The Effect of Venture Capital Involvement on Capital Structure Determinants*

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Abstract

This paper analyzes the change in the capital structure behavior in a sample of Spanish venture capital (VC) backed firms after the first capital infusion. We find that VC investors contribute to unlisted growing firms in the attraction of other long term sources of funds to continue their growth process. Our results show significant changes in determinants such as tangibility, size and profitability. Regarding tangibility and size, the entrance of an external investor seems to have a certification effect that eases the need to have either tangible assets or a large size to obtain additional debt financing. As regards profitability, the investments carried out after the initial VC investment do affect short term profitability (i.e. larger depreciation), but this situation is not linked to a restrained access to external debt.

JEL classification: G32, G24.

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1. *Introduction*

There is a vast literature that analyzes the role that venture capitalists (VCs, henceforth) play in their investee firms. The impact that venture capital (VC hereafter) exerts on job creation, professionalization of the firm, performance improvement and innovation, among others, has been thoroughly studied (Kortum and Lerner 2000; Hellmann and Puri 2002; Davila, Foster, and Gupta 2003; Baum and Silverman 2004; Alemany and Martí 2005; Engel and Keilbach 2006; among others). However, there are few studies related to the capital structure of VC-backed firms, and, in particular, to the effect that VC exerts in the subsequent financing of the firms they back. Once the firm approaches, and attracts, a VC investor, a substantial change occurs in the capital structure of the investee firm. Initially, a significant amount of equity, or quasi-equity, is added at the time of the investment event. If a staging strategy (Sahlman 1990) is applied, then more equity is added in the subsequent years. But the impact of VC is not only restricted to obtaining follow-on equity financing, from the same or from other VC firms, but also additional debt financing (Baeyens and Manigart 2006).

One of the main factors that drive this effect on subsequent financing is the value added services that VC firms provide for their investee firms. Among these services, contacts with investment bankers should be highlighted (Sahlman 1990; Tykvová 2007). These contacts, along with the increased equity base and the reputational effect of having a financial partner (Megginson and Weiss 1991), such as a VC firm, allow the investee firm to access further debt financing. Therefore, after the entry of a VC firm substantial changes in the capital structure of the firms backed are expected to occur.

However, and as far as we are aware, the literature has not analyzed yet the effect on the capital structure of firms after the entry of a VC investor. In order to cover this gap, the aim of this paper is to provide evidence on the determinants of the debt ratio after the initial VC investment, and, also, to compare these determinants with those found before the VC

entry. Moreover, we aim to analyze whether these changes, if any, contribute to explain the effect that VC could exert on further financing. In this way, we focus on the investee firm characteristics, which represents the demand side of the VC market, whereas most of the existing literature focuses on supply side approaches (Baeyens and Manigart 2006).

The analysis is carried out on a large sample of Spanish VC-backed firms that received an initial VC investment between 1995 and 2004, keeping track of their accounting data until 2007, whenever possible. By focusing on the Spanish market, we are able to check the effect on capital structure determinants of an external equity injection in firms located in a representative European bank-oriented market. Furthermore, we agree with De Clercq, Sapienza and Zaheer (2008) that limiting the scope of analysis to one country increases the likelihood that the participants operate under similar constraints derived from the institutional and legal environment. The sample is composed of firms at the expansion stage, including both successful and failed firms, which is thus not affected by survival bias.

After receiving the VC investment, the results show that debt is less dependent on tangibility. Regarding size, the impact on the debt ratio after the investment is less clear, showing either a similar or a weaker relationship between these two variables. The effects of volatility, growth opportunities and effective taxes paid are similar in the pre and post-investment periods, with the latter two variables showing a positive and significant effect on the debt ratio. Finally, profitability shows a stronger negative impact after the VC event.

As main contribution of this paper, the evidence provided on the capital structure determinants after an equity financing shock occurs in a firm, which has received little attention in the literature, should be highlighted. This paper also contributes to increasing the VC literature from a demand side perspective, which is often neglected. Also, the evidence presented is free of any survival bias, since both successful and failed firms are included in the sample.

The rest of the paper is organized as follows. Section two provides an overview on the theory concerning the pre and post-investment activities of VCs and their possible effect on debt financing. Section three describes the data and the methodology employed. The results of the regressions are presented in Section four. Finally, Section five concludes and discusses the results.

2. *Venture Capitalists and their Effects on Debt Financing*

2.1 Venture Capitalists: Pre and Post-investment Activities

Firms with significant growth opportunities and/or high research and development expenditures may face severe information asymmetry problems (Gompers 1995), which may lead to agency problems such as adverse selection and moral hazard. This may cause a substantial difference between the costs of internal and external funds (Carpenter and Petersen 2002), which limits the possibility of obtaining external financing.

Even if debt is available, banks typically require assets to be placed as collateral[1] and may include covenants in debt contracts to reduce information asymmetry problems (Berger and Udell 1998). Additionally, banks are cash flow lenders, since they are interested in lending money to firms that can honor the debt payments (Carey, Post, and Shape 1998). The access to external equity is even more problematic because the potential investors would demand a high premium for the possible adverse selection problems (Akerlof 1970). In the case of unlisted firms, the illiquid nature of the shares acquired is also a reason for concern. To sum up, it is difficult for unlisted firms without assets they can use as collateral and a well established track record to attract external funding. In this context, unlisted firms with valuable growth opportunities are limited to carrying out their investments mainly on the basis of internally generated funds.

[1] There is a vast literature that shows the key role that collateral plays in the contract between borrowers and lenders (Chan and Thakor 1987; Titman and Wessels 1988; Frank and Goyal 2009; among others).

To mitigate this problem, VCs appear as specialized financial intermediaries that can best deal with information asymmetry problems, allowing growing firms to receive funds that cannot be obtained from other sources. As Fried and Hisrich (1994) point out, VC represents the only source of external funds for some firms. VCs are considered as specialized and well informed investors that operate in environments where their relative efficiency in selecting and monitoring investments gives them a comparative advantage over other traditional investors (Amit, Brander, and Zott 1998; Ueda 2004). The information processing capacities that VCs possess help them to reduce information asymmetries and, therefore, adverse selection and moral hazard problems. But VCs do not limit their activity to providing funds, since they perform a variety of pre and post-investment activities.

Regarding the pre-investment activities, it should be highlighted that VCs carry out an intensive screening, thorough scrutiny and valuation process of the firm before providing capital. They assess factors such as management team competence, product and market/industry characteristics and financial aspects of the investment opportunity (Tyebjee and Bruno 1984; Fried and Hisrich 1994; Muzyka, Birley, and Leleux 1996; Sheperd, Ettenson, and Crouch 2000; Zacharakis and Meyer 2000; among others).

