%	0	0.0%	n.a.
Other business loan	1.55	0.7%	4	0.5%	293.73	0.23	0.0%	1	2.3%	9.89
Other individuals' loan	1.98	1.0%	5	0.7%	300.17	31.86	4.4%	2	4.7%	684.99
Other loans	0.50	0.2%	3	0.4%	126.33	5.81	0.8%	1	2.3%	249.83
Total debt:	93.73	45.1%	434	57.3%	163.70	187.86	26.2%	25	58.1%	323.12
Accounts payable:	74.76	35.9%	409	54.0%	138.55	153.60	21.4%	29	67.4%	227.75
Total external financing:	208.05	100.0%	587	77.4%	268.66	716.56	100.0%	38	88.4%	810.84
Short-term bank debt	28.97	13.9%	232	30.6%	94.65	7.27	1.0%	9	20.9%	34.73
Long-term bank debt	23.72	11.4%	61	8.0%	294.75	37.44	5.2%	5	11.6%	321.98
Line of credit	26.22	12.6%	160	21.1%	124.22	5.67	0.8%	5	11.6%	48.76
Non line of credit	26.47	12.7%	170	22.4%	118.03	39.04	5.4%	8	18.6%	209.84
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Year	Sample of nascent firms					Sub-sample of nascent firms that have patents				
	Value 2009		Count 2009		Mean 2009	Value 2009		Count 2009		Mean 2009
Owners' equity	6.40	4.1%	116	17.8%	36.03	26.26	3.6%	11	31.4%	83.55
Family and friends' equity	0.21	0.1%	8	1.2%	17.14	0.00	0.0%	0	0.0%	n.a.
Spouse's Equity	0.07	0.0%	4	0.6%	11.43	0.00	0.0%	0	0.0%	n.a.
Parents' Equity	0.14	0.1%	4	0.6%	22.86	0.00	0.0%	0	0.0%	n.a.
External equity	17.43	11.1%	8	1.2%	1,422.72	209.14	28.6%	3	8.6%	2,439.97
Angels' equity	6.68	4.3%	5	0.8%	872.41	109.14	14.9%	3	8.6%	1,273.30
Companies' equity	1.57	1.0%	2	0.3%	512.61	0.00	0.0%	0	0.0%	n.a.
Government's equity	3.82	2.4%	1	0.2%	2,494.46	0.00	0.0%	0	0.0%	n.a.
Venture Capital's equity	5.36	3.4%	2	0.3%	1,750.04	100.00	13.7%	1	2.9%	3,500.00
Total equity:	24.04	15.3%	122	18.7%	128.67	235.40	32.2%	12	34.3%	686.58
Personal debt	17.98	11.5%	250	38.3%	46.96	33.81	4.6%	9	25.7%	131.48
Personal credit card	2.83	1.8%	128	19.6%	14.44	3.03	0.4%	3	8.6%	35.35
Business credit card	2.93	1.9%	131	20.1%	14.61	3.23	0.4%	5	14.3%	22.61
Personal bank loans	4.09	2.6%	177	27.1%	15.09	0.26	0.0%	2	5.7%	4.55
Family loan to owners	7.90	5.0%	59	9.0%	87.44	27.29	3.7%	3	8.6%	318.38
Personal loan to owners	0.23	0.1%	9	1.4%	16.69	0.00	0.0%	0	0.0%	n.a.
Business debt	49.11	31.3%	233	35.7%	137.63	222.16	30.4%	16	45.7%	485.98
Bank business credit card	3.7	2.4%	132	20.2%	18.30	0.73	0.1%	5	14.3%	5.11
Bank credit line	16.1	10.3%	106	16.2%	99.18	12.29	1.7%	4	11.4%	107.54
Bank loan	19.11	12.2%	54	8.3%	231.09	148.57	20.3%	3	8.6%	1,733.32
Business loan from families	4.96	3.2%	12	1.8%	269.91	28.57	3.9%	1	2.9%	999.95
Business loan from owners	0.33	0.2%	12	1.8%	17.96	0.00	0.0%	0	0.0%	n.a.
Business loan from employees	1.26	0.8%	7	1.1%	117.54	20.00	2.7%	4	11.4%	175.00
Non bank loan	0.46	0.3%	2	0.3%	150.19	8.57	1.2%	1	2.9%	299.95
Government loan	3.00	1.9%	2	0.3%	979.50	0.00	0.0%	0	0.0%	n.a.
