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The Relationship Between Investment and Internal Cash Flows in VC-Backed SMEs: Does Firm Size Matter?

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ABSTRACT

Using panel data models and two research sub-samples composed of smaller and larger VC-backed, this study seeks to analyze the relationship between investment and internal cash flows. The results indicate that the investment sensitivity to internal cash flows is greater in larger than in the smaller VC-backed SMEs.
Debt is more important for smaller than for larger VC-backed SME investment. The moderation effect of VC ownership reduces the magnitudes of the positive impact of cash flows and debt as well as the negative effect of growth opportunities on investment in both smaller and larger VC-backed SMEs.

Keywords: Internal cash flows; Debt; Growth Opportunities; Investment in Fixed Assets; SMEs; Venture Capital.
JEL-Classification: C33, G23, G24, G32

I. Introduction

According to Modigliani and Miller (1958), in the context of perfect capital markets, financing and investment decisions are independent, since internal and external funds are perfect substitutes. However, the capital markets are not frictionless, and internal and external funds are not perfect substitutes.

Financial resources are easily converted into other types of resources, and access to capital is fundamental for firm growth and performance (Bamford et al., 1997). Firms need financial resources for innovative projects, which contribute to the exploitation of new growth opportunities (Zahra, 1991).

In the context of small and medium-sized enterprises (SMEs), the imperfections of financial markets generate financing constraints that impact negatively on the exploitation of investment opportunities (Schiantarelli, 1996; Whited, 2006). Problems of asymmetric information due to the lack of information disclosure about future investments SMEs, may aggravate the agency problems, namely, problems of adverse selection and moral hazard (Eisenhardt, 1989). The information asymmetry reduces the SME possibility of getting favourable terms of credit and limits the amount of credit granted (Stiglitz and Weiss, 1981).

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Smaller and younger firms face more problems of information asymmetry, thereby, relying more on internal cash flows to fund investment opportunities, since it is cost less in comparison to external finance (Berger and Udell, 1998, 2006; Dietrich, 2012; Sarno, 2008; Artola and Genre 2011; Canton et al. 2012; Ferrando and Mulier, 2013; Holton et al, 2014; Balboa et al, 2017). The ability of firms to optimally exploit investment opportunities may crucially depend on the level of financing constraints faced (lack of tangible firm assets to secure bank debt funding implies that firm owners must provide personal assets on which to secure business debt).

Previous studies conclude that the firm size is associated with obstacles in obtaining external finance (Beck et al, 2006; Artola and Genre, 2011; Canton et al., 2012; Ferrando and Mulier, 2013; Holton et al, 2014). Smaller firms face greater difficulties in accessing to external finance that may hinder the firm growth before to reach the minimum efficient scale (Berger and Udell, 1998; Artola and Genre, 2011; Canton et al., 2012; Ferrando and Mulier, 2013; Holton et al, 2014).

Venture Capital (VC) is a pool of capital provided by outside investors for funding firms with high potential growth (Sahlman, 1990), allowing firms to overcome the imperfections of financial markets. Besides the experience and management expertise, venture capitalists (VC's) do not require the collaterals required by other sources of debt financing (e.g. banks). VC's involvement brings reputation and creditworthiness to SMEs, reducing the problems of asymmetric information and agency problems between investee firms and creditors (Wang and Zhou, 2004). Thus, the entry of VC's may contribute to reducing the sensitivity of SME investment to internally generated funds. Smaller firms need external finance when internal finance is not enough to fund new investment and growth opportunities (Cowling et al., 2012). However, smaller firms face more obstacles in accessing external finance, thus they are more financially constrained. Results of the previous studies suggest that large firms have more access to venture capital and small firms may face greater difficulty in accessing that external finance source, and debt may be secured on the personal assets of the firm owner.

The current paper seeks to analyse the relationship between investment and internal cash flows in SMEs after VC financing (hereafter, VC-backed SMEs). Considering the importance of the relationship between firm size and financial constraints this paper, also, seeks to analyse if investment is more sensitive to cash flows in smaller than in larger VC-backed SMEs. Seeking to reach the paper objective, we use data from 900 unlisted VC-backed SMEs entry across Western Europe countries from the Amadeus database by Bureau van Dijk for the period between 2010 and 2015. To reach the paper´s objectives, the initial research sample was decomposed into two sub-samples: i) 570 smaller VC-backed SMEs, and ii) 330 larger VC-backed SMEs. Also, this paper analyses the data by resorting to a dynamic panel data estimator, specifically GMM system (1998) proposed by Blundell and Bond (1998) estimator, to capture the dynamic investment behaviour of VC-backed SMEs.