According to Wright and Robbie (1996), VCs use a wide set of financial and non financial information, including unpublished accounting and/or subjective information, in order to assess the feasibility of a specific investment. In a European study, Manigart , Wright, Robbie, Desbrières, and De Waele (1997) find evidence on the information sources used by VCs in their evaluation process, among which their own due diligence report, the coherence of the business plan and the financial reports (historic and projected) should be highlighted. Additionally, they find that the most important risk factors that determine the required returns are the managerial skills, the nature of the product/market and the stage of development of the candidate firm.

Another tool that VCs could use to reduce the uncertainty on the new investments is syndication[2] (Bygrave 1988; Lerner 1995; Hopp and Rieder 2010), by which the VC firm that originates the deal invites other VCs to take part in the investment. Beyond the interest in dividing the funding needed in the investment, and the related risk, which is spread among different players, the VC firm presenting the project aims to get a 'second opinion' from other VC investors (Lerner 1994). Lerner (1994) also finds that syndication is common in the first investment round, when the VC managers are not fully convinced about the firm's prospects and look for other VCs with similar experience to invest in the same project. Brander, Amit, and Antweiler (2002) argue that syndication may improve the selection process given that more than one independent VCs would be screening the project, and each one has his/her own experience from previous deals. In the same vein, Casamatta and Haritchabalet (2007) argue that syndication helps to gather information, thus improving the selection process. All these processes allow VCs to better address the problems of adverse selection.

Regarding the post-investment activities, and after the initial investment is carried out, VCs are deeply committed to adding value to their portfolio firms. Gorman and Sahlman (1989) find that, on average, the lead investor visits each company 19 times per year and spends 100 hours in direct contacts. VCs play an active role by means of a variety of activities, providing added value services such as strategic and tactic advice, recruitment of senior management, work with suppliers and customers and help in obtaining new funds, among others (Sahlman 1990; Hellmann and Puri 2000) and in some situations they are willing to take over day to day operations (Sahlman 1990). All these activities increase the likelihood of success and enhance the value of the investment. Syndication could also help to further increase the value added to investee firms, since syndicate members are able to share

[2] It is necessary to remark that there are other reasons for syndication. Manigart, Lockett, Meuleman, Wright, Landström, Bruining, Desbrières, and Hommel (2006) classify the motives in four groups: financial aspects, access to deal flow, deal selection and value-adding services. They consider that the first two improve the management of the overall portfolio, whereas the latter two improve the management of individual firm.

their specific knowledge, complementary skills and information (Brander, Amit, and Antweiler 2002).

The advisory role played by VCs entails a frequent interaction with the firm's chief executive officer (CEO), which depends on several factors, such as the incongruousness of potential goals, CEO experience and task uncertainty, among others (Sapienza and Gupta 1994). Additionally, VC managers will have at least one seat on the firm's board of directors (Gompers and Lerner 2001), with their involvement being more intensive when the need for oversight and monitoring is greater (Lerner 1995). VCs also contribute in the formulation of human resources policies, establishing stock option plans and hiring key executives, thus playing an important role in the professionalization of the investee firm (Gorman and Sahlman 1989; Hellmann and Puri 2002). The close monitoring of the firm as soon as it receives the money allows VCs to address moral hazard problems (Lerner 1995) and help them to respond quickly to warning signals, thus preventing serious troubles 'infecting' the firm (Hassan and Leece 2008).

Therefore, in both pre and post-investment activities, VCs play an important role serving as information producers (Chan 1983; Sahlman 1990), first through the scrutiny and screening process, and later by the close monitoring of the firm. These activities allow VCs to reduce information asymmetries, which in turn allow the firm to obtain financing in better conditions or, even, to obtain funds that would have been unavailable from other traditional sources.

In this sense, VCs contribute to the certification of the firm for outside investors/stakeholders. Given that VCs are perceived to be 'informed investors', able to identify firms with good prospects, their involvement provides a certification effect that may enable the firm to obtain further funds from other sources (Megginson and Weiss 1991). In the same vein, Sahlman (1990) points out that VC-backed firms can often gain access to more

funds because they have access to the VCs´ contacts in the financial community. Baum and Silverman (2004) also maintain that VC investment should facilitate the investee firm's efforts to obtain other necessary resources.

2.2 Debt Financing Behavior after the Initial VC Investment

Regarding the funding of portfolio firms after the first capital infusion, issuing more equity would imply a dilution of the VC firm's stake and, therefore, a decrease in the potential gain if the project is successful. On the other hand, the increased equity base after the investment, the certification that VCs provide on the investee firm's prospects and the decrease in the level of information asymmetries ease the access to new debt. Therefore, VCs push firms to use debt financing when available, thus reducing the need to commit more capital, which would dilute their share in the firm, and increasing the expected rate of return. Delaying the next capital infusion gives VCs time to evaluate the firm's prospects and to decide whether they will fund the next equity round or not (Ibrahim 2010).

Baeyens and Manigart (2003) find that, after an initial VC investment, VC-backed firms rely more on long and short term financial debt than non VC-backed firms. In the same line, Baeyens and Manigart (2006) analyze the financing strategies in a sample of start-ups, which are most affected by problems of information asymmetries, bankruptcy risk and limited debt capacity, after receiving VC. Contrary to their expectations they find that firms rely more on debt than equity, which could be explained by the certification effect that VCs provide for their portfolio companies. Given the screening and monitoring activities carried out by VCs to reduce information asymmetries, other sources of finance may benefit from the efforts of VCs at no cost.

Therefore, the desired capital structure of VC-backed firms may change after the VC entry. This implies that some differences in the factors that affect debt financing are expected to be found when the pre and post-investment stages are compared. As already stated, the

main aim of this paper is to analyze the changes in the determinants of the capital structure after the VC entry. The variables that are analyzed are those that have already proved to have an impact on the capital structure, namely tangible fixed assets, the size of the firm, profitability, volatility, growth opportunities and corporate taxes paid (among many others, Titman and Wessels 1988; Harris and Raviv 1991).

According to the theory on capital structure, agency problems and the probability of the liquidation of the firm justify the need to use collateral to obtain debt and guarantee debt repayment. In this sense, the entry of a VC firm could reduce the need for collaterals, since the high involvement of VCs after the investment reduces the information asymmetries and mitigates the potential agency problems. In addition to the close monitoring, the value added services carried out and the capital infusion provided by the VC investor reduce the insolvency risk. This implies that the potential liquidation of the firm is less probable. Finally, the certification effect of VCs and their contacts in the financial community help investee firms to obtain debt on more favorable terms. Our first hypothesis follows naturally from these ideas:

Hypothesis 1: After the initial VC investment the level of collateral required to obtain debt is not as important as in the pre-investment period.

