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FUNDACIÓN DE LAS CAJAS DE AHORROS
DOCUMENTO DE TRABAJO
Nº 614/2011

De conformidad con la base quinta de la convocatoria del Programa de Estímulo a la Investigación, este trabajo ha sido sometido a evaluación externa anónima de especialistas cualificados a fin de contrastar su nivel técnico.

ISSN: 1988-8767

La serie **DOCUMENTOS DE TRABAJO** incluye avances y resultados de investigaciones dentro de los programas de la Fundación de las Cajas de Ahorros.
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Abstract

This paper analyses the dynamic behaviour of the capital structure in a sample of Spanish venture capital (VC) backed firms and a matched sample of firms that do not receive VC. The results show that the former adjust their target debt ratio more slowly, which could be explained either by the existence of more severe financial constraints in these firms, as shown in previous literature, or by the fact that these firms could be more concerned about financing their growth than about reaching the target debt level. Additionally, differences in the factors that affect the debt ratio are found between both groups, especially regarding growth opportunities. In this way, the paper also sheds light on the factors related to the financial structure of firms that could explain why they access VC funding. Regarding the implications, it should be remarked that growing firms that are able to take advantage of growth opportunities should approach VC firms to reduce the increased distance to their target debt levels, if those firms choose to go ahead with the required investments, and/or to allow those firms not to forgo their growth prospects because their owners are not willing to accept leverage ratios beyond the target.

Keywords: capital structure, adjustment speed, venture capital, trade-off theory
JEL Classification: G32, G24

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Acknowledgements: We thank the financial support from the Spanish Ministry of Education under research grant ECO2008-02599/ECON.

1 Introduction

All firms must raise funds to take advantage of their growth opportunities. This is, however, affected by the range of financial sources available, which is not the same for listed and unlisted firms. In addition to their internally generated funds, listed firms are able to issue shares and have easier access to the debt market than unlisted firms (Vanacker and Manigart, 2010). Listed firms are required to provide periodic reliable information about their past operations and future projects, thus reducing the problems stemming from information asymmetries. They usually are larger in size and have more tangible assets to use as collateral. In the same vein, their operations and future prospects are followed by analysts and assessed by rating agencies. Conversely, unlisted firms are only required to publish an annual report and are rarely monitored by analysts or rating agencies (González and González, 2007). Since their size is also lower than that of listed firms, they have fewer assets to use as collateral. As a result, they are most affected by information asymmetry problems when accessing external sources of funds to finance their investment projects (Berger and Udell, 1998; Brav, 2009), which cause a substantial difference between the cost of internal and external funds (Myers and Majluf, 1984; Carpenter and Petersen, 2002). Therefore, unlisted firms may forgo their growth opportunities, not carrying out positive net present value projects, when internal funds are insufficient to finance their investment opportunities (Gompers, 1995; Michaelas et al., 1999).

In this context, Venture Capital (VC) becomes an alternative external financial source, which provides funds in the form of equity or quasi-equity to unlisted firms exhibiting outstanding growth opportunities. In addition to much needed funds, VC firms also provide many value added services to investee firms, such as monitoring, advisory services and reputational capital (Sahlman, 1990). The VC literature has deeply analysed supply-side issues that justify the role played by VC firms, as well as the main firm characteristics that are found to be attractive to venture capitalists (VCs). However, there is little research on the demand side, specifically, on the financial characteristics of firms that induce them to search for VC (Baeyens and Manigart, 2006).

Focusing on the demand side of the market, this paper analyses the capital structure behaviour and the financial characteristics of the firms that later receive VC. We study the capital structure adjustment process in unlisted growing firms over time. In particular, we aim to analyse the dynamic behaviour of leverage in a sample of firms prior to the initial VC investment event, and whether the existing adjustment process, if there is one, can help to explain why these firms have access to VC funding later. To the best of our knowledge, this issue has not been previously addressed in the literature.

The analysis is based on a sample of Spanish unlisted firms at the expansion stage that received the initial VC investment during the period from 1995 to 2007. Our analyses are also carried out on a one-by-one matched sample of firms that do not receive VC (the control group, hereafter). Possible differences in the dynamic behaviour of leverage in both groups of firms may arise, since, by definition, the type of funds that each group is accessing is radically different and this entails different implications in terms of the capital structure behaviour.

In order to analyse the dynamic behaviour of leverage, we use a target adjustment model, where the target debt ratio is estimated as a linear function of the determinants of leverage proposed in the literature on capital structure. Given the dynamic processes found in firm leverage, the estimations are based on the Generalised Method of Moments estimator developed by Blundell and Bond (1998). The use of this technique allows us to address the autoregressive process found in the debt ratio and the fact that the explanatory variables, including the lagged value of the debt ratio, are potentially endogenous.

The results show that the group of firms that later obtain VC adjust their capital structure to a target debt ratio more slowly than the control group. This behaviour could be explained because the first group of firms could be more financially constrained, thus exhausting their internally generated funds and showing higher leverage ratios than those found in firms belonging to the control group. We also find some significant differences in the determinants of the target debt ratio. While the leverage of firms that later obtain VC is related to

tangible fixed assets, size, profitability and growth opportunities, only size and profitability are significant in explaining the leverage of the control group.

The rest of the paper is organised as follows. Section two provides an overview on the VC process in order to understand the functioning of this activity. Section three provides a brief review of the existing literature on capital structure, which is related to VC as a source of external finance. Section four describes the sample and the methodology. The results are presented in Section five. Section six concludes the paper and discusses the results obtained.

2 Venture capital activity

The stages of the VC process are mainly three: fundraising, investment and divestment. These stages characterize the cyclical behaviour of this activity. In a first stage, VC organizations raise funds which typically take the form of closed-end funds with a limited life spam between eight and twelve years. As a general rule, when investors join a new fund, they sign just a commitment, since the money is disbursed as investments are approved. Additionally, investors often cannot always commit the amount of funds they would like to. This is due to the fact that VC organizations are usually reluctant to accept large sums of money, as the number of experienced investment managers often adjusts more slowly than the swings in capital (Gompers and Lerner, 2002). On average, the fundraising process takes between twelve and eighteen months.

The investment stage of the process begins when the VC organization activates a deal flow and starts screening investment proposals. The companies selected have to provide a comprehensive business plan. If an agreement is reached between both parties regarding the financial instruments to be used, a letter of intention is signed. Then, and before providing the money needed, the management team carries out a detailed investigation into the company concerned, which is known as due diligence. After that, the fund managers ask the investors to pay their share of the capital required. The whole process is slow and usually takes between fourteen and sixteen weeks since companies

which receive this type of finance are rarely stock market quoted. Due to the complexity of the process, the total time required to invest the majority of the fund is often around three years. It should be noted that VC organizations tend to invest in certain industries or stages of development of the firms where they can best provide experience, managerial advice and contacts with third parties (Norton and Tenenbaum, 1993).

In the final stage of the process the VC organization sells the shares of the companies in the portfolio, a process known as divestment. During the whole process and up to this moment, the aim of the fund managers is mainly to add value to the companies in the portfolio through management support and by providing credibility to third parties. The proceeds from divestments should be progressively returned to investors, so managers have to launch new funds to continue with the activity, which usually takes place every two or three years.