The current study shows, overall, that the cash flows stimulate the investment in booth smaller and larger VC-backed SMEs. Nevertheless, investment is more sensitive to cash flows in larger than in smaller VC-backed SMEs. Smaller VC-backed SMEs, that present a lower level of cash flows, seem to be forced to rely on debt to fund their investment in fixed assets. Finally, related to the VC ownership, it was possible to observe a positive impact on investment of VC-backed SMEs, so higher level of VC's participation reduces the negative impact of growth opportunities on the investment in both smaller and larger VC-backed SMEs. This last result enhances the role of VC ownership in promoting growth opportunities contributing to the value-added of the investee firms.

The remainder of this paper is organized as follows. In Section 2, we present the literature review and hypotheses formulation; Section 3 presents the methodology; in Section 4, we present the results; the results are discussed in Section 5; Section 6 presents the final considerations.

II. Literature Review and Hypotheses

A. The Importance of Cash-flows for VC-backed SME Investment

Contradictory results are found in the previous studies regarding the investment sensitivity to cash flows. On the one hand, according to Fazzari et al (1988), Hovakimian (2009) and Brinckmann et al (2011) the investment is more sensitive to the variations of internal cash flows in smaller and younger firms. Studies of Kaplan and Zingales (1997) and Cleary (1999, 2005) contradict the previous empirical evidence. According to these studies, investment in large firms present greater sensitivity to the availability of internal cash flows. Despite the ongoing debate above-mentioned, empirical evidence (Fazzari et al., 1988; Hoshi et al, 1991; Hubbard et al, 1995; Kaplan and Zingales, 1997, 2000; Cleary, 1999; Aggarwal and Zong, 2006; Brinckmann et al., 2011; Mateev et al, 2013) show a positive relationship between internal cash flows and firm investment.

Firm size, being a variable associated with the existence of problems of asymmetry of information with the creditors, can be a determinant factor of financing restrictions. Siedschlag et al. (2014) conclude that investment of European firms in tangible assets, particularly, of small firms, during the financial crisis of 2008-2009, was negatively affected by the restrictions in accessing credit. Those authors conclude that the restrictions in accessing credit were inversely related to firm age and size.

In spite of empirical evidence related to the relationship between venture capital and the firm size of the venture capital portfolio, there are no studies analyzing the investment sensitivity to cash flows after the VC's entry (Puri and Zarutskie, 2012). The VC entry is a positive signal sent to creditors regarding the firm quality and prospects about the investee firm (Megginson and Weiss, 1991; Baeyens and Manigart, 2003; Lopez-Gracia and Sogorb-Mira, 2015). To overcome the choice of the appropriate financing source to fund firm needs (Berger and Schaeck, 2011), entrepreneurs count with the experience and management expertise of VC's. Additionally, VC's can influence the investee firm capital structure, and the financing sources after their entry (Bertoni et al., 2010).

VC's may reduce the information opacity and agency problems, namely problems of adverse selection and moral hazard with firm outsiders (Admati and Pfleiderer, 1994). Consequently, VC´s enhance the SME reputation perceived by creditors, allowing SMEs to obtain funds on favorable terms to take advantage of investment opportunities (Ang, 1991; Megginson and Weiss, 1991; Bertoni et al., 2010).

The pecking order theory (POT) indicates the existence of hierarchical order in the selection of finance sources (Myers, 1984): firstly, firms choose retained earnings to fund their needs; after, they will select debt and, lastly, they will issue equity. SMEs, after the VC entry, usually, get better terms in accessing credit to fund their investment opportunities and, therefore VC-backed SMEs are, probably, less financially constrained and the investments become less dependent on internal cash flows given the better terms in accessing credit. Thus, VC-backed firms benefit from less information asymmetry problems and, thus they may use external finance a lower cost. Nevertheless, committing to the predictions of the POT, more profitable firms will resort to retained earnings to fund their investment opportunities given that this financing source is exempt from information asymmetry. VC-backed SMEs with lower levels of profitability may be forced to resort to external finance. Vanacker and Manigart (2011) argue that more profitable VC-backed firms will use retained earnings avoiding external equity and debt.

Mairesse et al. (1999) and Manigart et al. (2003) analysed if Belgian unlisted firms, receiving VC funding, reduce the sensitivity of investment in fixed assets to cash flows. However, using a control group of non-VC-backed SMEs, they conclude that the investment in fixed assets in VC-backed SMEs presents a greater sensitivity to cash flows than in non-VC-backed SMEs. Bertoni et al. (2010) studied the impact of VC funding on firm investment and found that the investment in VC-backed SMEs remains sensitive to cash flows. Engel and Stiebale (2014) analysed the relationship between the investment and internal finance of British and French private equity-financed firms. The

results suggest that after the acquisition by private equity investors, the investment presents a lower sensitivity to internal finance signalling a reduction of financing constraints. However, Martí and Ferrer (2012) concluded that the investment of VC-backed SMEs, which before the VC entry were financially constrained, is more sensitive to cash flows than non-VC-backed SMEs. The previous studies suggest that after VC entry, SME investment is sensitive to internal cash flows, mainly because smaller firms may face problems of information asymmetry and agency that causes a considerable differential of cost between internal finance and external finance (Carpenter and Petersen, 2002). Therefore, this type of firm becomes more dependent on internal cash flows to fund their investment opportunities (Beck et al, 2006; Brown et al, 2009).