Size is another firm characteristic related to the debt level. There is a vast literature that shows a positive relationship between both variables (Titman and Wessels 1988; Hovakimian, Opler, and Titman 2001; Frank and Goyal 2003; among others), since large firms are expected to be better diversified. Therefore, their profits and cash flows are subject to lower volatility. Regarding the change in that relationship after the VC investment, it should be noted that a significant part of the increase in size will be initially funded with equity or quasi-equity instruments. As a consequence, the positive relationship between size and debt might be affected shortly after the VC investment. Nevertheless, the augmented

equity will also allow the firm to increase the firm's debt exposure as well at a later stage. Additionally, due to the monitoring and other value added activities performed by VCs, the firm might be able to increase even further its debt exposure in the long term. To sum up, after the initial VC investment, the relationship between size and debt could be affected by the weight of the equity committed to the investee firm, thus reducing the dependency of size to changes in debt levels immediately after the VC investment,[3] but the certification effect could imply a larger share of debt when financing a firm's growth in the long term. Then, we hypothesize the following:

Hypothesis 2: The relationship between debt and size is unclear after the initial VC investment, with the most likely outcome being a reduction in the positive relationship in the short term.

Regarding profitability, there is evidence of a negative relationship between this variable and the debt ratio in small and medium-sized, privately owned firms (Sogorb-Mira 2005; Heyman, Deloof, and Ooghe 2008), since the most profitable firms prefer to finance investments internally. In the case of VC-backed firms and immediately after the initial investment, short term relative earnings before tax will be affected by an increase in fixed costs and depreciation due to the investments carried out to take advantage of the firm's growth opportunities. The equity provided, as well as the monitoring and value added services carried out by VCs, however, may help the investee firm to increase its debt exposure shortly after the initial VC financing event. Therefore, shortly after the VC investment a stronger negative relationship between profitability and the debt ratio should be expected. This leads to the following hypothesis:

[3] This evidence could last even longer if the investee firm is subject to a staging strategy whereby the VC investor/s commit more equity in several rounds up to three or four years after the initial investment.

Hypothesis 3: The relation between debt and profitability is expected to become even more negative than before shortly after the initial VC investment.

According to the finance literature, the relationship between earnings volatility and debt is expected to be negative (Titman and Wessels 1988; Harris and Raviv 1991; Michaelas, Chittenden, and Poutziouris 1999; among others), since a high dispersion on earnings would endanger debt payments at some future date. Nevertheless, higher volatility is expected in VC-backed firms after the initial VC investment. As explained in the previous paragraph, shortly after the investment takes place, a relative decrease in earnings is anticipated, but then a faster growth in earnings is expected to occur (Manigart and van Hyfte 1999; Alemany and Martí 2005; Engel and Keilbach 2007; among others) once the investee firm absorbs the investment shock. Therefore, volatility is expected to increase as earnings grow. As a consequence, the traditional negative relationship could become positive after the VC investment event because VC-backed firms are able to obtain funding from other sources (i.e. banks). This leads to the following hypothesis:

Hypothesis 4: After the VC investment the relationship between earnings volatility and debt remains unclear, when in most firms it is supposed to be negative.

According to Michaelas, Chittenden, and Poutziouris (1999), firms with high growth opportunities should use more debt, since the internally generated funds would be insufficient to finance their investments. Hence, a positive relationship between both variables is expected. One of the characteristics of firms that aim to obtain VC backing is the existence of sizable growth opportunities. Therefore, a positive relationship should be expected for VC-backed firms. At the time of the initial VC investment, VC-backed firms experience a financing shock, with the capital infusion being made in the form of equity or quasi-equity instruments (Sahlman 1990). As a result, a drastic change in the capital structure occurs, with a shift towards a greater share of equity. In the subsequent years, however, the increased

equity base, as well as the certification effect that VC firms provide, will imply a renewed access to bank financing to take advantage of growth opportunities. In parallel, with the additional funding received, the firm will also increase both tangible and intangible assets, with the latter being the proxy for future growth opportunities. Therefore, a positive relationship between debt and growth opportunities is also expected after the VC investment. Thus, we hypothesize the following:

Hypothesis 5: The relationship between debt and growth opportunities after the initial VC investment is expected to remain positive, due to the increase in intangible assets and the increase in debt financing based on the certification effect of VC involvement.

The literature has highlighted the direct and positive relationship between the effective corporate tax paid and debt (Graham 1996; Michaelas, Chittenden, and Poutziouris 1999). Firms that pay higher taxes could benefit more from tax shields. Right after the VC entry, however, the effective taxes paid would decrease, due to the greater fixed costs and larger depreciation, whereas the debt ratio would also decrease due to the equity added by the VC firm. Nevertheless, after the investment shock is absorbed, VC managers will usually make the firm's earnings grow faster. The latter would also lead to a significant increase in the corporate taxes paid. In parallel, in order to take advantage of tax shields, and to avoid a further dilution of the VCs if more external equity is added, the use of debt would be encouraged. The increase in the amount of debt will be possible thanks to the increased equity base (i.e. the initial VC investment) and the subsequent certification effect provided by VCs. Our sixth hypothesis follows naturally from this discussion:

Hypothesis 6: The relationship between effective corporate tax paid and debt is expected to be positive after the initial VC investment, but it is unclear whether its relative importance will increase or decrease.

3. *Data and Methodology*

3.1 Data and Sample Selection

The data is based on Spanish VC-backed firms that were at the expansion stage at the time of the initial VC investment. The period of analysis includes VC investments performed from 1995 to 2004. According to Martí, Salas, and Barthel (2010), 1,572 private equity investments were recorded over the period 1995-2004, including all stages, from seed to buyout, but excluding investments in financial and real estate sectors. We were able to find relevant accounting data from 1,313 of these firms, of which 34.88 percent were at the expansion stage at the time of the initial investment.

Since the aim of this paper is to analyze the impact of the VC entry in the capital structure behavior, we need to have enough time series observations during the pre and post-investment periods. We select firms that have at least three consecutive years before and after the initial VC investment with complete accounting data. As a result, only 265 out of the 458 VC-backed firms at the expansion stage fulfill these requirements and are, therefore, included in the sample.

Regarding the information about VC investments, the sources of data were the local Private Equity and Venture Capital Association (ASCRI) and www.webcapitalriesgo.com. The accounting data was obtained from the AMADEUS database.

3.2 Model and Methodology

There is a vast literature that relates the debt ratio with firm characteristics such as tangible fixed assets, size, probability of default, profitability, volatility, growth opportunities and tax effects, among others (Titman and Wessels 1988; Harris and Raviv 1991). However, there is little research about the determinants of the debt ratio in VC-backed firms before and after they are subject to a VC investment. Thus, in order to cover this gap, and rooted in capital structure theories, we estimate the following model:

$$D_{it} = \beta_0 + \beta_1 TANG_{it} + \beta_2 SIZE_{it} + \beta_3 PROF_{it} + \beta_4 VOL_{it} + \beta_5 GO_{it} + \beta_6 ETR_{it} + \eta_i + \mu_{it} \quad (1)$$

where η_i are the specific unobservable individual effects for each firm, which do not vary over time; and μ_{it} is an error term. The definition of all the variables used in the estimation process and their predicted effect on the debt ratio, both before and after the VC entry, can be found in Table 1. A more detailed review of these factors and their expected relationship can be found in Titman and Wessels (1988), Michaelas, Chittenden, and Poutziouris (1999), López-Gracia and Sogorb-Mira (2008), Balboa, Martí, and Tresierra (2009) and Frank and Goyal (2009), among others.