3 Venture capital and the capital structure adjustment process

3.1 Theories and evidence on capital structure and its adjustment process

Since the eighties, several theories have been proposed to explain the firm's financial behaviour, with the most traditional ones being the Trade-off and the Pecking Order theories.[1] The former states that firms balance the advantages[2] and disadvantages of debt in establishing their capital structure, leading to the existence of an optimum level of debt (Bradley et al., 1984). However, due to market imperfections firms cannot achieve this optimum and therefore aim to rebalance their capital structure in an attempt to reach this level. On the contrary, the Pecking Order theory (Myers, 1984; Myers and Majluf, 1984), which is based on the existence of information asymmetries,

[1] Other theories based on the market situation, such as market timing (Baker and Wurgler, 2002) or "Inertia" (Welch, 2004), have been proposed in recent years to explain the behaviour of capital structure.

[2] The advantages refer to tax shields (Modigliani and Miller, 1963; Mackie-Manson, 1990; Graham, 1996) and mitigation of agency free cash flow problems (Jensen, 1986). Disadvantages are related to bankruptcy costs (Kraus and Litzenberger, 1973) and agency conflicts (Jensen and Meckling, 1976; Myers, 1977)

establishes that firms follow a hierarchy in the use of funds with the aim of minimizing the financing costs. Therefore, internally generated funds are preferred over external ones and risky debt over equity. Under the Pecking Order theory, there is not an optimum level of debt, which would then depend, in each period, on the profitability and investment opportunities of the firm. In general, only the Trade-off theory states that each firm has an optimum level of debt (Flannery and Hankins, 2007).

The empirical evidence in a dynamic context, such as the one addressed in this paper, sets the validity of the Trade-off theory if leverage follows an adjustment process. However, Shyam-Sunder and Myers (1999) and Chen and Zhao (2005) argue that the reversion process of the leverage ratio can also be observed even if the Pecking Order theory holds. Thus, to some extent there is evidence that both theories could support the existence of a reversion of the leverage ratio. While some papers find evidence of the Trade-off theory (Jalilvand and Harris, 1984; Fischer et al., 1989; De Miguel and Pindado, 2001; Hovakimiam et al., 2001; Ozkan, 2001; Flannery and Ragan, 2006; González and González, 2007; Lemmon et al., 2008; López-Gracia and Sogorb-Mira, 2008; Huang and Ritter, 2009; among others), others prove that the Pecking Order theory is able to explain better the firm's financing behaviour (Shyam-Sunder and Myers, 1999; Watson and Wilson, 2002; Sánchez-Vidal and Martín-Ugedo, 2005). Some studies also find that there are mixed effects from both theories (Fama and French, 2002; Frank and Goyal, 2003).

Focusing on the Spanish economy and, in particular, on unlisted firms, which are severely affected by information asymmetry problems, some papers find evidence in favour of the Pecking Order theory (see Sánchez-Vidal and Martín-Ugedo, 2005; or Cardone and Cazorla, 2006, among others). However, some of these studies build on the methodology presented by Shyam-Sunder and Myers (1999), which is criticised by Chirinko and Singha (2000) as a valid test of the Pecking Order theory. Additionally, they are based on the negative relationship between profitability and debt, which could also be expected in a dynamic Trade-off framework (Strebulaev, 2007). In this sense, Gonzalez and Gonzalez (2007) and Lopez-Gracia and Sogorb-Mira (2008) conclude that both the Pecking Order theory and the Trade-off theory are useful in explaining the

firm's financing behaviour. They find that the firm's debt ratio follows an adjustment process to a target, but at a slow speed due to the high adjustment costs that these firms face. In this way, the literature shows that, in any case and under both theories, firms seem to adjust their debt ratio to some certain level, thus pointing to the importance of analysing this issue in a dynamic framework.

There is literature that analyses the drivers of the adjustment speed of the debt ratio. Drobetz and Wanzenried (2006) argue that the adjustment speed largely depends on firm characteristics, such as size, growth opportunities and the difference between the observed and the target debt ratio. In our opinion, these factors are proxies for attributes such as financial constraints and external financing costs, among others. Flannery and Hankins (2007) state that the adjustment process depends on external financing costs, financial constraints, potential costs of distress and the value of tax shields, which lead to an incomplete adjustment to the target leverage in each period. However, it should be noted that the aim of this paper is to estimate the adjustment speed in a group of firms that later receive VC, leaving for further research the factors that influence it.

2.2 Venture capital funding and the capital structure adjustment process

Unlisted firms, such as the ones analysed in this paper, are only required to report once a year, do not have a verifiable track record and are rarely monitored by analysts or rating agencies. As a consequence, they are most affected by problems derived from information asymmetries. Therefore, external investors do not have access to enough information about the firm's investment projects (adverse selection) or can not ensure that the funds provided are used adequately (moral hazard).

Vanacker and Manigart (2010) affirm that most high growth companies, which are usually unlisted firms, have considerable outside financing needs. Nevertheless, to access bank loans, companies seeking external funding must hold sufficient tangible assets to be used as collateral. Additionally, moral hazard problems would make debt contracts more problematic, and more rigid covenants would be necessary to mitigate these problems (Berger and Udell,

1998). If long term debt is not available, growing unlisted firms should then rely on short term debt to finance their projects, albeit this would affect the maturity-matching principle between assets and liabilities. Short term debt would also compromise the firm's liquidity, as well as its financial situation. The restrained access to traditional external financing sources that growing firm's experience could exert an influence over the adjustment speed of the leverage ratio. According to Flannery and Hankins (2007), financial constraints affect the rebalancing costs[3] and, therefore, the speed of adjustment towards the target. This is in line with Dang et al. (2009), who find that financially constrained UK firms adjust their debt ratio more slowly than less constrained firms.

In this context, VC funding arises as an alternative long term financial source, which is often the only one available for unlisted firms. The study of the capital structure of VC-backed firms has received little attention in the literature. Most works concentrate on the instruments that should be used to guarantee the fulfilment of the contracts (Bergeman and Hedge, 1998; Cumming, 2005), but very few analyse the effect that VC could exert on the behaviour of the capital structure of firms in which they invest (one example is the research conducted by Hogan and Hudson, 2007). In particular, the study of the dynamic behaviour of the debt ratio in VC-backed firms has received scant attention. This paper aims to cover this gap by analysing the dynamic behaviour of the debt ratio in firms that later receive VC funds, and whether this behaviour can explain why these firms approach institutions that provide this type of funds later on.

The speed of adjustment towards a target in VC-backed firms may be driven by the lower financial flexibility that these firms face. Balboa et al. (2009) find that Spanish VC-backed firms exhibit greater growth opportunities, but also greater debt ratios, than similar firms that do not have access to VC funding, before the initial VC round. They argue that those firms might be exhausting their debt capacity before accessing VC funding. Those firms seem to focus on taking advantage of their growth opportunities rather than adjusting to their

[3] Flannery and Hankins (2007) argue that the cost of external financing sources and financial constraints affect the rebalancing costs for the debt ratio. However, we think that the former affects the availability of funds for the firm, which could be reflected in the financial constraints that the firm faces.

target debt levels. In this sense, Manigart et al. (2002) and Bertoni et al. (2010) find evidence of the presence of more severe financial constraints in VC-backed firms than in non-VC-backed ones before the initial VC investment. On the other hand, Engel and Stiebale (2009) argue that firms selected by VCs might be confronted with credit rationing to a different extent than other firms do before the investment event and, thus, may be characterised by different debt levels. In this line, Baeyens and Manigart (2006) find that VC-backed firms have higher debt ratios than their non-VC-backed counterparts before the initial investment event. This could probably lead to a reduction in their additional debt capacity and, therefore, in their financial flexibility.

