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Effects of venture capital and private equity on investment-cash flow sesitivity of Spanish firms

MEMORIA PARA OPTAR AL GRADO DE DOCTOR

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INTRODUCTION

In general, Small and Medium-Sized Enterprises (SMEs, hereafter) are characterised by the lack or low level of collateral and the lack of any history or financial track record. As a result, the problems stemming from information asymmetries seem to be more acute in this group of firms and access to the stock and debt markets is more difficult, or even impossible, to achieve. Without external financing, investment decisions related to growth opportunities are then conditioned to the available internally generated funds.

Nevertheless, when SMEs cannot carry out investments to take advantage of growth opportunities, they search for financial intermediaries able to alleviate and manage information asymmetries. Their ambitions to grow as well as their needs to look for financial intermediaries change their attitude towards accessing external stakeholders.

In this framework, Venture Capital (VC, hereafter) represents an alternative source to finance investment opportunities for newly-created firms with a high growth potential. These specialised investors can deal effectively with adverse selection and moral hazard problems, and alleviate the problems stemming from information asymmetries between SMEs and investors. In addition to the funds supplied, venture capitalists provide non-financial services which add value to investee firms and increase their credibility in their relation with the stakeholders, namely potential shareholders, creditors, customers and suppliers. The latter make it easier for SMEs to access additional financial resources, thus alleviating the investment dependency on internally generated funds.

The main aim of this research is to fill the gap in the literature about the role played by venture capitalists in the reduction of the natural dependency of SMEs on internally generated funds to finance their growth opportunities. Most of the studies about VC financing on SMEs focus on the determinants of the firm's access to the financial resources provided for these investors as well as on the facts that determine the entry of venture capitalists. More recently, few papers focus on the investment sensitivity to cash flow in VC-backed firms and they obtain mixed results concerning the impact of VC funding due to methodological and sample selection issues.

We conduct our analysis on a representative sample of unlisted Spanish SMEs that were subject to a VC deal. Even though we will also consider mature firms, the main focus of attention will be firms at the expansion stage, for which growth is an important variable and data on both the pre and post-investment period are available.

Two empirical exercises are carried out to test our central research question. First, we test if the investment-cash flow sensitivity in firms that later receive VC funds differs from firms without VC involvement in the period prior to the investor's joining the SME. And second, we study to what extent venture capitalists reduce the investment dependency on cash flow of SMEs when that relationship in the pre and post-investment period is compared.

In both empirical works the results confirm the existence of the investment dependency on cash flow in the period prior to the entry of the venture capitalists. Nevertheless, this investment sensitivity becomes less

significant in the post-investment period. These results are consistent with the idea that VC does reduce SME's investment dependency on internally generated funds.

Additionally, we study whether the role played by VC investors in the investment sensitivity depends on the stage of the investee firm at the time of the funding. With a different methodological approach, we test our hypothesis on a sample of unlisted Spanish firms that were invested in at the expansion or later stages. The positive and significant relationship between investments and cash flows found in firms at the expansion stage before the investment event is significantly reduced in the post-investment period. As in previous empirical works, these results suggest that venture capitalists do reduce firm's sensitivity of investments to the internally generated cash flows. Conversely, investee firms at the late stage, namely buyout, did not exhibit any significant investment dependency before the Private Equity (PE, hereafter) deal whereas it becomes positive and significant after the firms are acquired by PE investors.

The empirical demonstration of the investment-cash flow sensitivity in unlisted SMEs, as well as its reduction after the VC investment, are the main contributions to the literature. These findings are robust to different settings, and methodologies. As alternative financial intermediaries, the financial and non-financial services provided by venture capitalists exert a positive effect on the investment-cash flow sensitivity of SMEs.

This PhD thesis is organised as follows. Chapter 1 presents a review of

literature outlining the financial problems found in SMEs as well as in mature firms, and the impact of VC and PE involvement on those groups of firms. In chapter 2, we describe the existing empirical framework related to the investment-cash flow sensitivity and the different methodological approaches to analyse this relationship. Chapters 3, 4 and 5 present the empirical results of our study. Chapter 3 provides evidence of the investment sensitivity to cash flow in firms belonging to the manufacturing sector prior to the entry of the venture capitalist. Chapter 4 illustrates the positive role played by VC on investee firms by testing the relationship between investments and cash flows on a sample of firms belonging to the technology, media and telecommunications (TMT), manufacturing and service sectors between the pre and post-investment period. In chapter 5, we apply a different methodology in order to identify the different role played by VC and PE investors. We analyse the investment-cash flow sensitivity in investee firms operating in low and medium technology firms, before and after the investment event. Finally, a discussion of the main findings and the main contributions to the literature are compiled in the last chapter. We also examine the limitations and implications of our work as well as our ideas for conducting further research on this topic. The process to build the dataset is described in the Annex. The samples of firms used in the three empirical works are based on that dataset.

CHAPTER 1
THE IMPACT OF VENTURE CAPITAL AND PRIVATE EQUITY INVOLVEMENT

1.1. INTRODUCTION

The problems stemming from information asymmetries make it difficult, or even impossible, for Small and Medium-Sized Enterprises (SMEs, hereafter) to access the capital markets. As a result, most SMEs must rely on their owners' wealth plus the internally generated resources to fund their operations. Nevertheless, the latter may not be sufficient to cover the investment required to develop their growth opportunities. An alternative financial source, such as Venture Capital (VC, hereafter), plays a critical role for SMEs, which would otherwise base their growth on short term debt or, else, forgo their growth opportunities.

But VC represents more than a financial source for entrepreneurs (Hsu, 2004; Chemmanur et al., 2009), with the VC institutions also providing many value-added services to investee firms, such as monitoring, advisory services and reputational capital (Sahlman, 1990; Gompers and Lerner, 1998). As specialised investors (Barry, 1994; Wright and Robbie, 1998; Gompers and Lerner, 2001; Tykvová, 2007), venture capitalists tend to closely follow the technology and market developments in their area of expertise. Accordingly, unlike traditional financial intermediaries, VC investors are actively involved in the investee firm (Sahlman, 1990; Gompers and Lerner, 1998; Wright and Robbie, 1998; Hellmann and Puri, 2000).

The origins of VC can be traced back to the US in the mid 1940s (Bygrave and Timmons, 1992). Its introduction in Europe occurred almost four decades later and with mixed success. First, most investments performed at the early

stages turned out not to be as profitable as they had been in the US. Second, the existence of less developed stock markets in Europe gave rise to a substantial flow of deals in unlisted mature firms, mostly related to low and medium technology sectors. In most cases the purpose was to provide an exit for the existing shareholders, who were no longer experiencing high growth rates but had stable cash flows to pay back debt. In such deals the high returns realised were based on a combination of high leverage, an active asset management and a substantial strategic shakeout after having acquired a majority stake. The importance of these deals resulted in the emergence of a market in Europe dominated by Private Equity (PE, hereafter), rather than VC, investors.

Notably, VC and PE play substantially different roles in investee firms. VC, which focuses on early stage growing firms, provides additional financing, alongside coaching and mentoring. PE, instead, does not usually inject additional funding in investee companies but, on the contrary, contributes to increasing their leverage.

Building on Jensen and Meckling (1976), Stiglitz and Weiss (1981), Myers and Majluf (1984) and Jensen (1986), the aim of the chapter is to describe the financial problems in SMEs as well as in mature firms, and the impact of VC and PE involvement on both groups of firms. The rest of the chapter is organised as follows. The following one focuses on the finance of SMEs and the value-added by VC institutions in addition to the financial resources. The third section describes the governance issues in mature corporations and the role played by PE institutions in this group of firms.

1.2. SMALL AND MEDIUM-SIZED ENTERPRISES AND VENTURE CAPITAL

1.2.1. THE FINANCING OF SMALL AND MEDIUM-SIZED ENTERPRISES

The unique characteristics of SMEs, which are not considered in the modeling of the mature firm paradigm, could generate a different set of financial problems. Those different characteristics may also explain why SMEs could find themselves faced by the same set of financial problems that mature firms address, but from a different angle (Ang, 1991). Unlike mature firms, SMEs are characterised by the lack or limited reliability of their financial track record (Ang, 1991; Chittenden et al., 1996; Berger and Udell, 1998). Therefore, SMEs are more affected by information asymmetries in their relationship with external sources of capital. These problems become more acute due to the lack or low level of tangible assets to pledge as collateral (Ang, 1991; Chittenden et al., 1996; Berger and Udell, 1998).

The problems stemming from information asymmetries, described by Jensen and Meckling (1976) and Myers and Majluf (1984) for the equity market and by Stiglitz and Weiss (1981) for the credit market, among others, imply that stakeholders do not have the same access to information. The lack of sufficient information to assess the quality of different investment projects in the firm[1] (adverse selection problems), or to ensure that the funds will not be diverted (moral hazard problems), determines the level of risk that creditors and/or equity investors face. A higher level of risk is then reflected by a high cost of external capital. Thus, information asymmetries between

[1] Each interest group has its own evaluation criteria (Cassar and Holmes, 2003).

stakeholders and entrepreneurs condition the choice of financing between outside sources and internally generated funds, and, regarding external financing, the choice between debt and equity. Jensen and Meckling (1976), Myers and Majluf (1984), and Stiglitz and Weiss (1981) affirm that information asymmetries may lead to the rejection of positive net present value investment opportunities in order to avoid the excessive cost of external financial resources. Regarding SMEs, this implies that they face additional difficulties to carry out investments to expand or, even, maintain their stake in the market.

According to Myers (1984) and Myers and Majluf (1984), there is a hierarchy in the use of funds, which is based on information asymmetry, when additional financing is required to take advantage of growth opportunities. This preference reflects the relative costs of the various sources of finance. Initially, funding firm investments should be covered by internally generated funds, which are not affected by adverse selection problems. If these were not enough, debt would be the next option and, finally, a stock issue would be the last choice. In this framework, firms with high levels of internally generated funds may carry out their investment opportunities with no need to seek external finance.

Since problems stemming from adverse selection and moral hazard may well be greater for SMEs (Carpenter and Petersen, 2002a; Frank and Goyal, 2003), their ability to attract funding from traditional external sources is limited. In addition to highly variable returns (Carpenter and Petersen, 2002b), the evaluation of the quality of the assets and the assessment of the

feasibility of investment opportunities may be difficult for suppliers of external funds (Fazzari et al., 1988). As a result, fast-growing SMEs usually do not follow the previously described hierarchy in access to external funds. Berger and Udell (2002) suggest that debt might be the first choice to finance expansion in firms where adverse selection problems dominate. Conversely, they argue that an external equity issue should be the first option in firms that are most affected by moral hazard problems. Hovakimian et al. (2001) consider that firms should finance growth opportunities with more equity than debt, and the latter more than the former should be used to finance assets.

The access of fast-growing SMEs to bank loans (Gregory et al., 2005) results in high costs (Berger and Udell, 1998; Titman and Wessels, 1988; Wald, 1999), complex contracts (Berger and Udell, 1998; Carpenter and Petersen, 2002a), and the risk of credit rationing (Stiglitz and Weiss, 1981; Carpenter and Petersen, 2002a and 2002b). The credit contract may allow banks to renegotiate the terms of the covenants. So firms face the risk of the bank reducing the funds provided or, even, asking for an anticipated return. Additionally, even for creditworthy SMEs, firms may be discouraged from applying for credit in the first place if they are not confident about the outcome of the process or, even, about the time required to receive an answer (Levenson and Willard, 2000). Based on the previous ideas, the extensive use of debt may not be appropriate for SMEs (Carpenter and Petersen, 2002a), and then they might be forced to turn down an investment project because the expected return is wiped out by a high cost of capital.

If long term debt is not available, fast-growing SMEs are compelled to

rely on short term debt (Chittenden et al., 1996; Weston and Brigham, 1991). However, the firm's financial position would be compromised by not being able to match the maturities of accounts receivable and accounts payable. Similarly, short term bank loans are a relatively accessible source of funds for fast-growing SMEs but their high cost may be impossible for entrepreneurs to take on. Therefore, this type of funding has a significant effect on the liquidity level of these firms but places its financial stability in jeopardy. Additionally, bank lines of credit, also known as revolving credit facilities, represent an alternative short term source (Riddiough and Wu, 2009) whereby banks closely monitor the financial situation of the firm. Conditional on that credit capacity, the firm chooses to invest when opportunities are available (Riddiough and Wu, 2009). Nevertheless, covenant violation may involve a restriction in the availability of credit, or even the inability to access unused credit (Sufi, 2009).[2]

In parallel, regarding outside equity, the stock market does not constitute an alternative for the financing of fast-growing SMEs, since it is relatively expensive and, even, out of the reach of smaller firms (Ang, 1991 and 1992; Kadapakkam et al., 1998) outside the US. With the exception of the UK, SMEs cannot easily raise equity capital in Europe (Weber and Posner, 2000). In the US, where the equity market is more developed, high-growth entrepreneurial firms can raise equity finance effectively through the NASDAQ. Nevertheless, the cost of a new share issue involving low volumes, including underwriting costs, registration fees and taxes, as well as selling and administrative

[2] On a sample of US firms, Sufi (2009) finds that a covenant violation is associated with a 15 to 25 per cent drop in the availability of both total and unused lines of credit.

expenses, can be unbearable (Fazzari et al., 1988).