Insert Table 1 about here

In addition to those factors, we also control for industry effects in two ways. First, we define a dummy variable that takes value 1 if the investee firm belongs to high technology[4] sectors, and zero otherwise. Second, we include an industry variable representing the median leverage per year for each sector, as suggested by Lemmon, Roberts, and Zender (2008) and Frank and Goyal (2009). Finally, all models include time dummies in order to control for possible time effects on the leverage ratio.

Since the data refer to time series observations on a sample of firms, the panel data methodology is employed to carry out the estimations of the models. In order to analyze the possible correlation between the exogenous variables and the individual effects, the Hausman test (Hausman 1978) is used to check whether fixed or random effects are best suited in the estimation process.

Given that the aim of this paper is to understand whether the VC entry affects the capital structure behavior, we also extend model (1) by adding interaction terms between all

[4] As technology sectors we consider the following categories: information technology, medical/health care/life science and research & development.

the variables and a dummy variable t_{VC} (which equals 1 from the investment event onwards, and zero otherwise). Thus, the resulting model is as follows:

$$\begin{aligned} D_{it} = {} & \beta_0 + TANG_{it}\left(\beta_1 + \beta_2 t_{VC}\right) + SIZE_{it}\left(\beta_3 + \beta_4 t_{VC}\right) + PROF_{it}\left(\beta_5 + \beta_6 t_{VC}\right) \\ & + VOL_{it}\left(\beta_7 + \beta_8 t_{VC}\right) + GO_{it}\left(\beta_9 + \beta_{10} t_{VC}\right) + ETR_{it}\left(\beta_{11} + \beta_{12} t_{VC}\right) \\ & + \eta_i + \mu_{i,t} \end{aligned} \qquad (2)$$

To estimate this model we use the whole sample. We test our hypotheses by analyzing the interaction terms $\beta_i t_{VC}$ in each case. In this way, if the corresponding β_i is significantly different from zero, then the VC entry has a significant effect on the leverage ratio. However, and as a robustness check, we also split the sample into two parts, dividing the pre and post-investment observations in all VC-backed firms, and then run the regressions in both subsamples.

3.3 Descriptive Statistics

The leverage ratios[5] before and after the initial VC investment event are presented in Table 2. It shows that VC-backed firms increase the mean and the median debt ratio after the VC investment, but the ratio also exhibits more dispersion. This finding is in line with the evidence found by Baeyens and Manigart (2006), who report that after the VC investment firms rely more on debt than equity.

With regard to the explanatory variables, some differences between the pre and post-investment periods are found. Table 3 shows that the second measure of tangibility (*Tang2*), which includes both fixed assets and inventories, is slightly greater before the VC entry, whereas no significant difference is found in the first measure of tangibility (*Tang1*). The

[5] A further comment should be made about the maximum and minimum leverage ratios, since values above one and below zero are found, respectively. They are related to negative equity values, due to cumulative losses that are found in some firms. Excluding these observations could lead to a bias in the results obtained. Michaelas, Chittenden, and Poutziouris (1999) and Hall, Hutchinson, and Michaelas (2000) argue that excluding bankruptcy firms from their sample could censor it. Additionally, Baeyens and Manigart (2003) argue that including both surviving and non-surviving companies eliminates a positive survival bias and increases the validity of the results.

difference in *Tang2* could be explained by a tighter inventory management carried out after the VC investment as well as the emergence of scale economies in inventory requirements as the firm grows. The size of the firm after the investment is greater, which is an expected result given the infusion of funds and the corresponding increase in total assets.

Regarding profitability, the significant decrease in the first years after the VC investment is to be expected, since investee firms immediately hire more employees and invest in assets that are subject to depreciation. Conversely, the subsequent increase in revenues takes some time to happen. In this line, the variable *Prof*1, which is related to the EBITDA, does not decrease as much as *Prof*2 (EBIT), since the former variable does not include depreciation whereas the latter accounts for a larger depreciation. A second explanation for the decrease in both variables is based on the scaling process applied to all variables. The increase in the denominator, namely total assets, due to the additional investments carried out after the VC investment, does not immediately lead to an increase in EBITDA and EBIT. The increased spending after the initial VC investment also affects the effective taxes paid, which decrease significantly in the first years after the investment. As regards volatility, no significant differences are found on the mean values, albeit with larger values after the VC investment. Regarding median values, there is a significant increase in EBIT volatility after the VC investment. The investment activity carried out by the investee firm after the initial VC funding leads to a significant increase in growth opportunities, which are proxied by intangible assets. Finally, and as already commented, the effective taxes paid are significantly lower after the initial VC investment.

Insert Table 2 about here

Insert Table 3 about here

Pair wise correlations among all variables are shown in Table 4. Excluding the obvious conflict between variables included under the same category, there is no concern about the correlation among the remaining ones.

Insert Table 4 about here

4. *Results*

The results of the regression models are shown in Table 5. The results of the Hausman test, which was run in all models, indicate that fixed effects estimation is the most suitable method in all specifications. As already stated in Section three, all models include, as control variables, time and industry dummies[6] in order to control for these possible effects on the debt ratio.

The results show that the debt ratio is positively related to the tangibility of assets and size. These results are robust in all specifications and are consistent with the literature related to the capital structure (Titman and Wessels 1988; Hovakimian, Opler, and Titman 2001; Frank and Goyal 2003; among others). In relation to profitability, partial evidence about the negative relation of this variable with the debt ratio is found, since only *Prof1* is significant.

The variable volatility does not have a significant impact on the debt ratio in any model. As already commented in Section two, this could be due to the ambiguous relationship between volatility and debt in firms that are later backed by VC firms. The variable representing growth opportunities is positively and significantly related to the debt ratio, which is in line with the fact that VC firms usually invest in firms with high growth opportunities. Internally generated funds in these firms at the expansion stage are usually insufficient to fund growth and, hence, they must rely on external funds to continue their

[6] We use as industry variable the second definition: the median leverage per year for each group, since fixed effects estimations remove all the variables that are time invariant.

growth process. Finally, the relationship between the effective tax paid and the debt ratio is positive and significant, which is consistent with the existence of tax shields.

Regarding our hypotheses, presented in Section two, we should focus on the variables that represent the interaction terms. The coefficient of the interaction between tangibility and VC involvement is negative and significant in all models, which implies a reduction in the positive and significant relationship between collaterals and debt in the post-investment stage. Among the possible reasons underlying this fact, the close monitoring implemented after the provision of funds and the certification effect that VCs provide should be highlighted. All these factors increase the likelihood that the VC-backed firm will honor debt payments, thus confirming Hypothesis 1.