As a consequence, firms that obtain VC funding later are probably more financially constrained, or at least exhibit a lower financial flexibility. According to Flannery and Hankins (2007) and Dang et al. (2009) a slower speed of adjustment is expected in financially constrained firms. The following hypothesis follows naturally from this discussion.

VC-backed firms exhibit a lower speed of adjustment to the target before the initial VC investment event than similar firms that do not obtain VC funding.

2.3 The determinants of the target debt ratio

The factors related to leverage have been widely studied in the literature. In their review, Harris and Raviv (1991) argue that there is a general consensus about the determinants that affect the capital structure of the firm, including factors such as tangible fixed assets, size, probability of default, profitability, volatility, growth opportunities, tax effects, marketing expenditures, research and development expenditures and the specificity of the product. On the other hand, Frank and Goyal (2009) find that only tangibility, profitability and median industry leverage are reliable factors that explain leverage when the book value is considered.

Since we do not have information about marketing and research and development expenditures, nor about the specificity of the product, this paper considers the remaining characteristics for estimating a target debt ratio. These characteristics and their predicted effect on the debt ratio are presented in

Table 1. A more detailed review of these factors and their expected relationship can be found in Titman and Wessels (1988), Michaelas et al. (1999), López-Gracia and Sogorb-Mira (2008) and Frank and Goyal (2009), among others.

Table 1. Firm characteristics related to the target debt ratio and their predicted effect

Firm characteristic	Effect on debt ratio
Tangible assets	Positive
Size	Positive
Profitability	Positive / Negative
Volatility	Negative
Growth opportunities	Positive / Negative
Effective tax paid	Positive

In addition to the firm characteristics considered in the literature, the activity sector should also be included in the analysis. Scott and Martin (1975) and Bowen et al. (1982) affirm that leverage ratios exhibit significant differences across industries. Ferry and Jones (1979) find a slight statistical relation between the relative debt structure and the generic industry group of the firm. Bradley et al. (1984) also find that the long term average debt ratios are strongly related to the industry classification. Therefore, there seem to be some factors related to the industry classification that lead to different debt ratios across industries.

To name only a few of the industries considered in the literature, Gupta (1969) argues that industries with high fixed asset turnover tend to have high leverage. Titman and Wessels (1988) state that companies belonging to specialised manufacturing industries, which face high bankruptcy costs, should be less exposed to debt financing. Mackay and Phillips (2005) show that firms in concentrated industries have higher leverage than firms in competitive ones. Miao (2005) finds that industries with high technology growth, risky technology, high bankruptcy costs or high fixed operating costs have, on average, lower relative leverage. Antoniou et al. (2008) argue that capital intensive industries,

such as manufacturing and utilities, are characterised by high debt ratios while others, namely high-tech industries, are known to have low debt levels. In the same vein, Hogan and Hutson (2007) find that in new technology-based firms the use of debt is rare and equity financing is the preferred source of external funds. Finally, Frank and Goyal (2009) find evidence that companies belonging to the same industry are affected by similar competitive forces, such as the degree of competition or the product-market interaction, and these forces may have an influence on leverage.

Consequently, it is necessary to include industry effects in the analysis of the capital structure determinants and its dynamics. In this sense, Mackay and Phillips (2005) show that within-industry characteristics help to explain the capital structure choice. Moreover, if the omitted factors are correlated with one or more of the explanatory variables, the coefficients estimated could be biased (Parsons and Titman, 2008).

3 DATA AND METHODOLOGY

3.1 Data and sample selection

The data used in the analysis is based on a sample of Spanish unlisted firms. The period analysed covers initial VC investments reported from 1995 until 2007. The source of data is the Spanish Private Equity and Venture Capital Association (ASCRI) and www.webcapitalriesgo.com, which feeds an annual database in collaboration of one of the co-authors since 1984.[4] The key advantage of using this database is that it covers all individual deals carried out in Spain, allowing us to create an unbiased sample that is close to the full population. According to these sources, during this period 2,651 firms were subject to a VC investment in Spain, excluding investments in financial and real estate sectors. We were able to fully identify 2,110 VC-backed firms, once duplicated firms (i.e. those affected by syndication and those invested by other VC investors in previous years) are excluded. Of these firms, 1,063 were initially funded at the seed or start-up stages, 779 were at the expansion stage and 268 belonged to the buyout and other late stages category.

[4] No other official source keeps track of VC activity in Spain, neither the Bank of Spain nor the Securities and Exchange Commission (CNMV).

We focus the analysis on firms at the expansion stage for three reasons. First, since the capital structure behaviour is driven by very different factors and motivations depending on the stage of the firm, including firms at early, expansion and late stages would introduce several biases and derive to conclusions that may not be valid for all firms. Second, we analyse the behaviour of the capital structure before the VC investment event. Therefore, firms at the early stages have to be excluded because there are not enough data available to analyse this period. Third, we do not include firms at late stages because we are interested in analysing the dynamic behaviour of the debt ratio in firms that are supposed to suffer from information asymmetry problems, as stated in the previous section.

We found accounting data on 757 VC-backed firms at the expansion stage in the Official Trade Registers and the AMADEUS Database.[5] We tried to match each VC-backed firm, one-by-one, with comparable firms not receiving VC funding. Comparable firms were randomly chosen from the AMADEUS Database, matching the sector, by means of the NACE Rev2 code (4-digit code), the number of employees, the revenues, the asset volumes, the age and the location.[6] All these characteristics were matched in the year before the initial VC investment. We were able to identify a valid comparable firm for 605 firms that were later subject to a VC investment.

Nevertheless, the estimation process described in the following subsection requires data on at least six consecutive years, before the external financing event, to define instrumental variables efficiently (De Miguel and Pindado, 2001; Gaud et al., 2005). Since some firms were not old enough at the time of the initial investment, this requirement reduced our sample of VC-backed firms at the expansion stage to 237 firms, representing 30.4 per cent of the population of firms at that stage and 39.2 per cent of the sample of VC-backed firms for which we were able to identify a comparable non-VC-backed firm at the same stage. Our dataset also includes 237 comparable control group firms that meet the same data requirement.

[5] This database records information on 1,202,363 Spanish firms.
[6] In some cases we did not find a firm in the same region, so a firm in another Spanish region with a similar average level of personal income was selected.

We expect the impact of any survival bias to be limited because we focus on the pre-investment period, in which all VC-backed firms were obviously alive. Therefore, the survival bias could only marginally affect the control group firms, because the AMADEUS database deletes data on firms that disappear, albeit several years later. To mitigate this effect further, we randomly searched for comparable firms in old DVDs provided by AMADEUS when matching investments of the mid-nineties and those carried out around year 2000.