Given that the firm size is associated with financial constraints, it is expected, after VC entry, smaller SMEs continue to face more obstacles in accessing external finance. Therefore, we argue that investment in smaller VC-backed SMEs present greater sensitivity to cash flows than in larger VC-backed SMEs. Based on the above-mentioned arguments, it is formulated the following hypothesis:

H1: Cash flows have a positive effect of a greater relative magnitude on the investment in smaller VC-backed SMEs than in larger VC-backed SMEs.

B. The Importance of Debt for VC-backed SME Investment

SMEs present a low level of diversification of their activities, thus facing a greater level of information asymmetry and a higher level of risk that banks transfer to the customers, increasing the interest rates and/or requiring collaterals for granting credit (Beck et al., 2008). The lack of bargaining power, the costs of alternative debt sources (Dietrich, 2012; Roberts and Sufi, 2009) and the inability for accessing to stock markets are obstacles faced by many SMEs (Comeig et al., 2015), which implies a high dependence on internal cash flows and, consequently, inhibiting the exploitation of investment opportunities. Indeed, larger and foreign-owned banks present difficulties in extending their relationships to opaque small firms, and one way that these firms have is to borrow from multiple banks (raising by this way their borrowing costs and destroying some of the relationship benefits) (Berger et al, 2001). Thus, SMEs may face underinvestment problems due to restrained access to external finance because of information asymmetry and agency problems between entrepreneurs and creditors (Berger and Udell, 1998, 2006; Dietrich, 2012; Sarno, 2008). More recently, Moro et al (2015), examining the relationship between quality, quantity, completeness, and timeliness of the information loan managers obtained from Italian SMEs observed that a reduction in information asymmetry is associated with a greater amount of credit (particularly, on the amount of short-term credit).

However, once SMEs receive VC funding, they acquire reputation contributing to the access to credit with more favourable terms (Nahata, 2009). Thereby, these firms can obtain credit on favourable terms to take advantage of investment opportunities (Ang, 1991; Bertoni et al., 2013).

Vanacker and Manigart (2011) concluded that VC´s play an important role in financing high-growth firms as well as that, after the VC´s entry, debt is the most important finance source of investee firms. Nevertheless, empirical evidence suggest a negative relationship between firm debt and investment (McConnell and Servaes, 1995; Aivazian et al., 2005; Lee and Ratti, 2008). This negative relationship may be the consequence of a higher level of debt that implies to pay back loans and interests, which may decrease the probability of SMEs to take advantage of investment opportunities (Mills et al., 1995; Cleary, 2005). Thus, these firms seem to follow the predictions of pecking order theory suggesting the existence of interdependence between financing and investment decisions.

On the one hand, in smaller VC-backed SMEs, debt might be a catalyst determinant factor of investment due to the possibility to fund investment opportunities when internal cash flows are exhausted. On the other hand, the information opacity in smaller and younger firms might imply difficulties in accessing to credit on favourable terms, making debt a restrictive determinant of the SME investment. Based on the above-mentioned arguments, this study formulates the following hypothesis:

H2: Debt has a positive effect of a greater relative magnitude on the investment in larger VC-backed SMEs than in smaller VC-backed SMEs.

III. Methodology

A. Database and Variables

This study uses data gathered from Amadeus database by Bureau van Dijk for VC-backed SMEs of Western European countries for the period between 2010 and 2015. For the selection of the sample, we used two criteria: i) the definition of SMEs by European Commission (Recommendation 2003/36/CE): it is considered a small firm when: i) it employs fewer than 50 people; and ii) its turnover or annual balance sheet total does not exceed € 10 million. Also, according to the European Commission's recommendation, a firm is considered medium-sized when at least two of the following criteria are met: i) having between 50 and 250 employees; ii) total assets between € 10 million and € 43 million; and iii) turnover between € 10 million and € 50 million; and iii) the selection of unlisted firms in which the shareholders list contains venture capital or private equity firms.

Venture capital or equity entry occurred only once in the period of analysis. After the VC entry, SMEs composing the initial research sample have not issued equity. SMEs with less than four consecutive firm-years were deleted from the sample, and this study uses an unbalanced panel data, which allows the free entry and exit of firms in the sample. Data was trimmed at one percent tails in order to control the effects of outliers, which may be due to events such as an error in coding or large mergers (Guariglia, 2008). Also, all financial firms were deleted.