Due to the difficult access to the traditional, most established sources of external funding, the only alternative to the internally generated funds for financing SMEs' investment opportunities is private placements of shares subscribed by business angels and venture capitalists. Nevertheless, most entrepreneurs are against dilution of ownership and loss of management control (Holmes and Kent, 1991; Chittenden et al., 1996). Based on the evolution over time of entrepreneurial attitudes towards control, Cressy (1995) identifies two groups of entrepreneurs: *Stayers* and *Movers*. *Stayers* are conservative entrepreneurs who prefer to maintain independence at the expense of abandoning growth opportunities. They generally experience low levels of external financing. On the other hand, *Movers'* preferences towards control evolve over time. They seem to display a strong ambition to grow, which in turn leads to a greater need for capital. These entrepreneurs are more active in searching for alternatives for financing their expansion process (Olofsson, 1994). As control aversion diminishes, they will progressively borrow to finance expansion. This group of entrepreneurs tends to exhibit high levels of external financing.

Entrepreneurs with a more open attitude tend to search for financial intermediaries able to deal effectively with adverse selection and moral hazard problems (Gompers, 1995), and to alleviate the problems of information asymmetries between SMEs and investors (Wright and Robbie, 1998; Gompers and Lerner, 2001; Hsu, 2004). Hogan and Hutson (2005) and Paul et al. (2007) find evidence of SME stock issues being the main source of external

financing, rather than debt, when equity capital was supplied earlier by specialised investors such as venture capitalists.

1.2.2. VENTURE CAPITAL INSTITUTIONS AS FINANCIAL INTERMEDIARIES

VC is a form of equity financing that is currently best suited to address the capital market imperfections inherent in the financing of firms' growth (Carpenter and Petersen, 2002b).[3] In some cases, it represents the only potential source of financing for high-risk firms, with significant intangible assets, expected years of negative earnings, and uncertain prospects (Gompers and Lerner, 1998; Scholtens, 1999).

In order to select the most promising firms, VC investors spend a significant amount of time and effort collecting private information during the pre-investment screening (Rajan, 1992; Admati and Pfleiderer, 1994; Reid, 1996; Kaplan and Strömberg, 2003). Fried and Hisrich (1994) find evidence that venture capitalists spend, on average, three weeks of full-time effort in the process of evaluation and closing of the deal, and that nearly 100 days are required to complete the whole investment process. The lack or insufficiency of information forces VC investors to base their evaluation on the personality of the entrepreneur, the uniqueness of the idea, or the structure of the market (Tykvová, 2007).

[3] In general, equity financing does not require collateralisable assets nor does it increase the probability of financial distress (Carpenter and Petersen, 2002a and 2002b; Brown et al., 2009); and it does not face the moral hazard problems associated with leverage (Carpenter and Petersen, 2002a and 2002b).

During the screening process, venture capitalists carefully review the firm's business plan and design contracts that minimise potential agency costs (Gompers, 1995). In this analysis, VC investors consider the attractiveness of the opportunity, the risk factors, the management team, and the contract terms (Gorman and Sahlman, 1989). At the same time, they identify areas in which they could add value through monitoring and support (Kaplan and Strömberg, 2003). Kaplan and Strömberg (2003) provide evidence that VC investors explicitly consider the attractiveness and the risks associated with the opportunity (market, strategy, technology, customer adoption, competition, and management). They highlight management risk as one of the most common sources of uncertainty identified by venture capitalists. Nevertheless, Kaplan and Strömberg (2003) find that VC investors are less concerned about undesirable characteristics of the entrepreneurs and about the management team being incomplete in some sense.

When making an investment, VC investors structure the deal and set appropriate incentive and compensation systems (Sahlman, 1990; Kaplan and Strömberg, 2003). Based on the screening, venture capitalists adjust the allocations of control rights, and the staging of the funds committed (Kaplan and Strömberg, 2003).

As a long term financing source, VC investors usually supply funds in the form of equity, or quasi-equity, instruments that involve holding minority stakes in growing SMEs (Sahlman, 1990; Kaplan and Strömberg, 2009). Additionally, venture capitalists do not aim to become permanent shareholders in the investee firms. As temporary investors, they aspire to help the entrepreneurs

develop their growth plans and, then, implement a successful exit.

Considering that venture capitalists invest in high risk ventures, they tend to limit investment to specific areas or stages of development (Barry, 1994), or to a limited technology, product and market range (Tyebjee and Bruno, 1984), with which they are familiar.

VC activity includes a wide range of activities in firms at different stages of development. Although Sahlman (1990), based on Plummer (1987), describe eight stages of VC investing, Jeng and Wells (2000), the European Private Equity and Venture Capital Association (EVCA),[4] The National Venture Capital Association (NVCA),[5] among others, only describe three stages: seed, start-up, and expansion. Firms at the seed stage usually apply the funds received to finance initial product research and development and to assess the commercial potential of ideas. They are still at a pre-manufacturing stage. In the case of firms at the start-up stage, they are bringing together a management team, refining the business plan, and preparing to manufacture, distribute, and sell their products. Usually these firms need more cash than the amount they generate.[6] Firms at the expansion stage already have their products in the marketplace, although they sometimes might still be unprofitable and need additional funds to finance the growth of their manufacturing and distribution capacity, as well as further Research and

[4] Established in 1983, the European Private Equity and Venture Capital Association (EVCA) represents the European Private Equity and Venture Capital sector and promotes the asset class both within Europe and through out the world (EVCA, 2007).
[5] The National Venture Capital Association (NVCA) is the leading trade association that represents the U.S. Venture Capital industry.
[6] Investments at either seed or start-up stage are also referred to as early stage investments (Jeng and Wells, 2000).

Development (R&D).

1.2.3. NON-FINANCIAL SERVICES PROVIDED BY VENTURE CAPITAL INSTITUTIONS

Throughout the investment process, venture capitalists provide a variety of non-financial services (Hellmann and Puri, 2000), which may considerably increase the probability of success of VC-backed firms (Chemmanur et al., 2009). In this way, VC investors differ from traditional intermediaries, who limit their involvement to providing financial resources.

In the investment process, venture capitalists face some industry-specific agency problems (Kaplan and Strömberg, 2004). Eventually, entrepreneurs and venture capitalists' interests may not be perfectly aligned[7] and the monitoring is costly if performed continuously (Gompers, 1995; Wright and Robbie, 1998). Thus, investors structure financial contracts to provide incentives for entrepreneurs to behave optimally (Kaplan and Strömberg, 2003 and 2004).

In addition to tailor-made contracts, venture capitalists employ some mechanisms to exercise more control over the management. Sahlman (1990) argues that the most common mechanisms are: the use of convertible securities, syndication of investment with other venture capitalists, and staging of capital infusions rather than a completing one-off injection of funds (Wright and Robbie, 1998). Many VC investments are made as purchases of

[7] The conflict between VC investors and entrepreneurs arises because entrepreneurs have information that VC investors do not have and because entrepreneurs make choices that are not fully known by VC investors (Barry, 1994).

convertible preferred stock (Sahlman, 1990), which is a more flexible instrument to allocate incentives to venture capitalist and entrepreneurs (Cumming, 2006). Nevertheless, Kaplan and Strömberg (2003) provide evidence of venture capitalists using combinations of multiple classes of common stock and straight preferred stock. Additionally, VC investors use 'participating preferred' stock (Sahlman, 1990; Kaplan and Strömberg, 2003), which is a combination of preferred stock and common stock. It guarantees the stakeholder a predetermined sum of cash if the firm is sold or makes an Initial Public Offering (IPO) (EVCA, 2007). This variant of convertible preferred stock is better categorised as a position of straight preferred stock and common stock than as a position of convertible preferred stock (Kaplan and Strömberg, 2003).

Regarding syndication, it represents more than a control mechanism. It allows the lead venture capitalist to share the investment risks with syndicate partners (Lerner, 1994; Wright and Robbie, 1998). As a consequence of the information shared by syndicate partners, Lerner (1994), Gompers and Lerner (2001) and Tykvová (2007) agree that syndication also helps to reduce uncertainty during the selection process and improve the selection of high quality projects. As Lerner (1994) argues, venture capitalists are more comfortable with a deal when other VC investors of similar experience are willing to invest as well. At the same time, when many high-profile co-investors constitute syndication, the alliance benefits from the reputation of the members of the group (De Clercq et al., 2008). Therefore, multifirm alliances imply greater market power for VC institutions and significant certification value to the

investee firms which the latter helps in accessing new customers, as well as other financial sources and enhance the chances of securing high-reputation underwriters (De Clercq et al., 2006; Stuart et al., 1999).

Even though use of convertible securities and syndication of investment is a strong control mechanism, Sahlman (1990) considers that staging capital infusions is the most powerful control mechanism that VC investors can employ to prevent an inefficient use of the funding provided. The capital invested at each point should be sufficient to push the firm to the next stage of its development (Tykvová, 2007). Staging capital infusions allows venture capitalists to provide incentives to entrepreneurs, and at the same time, to discipline and apply strong sanctions. Gompers and Lerner (1998) and Gompers (1995) examine the staging of investments and find evidence to support the view that venture capitalists provide more financing and a greater number of rounds of financing in the most successful transactions and cut off new financing if the information about future returns is negative. Thus, staging provides venture capitalists with an option to wait and not pre-commit funds. It also allows for the opportunity to renegotiate the terms of the agreement if the performance of the firm is not as expected (Gompers, 1995; Kaplan and Strömberg, 2003).

Another central feature of the financial contracts is the allocation of control rights between the VC investors and the entrepreneurs. Frequently, control rights are usually separated from VC investors' ownership rights and are contingent on firm performance (Tykvová, 2007). If the firm performs poorly, board rights, voting rights, and liquidation rights leave full control to

the VC investors. As performance improves, the entrepreneur retains/obtains more control rights. If the firm performs very well, the VCs retain their cash flow rights, but relinquish most of their control and liquidation rights (Kaplan and Strömberg, 2003).

After investment, the VC investors spend effort and time interacting with the investee firm (De Clercq et al., 2008). Post-investment VC actions include monitoring management, finding management, raising additional financing, offering strategic assistance, and providing advice (Gorman and Sahlman, 1989; Wright and Robbie, 1998; Kaplan and Strömberg, 2003).

Usually, the role of advisor played by venture capitalists implies that the investor takes seats on the firm's board of directors (Gompers and Lerner, 1998 and 2001). Lerner (1995) finds that VC investors are more likely to join or be added to the boards of private firms in periods when the CEO changes and when the need for monitoring is greater.

The information collection process continues after the initial investment. As Gompers (1995) argues, the monitoring activities depend on different characteristics of the firm: the lower the asset tangibility, the higher the growth options, or the greater the asset specificity of a firm, the closer the monitoring required by venture capitalists.

In addition to the monitoring role, VC investors provide support for building up the internal organization (Gorman and Sahlman, 1989; Bygrave and Timmons, 1992; Hellmann and Puri, 2002). They frequently replace the original founder as CEO (Hellmann, 1998), and assist firms in recruiting senior

managers (Gorman and Sahlman, 1989; Bygrave and Timmons, 1992; Chemmanur et al., 2009). Thus, the experience of VC investors in managerial activities implies that they may collaborate in the establishing of the optimal structure of the firm and participate in organizational, financial, strategic, and other decisions (Tykvová, 2007).

The continuous monitoring helps venture capitalists to reduce the information asymmetries as well as to provide certification to outside stakeholders (Sahlman, 1990). Venture capitalists also contribute with a network of contacts with suppliers, customers, financiers and or industry specialists with technical expertise (Tyebee and Bruno, 1984; Sahlman, 1990; Bygrave and Timmons, 1992; Barry, 1994; Gompers and Lerner, 1998; Chemmanur et al., 2009, among others), which help the investee firm create strategic alliances (Stuart et al., 1999) and access to additional finance (Sahlman, 1990; Admati and Pfleiderer, 1994; Wright and Robbie, 1998; Gompers and Lerner, 2001, Tykvová, 2007). This ability to raise additional long term funds increases the level of liquidity of fast-growing SMEs and releases their investment dependency on internally generated funds far beyond what was expected from the direct investment made by the VC firm.

The value-added by VC investors is positively perceived by both the entrepreneurs (Hsu, 2004) and the financial markets (signalling effect, e.g., Megginson and Weiss, 1991; Stuart et al., 1999). As Hsu (2004) argues, when the quality of a firm cannot be directly observed, firm outsiders rely on the quality of firm's affiliates as a signal of the firm's own quality. Thus, the amount of capital that a firm can raise could be less important than the quality

of the VC investor (Bygrave and Timmons, 1992; Sahlman, 1990) and the certification that the former can provide.[8]

1.3. PRIVATE EQUITY AND LATE STAGE INVESTMENTS

1.3.1. GOVERNANCE ISSUES IN MATURE CORPORATIONS

To a large extent financing problems exhibited by SMEs are not usually found in mature firms. Since this latter group of firms is less informationally opaque and less risky than SMEs, the capital structure decision between equity and debt is subject to different determinants in both groups (Berger and Udell, 1998; Cassar and Holmes, 2003). The relative transparency of mature firms (Berger and Udell, 1998) implies that they have an easier access to external finance than SMEs do (Berger and Udell, 2002). While SMEs only have access to VC, business angels and short term debt, whenever possible, mature firms also have access to public markets (Berger and Udell, 1998) and long term debt. As Cassar and Holmes (2003) point out, financing opportunities are naturally available for mature, more established firms, due to their longevity and more demanding reporting abilities. Along with a relatively longer operating history (Jelic et al., 2005), it is also easier to get day-to-day information from them than from SMEs (Kadapakkam et al., 1998).