Panel A of Table 2 shows mean values for sales, headcount, total assets and age for the population of VC-backed firms at the expansion stage and those firms finally included in the sample. No significant differences are found for all variables, with the exception of age,[7] so that the sample can confidently be considered as representative of the population. Panel B shows the same descriptive statistics but for the sample of firms that were later subject to a VC investment and the corresponding control group included in the sample. It is important to highlight that the mean values for all variables in both groups are not statistically different, thus showing a successful matching process based on all these characteristics.

Table 2. Mean of sales, headcount, total assets and age in the sample

Group	Number	Sales*	Employees	Assets*	Age**
Panel A-Comparison firms later receive VC: population vs. sample					
Population	757	27,195	180	23,867	12.593
Sample	237	25,461	185	22,865	18.515
	p-value	0.7873	0.9132	0.8199	0.0000
Panel B-Comparison sample: later receive VC vs. Control Group					
Later receive VC	237	25,461	185	22,865	18.515
Control Group	237	22,955	153	17,382	17.404
	p-value	0.6501	0.5191	0.1969	0.2951

Data refers to the year before the VC investment event.
*Thousand constant 2005 Euros.
** In years.
Source: Amadeus Database.

[7] This was to be expected, since we do not consider in the sample young firms at the expansion stage because data on six consecutive years before the initial investment are not available.

3.2 Model and methodology

The adjustment process of the debt ratio can be represented by a partial target adjustment model (De Miguel and Pindado, 2001; Lopez-Gracia and Sogorb-Mira, 2008). The form of the model shows that changes in the debt ratio ($D_{it} - D_{it-1}$) partially absorb the difference between the target level and the previous debt ratio ($D^*_{it} - D_{it-1}$):

$$D_{it} - D_{it-1} = \alpha\left(D^*_{it} - D_{it-1}\right) \quad (1)$$

where D_{it} and D_{it-1} are the debt levels in the current and the previous period, respectively, D^*_t is the company target debt level and α [8] measures the speed of adjustment. The adjustment costs[9] are inversely related to α and can be represented as $1-\alpha$ (Lopez-Gracia and Sogorb-Mira, 2008). In this line, if α is zero the adjustment costs are very high and the company never adjusts its debt level to reach the target ($D_{it} = D_{it-1}$). On the contrary, if α is equal to one there are no adjustment costs and the company automatically reaches its target level ($D_{it} = D^*_{it}$). Thus, if firms follow an adjustment process to reach their target debt level, then the coefficient α should have a positive value between 0 and 1 (Lopez-Gracia and Sogorb-Mira, 2008). This implies a dynamic behaviour, where a firm adjusts its debt level towards the target according to the value of transaction costs.

According to (1), the actual level of debt is determined by:

$$D_{it} = \alpha D^*_{it} + (1-\alpha)D_{it-1} \quad (2)$$

In this equation, it should be highlighted that the target debt level is unknown and should be estimated. While in some works the target is externally determined (Jalilvand and Harris, 1984; Shyam-Sunder and Myers, 1999), most studies estimate this target through a regression that incorporates the

[8] This coefficient is assumed to be constant across companies. Nevertheless, it is probable that each firm has an individual coefficient due to its individual specific characteristics.

[9] As in Kayhan and Titman (2007), we simplify the specification of the adjustment costs by assuming that both leverage increasing and decreasing adjustments are symmetric. Byoun (2008) analysed the differences in the adjustment process according to whether the firm have above-target (below-target) debt with a financial surplus (deficit).

determinants of the capital structure shown in the previous section of this paper as explanatory variables (De Miguel and Pindado, 2001; Flannery and Ragan, 2006; González and González, 2007; Lopez-Gracia and Sogorb-Mira, 2008). The latter approach is the one considered in this paper, with the target being estimated by the following model:

$$D_{it}^{*} = \text{F (Tangibility, Size, Profitability, Volatility, Growth opportunities, Effective tax paid)} \quad (3)$$

Finally, incorporating equation (3) into equation (2) we have:

$$D_{it} = \beta_0 + (1-\alpha) D_{it-1} + \beta_1 TANG_{it} + \beta_2 SIZE_{it} + \beta_3 PROF_{it} + \beta_4 VOL_{it} + \beta_5 GO_{it} + \beta_6 ETR_{it} + \eta_i + \mu_{it} \quad (4)$$

where η_i represents 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 is as follows:

- D_{it}: is the ratio between long term debt[10] and total assets for each firm and year, as in Sogorb-Mira (2005).
- $Tang_{it}$: is a measure of the tangibility of assets for each firm and year. In particular, we use two measures for this variable. Tang1 is the ratio between tangible fixed assets and total assets, as in Rajan and Zingales (1995), Hovakimian et al. (2001), Frank and Goyal (2003), and Flannery and Ragan (2006). Tang2 is the ratio between tangible fixed assets plus inventories and total assets, as in Titman and Wessels (1988) or Sogorb-Mira (2005).
- $Size_{it}$: represent the size of the firm each year. It is measured by the natural logarithm of total assets, as in Titman and Wessels (1988), Hovakimian et al. (2001), Fama and French (2002) and Flannery and Rangan (2006), among others.
- $Prof_{it}$: measures the profitability for each firm and year. As in Titman and Wessels (1988), Hovakimian et al. (2001), and Ozkan (2001), among others, we define it as the ratio between earnings before interest, taxes,

[10] This category includes long term bank loans, long term debt issued by other firms belonging to the same corporate group, obligations related to leasing contracts and other long term debt. This latter category would include all bonds issued by the firm, including convertible bonds. However, the breakdown into these categories is not available.

depreciation and amortization (EBITDA) and total assets (Prof1); or as the ratio between earnings before interest and taxes (EBIT) and total assets (Prof2), as in Fama and French (2002), Frank and Goyal (2003), Sogorb-Mira (2005) and Flannery and Rangan (2006).

- Vol_{it}: is a measure of volatility for each firm and year. Following Balboa et al. (2009), it is defined as a moving standard deviation computing the changes in EBITDA (Vol1), or EBIT (Vol2), of the current and the previous two years.
- GO_{it}: measures growth opportunities for each firm and year. As in Michaelas et al. (1999), we use the ratio between intangible assets and total assets.
- ETR_{it}: is the effective corporate tax paid for each firm and year, and it is computed, as suggested by Ozkan (2000) and Lopez-Gracia and Sogorb-Mira (2008), as the ratio between effective corporate tax paid and the earnings before tax.

Also, two control variables are included in the empirical models. First, and in order to control for industry effects, we also include in the regression analysis an industry variable representing the median leverage per year for each group (Lemmon et al., 2008; Frank and Goyal, 2009). Second, all models include time year dummies in order to control for possible time effects on the leverage ratio of firms.

Regarding the methodology employed, the dynamic model used to represent firm leverage behaviour requires the use of the Generalised Method of Moments (GMM) estimators for dynamic panel data models. The estimations are carried out using the Blundell and Bond (1998) GMM estimator, which employs additional moment conditions based on first differences (in addition to the levels) to increase the efficiency of the estimation. The use of GMM is the adequate methodology when the data shows an autoregressive process (as happens with the debt ratio) and there is a potential endogeneity problem in the explanatory variables.