Seeking to analyse the investment sensitivity to cash flows in VC-backed SMEs, we use the firm size variable, measured by the natural logarithm of total book assets, to create two research samples, distinguishing between smaller and larger VC-backed SMEs. Size is a good proxy for financing constraints given that smaller firms2 (Fazzari et al., 1988; Brinckmann et al., 2011) , face higher problems of information asymmetry and greater transaction costs, which are obstacles for SMEs in obtaining external finance. Therefore, this study used the following strategy: if the firm size is in the first or second quantile, the VC-backed SMEs were classified as smaller firms, while if the firm size is in the third or fourth quantile, the VC-backed SMEs were classified as larger firms. The initial research sample consists of 900 VC-backed SMEs that was divided into two research subsamples: i) 570 smaller VC-backed SMEs and ii) 330 larger VC-backed SMEs. The sample description by the industry sector is depicted in Table 1.

2 In order to check the robustness of the results, and considering that younger SMEs have not acquired strong reputation (Diamond, 1989), facing higher problems of information asymmetry, we analyse the investment sensitivity to cash flows for two subsamples obtained on the basis of an alternative criterion, i.e., firm age: we consider as younger SMEs those up to 10 years of age, classifying as older SMEs those over 10 years old.

Table 1 - Sample description by industry sector

Industry sector (NACE rev.2)	**Smaller VC-backed SMEs**			**Larger VC-backed SMEs**		
	Observations	%	Cum.	Observations	%	Cum.
C. Manufacturing	262	18,88	18,88	150	18,84	18,84
F. Construction	42	3,03	21,90	29	3,64	22,49
G. Wholesale and retail trade; repair of motor vehicles and motorcycles	123	8,86	30,76	102	12,81	35,30
I. Accommodation and food service activities	55	3,96	34,73	50	6,28	41,58
J. Information and communication	424	30,55	65,27	166	20,85	62,44
L. Real estate activities	40	2,88	68,16	20	2,51	64,95
M. Professional, scientific and technical activities	362	26,08	94,24	214	26,88	91,83
N. Administrative and support service activities	66	4,76	98,99	53	6,66	98,49
R. Arts, entertainment and recreation	14	1	100	12	2	100
Total	1388	100	-	796	100	-

In this study, the dependent variable is the net investment in fixed assets. Based on the previous studies, various explanatory variables were considered. The measures of the research variables are depicted in Table 2.

Table 2 – Investment determinants measurement

Variables	**Term**	**Measurement**
Dependent variable:		
Investment in fixed assets	$INV_{i,t}$	Ratio of the variation of fixed capital less amortizations and depreciations in the current period to fixed assets in the previous period
Independent variables:		
Investment in fixed assets in the previous period	$INV_{i,t-1}$	Investment in fixed assets in the previous period
Cash flows in the previous period	$CF_{i,t-1}$	Ratio of cash flows to total assets
Leverage in the previous period	$LEV_{i,t-1}$	Ratio of long-term debt plus short-term debt to total assets
Age in the previous period	$AGE_{i,t-1}$	Natural logarithm of the number of years of firm life
Growth opportunities in the previous period	$GO_{i,t-1}$	Ratio of Intangible fixed assets to total assets
Venture capital ownership	$VCOWN_{i,t}$	This is a dichotomous variable: assumes value of 1 if the VC's detain more than 50% of the SME control rights and 0 otherwise; this percentage >50% is verified during all the period of analysis.
Gross national product	GNP_t	Natural logarithm of gross national product

Investment in fixed assets of the previous period is an explanatory variable, allowing to verify if the investment in fixed assets is persistence. Internal cash flows are a proxy of internal finance seeking to measure its importance for firm investment in fixed assets. In order to evaluate the dependence on external finance to fund investment opportunities, it is used the variable leverage. Besides cash flow and leverage as the main determinants considered in the current study, we also analyse other determinants of investment in fixed assets used in the literature (Aivazian et al., 2005; Lee and Ratti, 2008; Guariglia, 2008). In following we present the remaining investment determinants.

Firm age is a proxy for the obstacles faced by SMEs in accessing credit to fund their investments (Beck et al., 2006). According to Diamond (1989), the firm reputation can be proxied by

age. Younger firms may face greater problems of information asymmetry, and, consequently, unfavourable terms in accessing credit, i.e., they may face a higher cost of capital (Diamond, 1989).

Given that financial constraints may impact negatively on investment of fixed assets, growth opportunities constitute an important explanatory variable of SME investment in fixed assets (Carpenter and Guariglia, 2008), mainly for younger and smaller firms (Fraser et al., 2015). Michaelas et al. (1999), Sogorb-Mira (2005) and Degryse et al. (2012) used the intangible assets as a proxy for growth opportunities. In the context of investee SMEs, future growth opportunities comprise a key factor for VC entry, by enabling greater capital gains to be obtained. Therefore, in the current study, it is considered the variable ratio of intangible assets to total assets as a proxy of the growth opportunities.