Hypothesis 2 predicted either a smaller relationship between size and the debt ratio after the VC investment because of the infusion of equity in the short term, or a stronger relationship because of the additional debt that the firm could obtain at a later stage due to the certification effect of VC involvement. This hypothesis is partially confirmed. In some models this variable shows a positive and significant coefficient after the financing event, whereas in others there is not a significant effect of this variable on the debt ratio. Regarding profitability, the coefficients are negative and significant in all models, confirming Hypothesis 3. This result is also consistent with the descriptive statistics shown in Table 3, since there is a decrease in earnings and an increase in the debt ratio in the post-investment period. Whereas the former is related to the increase in fixed costs and depreciation, the latter is explained by the enhanced credibility of the investee firm, which is expected to increase its future cash flows and, thus, its capacity to repay more debt.

The interaction terms of the remaining variables are not significant. In the case of volatility, Hypothesis 4 is confirmed, since arguments in favor of a stronger but also a weaker relationship between these two variables were presented in Section two. Hypothesis 5

predicted a positive and significant relationship between growth opportunities and debt, which is in fact positive in the whole period, but does not seem to change after the initial VC investment. Thus, Hypothesis 5 is confirmed. Regarding the effective corporate tax paid, even though the relationship is positive and significant, no differences between the pre and the post-investment periods are found. As a result, VC involvement does not lead to a greater effect of taxes paid on the debt levels. A possible explanation could rely on the fact that the increase in revenues may be offset by the increase in expenses that are necessary to support growth. Hypothesis 6 predicted a positive relationship after the VC entry, but it was unclear whether the effect was stronger or weaker. We do in fact find no differences between the pre and post-investment periods, thus confirming Hypothesis 6.

Insert Table 5 about here

As a robustness check, regressions are also carried out for the pre and the post investment periods separately. The results are reported in Tables 6 and 7, respectively. For the variable tangibility, the results are similar to the ones already shown in Table 5, since the coefficient is positive but lower after the VC investment event, thus reducing the importance of the use of collaterals.

The coefficients for size are significant in all models when the pre-investment stage is analyzed, and it is only partially significant in the post-investment stage regressions, with the values being higher in the former. This could be related to the high dispersion in significance found for the interaction term of the size variable in Table 5. In this way, the overall effect of size shortly after the VC investment would not be showing a clear pattern, as predicted, due to the initial effect of the equity provided on the size of the firm. Nevertheless, this effect should fade away as more post-investment observations are considered.

The coefficient regarding the profitability variable continues to be negative but stronger after the VC investment, which again is consistent with the previous results. The

results for volatility are also similar to the ones obtained previously, since this variable is neither significant before nor after the VC entry. Growth opportunities continue to be significant, with similar coefficients, after the VC investment. This is consistent with the insignificance of the interaction term in Table 5, thus confirming that growth opportunities also play a significant role in explaining the level of debt after the initial VC investment. Finally, Table 5 showed that the effective corporate tax paid was positive and significant in the pre-investment period, while the interaction term was not significant. Consistently, we should have expected a similar, positive relationship for both periods. However, this variable is not significant in any period. This could be due to the fact that regressions in Tables 6 and 7 are using a reduced number of observations.

Overall, the regressions carried out on both subsamples separately confirm most of the findings reported in Table 5, except in size (partially) and the effective tax paid, albeit they are based on a smaller number of observations.

Insert Table 6 about here

Insert Table 7 about here

Finally, we perform some additional robustness checks. As already commented in Section two, during the post-investment period and for some variables, we expect a slightly different impact on the debt ratio if we distinguish between the short term impact, or the period just immediately after the investment shock occurs, and the long term impact. It should be taken into account that the VC investor usually stays an average of four to five years after the initial investment. To test these effects, we run the post-investment regressions again but just including the observations related up to three years and up to four years after the investment event occurs. In this way, these new regression would be testing the effect in the short term, whereas the regressions in Tables 6 and 7 would be testing the long term effect, since all observations are included in the latter case.

We find some interesting results that confirm the hypotheses. In the case of collaterals, we find that, in the short term, collaterals are significant but less important than in the long term. This would be showing that when the VC investor still has its participation in the firm, collaterals are not so required due to the certification role performed by VCs. However, in the long term, the level of collaterals is more relevant than in the short term, but still less important than during the pre-investment period.

Regarding the size variable, the results are even more conclusive. In the short term, this variable does not have a significant impact on the debt ratio, due to the effect of the initial equity funding on the size increase. However, in the long term, this variable has a significant and positive impact in some regressions but is not significant in others, as already seen in Tables 6 and 7. This confirms the intuition behind Hypothesis 2. In the short term, and because of the effect of the shock in equity, the proportion of debt drops while the size of the firm increases and no significant effect of size on debt is found. However, in the long term, when the VC-backed firm is able to attract new debt, the relation between size and debt begins to become, again, positive and significant. Overall, the results show that the VC infusion has a slightly different effect in the short or in the long term, which becomes an area which deserves more research in the future.

5. *Conclusions and Discussion*

The effect that VCs exert on their investee firms has received significant attention in the VC literature, showing the positive impact that VC has on job creation, innovation and performance. However, the study of the determinants of the capital structure after the VC investment event has received little attention. For this reason, this paper aims to contribute with a better understanding of the financing behavior of firms after the initial VC funding event, showing whether the determinants of the debt ratio before and after the VC event change or not.

Our results show that, after the VC investment, the determinants of the capital structure change. The effects that VCs exert on their investee firms through high involvement in management, close monitoring and the provision of funds, among other factors, along with the certification effect, allow firms to obtain more debt. The results also show that debt is less dependent on the tangibility of assets, since VC involvement reduces the need to provide collateral to obtain additional debt. The results of the effect of size after the VC entry, for which there were arguments in favor of a weaker but also of a stronger relationship, are also in this line, since in some models this variable shows a positive and significant coefficient whereas in others there is not a significant effect of this variable on the debt ratio. The effect of profitability is more negative, since the decrease in earnings that follows the VC investment, due to the increase in fixed costs and depreciation, is accompanied by an increase in debt. The latter is based on the monitoring and other value added services carried out by VCs, which will later help to increase the amount and stability of operational cash flows. We also find that the relationships of volatility, growth opportunities and effective taxes paid with the debt ratio do not change after the investment. In this sense VCs play a crucial role, given that obtaining debt is essential to continue supporting the firm's growth.

Our findings have implications for policy makers and entrepreneurs. Regarding the former, this paper provides evidence that VC firms not only contribute to fill the equity gap in unlisted growing firms, but this contribution also helps them to have access to long term funding in order to continue their future growth process. Therefore, policy makers may find more reasons to justify schemes that favor VC due to the role they play in helping unlisted firms to obtain additional long term sources of external funding. As regards the latter, VCs should not be considered only as a source of equity, or quasi-equity, funding. The certification effect, which arises from the reduction of information asymmetry problems, also facilitates access to other long term sources of finance. This benefit may outweigh the natural reluctance

of most entrepreneurs to allow the entry of external equity investors, such as VCs, to avoid losing control of the firm.