Mature firms are usually more diversified and have less volatile profits. Therefore, they bear less risk and exhibit lower probability of default (Eriotis et

[8] In a sample of entrepreneurial start-ups with multiple financing offers, Hsu (2004) finds that entrepreneurs are willing to forego offers with higher valuations in order to affiliate with more reputable VC investors.

al., 2007). With stable cash flows (Jensen, 1986; Wright et al., 2001; Jelic et al., 2005), mature firms in a given industry easily attract financial suppliers and face lower transactions costs than SMEs do (Cressy, 1995; Kadapakkam et al., 1998).

When the ownership of mature firms is separated from control, the agency theory suggests that managers may pursue pecuniary and non-pecuniary maximising behaviours to the detriment of shareholders. In the presence of high free cash flow[9] and few attractive investment opportunities, the agency problems are more severe in this group of firms (Wright et al., 2001). This situation may affect investment and financing decisions (Wright and Robbie, 1998). Since payouts to shareholders reduce the funds under managers' control, as well as their power and, in some cases, managers' compensation (Jensen, 1986 and 1989), managers tend to retain cash flow in excess rather than distributing it to shareholders (Jensen, 1989). Managers are tempted to invest large amounts of free cash flow in low-return investment projects and expand firm size beyond that which maximises shareholder wealth (Jensen, 1986). A larger size of the firm enhances the social prominence, public prestige, and political power of managers (Jensen, 1986). These investments in firm growth tend to build 'empires' (Aggarwal and Samwick, 2006) that are more likely to destroy, rather than to create, value (over-investment problems).

This situation cannot be easily perceived by stakeholders when managers

[9] Jensen (1986 and 1989) defines free cash flow as cash flow in excess of what is required to fund all investment projects with positive net present values.

finance firm projects with internally generated funds (Jensen, 1986). If the ownership is so broadly dispersed across large numbers of shareholders, they experience a loss of control over the financial resources and cannot properly supervise managerial performance (Demsetz, 1983). When the conflicts described are especially severe, a financial restructuring might disgorge cash to stakeholders and resolve incentive and control problems through the introduction of new ownership and governance structures (Scholes et al., 2009).

On the other hand, ownership and control issues do not represent an important source of conflicts in owner-managed corporations. This ownership structure is typically found in family businesses in which ownership and management are assumed by a concentrated group of family members (Scholes et al., 2009). Nevertheless, closely-held firms without succession alternatives seek outside intermediaries for subsequent stages of organizational growth (Wright et al., 2001). Frequently, the owner wants his or her firm to remain independent but has not identified a top management successor (Wright et al., 2001). The founders of this group of firms may become overly conservative over time with the aim of preserving the wealth created, even though the firm may have attractive growth opportunities (Wright et al., 2001). That excessive conservatism could be based on owners' fear of losing control over the firm (Cressy, 1995) and may lead to under-investment problems. In some cases founders may be successful at starting a business but lack the required skills to manage a larger and more complex firm (Wright et al., 2001).

While stakeholders of mature firms with wide ownership-control separation demand a financial intermediary able to deal with the agency problems, owners of closely-held corporations want their firms to achieve growth by obtaining access to more professional managers. In both situations, PE investors represent an efficient alternative to mitigate the destruction or the downside of firm value as well as to survive over time.

1.3.2. PRIVATE EQUITY INSTITUTIONS AND MATURE FIRMS

The introduction of VC institutions in Europe did not lead to similar results to those found in the US. By the end of the 1980s most of the amount invested was allocated to mature, well established firms belonging to low and medium technology sectors (EVCA, 1993). As a result, the use of a new term, namely Private Equity (PE) soon became common, representing the new activities performed by those specialised investors.

PE are 'active investors' focused on value creation, as VC firms are, but they concentrate on asset, cash and leverage management in consolidated firms. Since value creation cannot be based on fast growth, because target investee firms are mature, it is based on asset management in highly-levered transactions performed in firms with stable cash flows. As mentioned in the previous section, mature firms can be affected by agency problems, when shareholders are dispersed, or by excessive conservatism, in closely-held firms. Both situations lead to sub-optimal asset allocation and capital structure decisions. Over-investment problems in corporations with acute agency

problems as well as under-investment problems in owner-managed firms may have negative effects on the shareholders' wealth. These problems may decrease the market value of the firm as well as the return to shareholders.

After a process of negotiation among three parties, namely PE investors, the management team and the incumbent owner, a firm is acquired by using a relatively small portion of equity and a relatively large amount of debt (Jensen, 1986; Kaplan, 1989; Wright et al., 2001; Kaplan and Strömberg, 2009). In a PE deal, known as buyout, the PE funds are committed to purchase the existing shares of a firm, with its price showing a significant increase (Jensen, 1986). The acquisition is carried out through an investment vehicle known as Newco, where the limited equity to be used in the acquisition is allocated. Since not all assets could be used as collateral, part of the debt used is unsecured, with subordinated debt being one of the most common financial instruments found. After the acquisition the Newco and the target firm will merge, usually retaining the original name of the target firm.

Since the PE firm buys a majority stake of an existing or mature firm (Kaplan and Strömberg, 2009), the substitution of debt for equity in the capital structure also enables greater concentration in the ownership structure (Thompson et al., 1992; Thompson and Wright, 1995; Wright et al., 2001). At the same time, PE investors retain the control of the board of directors and monitor managers with detailed contractual restrictions (Wright et al., 2009). Thus, they become 'active investors' involved in governance of the investee firm (Kaplan and Strömberg, 2009), with access to comprehensive and timely information (Wright et al., 2009).

Once the acquisition is completed, PE actions include sitting on the board of directors, monitoring and dismissing management (whenever necessary). As 'active investors', PE managers are also involved in the long term strategy of investee firms and, sometimes, manage the firms themselves (Jensen, 1986 and 1989).

The presence of a high level of debt represents a governance and control device (Wright et al., 2001). After a buyout deal, the 'overleveraging' approach might have a desirable and effective economic sense for investee firms (Jensen, 1989) since debt restrains managers from wasting resources on low-return investment projects (Jensen, 1986). Their actions focus on analysing the assets needed to support the core business and the basic sources of cash flow. The firm is forced to sell off parts of the business, refocuses its energies on a few core operations, and rethinks its entire strategy and structure in order to meet the debt service payments (Jensen, 1989; Thompson and Wright, 1995; Wright et al., 2009). Non-core assets are then sold to raise additional cash and reduce debt exposure. The proceeds of the assets sold help reduce debt to more sustainable, normal or permanent levels, and, at the same time, to create a more efficient and competitive firm (Jensen, 1986 and 1989).

PE deals provide a mean to improve managerial and employee incentives to unlock dormant firm resources that may have been blocked by prior ownership arrangements (Wright et al., 2001). The scheme of incentives of managers becomes a relevant issue for PE investors since they require meaningful investments that maximise the value of the investee firm

(Thompson and Wright, 1995; Kaplan and Strömberg, 2009; Wright et al., 2009). These decisions are reinforced by the pressure of interest and principal payments created by leverage (Kaplan and Strömberg, 2009), where asset management generates the needed cash (Jensen, 1986) and stimulates strategic change (Wright et al., 2001).

After a buyout deal, decision rights over strategic and operating choices are controlled by managers (Wright et al., 2001), who frequently receive 15-20 per cent of the equity (Jensen, 1986). The latter play an important role in structuring the debt to finance the buyout and in monitoring management in the post-buyout firm (Cotter and Peck, 2001).

As is common in VC funds, PE funds have a limited life span, therefore, they are committed to sell the firms they acquire and return the money to the limited number of partners (Norbäck et al., 2010). As a consequence, PE acquisitions are organised to complete the restructuring and value creation process in about three to five years. Then PE managers would ideally find an exit though an IPO or a trade sale, which could be made to another PE firm.

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While investment ratios are higher for VC-backed firms in all sectors, the wedge between the two groups is particularly wide in the TMT sector (0.0537 pre-investment which increases to 0.0637 post-investment period). At the same time TMT firms are those for which the difference in the (negative) cash flow ratio between VC-backed and control group firms is larger in absolute terms and becomes sizeably larger after-investment (-0.0180 vs. -0.0398). The intangible assets ratio for VC-backed firms is always higher than for control group firms, regardless of the sector, and again TMT sectors show the most extreme difference (0.0573 and 0.0818 in the pre and post- investment periods respectively).

4.4. RESULTS

Table 4.6 shows the results obtained from the estimation of the models described in section 4.3.2 on the whole sample, splitting the pre and post-investment period.

Consistently with Hypothesis 4.1, we find evidence of a positive and significant relationship between investments and cash flows in both specifications and sub-periods. Non-VC-backed firms in our sample, thus, seem to be significantly financially dependent on internally generated cash flows. In the pre-investment period the *VC* coefficient is positive and significant while the *VC*CF* interaction term is not significant. Firms which eventually receive VC, thus, invest more but do not appear to be more sensitive to their level of cash-flows than control group firms.

TABLE 4.6.
REGRESSION RESULTS OF THE INVESTMENT-CASH FLOW SENSITIVITY FOR PRE AND POST-INVESTMENT PERIOD: WHOLE SAMPLE DIVIDED BY INVESTMENT PERIOD

	DEPENDENT VARIABLE: INVESTMENT			
INDEPENDENT VARIABLES	***PRE-INVESTMENT PERIOD***		***POST-INVESTMENT PERIOD***	
CF_{it}	0.4335 ***	0.4598 ***	0.2339 ***	0.2384 ***
	(0.0602)	(0.0621)	(0.0465)	(0.0454)
$Intang_{it}$	0.8930 ***	0.8990 ***	0.5946 ***	0.5986 ***
	(0.0688)	(0.0685)	(0.0519)	(0.0534)
$Size_{it}$	-0.0093	-0.0084	-0.0010	-0.0009
	(0.0063)	(0.0063)	(0.0030)	(0.0030)
Age_{it}	-0.0022 ***	-0.0023 ***	-0.0008 **	-0.0008 **
	(0.0007)	(0.0007)	(0.0003)	(0.0003)
TMT_i		-0.0236		-0.0112
		(0.0215)		(0.0115)
$TMT_i * CF_{it}$		-0.0435		0.0375
		(0.0400)		(0.0341)
VC_i	0.0252 *	0.0234 *	0.0403 ***	0.0421 ***
	(0.0137)	(0.0137)	(0.0081)	(0.0081)
$VC_i * CF_{it}$	0.0001	0.0018	-0.0472 **	-0.0762 ***
	(0.0063)	(0.0046)	(0.0224)	(0.0295)
Intercept	0.1096 ***	0.1084 ***	0.0849 ***	0.0855 ***
	(0.0260)	(0.0269)	(0.0182)	(0.0185)
Nº observations	3,088	3,088	3,324	3,324
Nº groups	639	639	643	643

The table reports the Generalised Least Squares, random effects, estimation of the model. The dependent variable is the ratio between investments (i.e. increase in net fixed assets of the firm *i* in year *t* plus depreciation in year *t*) and beginning-of-period total assets of the firm. The independent variables are: (1) CF_{it-1}: net earnings plus depreciation divided by beginning-of-period total assets; (2) $Intang_{it}$: intangible fixed assets normalised by beginning-of-period total assets; (3) $Size_{it}$: natural logarithm of total the number of employees of the firm *i* in the period *t*; (4) Age_i: age of the firm *i* at the period *t*; (5) TMT_i: dummy variable indicating firms which operate in the technology, media and telecommunications.; (6) VC_i: dummy variable indicating firms in the VC-backed group (i.e. 0 for firms in the control group). All ratios are winsorised at the 2% threshold. Robust standard errors are reported in parenthesis. ***, ** and * indicate, respectively, significance levels of <1%, <5% and <10%.

In the post-investment period, instead, VC-backed firms continue to invest more than control group firms (and the wedge seems to have widened, consistently with preliminary evidence presented in section 4.4) and, more interestingly, their investment level is less sensitive to current cash flows, as

shown by the negative and significant coefficient of the *VC*CF* covariate. This is consistent with our Hypothesis 4.2: after VC financing the relationship between investments and cash flows is significantly reduced.

Our control for growth opportunities, the ratio of intangible assets, is always positive and significant, reassuring us on the fact that it captures firm's investment opportunities as suggested by Manigart et al. (2003). *Age* and *Size* are, as expected, negative (older and larger firms invest relatively less) despite only *Age* being significant at usual confidence levels.