Other business loan	0.00	0.0%	1	0.2%	0.00	0.00	0.0%	0	0.0%	n.a.
Other individuals' loan	0.01	0.0%	1	0.2%	6.53	0.14	0.0%	1	2.9%	4.90
Other loans	0.18	0.1%	2	0.3%	58.77	3.29	0.5%	2	5.7%	57.58
Total debt:	67.09	42.8%	349	53.4%	125.53	255.97	35.0%	19	54.3%	471.52
Accounts payable:	65.66	41.9%	330	50.5%	129.93	239.62	32.8%	21	60.0%	399.37
Total external financing:	156.79	100.0%	487	74.6%	210.23	730.99	100.0%	27	77.1%	947.58
Short-term bank debt	19.80	12.6%	199	30.5%	64.97	13.02	1.8%	8	22.9%	56.96
Long-term bank debt	19.11	12.2%	54	8.3%	231.09	148.57	20.3%	3	8.6%	1,733.32
Line of credit	16.10	10.3%	106	16.2%	99.18	12.29	1.7%	4	11.4%	107.54
Non line of credit	22.81	14.5%	161	24.7%	92.52	149.30	20.4%	8	22.9%	653.19
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Year	Sample of nascent firms					Sub-sample of nascent firms that have patents				
	Value 2010		Count 2010		Mean 2010	Value 2010		Count 2010		Mean 2010
Owners' equity	4.82	2.5%	106	17.2%	28.01	21.57	2.3%	8	23.5%	91.67
Family and friends' equity	0.39	0.2%	5	0.8%	48.05	0.00	0.0%	0	0.0%	n.a.
Spouse's Equity	0.12	0.1%	2	0.3%	36.96	0.00	0.0%	0	0.0%	n.a.
Parents' Equity	0.27	0.1%	3	0.5%	55.44	0.00	0.0%	0	0.0%	n.a.
External equity	17.64	9.3%	10	1.6%	1,086.62	296.76	31.8%	4	11.8%	2,522.46
Angels' equity	1.00	0.5%	7	1.1%	88.00	2.65	0.3%	2	5.9%	45.05
Companies' equity	3.41	1.8%	2	0.3%	1,050.28	58.82	6.3%	1	2.9%	1,999.88
Government's equity	0.24	0.1%	1	0.2%	147.84	0.00	0.0%	0	0.0%	n.a.
Venture Capital's equity	12.99	6.8%	1	0.2%	8,001.84	235.29	25.2%	1	2.9%	7,999.86
Total equity:	22.85	12.0%	113	18.3%	124.56	318.33	34.1%	9	26.5%	1,202.58
Personal debt	30.33	15.9%	233	37.8%	80.19	17.33	1.9%	10	29.4%	58.92
Personal credit card	2.22	1.2%	101	16.4%	13.54	1.65	0.2%	4	11.8%	14.03
Business credit card	2.39	1.3%	103	16.7%	14.29	1.33	0.1%	7	20.6%	6.46
Personal bank loans	4.26	2.2%	166	26.9%	15.81	14.22	1.5%	4	11.8%	120.87
Family loan to owners	19.97	10.5%	42	6.8%	292.89	0.13	0.0%	1	2.9%	4.42
Personal loan to owners	1.49	0.8%	8	1.3%	114.73	0.00	0.0%	0	0.0%	n.a.
Business debt	58.55	30.7%	185	30.0%	194.96	256.57	27.5%	13	38.2%	671.03
Bank business credit card	3.47	1.8%	104	16.9%	20.55	2.41	0.3%	6	17.6%	13.66
Bank credit line	15.50	8.1%	88	14.3%	108.50	16.94	1.8%	6	17.6%	95.99
Bank loan	32.70	17.2%	55	8.9%	366.24	232.57	24.9%	5	14.7%	1,581.48
Business loan from families	0.41	0.2%	5	0.8%	50.51	0.00	0.0%	0	0.0%	n.a.