Regarding the limitations, the main one relates to the potential endogeneity of the models, since we are dealing with accounting variables that could not be fully exogenous. Focusing on a dynamic model could address this concern, but a considerable amount of important information would be lost. It should be taken into account that the analyses in Tables 6 and 7 are also based on a reduced number of years, since the observations are split into two periods. Additionally, and due to unavailability of data, some variables that are sometimes considered in the literature could not be considered in this paper, such as research and development expenditures.

For future research, it would be interesting to distinguish between the short and the long term effect of the VC investment on the capital structure of these firms. Also, an interesting test would be to analyze whether the change in the capital structure of the firm persists when the VC investor, which aims to stay only temporarily, divests its stake. Similarly, it would be interesting to test how the speed of adjustment to a target debt ratio evolves over time as the VC investor exits the firm. Additionally, testing the effect of the VC investment on the capital structure of firms in more mature VC markets could shed light on whether the effect of VC is related to the stage of development of the market. Similarly, it would be interesting to test the same effect on market-oriented countries, such as the US or the UK.

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Table 1

Dependent and Explanatory Variables

Panel A. Description of Variables

Variable	Description	Authors
Ratio	Ratio between long term debt and long term debt plus total equity	Rajan and Zingales (1995); De Miguel and Pindado (2001).
Tang1	Ratio between tangible fixed assets and total assets.	Rajan and Zingales (1995); Hovakimian, Opler, and Titman (2001); Frank and Goyal (2003); Flannery and Ragan (2006).
Tang2	Ratio between tangible fixed assets plus inventories and total assets.	Titman and Wessels (1988); Sogorb-Mira (2005).
Size	Natural logarithm of total assets.	Titman and Wessels (1988); Hovakimian, Opler, and Titman (2001); Fama and French (2002); Flannery and Ragan (2006).
Prof1	Ratio between earnings before interest, taxes, depreciation and amortization (EBITDA) and total assets.	Titman and Wessels (1988); Hovakimian, Opler, and Titman (2001); Ozkan (2001).
Prof2	Ratio between earnings before interest and taxes (EBIT) and total assets.	Fama and French (2002); Frank and Goyal (2003); Sogorb-Mira (2005); Flannery and Ragan (2006).
Vol1	Moving standard deviation of the change in EBITDA, computing the current and the two previous years.	Balboa, Martí, and Tresierra (2009).
Vol2	Moving standard deviation of the change in EBIT, computing the current and the two previous years.	Balboa, Martí, and Tresierra (2009).
GO	Ratio between intangible assets and total assets.	Michaelas, Chittenden, and Poutziouris (1999).
ETR	Ratio between the effective corporate tax paid and the earnings before tax.	Ozkan (2000); Lopez-Gracia and Sogorb-Mira (2008).

Panel B. Predicted effect on the debt ratio

	Effect on debt ratio	
Firm characteristic	**Before the VC investment**	**After the VC investment**
Tangible assets	Positive	Positive, but smaller
Size	Positive	Unclear, but likely to be positive
Profitability	Positive / Negative	Negative, and stronger
Volatility	Negative	Unclear
Growth opportunities	Positive / Negative	Positive
Effective tax paid	Positive	Positive

Table 2

Descriptive Statistics of the Debt Ratio

Stage	Obs.	Mean	Median	Std. Dev.	Min	Max
Before VC investment	1,092	0.3074	0.2695	0.2692	-0.5106	2.2414
After VC investment	1,752	0.3638	0.3325	0.4475	-6.3690	5.8199
p –value		0.0000	0.0000			

Table 3

Descriptive Statistics of the Explanatory Variables

Variable	Period	Obs.	Mean	Median	Std. Dev.	Min	Max
Tang1							
	Pre	1,092	0.2675*	0.2279	0.1894	0.0000	0.9673
	Post	1,752	0.2575	0.2316	0.1934	0.0000	0.8940
Tang2							
	Pre	1,092	0.4282***	0.4409***	0.2165	0.0000	0.9673
	Post	1,752	0.3982	0.3994	0.2233	0.0000	0.9084
Size							
	Pre	1,092	15.6494***	15.6226***	1.3430	11.7519	19.9404
	Post	1,752	16.4716	16.4466	1.2393	10.9682	20.4937
Prof1							
	Pre	1,092	0.1134***	0.1046***	0.1034	-0.8000	0.6863
	Post	1,752	0.0794	0.0786	0.1123	-0.8747	0.9199
Prof2							
	Pre	1,092	0.0670***	0.0608***	0.0978	-0.9536	0.6346
	Post	1,752	0.0284	0.0338	0.1262	-2.0451	0.8876
Vol1							
	Pre	1,092	1.4756	0.2641	8.8352	0.0003	176.5412
	Post	1,752	1.7141	0.2897	10.2095	0.0002	176.2310
Vol2							
	Pre	1,092	2.1787	0.4137***	13.1157	0.0001	271.7149
	Post	1,752	2.3021	0.5272	8.7462	0.0007	137.8687
GO							
	Pre	1,092	0.0631***	0.0258***	0.0886	0.0000	0.6243
	Post	1,752	0.0806	0.0338	0.1155	0.0000	0.8095
ETR							
	Pre	1,092	0.2318***	0.2615***	0.1985	0.0000	1.0000
	Post	1,752	0.2055	0.1935	0.2269	0.0000	1.0000

Tang1: Ratio between tangible fixed assets and total assets; Tang2: Ratio between tangible fixed assets plus inventories and total assets; Size: Natural logarithm of total assets; Prof1:Ratio between EBITDA and total assets; Prof2: Ratio between EBIT and total assets; Vol1: Moving standard deviation of the change in EBITDA, computing the current and the previous two years; Vol2: Moving standard deviation of the change in EBIT, computing the current and the two previous years; GO: Ratio between intangible assets and total assets; ETR: Ratio between the effective corporate tax paid and the earnings before tax.

Differences in means (t- test) and medians (chi-squared test statistic) are reported between pre and post investment stages.

Significance at levels ***1%, **5%, *10%.