Surprisingly the coefficients of *TMT* and *TMT*CF* are negative, although not significant. TMT firms, contrary to expectations, do not seem to invest more than medium and low tech firms once investment opportunities have been controlled for, and they do not seem to be more dependent on cash flows. This might be reflecting easier access to alternative sources of money, such as innovation subsidies provided by public-sector-related bodies, as argued by Di Giacomo (2004).

To control for possible biases in our results due to possible imperfections in the matching process (which is by definition only made on observable characteristics), we also estimate equation (4.1) (and its augmented version including *TMT* and *TMT*CF*) on the restricted sample of VC-backed firms, excluding the control group (Table 4.7). We find that the *CF* coefficient is positive and highly significant before VC investment (consistently with Hypothesis 4.1), and that, while it is still positive after VC investment, it shows a sharp reduction, consistently with Hypothesis 4.2. Other variables

follow a similar pattern to that shown in Table 4.6, thus confirming that our results should not be driven by unobservable and uncontrolled differences between the two samples.

The significance of the *TMT*CF* term in Table 4.7 suggests that investment patterns, as well as cash flow sensitivity, might be substantially different across industries. Accordingly, we re-estimate equation (4.1) splitting by sectors on the whole sample (Table 4.8) and on the VC-backed sample only (Table 4.9).

The pattern found in firms belonging to the manufacturing and service sectors shown in Table 4.8 is similar to that shown in Table 4.6. Firms included in those two groups experience a sharp reduction in the *CF* coefficient after the investment occurs even though with a different dynamic: VC-backed manufacturing firms are more dependent on cash flows before VC investment than control group firms while this difference disappears after the initial VC investment; VC-backed service firms do not exhibit a different sensitivity before investment but a lower sensitivity after the VC investment. In either case, though, VC reduces investment sensitivity. These results are confirmed by figures shown in Table 4.9, where a substantial reduction in the *CF* coefficient is found in the period after the investment in both groups.

TABLE 4.7.
REGRESSION RESULTS OF THE INVESTMENT-CASH FLOW SENSITIVITY FOR VC-BACKED FIRMS FOR PRE AND POST-INVESTMENT PERIOD

	DEPENDENT VARIABLE: INVESTMENT			
INDEPENDENT VARIABLES	***PRE-INVESTMENT PERIOD***		***POST-INVESTMENT PERIOD***	
CF_{it}	0.4274 *** (0.0847)	0.5088 *** (0.0857)	0.2073 *** (0.0646)	0.2394 *** (0.0643)
$Intang_{it}$	0.9383 *** (0.0847)	0.9247 *** (0.0825)	0.6864 *** (0.0718)	0.6928 *** (0.0734)
$Size_{it}$	-0.0156 * (0.0090)	-0.0123 (0.0091)	-0.0096 * (0.0056)	-0.0102 * (0.0056)
Age_{it}	-0.0026 * (0.0008)	-0.0027 *** (0.0008)	-0.0011 ** (0.0005)	-0.0010 ** (0.0005)
TMT_i		-0.0427 (0.0268)		-0.0161 (0.0195)
TMT_i*CF_{it}		-0.1211 *** (0.0209)		-0.0382 ** (0.0177)
Intercept	0.1617 *** (0.0387)	0.1468 *** (0.0399)	0.1671 *** (0.0337)	0.1670 *** (0.0341)
Nº observations	1,572	1,572	1,614	1,614
Nº groups	320	320	321	321

The table reports the Generalised Least Squares, random effects, estimation of the model. The dependent variable is the ratio between investments (i.e. increase in net fixed assets of the firm *i* in year *t* plus depreciation in year *t*) and beginning-of-period total assets of the firm. The independent variables are: (1) CF_{it-1}: net earnings plus depreciation divided by beginning-of-period total assets; (2) $Intang_{it}$: intangible fixed assets normalised by beginning-of-period total assets; (3) $Size_{it}$: natural logarithm of total the number of employees of the firm *i* in the period *t*; (4) Age_i: age of the firm *i* at the period *t*; (5) TMT_i: dummy variable indicating firms which operate in the technology, media and telecommunications.; (6) VC_i: dummy variable indicating firms in the VC-backed group (i.e. 0 for firms in the control group). All ratios are winsorised at the 2% threshold. Robust standard errors are reported in parenthesis. ***, ** and * indicate, respectively, significance levels of <1%, <5% and <10%.

As regards *TMT*, results are, again, different from those found in the other two sectors and somewhat less clear-cut. In Table 4.8, results show that the *CF* coefficient is only significant in the period before the investment and becomes insignificant after the investment. When only the TMT VC-backed group is considered, in Table 4.9 however, in neither of the two periods is the *CF* coefficient significant; yet, the limited number of observations of this group limits the validity of this result. The interaction term between VC and cash flow

shows a negative sign in both periods in Table 4.8. This result may reinforce evidence shown in Table 4.7, and could be compatible with TMT firms getting sizeable subsidies that distort investment sensitivity to cash flows. An alternative explanation could be related to the low cash flow generation of TMT firms in the early stages, when these firms rely much more on entrepreneur's personal resources than on firm's cash flows. In this phase cash flows could not be a valid proxy for the availability of financial resources.

TABLE 4.8.
REGRESSION RESULTS OF THE INVESTMENT-CASH FLOW SENSITIVITY FOR PRE AND POST-INVESTMENT PERIOD: WHOLE SAMPLE DIVIDED BY SECTOR

	Dependent Variable: Investment					
Independent variables	***Technology, media and telecommunications***		***Manufacturing***		***Services***	
	Pre-investment period	***Post-investment period***	***Pre-investment period***	***Post-investment period***	***Pre-investment period***	***Post-investment period***
CF_{it}	0.2850 ***	0.1297	0.5791 ***	0.1623 *	0.5076 ***	0.2780 ***
	(0.1077)	(0.0881)	(0.1023)	(0.0917)	(0.1013)	(0.0672)
$Intang_{it}$	0.8891 ***	0.7313 ***	0.7042 ***	0.4867 ***	1.1312 ***	0.6223 ***
	(0.1376)	(0.0801)	(0.0956)	(0.0865)	(0.1083)	(0.1011)
$Size_{it}$	0.0072	-0.0023	-0.0279 ***	-0.0084 **	0.0040	0.0046
	(0.0148)	(0.0113)	(0.0098)	(0.0048)	(0.0096)	(0.0039)
Age_{it}	-0.0035 **	-0.0001	-0.0017 **	-0.0006	-0.0020	-0.0012 **
	(0.0016)	(0.0012)	(0.0007)	(0.0004)	(0.0014)	(0.0006)
VC_i	0.0126	0.0248	0.0282	0.0416 ***	0.0355	0.0273 **
	(0.0376)	(0.0253)	(0.0173)	(0.0133)	(0.0250)	(0.0134)
VC_i*CF_{it}	-0.1030 ***	-0.0299 **	0.0080 ***	0.1304	-0.0837	-0.0935 ***
	(0.0226)	(0.0137)	(0.0028)	(0.1182)	(0.0666)	(0.0166)
Intercept	0.0664	0.0979 *	0.1672 ***	0.1018 ***	0.0334	0.0926 ***
	(0.0583)	(0.0511)	(0.0416)	(0.0251)	(0.0400)	(0.0350)
Nº observations	356	473	1,674	1,732	1,048	1,119
No groups	91	92	334	335	212	216

The table reports the Generalised Least Squares, random effects, estimation of the model. The dependent variable is the ratio between investments (i.e. increase in net fixed assets of the firm *i* in year *t* plus depreciation in year *t*) and beginning-of-period total assets of the firm. The independent variables are: (1) CF_{it-1}: net earnings plus depreciation divided by beginning-of-period total assets; (2) $Intang_{it}$: intangible fixed assets normalised by beginning-of-period total assets; (3) $Size_{it}$: natural logarithm of total the number of employees of the firm *i* in the period *t*; (4) Age_i: age of the firm *i* at the period *t*; (5) TMT_i: dummy variable indicating firms which operate in the technology, media and telecommunications.; (6) VC_i: dummy variable indicating firms in the VC-backed group (i.e. 0 for firms in the control group). All ratios are winsorised at the 2% threshold. Robust standard errors are reported in parenthesis. ***, ** and * indicate, respectively, significance levels of <1%, <5% and <10%.

TABLE 4.9.
REGRESSION RESULTS OF THE INVESTMENT-CASH FLOW SENSITIVITY FOR PRE AND POST-INVESTMENT PERIOD: SAMPLE OF VC-BACKED FIRMS DIVIDED BY SECTOR

	Dependent Variable: Investment					
Independent variables	*Technology, media and telecommunications*		*Manufacturing*		*Services*	
	Pre-investment period	*Post-investment period*	*Pre-investment period*	*Post-investment period*	*Pre-investment period*	*Post-investment period*
CF_{it}	0.0463 (0.1445)	0.0957 (0.1091)	0.5839 *** (0.1337)	0.2809 ** (0.1178)	0.4210 *** (0.1447)	0.2850 *** (0.1010)
$Intang_{it}$	1.1362 *** (0.1502)	0.9093 *** (0.1114)	0.7344 *** (0.1195)	0.5554 *** (0.1062)	1.1973 *** (0.1418)	0.7677 *** (0.1493)
$Size_{it}$	-0.0093 (0.0213)	-0.0098 (0.0248)	-0.0351 ** (0.0148)	-0.0204 ** (0.0092)	-0.0024 (0.0124)	-0.0025 (0.0068)
Age_{it}	-0.0011 (0.0019)	0.0003 (0.0020)	-0.0019 ** (0.0009)	-0.0006 (0.0006)	-0.0042 ** (0.0019)	-0.0023 *** (0.0009)
Intercept	0.1646 * (0.0852)	0.1266 (0.0933)	0.2319 *** (0.0638)	0.1746 *** (0.0482)	0.0991 * (0.0561)	0.1963 *** (0.0623)
Nº observations	188	230	853	842	531	542
No groups	46	46	167	167	107	108

The table reports the Generalised Least Squares, random effects, estimation of the model. The dependent variable is the ratio between investments (i.e. increase in net fixed assets of the firm *i* in year *t* plus depreciation in year *t*) and beginning-of-period total assets of the firm. The independent variables are: (1) CF_{it-1}: net earnings plus depreciation divided by beginning-of-period total assets; (2) $Intang_{it}$: intangible fixed assets normalised by beginning-of-period total assets; (3) $Size_{it}$: natural logarithm of total the number of employees of the firm *i* in the period *t*; (4) Age_i: age of the firm *i* at the period *t*; (5) TMT_i: dummy variable indicating firms which operate in the technology, media and telecommunications.; (6) VC_i: dummy variable indicating firms in the VC-backed group (i.e. 0 for firms in the control group). All ratios are winsorised at the 2% threshold. Robust standard errors are reported in parenthesis. ***, ** and * indicate, respectively, significance levels of <1%, <5% and <10%.

To sum up, we find firm evidence that investments are sensitive to cash flows in all SMEs, including firms that are later invested by VC, consistently with Hypothesis 4.1. Regarding the period after the investment, we find that the investment-cash flow sensitivity is significantly reduced in the VC-backed group, with the interaction term showing a significantly smaller dependency in that group when compared with the control group, consistently with our Hypothesis 4.2. VC institutions thus effectively alleviate the investment dependency on internally generated funds in growing SMEs. Finally, all the results shown in this section are robust to an alternative measure of growth opportunities, namely growth of sales. The regressions are available upon request to authors.

4.5. CONCLUSIONS AND DISCUSSION

SMEs have a difficult access to external funding due to both problems stemming from information asymmetries, which limit the supply of external capital towards them, and problems deriving from control aversion of entrepreneurs, which limit their own demand for external capital in the first place. Information asymmetries cause suppliers of financial resources to demand enough assets as to be used as collateral and high interest rates, thus conditioning the ability of SMEs to take advantage of their growth opportunities. The fear of losing control on their businesses also limits the interest of entrepreneurs in finding external equity. As a result, most SMEs basically rely on their internally generated funds to finance growth.

VC is a long term source of external equity, which also brings value-added in the form of corporate governance and mentoring activities. Those value-added activities enhance the reliability of investee's financial statements and of the business itself. The increased equity base and the more solid accounts help entrepreneurs to raise long term resources, thus reducing the investment dependency on internally generated funds. Additionally, the temporary nature of the holding period of minority stakes by VC investors, also diminishes the control aversion shown by entrepreneurs.

In this work we analyse to what extent VC investors reduce the investment dependency on cash flow in fast-growing SMEs. We carry out our analyses on a sample of 322 growing Spanish SMEs that received a VC investment over the period 1995-2004. Our results are compared with a one-by-one matched sample of similar SMEs with no VC involvement.

After controlling for growth opportunities, size, age and sector, we find evidence of a positive and significant relationship between investment and cash flow when all firms, both VC-backed and not, are included in the analysis. As regards VC-backed firms, a significant reduction in the investment dependency on cash flows is found after the initial VC investment event. Although the relationship between investment and cash flow is positive and significant in both pre and post-investment periods, except in the group of TMT firms, the value of the coefficient decreases sharply after the entry of venture capitalists.