Business loan from owners	2.46	1.3%	7	1.1%	216.48	3.47	0.4%	1	2.9%	117.98
Business loan from employees	1.34	0.7%	8	1.3%	103.18	1.18	0.1%	1	2.9%	40.12
Non bank loan	0.19	0.1%	1	0.2%	117.04	0.00	0.0%	0	0.0%	n.a.
Government loan	0.36	0.2%	1	0.2%	221.76	0.00	0.0%	0	0.0%	n.a.
Other business loan	2.12	1.1%	3	0.5%	435.31	0.00	0.0%	0	0.0%	n.a.
Other individuals' loan	0.00	0.0%	3	0.5%	0.00	0.00	0.0%	0	0.0%	n.a.
Other loans	0.00	0.0%	0	0.0%	n.a.	0.00	0.0%	0	0.0%	n.a.
Total debt:	88.88	46.7%	307	49.8%	275.14	273.90	29.3%	17	50.0%	729.95
Accounts payable:	78.74	41.3%	300	48.7%	161.68	341.22	36.6%	21	61.8%	552.45
Total external financing:	190.47	100.0%	444	72.1%	264.26	933.45	100.0%	27	79.4%	1,175.46
Short-term bank debt	18.97	10.0%	155	25.2%	75.39	19.35	2.1%	10	29.4%	65.79
Long-term bank debt	32.7	17.2%	55	8.9%	366.24	232.57	24.9%	5	14.7%	1,581.48
Line of credit	15.50	8.1%	88	14.3%	108.50	16.94	1.8%	6	17.6%	95.99
Non line of credit	36.17	19.0%	139	22.6%	160.29	234.98	25.2%	10	29.4%	798.93
#	616					34				

Appendix I

Year	Sample of nascent firms					Sub-sample of nascent firms that have patents				
	Value 2011		Count 2011		Mean 2011	Value 2011		Count 2011		Mean 2011
Owners' equity	14.05	7.1%	90	16.6%	84.77	185.27	29.7%	6	23.1%	802.84
Family and friends' equity	0.44	0.2%	6	1.1%	39.82	0.00	0.0%	0	0.0%	n.a.
Spouse's Equity	0.05	0.0%	3	0.6%	9.05	0.00	0.0%	0	0.0%	n.a.
Parents' Equity	0.39	0.2%	3	0.6%	70.59	0.00	0.0%	0	0.0%	n.a.
External equity	7.17	3.6%	9	1.7%	432.59	90.38	14.5%	2	7.7%	1,174.94
Angels' equity	2.24	1.1%	6	1.1%	202.72	13.46	2.2%	2	7.7%	174.98
Companies' equity	4.33	2.2%	3	0.6%	783.73	76.92	12.3%	1	3.8%	1,999.92
Government's equity	0.60	0.3%	1	0.2%	325.80	0.00	0.0%	0	0.0%	n.a.
Venture Capital's equity	0.00	0.0%	0	0.0%	n.a.	0.00	0.0%	0	0.0%	n.a.
Total equity:	21.66	10.9%	101	18.6%	116.45	275.65	44.1%	8	30.8%	895.86
Personal debt	32.35	16.3%	191	35.2%	91.97	12.12	1.9%	9	34.6%	35.01
Personal credit card	2.17	1.1%	79	14.5%	14.92	1.81	0.3%	3	11.5%	15.69
Business credit card	2.32	1.2%	84	15.5%	15.00	2.58	0.4%	6	23.1%	11.18
Personal bank loans	3.21	1.6%	143	26.3%	12.19	3.08	0.5%	1	3.8%	80.08
Family loan to owners	24.59	12.4%	33	6.1%	404.62	4.65	0.7%	3	11.5%	40.30
Personal loan to owners	0.06	0.0%	3	0.6%	10.86	0.00	0.0%	0	0.0%	n.a.
Business debt	63.61	32.0%	165	30.4%	209.33	37.25	6.0%	12	46.2%	80.71
Bank business credit card	3.73	1.9%	90	16.6%	22.50	4.62	0.7%	8	30.8%	15.02
Bank credit line	29.91	15.1%	93	17.1%	174.64	21.39	3.4%	4	15.4%	139.04
Bank loan	25.60	12.9%	40	7.4%	347.52	1.24	0.2%	1	3.8%	32.24
Business loan from families	0.64	0.3%	5	0.9%	69.50	9.62	1.5%	1	3.8%	250.12
Business loan from owners	1.39	0.7%	6	1.1%	125.80	0.38	0.1%	1	3.8%	9.88
Business loan from employees	0.13	0.1%	2	0.4%	35.30	0.00	0.0%	0	0.0%	n.a.