Table 4

Correlation Matrix

	Tang1	Tang2	Size	Prof1	Prof2	Vol1	Vol2	GO	ETR
Tang1	1.0000								
Tang2	0.7951	1.0000							
p-value	0.0000								
Size	-0.0433	-0.0639	1.0000						
p-value	0.6131	0.0287							
Prof1	0.0651	-0.0179	-0.0358	1.0000					
p-value	0.0226	1.0000	0.9273						
Prof2	-0.0128	-0.0298	0.0509	0.9063	1.0000				
p-value	1.0000	0.9952	0.2600	0.0000					
Vol1	-0.0212	-0.0270	-0.0215	-0.0494	-0.0473	1.0000			
p-value	1.0000	0.9993	1.0000	0.3146	0.4116				
Vol2	0.0053	-0.0195	-0.0302	-0.1171	-0.1106	0.2504	1.0000		
p-value	1.0000	1.0000	0.9939	0.0000	0.0000	0.0000			
GO	-0.2187	-0.3245	-0.0809	0.0126	-0.1099	0.0442	0.0462	1.0000	
p-value	0.0000	0.0000	0.0007	1.0000	0.0000	0.5658	0.4629		
ETR	-0.0320	-0.0251	-0.0306	0.1649	0.1625	-0.0435	-0.0812	0.0085	1.0000
p-value	0.9842	0.9999	0.9923	0.0000	0.0000	0.6016	0.0007	1.0000	

Tang1: Ratio between tangible fixed assets and total assets; Tang2: Ratio between tangible fixed assets plus inventories and total assets; Size: Natural logarithm of total assets; Prof1:Ratio between EBITDA and total assets; Prof2: Ratio between EBIT and total assets; Vol1: Moving standard deviation of the change in EBITDA, computing the current and the previous two years; Vol2: Moving standard deviation of the change in EBIT, computing the current and the previous two years; GO: Ratio between intangible assets and total assets; ETR: Ratio between the effective corporate tax paid and the earnings before tax.

Table 5

Regression results of the capital structure determinants: pre and post-investment periods

	Dependent Variable: Debt ratio							
Variable	**Tang 1**				**Tang 2**			
Tang	0.3679***	0.3715***	0.3889***	0.3909***	0.4022***	0.4004***	0.4153***	0.4126***
	(0.0901)	(0.0890)	(0.0874)	(0.0865)	(0.0632)	(0.0635)	(0.0624)	(0.0628)
Size	0.0901***	0.0906***	0.1006***	0.1010***	0.0906***	0.0911***	0.1012***	0.1015***
	(0.0245)	(0.0244)	(0.0242)	(0.0241)	(0.0241)	(0.0240)	(0.0240)	(0.0238)
Prof1	-0.2474**	-0.2610**			-0.2235*	-0.2352**		
	(0.1206)	(0.1209)			(0.1148)	(0.1149)		
Prof2			-0.1608	-0.1727			-0.1369	-0.1478
			(0.1272)	(0.1289)			(0.1235)	(0.1251)
Vol1	-0.0005		-0.0005		-0.0007		-0.0008	
	(0.0011)		(0.0012)		(0.0011)		(0.0012)	
Vol2		-0.0011		-0.0010		-0.0010		-0.0009
		(0.0013)		(0.0013)		(0.0013)		(0.0013)
GO	0.5799***	0.5806***	0.6238***	0.6231***	0.6440***	0.6445***	0.6932***	0.6926***
	(0.1472)	(0.1466)	(0.1525)	(0.1527)	(0.1471)	(0.1468)	(0.1525)	(0.1530)
ETR	0.1630**	0.1561**	0.1597**	0.1535**	0.1539**	0.1485**	0.1495**	0.1448**
	(0.0718)	(0.0698)	(0.0729)	(0.0708)	(0.0720)	(0.0700)	(0.0730)	(0.0709)
Tang x t_{vc}	-0.1478**	-0.1499**	-0.1725***	-0.1732***	-0.1806***	-0.1789***	-0.1906***	-0.1881***
	(0.0679)	(0.0670)	(0.0625)	(0.0617)	(0.0609)	(0.0611)	(0.0593)	(0.0596)
Size x t_{vc}	0.0044*	0.0041*	0.0038	0.0035	0.0071***	0.0068**	0.0063**	0.0059**
	(0.0024)	(0.0024)	(0.0024)	(0.0024)	(0.0028)	(0.0028)	(0.0027)	(0.0028)
Prof1 x t_{vc}	-0.4421*	-0.4278*			-0.4868**	-0.4738**		
	(0.2311)	(0.2318)			(0.2245)	(0.2251)		
Prof2 x t_{vc}			-0.3690*	-0.3557*			-0.4098*	-0.3967*
			(0.2118)	(0.2134)			(0.2097)	(0.2113)
Vol1 x t_{vc}	0.0001		0.0001		0.0001		0.0001	
	(0.0002)		(0.0002)		(0.0002)		(0.0002)	
Vol2 x t_{vc}		0.0011		0.0011		0.0012		0.0012
		(0.0017)		(0.0017)		(0.0016)		(0.0017)
GO x t_{vc}	-0.0190	-0.0251	-0.0958	-0.1003	-0.0913	-0.0976	-0.1725	-0.1772
	(0.1595)	(0.1580)	(0.1599)	(0.1586)	(0.1620)	(0.1604)	(0.1624)	(0.1612)
ETR x t_{vc}	-0.1323	-0.1265	-0.1374	-0.1320	-0.1287	-0.1236	-0.1331	-0.1285
	(0.0897)	(0.0886)	(0.0890)	(0.0878)	(0.0888)	(0.0877)	(0.0885)	(0.0874)
Median	0.3699*	0.3688*	0.4216*	0.4193*	0.3985*	0.3958*	0.4505**	0.4468**
	(0.2136)	(0.2141)	(0.2179)	(0.2183)	(0.2136)	(0.2143)	(0.2181)	(0.2188)
Time dummies	yes	yes	yes	yes	yes	yes	yes	yes
Constant	-1.2581***	-1.2620***	-1.4430***	-1.4464***	-1.3400***	-1.3410***	-1.5235***	-1.5232***
	(0.3924)	(0.3913)	(0.3902)	(0.3889)	(0.3939)	(0.3928)	(0.3936)	(0.3923)
Obs	2,844	2,844	2,844	2,844	2,844	2,844	2,844	2,844
Firms	265	265	265	265	265	265	265	265
Hausman	59.04	57.17	64.09	62.19	58.96	55.38	63.45	59.72
p-value	0.0005	0.0014	0.0001	0.0003	0.0006	0.0022	0.0001	0.0007

Regressions are carried out using fixed effects.

Dependent variable: Ratio between long term debt and long term plus total equity. Independent Variables: Tang1: Ratio between tangible fixed assets and total assets; Size: Natural logarithm of total assets; Prof1:Ratio between EBITDA and total assets; Prof2: Ratio between EBIT and total assets; Vol1: Moving standard deviation of the change in EBITDA, computing the current and the two previous years; Vol2: Moving standard deviation of the change in EBIT, computing the current and the two previous years; GO: Ratio between intangible assets and total assets; ETR: Ratio between the effective corporate tax paid and the earnings before tax; Median: median of leverage per group of firms and year; t_{VC} (dummy: 1 from the investment event onwards, 0 otherwise).

Robust standard errors in brackets. Significance at levels *** 1%, ** 5%, * 10%.