Our contribution to the literature is threefold. First, we provide new

evidence to the scarce and mixed results found in this field (Manigart et al., 2002; Bertoni et al., 2008; and Engel and Stiebale, 2009). Second, we provide a separate view in different sectors, highlighting the role of VC investors in low and medium technology sectors such as manufacturing and general services, while the sectoral dimension is often neglected in the literature. Finally, this is, to our knowledge, the first study about the investment behaviour of VC- and non-VC-backed Spanish SMEs and, as such, it is based on a totally unexplored population.

Regarding our limitations, we base our analyses on a static random effects model, building on the classical model by Fazzari et al. (1988), and using an alternative measure of growth opportunities. Since we aim to fully separate the pre and post-investment periods, the lack of data prevents us from using other approaches, such as the sales accelerator model (Abel and Blanchard, 1988) or the Euler equation model (Bond and Meghir, 1994), which require a larger time window to converge. However, our results are consistent across estimates and are not significantly affected when we estimate the models on difference sub-samples, which reassures us on their robustness.

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CHAPTER 5
VENTURE CAPITAL, PRIVATE EQUITY AND INVESTEE FIRM'S INVESTMENT SENSITIVITY TO CASH FLOW[***]

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5.1. INTRODUCTION

Venture Capital (VC, hereafter) is a source of external equity aiming at new firms with high growth potential. These unlisted firms are often considered to be financially constrained. On the one hand, they have very limited access to both debt and external equity when compared with listed firms. On the other hand, their ability to generate free cash flows from operations (i.e. internal financing) is often, especially for high-tech firms, out of reach (Carpenter and Petersen, 2002b). In parallel, the Private Equity (PE, hereafter) focus of investments moved away from newly created fast-growing firms and increasingly oriented towards large, mature firms, mostly related to low and medium technology sectors (EVCA, 1988-2008). In most cases the purpose of PE transactions is to provide an exit for the existing shareholders in firms that are no longer experiencing high growth rates, but have stable cash flows to pay back debt.

VC and PE investments include a wide scope of activities in firms at different stages, from funding start ups or firms at the expansion stage to structuring levered acquisitions, and the role played by these investors changes dramatically as well. VC and PE investments are also performed in a wide variety of sectors, including low and high technology, with the former having, at least in Europe, a larger share.

The aim of this chapter is to identify the different role played by VC and PE investors by analysing the investment-cash flow sensitivity in investee firms operating in low and medium technology firms, before and after the

investment event. We centre on a very large sample of Spanish low and medium tech manufacturing and services firms that were invested in between 1995 and 2004 at the expansion (VC) or buyout stages (PE). We estimate several specifications of an Euler equation relying on different assumptions about the extent of the 'structural break' which is caused by VC and PE investments.

We find consistent results across different specifications that low and medium technology firms at the expansion stage that were eventually funded by VC investors showed a positive and significant relationship between investments and cash flows before the investment event. Investment-cash flow sensitivity becomes almost insignificant in the post-investment period, suggesting that VC does reduce firm's dependency of investments on internally generated cash flows. On the contrary, we find that late stage low and medium tech firms did not show any significant investment-cash flow sensitivity before they were acquired by a PE investor but that positive relationship between investment and cash flows emerges subsequently. This latter piece of evidence is particularly new to the literature and is consistent with our hypotheses (see the discussion in section 5.2). VC invests in firms that exhibit a positive correlation between investments and cash flow, and subsequently eases that dependency. PE, on the contrary, invests in firms that are not dependent on internally generated cash flows, and engages in asset management activities which, combined with a substantial increase in leverage, put managers under the pressure of debt repayment. In other words, we show that while VC is eventually successful in alleviating the above-

mentioned dependency faced by new unlisted firms at the expansion stage (Carpenter and Petersen, 2002a), PE causes investment-cash flow sensitivity to wipe up management conservatism in consolidated firms.

5.2. RESEARCH HYPOTHESES

Obtaining financing is one of the necessary conditions to spur growth in fast-growing firms. These firms face important information asymmetries (Frank and Goyal, 2003), due to both the lack of a reliable financial track record (Ang, 1991; Chittenden et al., 1996; Berger and Udell, 1998) and the uncertainty of future growth opportunities (Berger and Udell, 2002), which derive from adverse selection and moral hazard problems that limit their ability to attract funding from traditional external sources. As a result, these firms are likely to be more constrained than others in financing their growth opportunities with only internally generated funds. VC, however, arises as an alternative source of external equity for a number of fast-growing firms. Allegedly, firms which eventually are invested in by venture capitalists, should then exhibit high investment sensitivity to cash flows. Hypothesis 5.1 follows naturally from this discussion.

Hypothesis 5.1: The relationship between cash flow and investment should be positive and significant in firms that are either funded by a VC institution later or not.

The contribution of PE to the investment-cash flow sensitivity of mature

firms is likely to be dramatically different from that of VC. Before the acquisition by a PE organisation, mature firms are far less dependent on external financing to finance their investment projects because they are less affected by information asymmetries than newly created firms without any track record (Frank and Goyal, 2003). These firms have a relatively longer operating history (Jelic et al., 2005), assets that can be used as collateral (Harris and Raviv, 1991), low gearing (Smith, 1990; Wright, Gilligan and Amess, 2009), stable cash flows, and more limited investment opportunities (Smith, 1990; Wright et al., 2001; Jelic et al., 2005). As Wright et al. (1992) point out, these target firms exhibit great capacity to generate financial resources, together with limited growth prospects. On these grounds, no significant dependence between investments and cash flows should be found in these firms before the PE investment event. Eventually, the reason itself why PE investors find these firms an interesting target might be the fact that they are not sufficiently 'under pressure' from financial constraints and, hence, end up being managed with excessive conservatism, as suggested by their low pre-investment productivity (Litchenberg and Siegel, 1987; Harris et al., 2005). Accordingly, we expect the following.

Hypothesis 5.2: Before a PE acquisition the dependency of firm's investments to cash flows should be marginally significant.

Moving now to the post-investment period, significant changes are expected in both VC and PE-backed firms. As an alternative source of external funding, and unlike other financial intermediaries, VC investors can also alleviate the problems of information asymmetries in fast-growing firms

(Gompers and Lerner, 2001; Hsu, 2004) by gaining private information on projects during the pre-investment screening (Rajan, 1992; Admati and Pfleiderer, 1994; Reid, 1996). In parallel, they add value to the firms they invest in (Sahlman, 1990; Gompers and Lerner, 1998; Jain, 2001; Hellmann and Puri, 2002; Chemmanur et al., 2009; among others).[29] The value-added by VC investors is positively perceived by both the entrepreneurs (Hsu, 2004) and other stakeholders (e.g. signalling effect: Megginson and Weiss, 1991; Stuart et al., 1999). The impact of VC on firm's financial constraints is, hence, expected to result in a very strong reduction in the extent to which firms have to rely on internally generated cash flows to fund their investments.

Hypothesis 5.3: After VC financing the sensitivity of firm's investment to cash flows should be significantly reduced, or even disappear.

Money committed by PE investors is, instead, mainly spent in buying existing shares from incumbent shareholders, with leverage representing 60 to 90 per cent of the price paid (Kaplan and Strömberg, 2009). This implies that normally no financial resource is conveyed to the firm itself. PE investors commit their share alone or accompanied by new and/or the existing managerial team. After the acquisition, there is active asset management aimed at enhancing the return on assets and raising cash to deleverage. Similarly, there is an active involvement in the management of the firm to control and monitor operational cash flow generation. In parallel, the high debt

[29] As active investors, venture capitalists provide many value added services to investee firms such as monitoring and advisory services, as well as reputational capital (Sahlman, 1990; Gompers and Lerner, 1998). The type of assistance included (Gorman and Sahlman, 1989): help with obtaining additional financing; strategic planning; management recruitment; operational planning; introductions to potential customers and suppliers; and resolving compensation issues.

levels limit the possibility of accomplishing high growth rates after the acquisition.[30] As a result, due to the asset management activities performed, which usually involve selling non-core assets (Wright et al., 2009), and the limited capacity to attract additional long term financing, we may find that positive investment sensitivity to cash flow arises after the acquisition. We hence expect the following.

Hypothesis 5.4: After a buyout in mature firms, the high level of debt used in the acquisition and the tight asset management carried out should lead to positive and significant investment-cash flow sensitivity.

5.3. METHODOLOGY

Several econometric models have been developed and adopted in the past few years to analyse the investment–cash flow sensitivity of firms (see Hubbard (1998), and Bond and Van Reenen (2007) for extensive reviews on this topic). The main distinction among different models is how they control for unobservable investment opportunities (which determine how much a firm should invest if no financial constraints were present). Controlling for investment opportunities is fundamental in this field, since they are likely to be correlated with current cash flows, which are used as a measure of the availability of internal capital. Consequently a relationship between current

[30] The exception to that rule is Buy and Build operations, also known as Leveraged Build-ups, where the leverage raised is used to spur growth though simultaneous acquisitions to gain size rapidly.

investment and cash flows can be nothing but a spurious correlation due to time varying unobserved heterogeneity (e.g. an increase in productivity will increase the profitability of investment opportunities, which will in turn translate into higher investments, and, at the same time, will boost cash flows; thus a positive correlation between investments and cash flows would be found even in the absence of financial constraints). In theory, investment opportunities could be captured by including the firm's marginal Tobin's q in the model. This is, however, difficult to estimate empirically, even for listed firms (see Hubbard, 1998), and virtually impossible for unlisted firms. Other alternative approaches have been proposed in the literature. For instance, Abel and Blanchard (1988) used a sales accelerator model which, with some modifications, is adopted by Manigart et al. (2003) and by Engel and Stiebale (2009). An alternative approach is to estimate an Euler equation (Bond and Meghir, 1994). This latter approach is followed by Whited (1992), Bond and Meghir (1994), Alti (2003), Whited and Wu (2006), and Bertoni et al. (2008), among others. In addition to the alternative reference to the Tobin's q as an estimate of growth opportunities, properly controlling unobserved growth opportunities, the effects of debt may also be assessed.

The basic specification of the Euler equation for firm's investments is as follows (Bond and Meghir, 1994):

$$\frac{I_{i,t}}{K_{i,t-1}} = \alpha_i + \beta_1\left(\frac{I_{i,t-1}}{K_{i,t-2}}\right) + \beta_2\left(\frac{I_{i,t-1}}{K_{i,t-2}}\right)^2 + \beta_3\left(\frac{CF_{i,t}}{K_{i,t-1}}\right) + \beta_4\left(\frac{S_{i,t}}{K_{i,t-1}}\right) + \beta_5\left(\frac{D_{i,t}}{K_{i,t-1}}\right)^2 + \varepsilon_{i.t} \qquad (5.1)$$

where $I_{i,t}$ measures the level of investments of firm i in period t, $K_{i,t}$ is the end-

of-period-t net value of firm i's invested assets; $CF_{i,t}$ is firm i's cash flow in period t; $S_{i,t}$ is firm i's sales during period t and $D_{i,t}$ is firm i's end-of-period-t total debts. If there are capital market imperfections and the external capital supply curve is upward sloping, β_3 should be positive and statistically significant, otherwise it should not be statistically different from zero. Equation (5.1) includes the lagged value of the dependent variable (and its square) among the regressors and, consequently, needs to be estimated by using a technique which controls for endogeneity since both Ordinary Least Square (OLS) and fixed-effects panel estimates would be biased (Bond et al., 2001). The technique which is most often used in recent years is the Generalised Method of Moments (GMM) estimation. In this work we use two step System-GMM estimation (Arellano and Bover, 1995; Blundell and Bond, 1998) with finite-sample correction (Windmeijer, 2005). The choice of System-GMM, as opposed to Difference-GMM, is motivated by the better performance in terms of precision of estimates which this technique is commonly found to give, especially when the dependent variable, as in this case, is highly persistent.[31]

To understand whether investment–cash flow sensitivity is affected by VC and PE financing, we estimate a set of augmented versions of equation (5.1), each of them corresponding to different hypotheses regarding the evolution of the parameters. The most general version of our model is as follows:

$$\begin{cases} \dfrac{I_{i,t}}{K_{i,t-1}} = \alpha_i^{PRE} + \beta_1^{PRE}\left(\dfrac{I_{i,t-1}}{K_{i,t-2}}\right) + \beta_2^{PRE}\left(\dfrac{I_{i,t-1}}{K_{i,t-2}}\right)^2 + \beta_3^{PRE}\left(\dfrac{CF_{i,t}}{K_{i,t-1}}\right) + \beta_4^{PRE}\left(\dfrac{S_{i,t}}{K_{i,t-1}}\right) + \beta_5^{PRE}\left(\dfrac{D_{i,t}}{K_{i,t-1}}\right)^2 + \varepsilon_{i,t} & \text{for } t < t_{INV_i} \\ \dfrac{I_{i,t}}{K_{i,t-1}} = \alpha_i^{POST} + \beta_1^{POST}\left(\dfrac{I_{i,t-1}}{K_{i,t-2}}\right) + \beta_2^{POST}\left(\dfrac{I_{i,t-1}}{K_{i,t-2}}\right)^2 + \beta_3^{POST}\left(\dfrac{CF_{i,t}}{K_{i,t-1}}\right) + \beta_4^{POST}\left(\dfrac{S_{i,t}}{K_{i,t-1}}\right) + \beta_5^{POST}\left(\dfrac{D_{i,t}}{K_{i,t-1}}\right)^2 + \varepsilon_{i,t} & \text{for } t \geq t_{INV_i} \end{cases} \quad (5.2)$$

[31] We also run all our estimates using Difference-GMM and the results are surprisingly similar to the ones we find using System-GMM.

where t_{INV_i} is the time when a VC or PE investor first invests in the firm. Equation (5.2) allows all parameters to vary throughout the investment. Our hypotheses can be easily translated in terms of tests made on coefficients in equation (5.2). The parameter of interest for Hypotheses 5.1 and 5.2 is β_3^{PRE}, which is expected to be positive and significant in the expansion sample and non significantly different from zero in the buyout sample. Hypotheses 5.3 and 5.4 translate, instead, in tests on β_3^{POST} and the extent to which it is different from zero. According to Hypothesis 5.3, β_3^{POST} should be close to zero, or at least positive but smaller than β_3^{PRE}, in the subsample of VC-backed firms at the expansion stage. According to Hypothesis 5.4, β_3^{POST} should be positive and significant, or at least greater than β_3^{PRE}, in the subsample of PE-backed buyouts.