To check for a possible misspecification of the model, two tests are carried out. The first is the Sargan test of over-identifying restrictions, which confirms the validity of the instruments used by checking the absence of

correlation between the instruments used in the estimation and the error term. The second test examines the hypothesis of a serially uncorrelated error, since consistent estimations are only obtained if this is the case. In a dynamic model, such as the one estimated here, where differences of the variables are taken to remove the unobserved individual effects in the estimation of the model, this condition is verified if there is a lack of second order serial correlation in the first difference residuals.

3.3 Descriptive statistics

The debt ratios for both groups of firms are shown in Table 3. According to Panels A and B, firms that later receive VC are more indebted. This result is in line with Baeyens and Manigart (2006). However, when firms are split according to whether they belong to non-technology or technology sectors, it is shown that while in the former, firms that later receive VC funding show a higher debt ratio, in the latter both groups of firms show similar values. Overall, the results highlight the need to control for industry effects. The reason for the lack of difference in debt ratios of technology-based firms could be related to the public-sector funding provided by agencies such as ENISA[11] or CDTI,[12] controlled by the Ministry of Industry and Energy, which are available to both VC and non-VC-backed innovative firms.

[11] *Empresa Nacional de Innovación.*
[12] *Centro para el Desarrollo Tecnológico e Industrial.*

Table 3. Descriptive statistics of the leverage ratio before the initial VC investment

Panel A. Descriptive statistics of the debt ratio

Whole sample	**Obs**	**Mean**	**Median**	**Std. Dev.**	**Min**	**Max**
All firms	2,934	0.1199	0.0797	0.1376	0.0000	0.9994
Later receive VC	1,489	0.1326	0.1007	0.1311	0.0000	0.9994
Control Group	1,445	0.1068	0.0530	0.1429	0.0000	0.9087
Non tech firms						
All firms	2,596	0.1201	0.0816	0.1347	0.0000	0.9994
Later receive VC	1,308	0.1344	0.1050	0.1278	0.0000	0.9994
Control Group	1,288	0.1056	0.0540	0.1399	0.0000	0.9087
Tech firms						
All firms	338	0.1182	0.0529	0.1586	0.0000	0.8278
Later receive VC	181	0.1198	0.0646	0.1529	0.0000	0.8278
Control Group	157	0.1164	0.0309	0.1655	0.0000	0.7373

Panel B. Debt ratio evolution prior to the initial VC investment

Group / Year		**t - 1**	**t – 2**	**t - 3**
Whole sample				
Mean values				
Later receive VC		0.1590	0.1457	0.1375
Control Group		0.1037	0.1087	0.1099
	p-value	0.0001	0.0058	0.0342
Median values				
Later receive VC		0.1218	0.1151	0.1038
Control Group		0.0536	0.0458	0.0586
	p-value	0.0000	0.0000	0.0010
Non tech firms				
Mean values				
Later receive VC		0.1600	0.1482	0.1391
Control Group		0.1003	0.1033	0.1083
	p-value	0.0000	0.0012	0.0220
Median values				
Later receive VC		0.1227	0.1216	0.1087
Control Group		0.0526	0.0450	0.0590
	p-value	0.0000	0.0000	0.0000
Tech firms				
Mean values				
Later receive VC		0.1516	0.1257	0.1253
Control Group		0.1301	0.1504	0.1222
	p-value	0.6774	0.6035	0.9479
Median values				
Later receive VC		0.0851	0.0931	0.0577
Control Group		0.0591	0.0805	0.0529
	p-value	0.7850	0.7850	0.7850

t: Year of the initial VC investment.

Panel B also reports that the debt ratios are significantly different between both groups of firms, despite the fact that they are not significantly different in age[13] or size, as reported in Table 2. Additionally, for firms that later receive VC, debt ratios show a slightly increasing pattern prior to the entry of the VC firm (which could mean that the internally generated funds are insufficient to back up subsequent growth), whereas the ratios for the control group are overly similar over time. The continuous growth found in the debt ratios for firms that later receive VC could be signalling that these firms are not able to rebalance their capital structure very quickly, because they are in a growth process and try to use all sources of funds available. Again, differences in the behaviour of the debt ratio over time are found across sectors, with non-technology firms showing significant differences between the group that later receives VC funding and the group of similar firms that does not obtain funds from VC investors. As mentioned for the whole sample, those differences are significant in any of the three years before the investment event. Furthermore, an increasing pattern in the debt ratio is found in firms that were later subject to a VC investment, whereas the debt ratio in the group of firms that did not obtain VC funding does not change over time.

Regarding the variables related to the target debt ratio, Table 4 shows several descriptive statistics for the whole sample and the subsamples of firms that later receive VC and the control group firms, respectively. It also includes information on a t-test and a chi-squared test of difference in means and medians, respectively, between both groups of firms. The significant differences on tangibility, profitability, growth opportunities and effective taxes paid should be highlighted between both groups. These significant differences in factors related to leverage could signal a different financing behaviour between them.

[13] According to Berger and Udell (1998), both firm characteristics affect the sources of funds available. It is important to highlight this fact because the differences found in the financing behaviour should be explained by other factors.

Table 4. Descriptive statistics of the exogenous variables

Variable	Group	Obs.	Mean	Median	Std. Dev.	Min	Max
Tang1	Whole	2,934	0.1917	0.1350	0.1902	0.0000	0.9240
	VC	1,489	0.2507***	0.2110***	0.1907	0.0000	0.9240
	CG	1,445	0.1309	0.0511	0.1694	0.0000	0.9220
Tang2	Whole	2,934	0.3400	0.3287	0.2277	0.0000	0.9751
	VC	1,489	0.4041***	0.4074***	0.2180	0.0000	0.9751
	CG	1,445	0.2738	0.2434	0.2184	0.0000	0.9748
Size	Whole	2,934	15.4525	15.4065	1.4717	8.8537	20.2716
	VC	1,489	15.5108**	15.4512*	1.4443	8.8537	20.2716
	CG	1,445	15.3924	15.3205	1.4975	11.4076	19.6797
Prof1	Whole	2,934	0.1132	0.1028	0.1064	-0.8000	0.7370
	VC	1,489	0.1044***	0.0976***	0.1069	-0.8000	0.7113
	CG	1,445	0.1223	0.1087	0.1052	-0.5111	0.7370
Prof2	Whole	2,934	0.0671	0.0609	0.1024	-0.9536	0.7111
	VC	1,489	0.0583***	0.0568***	0.1028	-0.9536	0.6168
	CG	1,445	0.0761	0.0653	0.1012	-0.6222	0.7111
Vol1	Whole	2,934	1.5342	0.2851	8.0027	0.0001	144.8789
	VC	1,489	1.6958	0.2860*	9.0543	0.0001	144.8789
	CG	1,445	1.3676	0.2841	6.7489	0.0001	137.2539
Vol2	Whole	2,934	2.1030	0.4232	11.5574	0.0001	215.4583
	VC	1,489	2.3706	0.4150	12.4227	0.0002	207.3391
	CG	1,445	1.8272	0.4258	10.5892	0.0001	215.4583
GO	Whole	2,934	0.0606	0.0161	0.1101	0.0000	0.9886
	VC	1,489	0.0642**	0.0233***	0.1020	0.0000	0.8421
	CG	1,445	0.0569	0.0108	0.1178	0.0000	0.9885
ETR	Whole	2,934	0.2467	0.2984	0.1902	0.0000	1.0000
	VC	1,489	0.2300***	0.2700***	0.1962	0.0000	1.0000
	CG	1,445	0.2639	0.3080	0.1823	0.0000	1.0000

Data refers to all years in the sample.
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: firms that later receive VC (VC) vs. firms that not receive VC (CG).
Significance at levels ***1%, **5%, *10%.