VC's usually acquire a significant share in the equity of the investee firms and become members of the board of directors, retaining important rights, which are often smaller than the size of their equity investment (Berger and Udell, 1998; Gompers and Lerner, 2001; Tan et al, 2008). Usually, to avoid future agency conflicts, VC´s have control over certain fields and investee firm owners have a large equity share to motivate their efforts in the firm success. Gompers (1995) concluded that VC´s monitor the investee firm owners/managers, namely when firms present low level of tangible assets, great level of growth opportunities, and great specificity of asset structure. Consequently, we consider VC ownership as an explicative variable of the investment in fixed assets.

Additionally, seeking to analyse the moderation effect of VC ownership on the relationships between internal cash flows, debt, growth opportunities on investment in fixed assets, this study also considers the following interactive variables: VC ownership*cash flows, VC ownership*leverage, and VC ownership*growth opportunities.

B. Estimation Method

Due to the dynamic nature of investment behaviour (DeMarzo and Fishman, 2007), our equations are estimated resorting to a dynamic panel data estimator, the GMM system (1998), proposed by Blundell and Bond (1998). The equation (1) presents the relationships between determinants and investment in VC-backed SMEs.

$$INV_{i,t} = \propto_0 + \beta_1 INV_{i,t-1} + \beta_2 CF_{i,t-1} + \beta_3 LEV_{i,t-1} + \beta_4 GO_{i,t-1} + \beta_5 AGE_{i,t-1} + \beta_6 GNP_t + \beta_7 VCOWN_{i,t} + S_s + d_t + \eta_i + \varepsilon_{i,t} \quad (1)$$

Where: S_s are the industry sector dummy variables; d_t are the annual dummy variables to capture business cycles effects; η_i are non-observable individual effects; and $\varepsilon_{i,t}$ is the error term. As mentioned in the previous section, this study considers the interaction terms between VC's ownership and growth opportunities, VC ownership and leverage, and VC ownership and cash flows. Therefore, the inclusion of those interactive variables is presented in equation (2).

$$\begin{aligned} \mathrm{INV_{i,t}} = \propto_0 + {} & \beta_1 \mathrm{INV_{i,t-1}} + \beta_2 \mathrm{CF_{i,t-1}} + \beta_3 \mathrm{LEV_{i,t-1}} + \beta_4 \mathrm{GO_{i,t-1}} + \beta_5 \mathrm{AGE_{i,t-1}} \\ & + \beta_6 \mathrm{GNP_t} + \beta_7 \mathrm{VCOWN_{i,t}} + \beta_8 \mathrm{VCOWN_{i,t}} * \mathrm{LEV_{i,t-1}} \\ & + \beta_9 \mathrm{VCOWN_{i,t}} * \mathrm{CF_{i,t-1}} + \beta_{10} \mathrm{VCOWN_{i,t}} * \mathrm{GO_{i,t-1}} + \mathrm{S_s} + \mathrm{d_t} \\ & + \eta_\mathrm{i} + \varepsilon_{\mathrm{i,t}} \end{aligned} \quad (2)$$

GMM system (1998) allows to consider firm heterogeneity in the investment dynamics over time and control for possible endogeneity problem, correlation errors over time and heteroscedasticity across firms. Two-step estimator is used with the small sample corrector proposed by Windmeijer (2005) to overcome the downward biased standard errors (Arellano and Bond, 1991; Windmeijer, 2005; Roodman, 2006), providing more accurate inference on two-step procedure in GMM system (1998) estimator (Roodman, 2009).

To verify whether the equations are correctly specified, two criteria must be filled: the Hansen test (Hansen) and the second-order autocorrelation test (m2). The Hansen test shows if the restrictions generated by the used of instruments are valid, which, under the null hypothesis meets the validity of the restrictions created by the instruments used. The m2 test is used to test the existence of second-order autocorrelation, under the null hypothesis that there is not second-order autocorrelation. If we do not reject both tests, Hansen test, and m2 test, we conclude that the results of the GMM system (1998) estimator are valid.

IV. Results

A. Descriptive Statistics and Correlation Matrices

Table 3 depicts the descriptive statistics of the research subsamples.

Table 3 - Descriptive statistics of the subsamples

Variables	Smaller VC-backed SMEs						Larger VC-backed SMEs					
	Observations	Mean	Median	SD	Min	Max	Observations	Mean	Median	SD	Min	Max
$INV_{i,t}$	1032	.026	-.15	.91	-1.8	6.4	766	.049	-.037	.7	-1.7	7.6
$CF_{i,t}$	1327	.23	.22	.78	-7.6	4.4	884	.38	.33	.62	-4.1	4.3
$LEV_{i,t}$	1477	.17	.045	.23	0	.98	920	.19	.13	.21	0	1
$GO_{i,t}$	1570	.18	.034	.25	0	.87	1015	.11	.0061	.19	0	.84
$AGE_{i,t}$	1617	1.8	1.8	.86	0	4.5	1024	2.2	2.2	.81	0	4.5
$VCOWN_{i,t}$	1570	.56	1	.48	0	1	1024	.61	1	.49	0	1

Note: SD: Standard Deviation; Min: Minimum; Max: Maximum.