Estimating equation (5.2) proves to be complicated by the fact that t_{INV_i} itself is not exogenous but endogenous, i.e. correlated with unobservable shifts in investment opportunities (which increase investments and attract external investors). To circumvent this problem we rely on different estimates for (5.2) and expect that results which hold across different models are, indeed, robust.

First, we estimate the two equations separately on the pre-investment and post-investment window. This estimation allows all coefficients to vary and would lead to correct estimates if t_{INV_i} was exogenous. However, even with an exogenous timing of investment, this technique leads to a serious

reduction in the efficiency of estimates. Making no assumptions at all on the coefficients of (5.2) leads to a serious reduction in the degrees of freedom available. This is true especially for the two α parameters which capture, broadly speaking, the 'trend' in firm's investments. By allowing α_i^{PRE} to differ from α_i^{POST}, we basically allow *each* firm to change its trend in investment after it receives VC or PE. While this is clearly a more conservative assumption than imposing a fixed structure on the relationship between α_i^{PRE} and α_i^{POST} it calls for the estimation of $2N$ intercepts, where *N* indicates the number of firms in the panel. Imposing more structure, for instance by allowing $\alpha_i^{POST} = \alpha_i^{PRE} + \delta$, would only entail the estimation of $N+1$ parameters. When *N* is large (in our case *N=324*) and *T* (the time horizon) is short (in our case it averages at 9.5), the loss of efficiency freedom is huge. This is made even worse by the fact that equation (5.2) includes the lagged dependent variable among the regressors. This means that in the post-investment period all observations in time $t = t_{INV_i}$ are dropped from estimation, thus reducing degrees of freedom by a further *N*.

At the other extreme, we estimate a model in which only the cash flow coefficient and the intercept are allowed to change across the VC or PE investment.

$$\frac{I_{i,t}}{K_{i,t-1}} = \beta_1\left(\frac{I_{i,t-1}}{K_{i,t-2}}\right) + \beta_2\left(\frac{I_{i,t-1}}{K_{i,t-2}}\right)^2 + \beta_4\left(\frac{S_{i,t}}{K_{i,t-1}}\right) + \beta_5\left(\frac{D_{i,t}}{K_{i,t-1}}\right)^2 + \left(1 - I_{t\geq t_{INV_i}}\right)\cdot\left(\alpha_i^{PRE} + \beta_3^{PRE}\left(\frac{CF_{i,t}}{K_{i,t-1}}\right)\right) + I_{t\geq t_{INV_i}}\cdot\left(\alpha_i^{PRE} + \delta + \beta_3^{POST}\left(\frac{CF_{i,t}}{K_{i,t-1}}\right)\right) + \varepsilon_{i,t} \quad (5.3)$$

where $I_{t\geq t_{INV_i}}$ is an indicator (dummy) variable which equals 1 after the investment is made and $\delta = \alpha_i^{POST} - \alpha_i^{PRE}$ is the acceleration (assumed constant across firms) in firms' investments after the investment is made. Equation (5.3) has two significant advantages over the splitting of the sample. The first is that equation (5.3) allows a significant increase in efficiency estimation, including only 2 parameters to estimate on top of those of a pooled equation and there is no loss of observations across t_{INV_i}. The second, methodologically more interesting, advantage is that some control for the endogeneity of t_{INV_i} can be included in the estimates. The main advantage of the GMM approach is that it allows for a vast flexibility about the assumption on the exogeneity of each variable. By assuming that $I_{t\geq t_{INV_i}}$ is endogenous, and hence including its lagged values as instruments in the first differenced equations and its lagged first differences as instrument for the level equations, we can control, albeit imperfectly, for the endogeneity of external investments. However, we reckon that equation (5.3) does impose an excessive structure on the model by forcing all other coefficients in (5.2) not to vary after the investment is made.

The intertemporal first-order condition from which the Euler equation derives, suggests to us that changes in firm's productivity or cost of capital will translate into shifts in the coefficients and, especially in β_4 and β_5. We hence estimate the following specification of equation (5.2):

$$\frac{I_{i,t}}{K_{i,t-1}} = \beta_1\left(\frac{I_{i,t-1}}{K_{i,t-2}}\right) + \beta_2\left(\frac{I_{i,t-1}}{K_{i,t-2}}\right)^2 + \left(1 - I_{t\geq t_{INV_i}}\right)\cdot\left(\alpha_i^{PRE} + \beta_3^{PRE}\left(\frac{CF_{i,t}}{K_{i,t-1}}\right) + \beta_4^{PRE}\left(\frac{S_{i,t}}{K_{i,t-1}}\right) + \beta_5^{PRE}\left(\frac{D_{i,t}}{K_{i,t-1}}\right)^2\right) + I_{t\geq t_{INV_i}}\cdot\left(\alpha_i^{PRE} + \delta + \beta_3^{POST}\left(\frac{CF_{i,t}}{K_{i,t-1}}\right) + \beta_4^{POST}\left(\frac{S_{i,t}}{K_{i,t-1}}\right) + \beta_5^{POST}\left(\frac{D_{i,t}}{K_{i,t-1}}\right)^2\right) + \varepsilon_{i.t} \quad (5.4)$$

Equation (5.4) allows, according to us, to the best compromise between model flexibility and estimation efficiency. It also allows us, just as we had for equation (5.3) to include the presence of an external investor as endogenous variable, thus allowing us to partially control for the endogenous switching between the 'non-invested' and the 'invested' status.

As will be shown in section 5.4, although our VC and PE subsamples are quite balanced across industries, so that biases arising from different sectoral compositions are unlikely to arise, we include a further estimate to control how cash flow sensitivity pre and post-investment evolves in different industries. This allows us to see whether VC and PE backed firms in different industries exhibit different investment behaviours before and after they are invested. To do so, we augment equation (5.3) by including sectoral interaction terms:

$$\frac{I_{i,t}}{K_{i,t-1}} = \beta_1\left(\frac{I_{i,t-1}}{K_{i,t-2}}\right) + \beta_2\left(\frac{I_{i,t-1}}{K_{i,t-2}}\right)^2 + \beta_4\left(\frac{S_{i,t}}{K_{i,t-1}}\right) + \beta_5\left(\frac{D_{i,t}}{K_{i,t-1}}\right)^2 + \alpha_i^{PRE} + I_{t\geq t_{INV_i}}\cdot\delta + \sum_s I_{s=s_i}\left[\left(1 - I_{t\geq t_{INV_i}}\right)\cdot\beta_3^{PRE,s}\left(\frac{CF_{i,t}}{K_{i,t-1}}\right) + I_{t\geq t_{INV_i}}\cdot\beta_3^{POST,s}\left(\frac{CF_{i,t}}{K_{i,t-1}}\right)\right] + \varepsilon_{i.t} \quad (5.5)$$

where $I_{s=s_i}$ is an indicator (dummy) variable equal to 1 when firm *i* is in sector *s* and zero otherwise. The reason why we chose equation (5.3) as the basis to build equation (5.5), rather than using equation (5.4) which is more general,

is that interacting coefficients with sectoral classification boosts geometrically the number of coefficients to estimate. We hence only decided to allow the interaction of the cash flow coefficient with sectoral dummies. We acknowledge that, with a higher number of observations, a more general model would have been preferable. However, considering the small differences we find in estimates between equation (5.3) and (5.4) we are quite confident that results from equation (5.5), which we use only as an additional evidence and robustness test, are sufficiently sound.

Finally, a further note on the instrument's set which is used in System-GMM estimations is due. We include among exogenous variables time dummies, sector dummies and (in equations in which stages are pooled, as in Table 5.4) stage dummies. In addition to the presence of the external investor, we include all the covariates in the set of endogenous variables, such as (lagged) investments, cash flows, sales and debt. This might be considered a somewhat excessively cautious assumption. However, the studies mentioned in section 5.2 do not propose a unanimous theoretical argument about which variables should be considered endogenous and which ones can be considered as exogenous or predetermined. We hence decided for the most general assumption. To limit the number of instruments and reduce overidentification, we limit the number of lags included in the regressions to 3 (i.e. lagged investments are used as instruments from t-2 to t-5 in differences for the level equations and from t-3 to t-6 in levels for the first differenced equations). We are still left with a sufficiently rich number of instruments without including very weak instruments such as remote lags of the covariates. To enhance

comparability we maintain the same set of instruments in all our specifications. The Hansen tests never reject the validity of the overidentifying restrictions, reassuring us about the soundness of our results.

5.4. SAMPLE AND DESCRIPTIVE STATISTICS

5.4.1. THE SAMPLING PROCESS

The sample used in this paper is based on unlisted Spanish firms that were subject to expansion (VC) and later stage (PE) investments between 1995 and 2004. In accordance with the data obtained from Spanish Private Equity and Venture Capital Association (ASCRI), in that period 1,572 VC and PE investments were recorded in Spain, including all stages but not counting firms belonging to the finance and real-estate sectors (Martí et al., 2010). We include in the population 1,313 of these firms. The remaining 259 firms include firms that never reported to the Official Register, for which accounting information is unavailable, and firms that were acquired less than three years after the PE investment, for which the post-investment window is too short to be significant. Regarding the former group some firms did not report on purpose, whereas others were early stage firms that never made it to the first or the second year. Regarding the latter, the acquired firms were mostly firms at the expansion or late stages that were subject to a rapid acquisition by a third party and in which PE only played the role of bridge financing. As a result, firms excluded from the sample do not seem to introduce a significant success bias in our analysis. For all 1,313 firms we take accounting

information from the AMADEUS Database, which records information on 1,202,363 Spanish firms.

Since the aim of this chapter is to analyse the change in the investment-cash flow sensitivity in VC- and PE-backed firms, we need to have a sufficient number of pre-investment observations, which would not be the case for early stage firms. After excluding 575 early stage firms from the sample, the remaining 738 firms belong to the expansion (579 firms) and buyout (159 firms) stages. We also restrict sectoral heterogeneity by focusing on the most typical sectors in which VC and PE invest. Accordingly we exclude from the sample 98 VC-backed and 12 PE-backed firms in the following sectors: Research & Development, High-tech manufacturing, and Primary.

In order to properly address the requirements of the dynamic models that are required in the empirical work, we only retained those firms for which we could have at least six consecutive years with complete accounting data. A huge effort was spent in tracking these firms over time since most VC and PE investors create new vehicles to pursue their acquisitions. Combining accounting data from the pre and post-investment period was however not always possible. In some cases, information was available in consolidated accounts but not in both the pre and post-investment period. In other cases, investors acquired two (or more) firms which were merged immediately afterwards. As a result, we were able to get reliable accounting data on six or more consecutive years, including the investment year, for 246 firms at the expansion stage and 78 firms that were subject to a buyout deal, representing 51.1 per cent and 53.1 per cent of the number of fully identified firms in their

respective categories.

Sample firms operate in the following low and medium research-intensive manufacturing and general services sectors (Dunning, 1986; Cantwell and Barnard, 2008): provision of electricity, gas, water, etc.; construction; wholesale and retail trade; hotels and restaurants; transportation; food products; beverages; textiles; clothing; leather and leather-type products; wood and wood products; paper and paper products; furniture and recycling; chemicals and chemical products; rubber and plastic products; building materials; basic metals and metal products; and motor vehicles and other transportation equipment.

5.4.2. DESCRIPTIVE STATISTICS

Table 5.1 reports the distribution of sample firms. Panel A shows the distribution of sample firms across sectors and Panel B reports the industry distribution of firms by stage. During the period 1995-2004, the VC investment in sample firms concentrates on low research-intensive manufacturing and general services (36.1 per cent and 33.6 per cent, respectively). Basically, these external investors invest more in firms at the expansion stage than at the buyout stage (75.9 per cent and 24.1 per cent, respectively).