Non bank loan	0.00	0.0%	0	0.0%	n.a.	0.00	0.0%	0	0.0%	n.a.
Government loan	1.84	0.9%	1	0.2%	999.12	0.00	0.0%	0	0.0%	n.a.
Other business loan	0.00	0.0%	0	0.0%	n.a.	0.00	0.0%	0	0.0%	n.a.
Other individuals' loan	0.00	0.0%	0	0.0%	n.a.	0.00	0.0%	0	0.0%	n.a.
Other loans	0.37	0.2%	1	0.2%	200.91	0.00	0.0%	0	0.0%	n.a.
Total debt:	95.96	48.3%	258	47.5%	201.96	49.37	7.9%	16	61.5%	80.23
Accounts payable:	80.95	40.8%	247	45.5%	177.96	299.76	48.0%	18	69.2%	432.99
Total external financing:	198.57	100.0%	369	68.0%	292.20	624.78	100.0%	23	88.5%	706.27
Short-term bank debt	33.64	16.9%	144	26.5%	126.85	26.01	4.2%	11	42.3%	61.48
Long-term bank debt	25.6	12.9%	40	7.4%	347.52	1.24	0.2%	1	3.8%	32.24
Line of credit	29.91	15.1%	93	17.1%	174.64	21.39	3.4%	4	15.4%	139.04
Non line of credit	29.33	14.8%	117	21.5%	136.12	5.86	0.9%	9	34.6%	16.93
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Appendix I.B

Year	Sample of nascent firms				
	Value 2009		Count 2009		Mean 2009
Owners' equity	6.40	1.4%	116	17.7%	36.08
Family and friends' equity	0.21	0.0%	8	1.2%	17.17
Spouse's Equity	0.07	0.0%	4	0.6%	11.45
Parents' Equity	0.14	0.0%	4	0.6%	22.89
External equity	323.24	69.6%	9	1.4%	23,488.77
Angels' equity	6.68	1.4%	5	0.8%	873.74
Companies' equity	1.57	0.3%	2	0.3%	513.39
Government's equity	3.82	0.8%	1	0.2%	2,498.28
Venture Capital's equity	311.17	67.0%	3	0.5%	67,835.06
Total equity:	329.85	71.0%	123	18.8%	1,753.84
Personal debt	17.98	3.9%	250	38.2%	47.04
Personal credit card	2.83	0.6%	128	19.6%	14.46
Business credit card	2.93	0.6%	131	20.0%	14.63
Personal bank loans	4.09	0.9%	177	27.1%	15.11
Family loan to owners	7.90	1.7%	59	9.0%	87.57
Personal loan to owners	0.23	0.0%	9	1.4%	16.71
Business debt	50.18	10.8%	234	35.8%	140.25
Bank business credit card	3.70	0.8%	132	20.2%	18.33
Bank credit line	17.17	3.7%	107	16.4%	104.95
Bank loan	19.11	4.1%	54	8.3%	231.44
Business loan from families	4.96	1.1%	12	1.8%	270.32
Business loan from owners	0.33	0.1%	12	1.8%	17.99
Business loan from employees	1.26	0.3%	7	1.1%	117.72
Non bank loan	0.46	0.1%	2	0.3%	150.42
Government loan	3.00	0.6%	2	0.3%	981.00
Other business loan	0.00	0.0%	1	0.2%	0.00
Other individuals' loan	0.01	0.0%	1	0.2%	6.54
Other loans	0.18	0.0%	2	0.3%	58.86
Total debt:	68.16	14.7%	350	53.5%	127.36
Accounts payable:	66.27	14.3%	331	50.6%	130.94
Total external financing:	464.28	100.0%	488	74.6%	622.21
Short-term bank debt	20.87	4.5%	200	30.6%	68.24
Long-term bank debt	19.11	4.1%	54	8.3%	231.44
Line of credit	17.17	3.7%	107	16.4%	104.95
Non line of credit	22.81	4.9%	161	24.6%	92.66
#	654				