Pair-wise correlations among all variables are shown in Table 5. Excluding the obvious conflict between variables included under the same category, there is no concern about the correlation among the remaining ones.

Table 5. Correlation matrix

Variable	Tang1	Tang2	Size	Prof1	Prof2	Vol1	Vol2	GO	ETR
Tang1	1.0000								
Tang2	0.7744	1.0000							
*	0.0000								
Size	0.1102	0.1286	1.0000						
*	0.0000	0.0000							
Prof1	0.0196	-0.0757	-0.0792	1.0000					
*	1.0000	0.0018	0.0008						
Prof2	-0.0578	-0.0947	-0.0491	0.9160	1.0000				
*	0.0747	0.0000	0.2973	0.0000					
Vol1	0.0005	-0.0217	-0.0206	-0.0642	-0.0543	1.0000			
*	1.0000	1.0000	1.0000	0.0224	0.1373				
Vol2	0.0037	-0.0146	-0.0103	-0.0907	-0.1224	0.3851	1.0000		
*	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000			
GO	-0.1286	-0.2070	-0.0123	-0.0311	-0.1339	0.0590	0.1105	1.0000	
*	0.0000	0.0000	1.0000	0.9871	0.0000	0.0604	0.0000		
ETR	-0.0611	-0.0700	-0.0118	0.1770	0.2159	-0.0633	-0.0506	-0.0778	1.0000
*	0.0406	0.0066	1.0000	0.0000	0.0000	0.0265	0.2400	0.0011	

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.

* p-values.

4 Results

Tables 6 and 7 show the results related to the variables *Tang1* and *Tang2*, respectively, which are rather similar. For firms that later receive VC the coefficient of the debt ratio lagged one period $(1-\alpha)$ is significant in all models, with the coefficient ranging between 0.4124 and 0.4639 in the case of firms that later receive VC funding and between 0.3763 and 0.3925 in the control group. As a result, the speed of adjustment varies from 0.5361 and 0.5876 in the former, whereas the range in the control group changes from 0.6075 to 0.6237. The average speed of adjustment of the different models estimated would stand

as 0.5624 for firms that were later subject to a VC investment and 0.6159 for the group of comparable firms not receiving VC funding.

Therefore, it seems that firms that later receive VC funding adjust their debt ratio more slowly than their similar matched firms selected as a control group. Since firms that later receive VC seem to be more affected by financial constraints, or exhibit less financial flexibility, our results are consistent with our hypothesis and with the evidence found by Dang et al. (2009). The limited financial flexibility hinders the chance to rebalance their capital structure to reach the target debt level. Additionally, these firms could be more concerned about financing their growth than about reaching the target debt level, which could be a second order consideration.

With regard to the factors related to the target debt ratio, we also find some differences between both groups of firms. In all models, tangibility, size, profitability and growth opportunities are significant for firms that later receive VC, whereas only size and profitability (tangibility is only fulfilled for *Tang1*) are significant in firms included in the control group. These differences on firm characteristics related to the debt ratio could imply a different financing behaviour in both groups. It should be highlighted that growth opportunities, which is an attribute VC investors pay attention to, is only significant, and positively related to the debt ratio, in firms that later receive VC.

In relation to industry effects, the variable median, which measures the median industry leverage and accounts for industry factors that may affect the debt ratio, is also introduced in the models estimated. This variable shows a positive relation with leverage, which is consistent with prior works (Lemmon et al., 2008; Frank and Goyal, 2009, among others). It should be noted that industry dummies can not be included in the models analysed, since the estimation process removes all the variables that are time invariant.

Table 6. Regression results considering Tang1

Indep. Var.	Model 1 VC	Model 1 CG	Model 2 VC	Model 2 CG	Model 3 VC	Model 3 CG	Model 4 VC	Model 4 CG
	Dependent Variable: Debt ratio							
$Debt_{t-1}$	0.4124^{***}	0.3836^{**}	0.4235^{***}	0.3764^{**}	0.4140^{***}	0.3840^{**}	0.4254^{***}	0.3763^{**}
	(0.1024)	(0.1608)	(0.1014)	(0.1553)	(0.0995)	(0.1630)	(0.0981)	(0.1574)
Tang1	0.2578^{***}	0.1243^{**}	0.2549^{***}	0.1108^{**}	0.2524^{***}	0.1186^{**}	0.2488^{***}	0.1064^{*}
	(0.0709)	(0.0554)	(0.0715)	(0.0555)	(0.0718)	(0.0558)	(0.0726)	(0.0555)
Size	0.0195^{*}	0.0376^{***}	0.0192^{*}	0.0315^{***}	0.0217^{**}	0.0381^{***}	0.0214^{*}	0.0329^{***}
	(0.0110)	(0.0137)	(0.0112)	(0.0108)	(0.0111)	(0.0141)	(0.0112)	(0.0107)
Prof1	-0.1149^{**}	-0.0581^{*}	-0.1208^{***}	-0.0600^{*}				
	(0.0451)	(0.0337)	(0.0433)	(0.0343)				
Prof2					-0.1057^{**}	-0.0886^{**}	-0.1123^{**}	-0.0928^{**}
					(0.0516)	(0.0392)	(0.0500)	(0.0393)
Vol1	-0.0004	-0.0001			-0.0004	-0.0001		
	(0.0008)	(0.0002)			(0.0008)	(0.0002)		
Vol2			-0.0002	-0.0000			-0.0002	-0.0000
			(0.0006)	(0.0003)			(0.0006)	(0.0003)
GO	0.2485^{***}	0.3446^{*}	0.2409^{***}	0.3474^{*}	0.2455^{***}	0.3273^{*}	0.2372^{***}	0.3295^{*}
	(0.0733)	(0.2044)	(0.0769)	(0.2044)	(0.0766)	(0.1985)	(0.0807)	(0.1987)
ETR	-0.0069	-0.0070	-0.0065	-0.0089	-0.0062	-0.0060	-0.0054	-0.0077
	(0.0212)	(0.0168)	(0.0209)	(0.0173)	(0.0211)	(0.0165)	(0.0208)	(0.0169)
Median	0.3535^{*}	0.7385^{*}	0.3564^{*}	0.7388^{*}	0.3378^{*}	0.6967^{*}	0.3408^{*}	0.6894^{*}
	(0.1854)	(0.4028)	(0.1888)	(0.4254)	(0.1828)	(0.3872)	(0.1855)	(0.4089)
Time dummies	yes	yes	yes	yes	yes	yes	yes	yes
Constant	-0.3024^{*}	-0.5382^{***}	-0.3416^{**}	-0.5078^{***}	-0.3356^{*}	-0.5431^{***}	-0.3769^{**}	-0.5286^{***}
	(0.1739)	(0.2044)	(0.1655)	(0.1722)	(0.1760)	(0.2102)	(0.1668)	(0.1695)
m_2	1.0533	0.0964	1.0397	0.0748	1.0458	0.0115	1.0301	-0.0198
p-value	0.2922	0.9232	0.2985	0.9404	0.2956	0.9908	0.3030	0.9842
Sargan	63.0480	63.5624	62.2026	64.6389	62.1563	62.9466	61.3927	63.9442
p-value	0.1868	0.1114	0.2073	0.0950	0.2084	0.1218	0.2282	0.1053

Regressions are estimated using the Blundell and Bond GMM estimator for panel data.
Dependent variable: Ratio between long term debt and total assets. 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 leverage per year and industry group.
m2: is the second order serial correlation test.
Sargan: is the Sargan test of the overidentifying restrictions.
Robust standard errors in brackets.
Significance at levels *** 1%, ** 5%, * 10%.