TABLE 5.1.
DISTRIBUTION OF THE SAMPLE FIRMS

PANEL A: *DISTRIBUTION OF THE SAMPLE FIRMS ACCORDING TO INDUSTRY*

SECTOR	***TOTAL SAMPLE***	
	n	***%***
General services	109	33.6
Low research-intensive manufacturing	117	36.1
Medium research-intensive manufacturing	98	30.3
Total	**324**	**100.0**

PANEL B: *DISTRIBUTION OF THE SAMPLE FIRMS ACCORDING TO INDUSTRY BY STAGES*

Stage	***Total sample***		***General services***		***Low research-intensive manufacturing***		***Medium research-intensive manufacturing***	
	n	***%***	***n***	***%***	***n***	***%***	***n***	***%***
Expansion	246	75.9	83	33.7	90	36.6	73	29.7
Later stage	78	24.1	26	33.3	27	34.6	25	32.1
Total	**324**	**100.0**	**109**	**33.6**	**117**	**36.1**	**98**	**30.3**

Panel A shows the distribution according to industry of a sample of 324 unlisted Spanish firms that were subject to a VC and PE investment during the period 1995-2004.
Panel B shows the sectoral distribution across different stages. Percentages in 'Total sample' column are related to the total number of sample firm. Percentages in the 'General services', 'Low research-intensive manufacturing' and 'Medium research-intensive manufacturing' columns are related to the total number of the firms in respectively the expansion or later stage.

It is quite important for our purposes to underline that the sectoral composition of VC and PE investments in our sample is similar. A χ^2 test does not reject the hypothesis that the two samples come from the same underlying sectoral distribution ($\chi^2(2)=2.65$). This reassures us that our results will not be driven by differences in investment-cash flow sensitivity across sectors. Still, as an additional robustness check, we will control for sectoral specificities by estimating equation (5.5). It should be noted, however, that the similarity in sectoral distribution in our sample should not be generalised to the whole VC and PE industry but is mainly the result of our choice to exclude from the analysis high-tech and Research and Development

(R&D) firms, where VC is far more specialised than PE.

Tables 5.2 and 5.3 report some descriptive statistics for the pre and post-investment periods, respectively. The descriptive statistics of investment is shown in Panel A, whereas those related to cash flow are shown in Panel B. The statistics are broken down by stage and sector. All variables are normalised using end-of-period-*t-1* stock of fixed assets. To control for the potential influence of outliers (which are extremely relevant when dealing with accounting ratios), all the variables are winsorised at a 2 per cent cut-off value for each tail. In other words, we truncate the distribution of each variable and impute to all observations falling beyond the 2nd and 98th percentiles the respective threshold levels.[32] The accounting information on the related firms was expressed in constant 2005 Euros using the Harmonised Consumer Price Index as deflator. Accounting information includes data from 1991 up to 2007, whenever possible.[33]

[32] This technique is usual in this field of analysis. See Cleary (1999) and Bertoni et al. (2008), among others. We replicate all the regressions using 1 per cent and 5 per cent winsorising thresholds and obtain fairly similar results.
[33] In a few firms data about 2008 are also included.

TABLE 5.2.
DESCRIPTIVE STATISTICS ON INVESTMENT AND CASH FLOW (PRE-INVESTMENT PERIOD)

PANEL A: *DESCRIPTIVE STATISTICS ON INVESTMENT ACCORDING TO INDUSTRY ACROSS STAGES*

Stage	***Total sample***	***Sector***		
		General services	***Low research-intensive manufacturing***	***Medium research-intensive manufacturing***
Expansion				
Observations	1,213	432	466	315
Mean	0.5044	0.6116	0.4431	0.4481
Std. Deviation	0.9279	1.0567	0.8363	0.8548
Later stage				
Observations	410	147	131	132
Mean	0.3732	0.5360	0.2440	0.3200
Std. Deviation	0.6366	0.7614	0.3235	0.6828
Total sample				
Observations	1,623	579	597	447
Mean	0.4712	0.5924	0.3994	0.4103
Std. Deviation	0.8654	0.9900	0.7585	0.8092

PANEL B: *DESCRIPTIVE STATISTICS ON CASH FLOW ACCORDING TO INDUSTRY ACROSS STAGES*

Stage	***Total sample***	***Sector***		
		General services	***Low research-intensive manufacturing***	***Medium research-intensive manufacturing***
Expansion				
Observations	1,213	432	466	315
Mean	0.3079	0.3537	0.2636	0.3107
Std. Deviation	0.4851	0.5779	0.4326	0.4086
Later stage				
Observations	410	147	131	132
Mean	0.3356	0.4658	0.2280	0.2973
Std. Deviation	0.4159	0.5422	0.2089	0.3700
Total sample				
Observations	1,623	579	597	447
Mean	0.3149	0.3821	0.2558	0.3068
Std. Deviation	0.4686	0.5707	0.3946	0.3972

The table reports descriptive statistics on winsorised (2% each tail) values of the variables. All variables are normalised by using beginning-of-period stock of fixed assets.

TABLE 5.3.
DESCRIPTIVE STATISTICS ON INVESTMENT AND CASH FLOW (POST-INVESTMENT PERIOD)

PANEL A: *DESCRIPTIVE STATISTICS ON INVESTMENT ACCORDING TO INDUSTRY ACROSS STAGES*

Stage	***Total sample***	***Sector***		
		General services	***Low research-intensive manufacturing***	***Medium research-intensive manufacturing***
Expansion				
Observations	1,951	676	683	592
Mean	0.3471	0.3924	0.3167	0.3304
Std. Deviation	0.7329	0.8196	0.7361	0.6132
Later stage				
Observations	605	210	210	185
Mean	0.6542	0.4607	0.2732	0.3252
Std. Deviation	0.8041	0.9929	0.6582	0.6996
Total sample				
Observations	2,556	886	893	777
Mean	0.3488	0.4086	0.3064	0.3292
Std. Deviation	0.7502	0.8637	0.7184	0.6343

PANEL B: *DESCRIPTIVE STATISTICS ON CASH FLOW ACCORDING TO INDUSTRY ACROSS STAGES*

Stage	***Total sample***	***Sector***		
		General services	***Low research-intensive manufacturing***	***Medium research-intensive manufacturing***
Expansion				
Observations	1,951	676	683	592
Mean	0.1660	0.1315	0.1615	0.2107
Std. Deviation	0.3662	0.4044	0.3464	0.3372
Later stage				
Observations	605	210	210	185
Mean	0.2392	0.3743	0.1200	0.2211
Std. Deviation	0.4284	0.5998	0.2929	0.2431
Total sample				
Observations	2,556	886	893	777
Mean	0.1834	0.1890	0.1518	0.2132
Std. Deviation	0.3830	0.4694	0.3349	0.3172

The table reports descriptive statistics on winsorised (2% each tail) values of the variables. All variables are normalised by using beginning-of-period stock of fixed assets.

During the pre-investment period, the average investment ratio (cash flow ratio) is higher (lower) for firms at the expansion stage than for firms at the buyout stage, as expected. The average investment ratio of firms at the expansion stage is 50.4 per cent, with the cash flow ratio being 30.8 per cent. Regarding buyouts, the average investment ratio stands at 37.3 per cent, whereas the cash flow ratio is 33.6 per cent. These findings might be reflecting the fast-growing process in the first group of firms, and the low growth rates and high level of available cash flow in mature, large firms during the period prior to the VC or PE investment, respectively.

According to the industry, the situation previously described is evidenced for firms in every sector, namely general services, low research-intensive manufacturing, and medium research-intensive manufacturing. Thus, the average investment and cash flow ratios are greater for firms at the expansion stage than are those at the buyout stage. It is worth noting that firms belonging to the general services category exhibit the greatest level of investment and cash flow in the whole sample. This holds true both in expansion and buyout firms.

As regards the post-investment period, the average investment and cash flow ratios are lower for firms at the expansion stage than they are for firms at the buyout stage. The average investment ratio of firms at the expansion stage is 34.7 per cent, with the cash flow ratio being 16.6 per cent. Turning to buyouts, the average investment ratio is 65.4 per cent, whereas the cash flow ratio stands at 23.9 per cent. After receiving VC funds, the growing process seems to be gradually absorbed in firms at the expansion stage, since they are

no longer experiencing high growth rates. Conversely, after a buyout deal, target firms exhibit a greater investment ratio and smaller cash flow ratio. These results may signal the active asset management carried out by PE managers after a buyout deal.

5.5. RESULTS

We begin the analysis of the evolution of cash flow sensitivity across VC and PE investments by reporting, in Table 5.4, the estimates of the models described in section 5.3 without any distinction between VC and PE investments. Estimates are obtained by including all firms in the regressions, regardless of their stage (namely expansion or buyout). We begin by noticing that Hansen, AR(1) and AR(2) tests respect in all models the expected level of significance. The Hansen test never rejects the null hypothesis of the validity of overidentifying restrictions, and errors exhibit a AR(1) structure but no higher order autocorrelation. Focusing on the coefficients of cash flow, we observe that, regardless of the model we consider, pre-investment sensitivity to cash flow is, on average, positive and significant and that post-investment sensitivity is still positive and significantly different from zero in two out of the three specifications of the model. Following our hypotheses, these results should be driven by the fact that we are pooling expansion and buy-out stages: the former are cash flow sensitive before the investment and the latter after the investment, resulting in a pooled sensitivity which is positive all over the interval.

TABLE 5.4.
CASH FLOW SENSITIVITY BEFORE AND AFTER VC AND PE INVESTMENTS

INDEPENDENT VARIABLES	EQUATION (5.1)		EQUATION (5.3)	EQUATION (5.4)
	PRE-INV	POST-INV		
Investments(t-1)				
Pre-Inv	0.2129 (0.141)			
Post-Inv		0.1896 * (0.101)		
Pooled			0.1436 * (0.076)	0.1377 * (0.075)
Investments(t-1)²				
Pre-Inv	-0.0240 (0.038)			
Post-Inv		-0.0250 (0.028)		
Pooled			-0.0080 (0.022)	-0.0067 (0.022)
Cash flows				
Pre-Inv	0.5635 *** (0.177)		0.6145 *** (0.177)	0.8391 *** (0.161)
Post-Inv		0.3637 * (0.210)	0.4581 ** (0.222)	0.2325 (0.257)
Sales				
Pre-Inv	-0.0061 (0.010)			-0.0080 (0.009)
Post-Inv		0.0065 (0.013)		0.0157 (0.015)
Pooled			0.0039 (0.009)	
Debt²				
Pre-Inv	0.0247 ** (0.010)			0.0272 *** (0.009)
Post-Inv		0.0305 *** (0.008)		0.0368 *** (0.009)
Pooled			0.0305 *** (0.006)	
δ			0.0930 * (0.053)	0.0246 (0.056)
Intercept	0.1519 *** (0.044)	0.0829 *** (0.029)	-0.0016 (0.046)	0.0360 (0.047)
Observations	1,285	1,926	2,971	2,971
Firms	255	321	324	324
Hansen	217.7	266.7	309.5	309.8
Hansen d.o.f.	217	252	324	322
Hansen p-value	0.4745	0.2524	0.7100	0.6763
AR(1)	-4.0930 ***	-6.5963 ***	-7.3612 ***	-7.1539 ***
AR(2)	-1.5577	0.1897	-0.5336	-0.8289

The table reports two-step System-GMM estimates with finite sample correction estimates on equations (5.1), (5.3) and (5.4) presented in section 5.3. The dependent variable is firm *i*'s investment ratio at time *t*. The independent variables are defined as: *Cash flow* is firm *i*'s cash flow in period *t*, *Sales* is firm *i*'s sales during period *t,* and *Debt* is firm *i*'s end-of-period-*t* total debts. Standard errors are reported in parentheses. ***, ** and * indicate, respectively, significance levels of <1%, <5% and <10%. AR(1) and AR(2) are tests of the null hypothesis of, respectively, no first- or second-order serial correlation. Hansen is a test of the validity of the overidentifying restrictions based on the efficient two-step GMM estimator. *Investments*, *Cash flows*, and *Debt* are all normalised by beginning of period level of fixed assets. Pre- and Post-row report estimates of coefficients respectively before or after the investment event. Pooled rows refer to coefficients which are assumed to remain constant.

To ascertain whether our hypotheses are correct we perform all estimates separately on the expansion and buyout samples. Results are reported in Table 5.5. Panel A shows the estimates of different models on the sample of expansion stage deals. Again, all diagnostic tests are within the acceptable limits. Coherently with Hypothesis 5.1, and with the results of related works, the investment-cash flow sensitivity of firms at expansion stage before receiving VC is positive and strongly significant in all models, ranging from 0.7072 in the split estimate of model (5.1) to 0.9683 in the estimation of equation (5.4). The post-investment sensitivity to cash flow is remarkably lower, ranging from 0.3409 in equation (5.4) to 0.4546 in equation (5.3). Moreover, it is not statistically different from zero in two of the three models, and retains a weak significance (*p-value* 8.7 per cent) in one case (equation 5.3). This is fully in line with our Hypothesis 5.3: after VC financing the sensitivity of firm's investment to cash flow is significantly reduced and, almost, disappears.