Table 6

Regression results of capital structure determinants for pre and post investment periods (Tang1)

	Dependent Variable: Debt ratio							
Indep.	**Model 1**		**Model 2**		**Model 3**		**Model 4**	
Variables	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
Tang1	0.5896***	0.3204***	0.6055***	0.3227***	0.5626***	0.3034***	0.5773***	0.3061***
	(0.1516)	(0.0686)	(0.1484)	(0.0686)	(0.1464)	(0.0670)	(0.1433)	(0.0671)
Size	0.1104***	0.0265	0.1189***	0.0270	0.1142***	0.0314*	0.1228***	0.0319*
	(0.0347)	(0.0189)	(0.0320)	(0.0191)	(0.0350)	(0.0185)	(0.0321)	(0.0187)
Prof1	-0.3107***	-0.6975***	-0.3259***	-0.6920***				
	(0.1176)	(0.2328)	(0.1166)	(0.2328)				
Prof2					-0.3412***	-0.5139**	-0.3535***	-0.5090**
					(0.1299)	(0.2087)	(0.1321)	(0.2083)
Vol1	-0.0000	-0.0004			-0.0000	-0.0004		
	(0.0007)	(0.0008)			(0.0007)	(0.0008)		
Vol2			-0.0017	0.0012			-0.0017	0.0013
			(0.0017)	(0.0009)			(0.0017)	(0.0009)
GO	0.6581***	0.7082***	0.6285***	0.7041***	0.6370***	0.6595***	0.6061***	0.6559***
	(0.1578)	(0.1418)	(0.1705)	(0.1406)	(0.1527)	(0.1389)	(0.1663)	(0.1376)
ETR	0.1231	0.0426	0.0995	0.0451	0.1238*	0.0311	0.1004	0.0339
	(0.0756)	(0.0726)	(0.0663)	(0.0725)	(0.0752)	(0.0703)	(0.0661)	(0.0702)
Median	0.4283**	0.3460	0.4307**	0.3413	0.4477**	0.4577	0.4501**	0.4518
	(0.2110)	(0.3347)	(0.2117)	(0.3355)	(0.2145)	(0.3500)	(0.2153)	(0.3507)
Time dummies	yes	yes	yes	yes	yes	yes	yes	yes
Constant	-1.6791***	-0.2131	-1.8108***	-0.2214	-1.7496***	-0.3414	-1.8854***	-0.3494
	(0.5966)	(0.3617)	(0.5479)	(0.3647)	(0.6028)	(0.3618)	(0.5502)	(0.3648)
Obs	1,092	1,752	1,092	1,752	1,092	1,752	1,092	1,752
Firms	265	265	265	265	265	265	265	265
Hausman	42.46	23.10	47.17	20.23	43.28	24.88	46.74	21.68
p-value	0.0010	0.2332	0.0002	0.3806	0.0007	0.1645	0.0001	0.3005

Regressions are carried out using fixed effects for pre and random effects for post-investment observations.
Dependent variable: Ratio between long term debt and long term plus total equity. Independent Variables: Tang1: Ratio between tangible fixed assets and total assets; Size: Natural logarithm of total assets; Prof1:Ratio between EBITDA and total assets; Prof2: Ratio between EBIT and total assets; Vol1: Moving standard deviation of the change in EBITDA, computing the current and the two previous years; Vol2: Moving standard deviation of the change in EBIT, computing the current and the two previous years; GO: Ratio between intangible assets and total assets; ETR: Ratio between the effective corporate tax paid and the earnings before tax; Median: median of leverage per group of firms and year.
Robust standard errors in brackets.
Significance at levels *** 1%, ** 5%, * 10%.

Table 7

Regression results of capital structure determinants for pre and post investment periods (Tang2)

	Dependent Variable: Debt ratio							
Indep.	**Model 1**		**Model 2**		**Model 3**		**Model 4**	
Variable	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
Tang2	0.3128***	0.2451***	0.3205***	0.2475***	0.2957***	0.2449***	0.3031***	0.2474***
	(0.0911)	(0.0629)	(0.0894)	(0.0631)	(0.0887)	(0.0639)	(0.0869)	(0.0641)
Size	0.1131***	0.0271	0.1206***	0.0276	0.1158***	0.0324*	0.1236***	0.0329*
	(0.0359)	(0.0191)	(0.0334)	(0.0192)	(0.0360)	(0.0187)	(0.0332)	(0.0188)
Prof1	-0.2949**	-0.6865***	-0.3101***	-0.6810***				
	(0.1188)	(0.2315)	(0.1186)	(0.2315)				
Prof2					-0.3506**	-0.5158**	-0.3636***	-0.5108**
					(0.1372)	(0.2084)	(0.1400)	(0.2080)
Vol1	-0.0002	-0.0004			-0.0002	-0.0004		
	(0.0007)	(0.0007)			(0.0007)	(0.0007)		
Vol2			-0.0016	0.0012			-0.0016	0.0013
			(0.0017)	(0.0009)			(0.0017)	(0.0009)
GO	0.6356***	0.7198***	0.6091***	0.7157***	0.6195***	0.6770***	0.5914***	0.6735***
	(0.1574)	(0.1408)	(0.1715)	(0.1396)	(0.1533)	(0.1385)	(0.1680)	(0.1373)
ETR	0.1091	0.0420	0.0878	0.0445	0.1106	0.0312	0.0893	0.0340
	(0.0767)	(0.0724)	(0.0677)	(0.0723)	(0.0763)	(0.0702)	(0.0674)	(0.0701)
Median	0.3726*	0.3241	0.3733*	0.3187	0.3982*	0.4259	0.3993*	0.4194
	(0.2072)	(0.3350)	(0.2086)	(0.3358)	(0.2120)	(0.3497)	(0.2135)	(0.3504)
Time dummies	yes	yes	yes	yes	yes	yes	yes	yes
Constant	-1.6864***	-0.2317	-1.8024***	-0.2402	-1.7390***	-0.3637	-1.8608***	-0.3720
	(0.6112)	(0.3664)	(0.5648)	(0.3694)	(0.6142)	(0.3660)	(0.5631)	(0.3691)
Obs	1,092	1,752	1,092	1,752	1,092	1,752	1,092	1,752
Firms	265	265	265	265	265	265	265	265
Hausman	42.07	23.95	44.68	20.96	43.25	24.22	47.40	20.91
p-value	0.0011	0.1980	0.0003	0.3391	0.0007	0.1879	0.0002	0.3417

Regressions are carried out using fixed effects for pre and random effects for post-investment observations.
Dependent variable: Ratio between long term debt and long term plus total equity. Independent Variables: Tang1: Ratio between tangible fixed assets and total assets; Size: Natural logarithm of total assets; Prof1:Ratio between EBITDA and total assets; Prof2: Ratio between EBIT and total assets; Vol1: Moving standard deviation of the change in EBITDA, computing the current and the two previous years; Vol2: Moving standard deviation of the change in EBIT, computing the current and the two previous years; GO: Ratio between intangible assets and total assets; ETR: Ratio between the effective corporate tax paid and the earnings before tax. Median: median of leverage per group of firms and year.
Robust standard errors in brackets.
Significance at levels *** 1%, ** 5%, * 10%.