Table 7. Regression results considering Tang2

Indep.	Dependent Variable: Debt ratio							
	Model 1		Model 2		Model 3		Model 4	
Var.	VC	CG	VC	CG	VC	CG	VC	CG
$Debt_{t-1}$	0.4505***	0.3925**	0.4639***	0.3841**	0.4490***	0.3922**	0.4625***	0.3838**
	(0.1001)	(0.1564)	(0.0965)	(0.1522)	(0.0979)	(0.1591)	(0.0939)	(0.1548)
Tang2	0.0961**	0.0330	0.0951**	0.0231	0.0933**	0.0329	0.0918**	0.0238
	(0.0380)	(0.0343)	(0.0378)	(0.0343)	(0.0379)	(0.0349)	(0.0378)	(0.0346)
Size	0.0261**	0.0363**	0.0254**	0.0310***	0.0279**	0.0370**	0.0273**	0.0325***
	(0.0117)	(0.0149)	(0.0119)	(0.0121)	(0.0118)	(0.0151)	(0.0119)	(0.0119)
Prof1	-0.1169***	-0.0639*	-0.1269***	-0.0656*				
	(0.0445)	(0.0334)	(0.0427)	(0.0340)				
Prof2					-0.1116**	-0.0935**	-0.1214**	-0.0968***
					(0.0510)	(0.0376)	(0.0492)	(0.0376)
Vol1	-0.0005	-0.0001			-0.0005	-0.0001		
	(0.0007)	(0.0002)			(0.0007)	(0.0002)		
Vol2			-0.0003	-0.0000			-0.0003	-0.0000
			(0.0005)	(0.0003)			(0.0005)	(0.0003)
GO	0.2361***	0.3306*	0.2301***	0.3376*	0.2337***	0.3144	0.2268***	0.3204
	(0.0724)	(0.1991)	(0.0759)	(0.2025)	(0.0760)	(0.1947)	(0.0797)	(0.1984)
ETR	-0.0090	-0.0063	-0.0097	-0.0079	-0.0075	-0.0054	-0.0079	-0.0069
	(0.0199)	(0.0179)	(0.0196)	(0.0182)	(0.0199)	(0.0176)	(0.0196)	(0.0178)
Median	0.3786**	0.6789*	0.3852**	0.6817	0.3619*	0.6477*	0.3681**	0.6438
	(0.1884)	(0.3902)	(0.1872)	(0.4151)	(0.1864)	(0.3797)	(0.1852)	(0.4054)
Time dummies	yes	yes	yes	yes	yes	yes	yes	yes
Constant	-0.4019**	-0.5105**	-0.3936**	-0.4287**	-0.4294**	-0.5191**	-0.4228**	-0.4489**
	(0.1911)	(0.2212)	(0.1916)	(0.1799)	(0.1929)	(0.2244)	(0.1930)	(0.1758)
m2	1.0189	-0.0480	1.0063	-0.0940	1.0106	-0.1240	0.9955	-0.1753
p-value	0.3082	0.9617	0.3143	0.9251	0.3122	0.9013	0.3195	0.8608
Sargan	62.3181	61.6297	60.5420	62.5654	61.6646	61.1387	60.0601	62.0325
p-value	0.2044	0.1464	0.2516	0.1285	0.2210	0.1564	0.2656	0.1385

Regressions are estimated using the Blundell and Bond GMM estimator for panel data.
Dependent variable: Ratio between long term debt and total assets. Independent Variables: 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 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 leverage per year and industry group.
m2: second order serial correlation test.
Sargan: is the Sargan test of the overidentifying restrictions.
Robust standard errors in brackets.
Significance at levels *** 1%, ** 5%, * 10%.

An important consideration in all the previous estimations has to do with the fact that the models are estimated, separately, for the two subsamples, which considerably reduces the number of observations used to estimate the models. Thus, we employ an alternative way to test for the relative lower speed of adjustment found in firms that later receive VC, which exploits all the

information more efficiently. In particular, we include an interaction term which is defined as the product of the debt ratio, lagged one period, and the dummy variable VC (which takes value 1 for firms that later receive VC, and zero otherwise), thus using all the observations together in the same estimation. In this way, the term corresponding to the lagged debt ratio is $a_1 D_{i,t-1} + a_2 D_{i,t-1} VC$. The adjustment costs are equal to a_1 in firms that are not financed by VC, whereas those costs are represented by $a_1 + a_2$ in firms that later receive VC funding.

As shown in Table 8 the results obtained on the speed of adjustment are significant in all models. Regarding the estimated coefficients in the different models, a_1 ranges from 0.2334 to 0.2543, with the average value being $a_1 = 0.2430$. Regarding a_2, the estimate values are between 0.2881 and 0.3589, with the mean value being $a_2 = 0.3244$. These results imply an average speed of adjustment of 0.7570 and 0.4327 for the control group and for firms that later receive VC, respectively. These results confirm that the adjustment process to the target in the case of firms that later receive VC is slower than in the control group.