TABLE 5.5.
CASH FLOW SENSITIVITY FOR VC-BACKED AND PE-BACKED FIRMS BEFORE AND AFTER THE INVESTMENT EVENT

	PANEL A: EXPANSION			
INDEPENDENT VARIABLES	**EQUATION (5.1)**		**EQUATION (5.3)**	**EQUATION (5.4)**
	PRE-VC	**POST-VC**		
Investments(t-1)				
Pre-VC	0.3242 **			
	(0.146)			
Post-VC		0.2529 **		
		(0.112)		
Pooled			0.1297	0.1326
			(0.086)	(0.084)
Investments(t-1)²				
Pre-VC	-0.0524			
	(0.041)			
Post-VC		-0.0327		
		(0.032)		
Pooled			0.0012	0.0001
			(0.025)	(0.025)
Cash flows				
Pre-VC	0.7072 ***		0.7695 ***	0.9683 ***
	(0.198)		(0.224)	(0.175)
Post-VC		0.4048	0.4546 *	0.3409
		(0.256)	(0.265)	(0.286)
Sales				
Pre-VC	-0.0152			-0.0078
	(0.011)			(0.010)
Post-VC		0.0129		0.0173
		(0.012)		(0.013)
Pooled			0.0045	
			(0.008)	
Debt²				
Pre-VC	0.0377 ***			0.0321 ***
	(0.009)			(0.009)
Post-VC		0.0192 ***		0.0220 ***
		(0.007)		(0.007)
Pooled			0.0273 ***	
			(0.005)	
δ			0.1006 *	0.0579
			(0.054)	(0.059)
Intercept	0.1314 **	0.0542	-0.0149	0.0035
	(0.052)	(0.034)	(0.044)	(0.045)
Observations	918	1,417	2,156	2,156
Firms	190	244	246	246
Hansen	184.4	236.0	234.9	236.7
Hansen d.o.f.	216	250	321	319
Hansen p-value	0.9418	0.7286	0.9999	0.9998
AR(1)	-3.7536 ***	-5.2356 ***	-5.8554 ***	-5.7656 ***
AR(2)	-1.3772	-0.3159	-1.0394	-1.1553

The table reports two-step System-GMM estimates with finite sample correction estimates on equations (5.1), (5.3) and (5.4) presented in section 5.3. The dependent variable is firm *i*'s investment ratio at time *t*. The independent variables are defined as: *Cash flow* is firm *i*'s cash flow in period *t*, *Sales* is firm *i*'s sales during period *t,* and *Debt* is firm *i*'s end-of-period-*t* total debts. Standard errors are reported in parentheses. ***, ** and * indicate, respectively, significance levels of <1%, <5% and <10%. AR(1) and AR(2) are tests of the null hypothesis of, respectively, no first- or second-order serial correlation. Hansen is a test of the validity of the overidentifying restrictions based on the efficient two-step GMM estimator. *Investments*, *Cash flows*, and *Debt* are all normalised by beginning of period level of fixed assets. Pre- and Post- row report estimates of coefficients respectively before or after the investment event. Pooled rows refer to coefficients which are assumed to remain constant.

TABLE 5.5. (CONT.)
CASH FLOW SENSITIVITY FOR VC-BACKED AND PE-BACKED FIRMS BEFORE AND AFTER THE INVESTMENT EVENT

	PANEL B: BUYOUTS			
INDEPENDENT VARIABLES	EQUATION (5.1)		EQUATION (5.3)	EQUATION (5.4)
	PRE-PE	POST-PE		
Investments(t-1)				
Pre-PE	0.1293 (0.127)			
Post-PE		-0.0588 (0.121)		
Pooled			-0.0194 (0.085)	0.0481 (0.073)
Investments(t-1)²				
Pre-PE	-0.0122 (0.029)			
Post-PE		0.0136 (0.034)		
Pooled			0.0115 (0.025)	-0.0079 (0.020)
Cash flows				
Pre-PE	0.1313 (0.159)		0.1422 (0.171)	0.1234 (0.229)
Post-PE		0.4798 *** (0.185)	0.4360 *** (0.169)	0.4945 ** (0.193)
Sales				
Pre-PE	0.0188 (0.015)			0.0283 (0.020)
Post-PE		-0.0116 (0.017)		-0.0130 (0.019)
Pooled			0.0089 (0.011)	
Debt²				
Pre-PE	0.0007 (0.013)			-0.0090 (0.014)
Post-PE		0.0634 *** (0.013)		0.0729 *** (0.013)
Pooled			0.0372 *** (0.014)	
δ			-0.0301 (0.078)	-0.0531 (0.088)
Intercept	0.1525 ** (0.063)	0.1213 ** (0.055)	0.1346 * (0.071)	0.1391 ** (0.060)
Observations	367	509	815	815
Firms	65	77	78	78
Hansen	60.2	67.1	66.9	62.4
Hansen d.o.f.	194	223	310	308
Hansen p-value	0.9999	0.9999	0.9999	0.9999
AR(1)	-2.3610 **	-4.0443 ***	-4.3393	-4.3466 ***
AR(2)	-0.9557	-0.8584	-0.2537	-0.9328

The table reports two-step System-GMM estimates with finite sample correction on equations (5.1), (5.3) and (5.4) presented in section 5.3. The dependent variable is firm *i*'s investment ratio at time *t*. The independent variables are defined as: *Cash flow* is firm *i*'s cash flow in period *t*, *Sales* is firm *i*'s sales during period *t,* and *Debt* is firm *i*'s end-of-period-*t* total debts. Standard errors are reported in parentheses. ***, ** and * indicate, respectively, significance levels of <1%, <5% and <10%. AR(1) and AR(2) are tests of the null hypothesis of, respectively, no first- or second-order serial correlation. Hansen is a test of the validity of the overidentifying restrictions based on the efficient two-step GMM estimator. *Investments*, *Cash flows*, and *Debt* are all normalised by beginning of period level of fixed assets. Pre- and Post- row report estimates of coefficients respectively before or after the investment event. Pooled rows refer to coefficients which are assumed to remain constant.

Interestingly, results reported in Panel B, which focuses on later-stage PE investments, depict a markedly different story. Pre-investment cash flow sensitivity is never found to be statistically significant at conventional confidence levels. This is exactly what we expect from Hypothesis 5.2: investment expenditures of buyout firms do not exhibit any significant sign of being hampered by cash flow before they are PE-backed. The estimates of post-investment cash flow sensitivity are, instead, large and highly statistically significant, ranging from 0.4360 (equation 5.1, post investment subsample) to 0.4945 (equation 5.4). It is also interesting to observe that the coefficient of firm's debt is positive and significant after firms receive PE, evidencing that this form of financing dramatically changes firm's financial structure and, accordingly, the relative coefficient in the Euler equation.

Finally, we move to the estimates of equation (5.5), in which investment-cash flow sensitivity before and after VC/PE involvement is allowed to change across sectors. In Table 5.6, we observe that our results are confirmed to be particularly strong in services and mid-tech, while they appear to be less significant for low-tech manufacturing firms.

As regards Hypotheses 5.1 and 5.2, they are confirmed in each sector: VC-backed and PE-backed firms exhibit, respectively, strong and weak cash flow sensitivity before the investment event. Hypotheses 5.3 and 5.4 are only confirmed in general services and mid-tech manufacturing firms. In both cases investment-cash flow sensitivity disappears from VC-backed firms and emerges in PE-backed firms. Results for low-tech manufacturing seem instead to show no significant changes in the significance of cash flow sensitivity

across investment.

TABLE 5.6.
CASH FLOW SENSITIVITY EVOLUTION FOR DIFFERENT STAGES AND SECTORS

INDEPENDENT VARIABLES		*TOTAL SAMPLE*	*EXPANSION*	*LATER STATE*
Investments(t-1)		0.1495 *	0.1405	-0.0240
		(0.082)	(0.092)	(0.095)
Investments(t-1)²		-0.0058	0.0005	0.0146
		(0.023)	(0.027)	(0.026)
Cash flows				
General services	*Pre-Inv*	0.4193 *	0.5845 *	0.1106
		(0.236)	(0.299)	(0.215)
	Post-Inv	0.2261	0.0088	0.4168 *
		(0.234)	(0.269)	(0.250)
Low-tech manufacturing	*Pre-Inv*	0.5038	0.5906 *	-0.1838
		(0.319)	(0.358)	(0.588)
	Post-Inv	0.8444 **	0.9160 *	0.5978
		(0.355)	(0.374)	(0.521)
Mid-tech manufacturing	*Pre-Inv*	1.5834 ***	1.4882 ***	0.0601
		(0.408)	(0.435)	(0.335)
	Post-Inv	-0.0416	0.3038	0.7083 **
		(0.342)	(0.548)	(0.303)
Sales		0.0138	0.0137	0.0108
		(0.011)	(0.010)	(0.013)
Debt²		0.0262 ***	0.0259 ***	0.0329 ***
		(0.006)	(0.005)	(0.012)
δ		0.1906 ***	0.1932 ***	-0.1126
		(0.066)	(0.065)	(0.106)
Intercept		-0.1063	-0.1183 *	0.1925 *
		(0.069)	(0.065)	(0.113)
Observations		2,971	2,156	815
Firms		324	246	78
Hansen		268.7	237.4	68.7
Hansen d.o.f.		273	270	259
Hansen p-value		0.5624	0.9244	0.9999
AR(1)		-7.2387 ***	-5.8854 ***	-4.4287 ***
AR(2)		-0.4212	-0.7506	-0.0807

The table reports two-step System-GMM estimates with finite sample correction estimates on equation (5.5) presented in section 5.3. The dependent variable is firm *i*'s investment ratio at time *t*. The independent variables are defined as: *Cash flow* is firm *i*'s cash flow in period *t*, *Sales* is firm *i*'s sales during period *t,* and *Debt* is firm *i*'s end-of-period-*t* total debts. Standard errors are reported in parentheses. ***, ** and * indicate, respectively, significance levels of <1%, <5% and <10%. AR(1) and AR(2) are tests of the null hypothesis of, respectively, no first- or second-order serial correlation. Hansen is a test of the validity of the overidentifying restrictions based on the efficient two-step GMM estimator. *Investments*, *Cash flows*, and *Debt* are all normalised by beginning of period level of fixed assets. Pre- and Post- row report estimates of coefficients respectively before or after the investment event.

5.6. CONCLUSIONS AND DISCUSSION

The aim of this chapter is to assess how the differences of VC and PE deals translate into different impacts on firm's cash flow sensitivity. We hypothesise that the participation in growing firms will alleviate the dependency on internally generated resources whereas in levered acquisitions, popularly known as buyouts, we hypothesise an opposite change. Levered transactions are performed in firms that have stable cash flows and non-core assets. In such firms no significant sensitivity is expected before the acquisition. Nevertheless, after the acquisition the burden imposed by the huge amount of debt raised to finance the deal will restrict the access to additional external resources to finance additional growth and put managers under the pressure of debt repayments, thus removing excessive conservatism.

We test our hypotheses on a firm-level large panel dataset on a representative sample of Spanish VC- and PE-backed firms that were subject to the initial investment between 1995 and 2004 in low and medium tech industries. Firms analysed were at the expansion or buyout stages and belonged to general services, low-tech manufacturing and medium-tech manufacturing sectors. To have better comparability and to be able to compare investment-cash flow sensitivity before and after VC/PE intervention, we exclude firms at the start-up stage (because no pre-investment data is available) and high tech manufacturing and service firms (where VC is more active than PE).

Our results confirm that there is a significant reduction in the investment-cash flow sensitivity in firms at the expansion stage after the VC deal. Regarding buyouts, we do not find a significant sensitivity before the investment event whereas a positive value is found after the acquisition. Results are robust to various specifications of the econometric model. This work contributes to the previous literature in several ways. First, it adds to the limited literature on investment-cash flow sensitivity in unlisted firms (Manigart et al., 2003; Guariglia, 2008; Bertoni et al., 2008; Engel and Stiebale, 2009). Regarding PE literature, we analyse a period that is long enough to avoid the distortion of the investment-cash low sensitivity due to short term economic conditions (as could be the case in Manigart et al., 2003). Furthermore, we explore the sensitivity in the most widely invested sectors in Europe, when the change was only previously analysed in VC- and non-VC-backed high tech firms (Bertoni et al., 2008). Finally, we also differentiate the role played by VC and PE, as in Engel and Stiebale (2009), but using an alternative methodology that allows the inclusion of debt and including at least six consecutive observations per firm. Our results are consistent with the evidence they provide on firms at the expansion stage, but differ with regards to buyouts.

Our results confirm the role of VC as a tool to fill the equity gap in firms at the expansion stage. Nevertheless, it remains to be explained whether the positive investment-cash flow sensitivity found after a buyout transaction is good or bad for the firm and the economy as a whole. We argue that the lack of sensitivity before the acquisition could be caused by the existence of stable

stream of cash flows in firms with low debt and excessive non-core assets generating below-market return on equity. Nevertheless, it remains to be proved whether these firms are able to perform better in the long run after the acquisition.

5.7. REFERENCES

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ANNEX