The results show that larger VC-backed SMEs on average, are older, have greater levels of investment, cash flows, and leverage than smaller VC-backed SMEs, whereas, the latter have, on average, greater level of growth opportunities than the former. Additionally, in general, it can be noticed greater volatility of the variables in smaller VC-backed SME in comparison to larger VC-backed SMEs. Seeking to check if there are statistically significant differences between the two subsamples, we perform a mean difference test (Table 4).

Table 4 - Mean difference t-test for VC-backed SME subsamples

Variables	**Smaller VC-backed SMEs**		**Larger VC-backed SMEs**		**Mean differences (t-test)**
	Observations	**Mean**	**Observations**	**Mean**	
$INV_{i,t}$	1032	0.026	766	0.049	-0.023**
$CF_{i,t}$	1327	0.226	884	0.381	-0.155*
$LEV_{i,t}$	1477	0.170	920	0.194	-0.024*
$GO_{i,t}$	1570	0.180	1015	0.108	0.072*
$AGE_{i,t}$	1617	1.824	1024	2.205	-0.382*

Notes: *Statistical significance at 1% level; **Statistical significance at 5% level

The results show that there are statistically significant differences between the two research subsamples for the variables in the analysis. With these results, we conclude that the determinants of investment in VC-backed SMEs are different between firms of the two subsamples. Table 5 presents the correlations between the variables used in this study for both research samples.

Table 5 - Correlation matrices for VC-backed SME subsamples

Variables	Smaller VC-backed SMEs							Larger VC-backed SMEs						
	$INV_{i,t}$	$INV_{i,t-1}$	$CF_{i,t-1}$	$LEV_{i,t-1}$	$TANG_{i,t-1}$	$GO_{i,t-1}$	$AGE_{i,t-1}$	$INV_{i,t}$	$INV_{i,t-1}$	$CF_{i,t-1}$	$LEV_{i,t-1}$	$TANG_{i,t-}$	$GO_{i,t-1}$	$AGE_{i,t-1}$
$INV_{i,t}$	1.000							1.000						
$INV_{i,t-1}$	0.245*	1.000						0.193*	1.000					
$CF_{i,t-1}$	0.096	0.141*	1.000					0.152*	0.046	1.000				
$LEV_{i,t-1}$	0.053	0.125*	-0.075	1.000				-0.006	0.045	-0.213*	1.000			
$GO_{i,t-1}$	0.031	0.146*	0.015	0.171*	-0.218*	1.000		-0.045	0.060	0.069	-0.007	-0.133*	1.000	
$AGE_{i,t-1}$	-0.232*	-0.250*	-0.103**	-0.184*	0.095**	-0.186*	1.0000	-0.121**	-0.160*	0.067	-0.113**	0.024	-0.104**	1.000

Notes: * Statistical significance at 1% level; ** Statistical significance at 5% level

From the correlation matrices, it can be noticed that there are not correlation coefficients above 30%, thus the potential problems of collinearity between explanatory variables are not relevant (Gujarati and Porter, 2010). Additionally, we find that the correlation between investment in the previous period and investment in the current period is statistically significant and positive in both research subsamples (Table 5).

B. Determinants of Investment in VC-backed SMEs

The results obtained for the Hansen test and m2 test reveal that we do not reject the null hypothesis in both tests and, thereby we conclude that the results of the GMM system (1998) estimator are valid and open to interpretation. Next, we present the results obtained from GMM system (1998) estimator for the relationships between the determinants and investment of VC-backed SMEs, for equation (1) and (2), in Table 63.

Table 6 - Determinants of Investment in VC-backed SME subsamples

	Larger VC-backed SMEs	**Larger VC-backed SMEs**	**Smaller VC-backed SMEs**	**Smaller VC-backed SMEs**
Variables	$INV_{i,t}$	$INV_{i,t}$	$INV_{i,t}$	$INV_{i,t}$
$\boldsymbol{INV_{i,t-1}}$	-0.08718***	-0.08706***	0.04454**	0.03480**
	(0.00863)	(0.00779)	(0.0139)	(0.01379)
$\boldsymbol{CF_{i,t-1}}$	0.45778***	0.73107***	0.21133***	0.55569***
	(0.07947)	(0.13877)	(0.06693)	(0.14977)
$\boldsymbol{LEV_{i,t-1}}$	0.20023**	0.34045***	0.46822***	0.88253**
	(0.07549)	(0.08251)	(0.07310)	(0.30392)
$\boldsymbol{GO_{i,t-1}}$	-0.50015***	-0.84720***	-0.84717***	-1.24637***
	(0.11423)	(0.09447)	(0.14098)	(0.25381)
$\boldsymbol{AGE_{i,t-1}}$	-0.15563***	-0.19559***	-0.14349**	-0.19060**
	(0.04319)	(0.02744)	(0.05175)	(0.06092)
VC ownership	0.14372**		1.12635***	
	(0.05349)		(0.31459)	
VC ownership*$\boldsymbol{CF_{i,t-1}}$		-0.50698***		-0.54523**
		(0.14037)		(0.17756)
VC ownership*$\boldsymbol{LEV_{i,t-1}}$		-0.27949**		-1.60924***
		(0.09583)		(0.43392)