Table 8. Regression results considering an interaction term

Indep. Var.	Dependent Variable: Debt ratio							
	Tang1				Tang2			
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**
$Debt_{t-1}$	0.2494**	0.2543**	0.2440**	0.2482**	0.2377**	0.2408**	0.2334**	0.2362**
	(0.1192)	(0.1167)	(0.1201)	(0.1171)	(0.1128)	(0.1099)	(0.1138)	(0.1105)
$Debt_{t-1}$xVC	0.3006*	0.2881*	0.3042*	0.2915*	0.3569**	0.3469**	0.3589**	0.3477**
	(0.1655)	(0.1615)	(0.1668)	(0.1623)	(0.1512)	(0.1480)	(0.1527)	(0.1492)
Tang	0.1716***	0.1697***	0.1670***	0.1650***	0.0537**	0.0512**	0.0517*	0.0496*
	(0.0456)	(0.0454)	(0.0457)	(0.0455)	(0.0265)	(0.0258)	(0.0264)	(0.0257)
Size	0.0267***	0.0259***	0.0282***	0.0278***	0.0296***	0.0289***	0.0310***	0.0307***
	(0.0076)	(0.0059)	(0.0076)	(0.0059)	(0.0074)	(0.0060)	(0.0075)	(0.0061)
Prof1	-0.0983***	-0.1057***			-0.0975***	-0.1039***		
	(0.0277)	(0.0270)			(0.0284)	(0.0275)		
Prof2			-0.1078***	-0.1161***			-0.1080***	-0.1152***
			(0.0304)	(0.0300)			(0.0312)	(0.0306)
Vol1	-0.0005		-0.0006		-0.0005		-0.0006	
	(0.0005)		(0.0005)		(0.0005)		(0.0005)	
Vol2		-0.0007**		-0.0008**		-0.0007**		-0.0007**
		(0.0004)		(0.0004)		(0.0003)		(0.0003)
GO	0.2916***	0.2923***	0.2873***	0.2895***	0.2721***	0.2758***	0.2678***	0.2728***
	(0.0791)	(0.0796)	(0.0789)	(0.0797)	(0.0735)	(0.0748)	(0.0737)	(0.0753)
ETR	-0.0081	-0.0079	-0.0079	-0.0075	-0.0086	-0.0087	-0.0084	-0.0084
	(0.0142)	(0.0140)	(0.0141)	(0.0140)	(0.0144)	(0.0143)	(0.0143)	(0.0143)
Median	0.3498**	0.3316**	0.3476**	0.3286**	0.3265**	0.3141**	0.3236**	0.3106**
	(0.1374)	(0.1327)	(0.1365)	(0.1319)	(0.1354)	(0.1309)	(0.1347)	(0.1303)
Time dummies	yes	yes	yes	yes	yes	yes	yes	yes
Constant	-0.4055***	-0.3766***	-0.4284***	-0.4062***	-0.4354***	-0.4133***	-0.4577***	-0.4418***
	(0.1107)	(0.0859)	(0.1117)	(0.0863)	(0.1087)	(0.0885)	(0.1097)	(0.0889)
m_2	1.0215	1.0017	1.0102	0.9840	0.9719	0.9484	0.9623	0.9340
p-value	0.3070	0.3165	0.3124	0.3251	0.3311	0.3429	0.3359	0.3503
Sargan	98.8738	93.8959	98.1746	93.0889	98.7640	94.1875	98.3547	93.6001
p-value	0.2934	0.4255	0.3105	0.4486	0.2960	0.4172	0.3061	0.4339

Regressions are estimated using the Blundell and Bond GMM estimator for panel data.
Dependent variable: Ratio between long term debt and total assets. Independent Variables: VC: dummy variable that takes value 1 for firms that later receive VC and zero otherwise; 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 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 leverage per year and industry.
m2: is the second order serial correlation test.
Sargan: is the Sargan test of the overidentifying restrictions.
Robust standard errors in brackets.
Significance at levels *** 1%, ** 5%, * 10%.

4.1 Robustness analyses

To further increase the confidence in our results, some checks for robustness are also performed. The first one relates to the industry effects. As in Frank and Goyal (2009), the median asset growth for industry and year is considered as a proxy for these effects. The results remain unchanged, with the coefficient of the industry variable being negative and significant.

Additionally, it is important to take into account that most of the firms considered in this paper are small and medium sized firms, for which total current liabilities represent a high percentage of their capital structure. Thus, in order to check the robustness of the results, the regressions are also carried out using another measure for the dependent variable that also includes these liabilities. In particular, a total debt ratio, defined as the sum of long term debt and total current liabilities, is also employed. The results obtained are consistent with our findings and also show significant different values in the speed of adjustment between both groups, with the speed being lower in the group of VC-backed firms.

To sum up, significant differences in the speed of adjustment to the target debt ratio are found between firms that later receive VC and similar firms that do not obtain VC funding. Additionally, differences in the factors that affect the debt ratio are also found between both groups.

5 Conclusions and discussion

Most of the literature about VC is focused on the supply side. To contribute with a better understanding of the demand side of the market, the aim of this paper is to analyse the differences in the capital structure of firms that later receive VC with those that do not obtain VC funding. In particular, the focus of this paper is to analyse the dynamic behaviour of the debt ratio in firms that are able to attract VC later. We predict that VC firms that attract VC funding have sound growth opportunities and, simultaneously, their managers are willing to access any external source available. Therefore, their managers are more concerned about funding the required investments rather than adjusting the firm’s debt ratio to a target level. In this way, we hypothesise that the speed of adjustment to the target debt level in those firms should be slower than that

of similar unlisted firms that did not have greater growth opportunities and/or in situations where their managers are reluctant to access external sources to carry out the required investments.

The adjustment speed to the target debt ratio is estimated for Spanish unlisted firms that later receive VC and these results are compared with a one-by-one matched sample of similar firms that are not financed by VC. Significant differences in the speed of adjustment are found between both groups of firms, with the adjustment process to the target debt level being slower in firms that later receive VC, as expected. In this way, this paper contributes to the literature on entrepreneurial finance by providing firm evidence on the differences in the dynamic behaviour of leverage in firms that are later financed by VC. The difference found in the speed of adjustment between both groups of firms is consistent with prior studies that show that firms that later access VC funding are probably more financially constrained, thus affecting their capacity to rebalance the capital structure. Our results also show that the speed of adjustment of firms that are not subject to VC funding, as is the case of most firms in the Spanish economy, is smaller than that estimated by De Miguel and Pindado (2001) on a sample of Spanish listed firms. However, Gonzalez and Gonzalez (2007) show that the speed of adjustment for a sample that includes both listed and unlisted Spanish firms is lower than that found in De Miguel and Pindado (2001), making the results more comparable to our sample of firms that are not subject to VC funding. The lower speed of adjustment for unlisted firms could be explained by the fact that adjustment costs for these firms could be unusually large (Flannery and Rangan, 2006). When compared with firms that are later backed by VC, the higher speed of adjustment found in unlisted firms that were not subject to a VC investment, which is line with the ideas of Dang et al. (2009), could be explained by the fact that those firms may forgo their growth opportunities to avoid reaching a debt ratio which is not close to the target.

We also find differences between both groups of firms in the factors that affect the target debt ratio, especially regarding the proxy for growth opportunities, which is only significant in the group of firms that later receive VC. These results are in line with the ones found by Balboa et al. (2009), which are based on a static model. The fact that the results are similar under both a static

and a dynamic methodology points to the robustness of the results regarding the determinants of the debt ratio.

As regards the limitations, and due to unavailability of data, some variables that are sometimes considered in the literature based on listed firms could not be considered in this study. We were unable to test the impact of marketing and research & development expenditures, or other variables concerning the specificity of the product, on the debt ratio. Alternatively, data on patents could also be used, but this could only be carried out as more data becomes available in the case of Spain.

Several implications derive from the results obtained in this paper. For growing firms, those able to take advantage of growth opportunities should approach VC firms to carry out the required investments to avoid being financially constrained or, else, to be forced to abandon their growth prospects. Regarding policy makers, our findings provide evidence on the role that VC firms play on growing unlisted firms, as a source of external funds that help to reduce the dependency on the internally generated funds. We provide a financial explanation on why growing unlisted Spanish firms approach, or are attracted by, VC firms, overcoming their natural reluctance to allow an external investor to become a shareholder of the firm.

Regarding future research, it would be interesting to test how the speed of adjustment, as well as the capital structure determinants, changes after the VC investment. In this line, the type of VC investor involved should also be considered in the analyses. Finally, it should be interesting to test whether the results obtained in this sample of Spanish firms that later receive VC are also found in other countries.

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