[3]In order to check the robustness of the results, and considering that younger SMEs have not acquired a strong reputation (Diamond, 1989), facing higher information asymmetry, we analyse the investment sensitivity to cash flows for two subsamples obtained on the basis of an alternative criterion, i.e., firm age: we consider as younger SMEs those up to 10 years of age, classifying as older SMEs those over 10 years old. Results are not presented but they can be available upon the request to the authors. The results obtained regarding the main explicative variables corroborate the results presented in Table 6.

VC ownership*$GO_{i,t-1}$		0.97219***		0.96412**
		(0.12332)		(0.32870)
$GDP_{i,t}$	-0.05320	-0.03512	-0.02751	-0.01369
	(0.01864)	(0.01360)	(0.02675)	(0.02454)
Constant	83.54938***	48.57783***	30.375**	68.95288**
	(16.98466)	(12.45256)	(16.64433)	(24.66675)
Observations	1154	1154	783	783
Number of firms	465	465	356	356
F	19.24	21.53	41.65	44.69
F p-value	0	0	0	0
Hansen	143.67	162.83	137.7	93.40
Hansen p-value	0.468	0.298	0.372	0.354
m1	-2.14***	-1.68*	0.581**	-1.99**
m2	-1.46	-1.48	0.561	0.05

Notes: 1. Standard errors in parentheses. 2. *** and ** are statistical significance at 1% level and 5% level, respectively. 3. Time and Industry dummies are included in estimations, but not shown.

In equation (2), we add the interaction terms to the equation (1), and we verify that the results are similar. For smaller SMEs, results show that: i) investment in the previous period, cash flows, leverage, VC ownership and the interaction between VC ownership*growth opportunities variables stimulate the investment; ii) growth opportunities and age, interactive variable VC ownership*cash flows, interactive variable VC ownership*debt are restrictive determinants of investment; and iii) GDP neither stimulates nor restricts investment.

As for larger VC-backed SMEs, results indicate that: i) cash flows, leverage, VC's ownership and the interaction between VC's ownership and growth opportunities stimulate investment; ii) investment in the previous period, growth opportunities, the interaction between VC's ownership and leverage, the interaction between VC's ownership and cash flows, and age restrict investment; iii) GDP neither stimulate nor restrict investment.

V. Results Discussion

The results indicate that cash flows stimulate the investment in smaller and larger VC-backed SMEs. Nevertheless, the cash flows have greater relative importance for investment in larger than in smaller VC-backed SMEs. Thereby, we reject the formulated hypothesis H1.

The results of the current study show that larger VC-backed SMEs, with higher average cash flows, prefer internal finance to fund investment in fixed assets. These results are according to Cleary (2005) who concludes that investment is more sensitive to cash flows in more profitable firms.

The existence of VC-backed SME investment sensitivity to cash flows is in accordance with previous studies (Fazzari et al., 1988; Hoshi et al., 1991; Hubbard et al., 1995; Kaplan and Zingales, 1997, 2000; Cleary, 1999; Mairesse et al, 1999; Manigart et al., 2003; Aggarwal and Zong, 2006; Beck et al., 2006; Brown et al., 2009; Brinckmann et al., 2011; Mateev et al., 2013; Bertoni et al., 2013). On the basis of previous studies, we expected that the investment in smaller VC-backed SMEs would be more sensitive to internal cash flows than in larger VC-backed SMEs. However, the results evidence the opposite, given that the internal cash flows are more important for the investment in larger VC-backed SMEs. This result may be due to larger VC-backed SMEs, presenting an average higher level of investment, become more financially restrained, and thus more dependent on internal cash flows. This result corroborates the study of Bertoni et al. (2013) that conclude that after private equity entry, firms were more financially restrained due to an increase in their growth, implying greater dependence on internal cash flows.

Despite the difference in the magnitudes of the effects, debt stimulates investment in both smaller and larger VC-backed SMEs. Thereby, both types of SMEs seem to rely on debt to fund the investment after the exhaustion of cash flows. The positive relationship between investment and debt in VC-backed SMEs may be a consequence of better terms in accessing credit after the VC entry. These results are in accordance with Vanacker and Manigart (2011) that concluded that Belgian VC-backed SMEs rise debt in a greater extent after VC entry.

The results show that debt has a positive effect on investment with a superior relative magnitude on smaller than in larger VC-backed SMEs. Thus, smaller firms seem to rise greater levels of debt for funding their investments in fixed assets. Therefore, based on these results we reject hypothesis 2. Smaller and larger VC-backed SMEs seem to follow the predictions of POT in their financing decisions to fund investment in fixed assets, choosing internal cash flows, which insufficiency forces the firm to rely on debt. The smaller VC-backed firms present, on average, lower level of cash flows and, thereby being more dependent on debt to face investment needs.

In the following, we discuss the results obtained for the remaining explanatory variables of VC-backed SMEs investment.

The growth opportunities have a negative impact on investment in both larger and smaller VC-backed SMEs. Thus, the negative relationship between growth opportunities and investment seems to affect negatively the investment in fixed assets. However, a positive relationship between firm growth opportunities and investment has been identified by several authors (Fazzari et al., 1988; Ascioglu et al, 2008; Carpenter and Guariglia, 2008; Junlu et al., 2009).

Firm age has a negative impact on the investment for both smaller and larger VC-backed SMEs. Age as a restrictive factor of investment suggests that these firms try to reach the minimum scale of efficiency, diminishing the level of investment as they advance through their life-cycle. The results of the current study are according to previous studies (Fazzari et al., 1988; Beck et al., 2006; Fagiolo and Luzzi, 2006; Hovakimian, 2009; Brinckmann et al., 2011; Fraser et al., 2015) that, independently of funding from VC, conclude that younger firms invest less than older firms, due to the financing restrictions (Devereux and Schiantarelli, 1990).

The VC ownership concentration has a positive impact with greater relative magnitude on the investment of smaller VC-backed SMEs in comparison to the larger VC-backed SMEs. The greater participation of VC´s in the equity of investee firms stimulates the investment, mainly, in smaller VC-backed SMEs. These results suggest that VC participation seeks to add value to investee firms by promoting the investment, allowing the smaller VC-backed SMEs to grow and reach the minimum efficiency scale. According to Haro-de-Rosario et al. (2016), there is usually a positive relationship between the level of VC ownership and its level of control and guidance of the investee firms. In general, the presence of a VC is associated with its inclusion on the board of directors, thus enhancing the investee firm image, and facilitating access to credit (Haro-de-Rosario et al., 2016).

Additionally, the interactive variable VC ownership concentration*debt has a negative impact with greater relative magnitude on the investment of smaller VC-backed SMEs in comparison to the larger VC-backed SME. These results suggest that the higher level of VC participation reduces the importance of debt for VC-backed SME investment in fixed assets, mainly in smaller firms.

Moreover, the interactive variable VC ownership concentration*growth opportunities has a positive impact on the investment on both smaller and larger VC-backed SMEs. Therefore, a higher level of VC concentration reduces the negative impact of growth opportunities on investment in fixed assets. These results suggest that greater participation of VC attenuates the inverse relationship between growth opportunities and investment in fixed assets in VC-backed SMEs. It is worth to refer that the magnitude of the effect of that interactive variable is similar for both types of firms suggesting that higher VC participation seems to promote the investment either in growth opportunities or in fixed assets. These results corroborate the argument of Wena and Xiaa (2016) regarding the role of VC in enhancing the growth and innovation in investee SMEs. In fact, Haro-de-Rosario et al. (2016) conclude that growth opportunities are a factor for VC entry due to a greater probability of capital

gains. According to several authors, VC's participation implies an active involvement in firm management, which is related to value-adding that is the main driver of the investee firm performance (Alperooych and Hübner, 2013; Haro-de-Rosario et al., 2016). The results of the current study suggest that the greater level of VC ownership seems to be associated with the effort of conciliation between the investment in fixed assets and the exploitation of growth opportunities.

VI. Final Considerations

This study seeks to analyse the relationship between investment and internal cash flows in VC-backed SMEs. To reach the study objective, we collect data for a sample of 900 VC-backed SMEs. The initial sample was divided into two research subsamples: (i) 570 smaller VC-backed SMEs and (ii) 330 larger VC-backed SMEs. Data was collected from the Amadeus database by Bureau van Dijk for Western European SMEs for the period between 2010 and 2015. We use dynamic panel data, specifically, the GMM system (1998) estimator to capture the dynamic investment behaviour of larger and smaller VC-backed SMEs.

The results indicate that cash flows stimulate the investment in smaller and larger VC-backed SMEs. The investment is more sensitive to cash flows in larger than in the smaller VC-backed SMEs. VC-backed SMEs, are, on average, older, thus, probably present greater capacity to generate cash flows that seem to be the main finance source of investment in larger VC-backed SMEs. This may contribute to explain the greater sensitivity of investment to cash flows in larger VC-backed SMEs, suggesting that these firms avoid relying on external finance.

Smaller VC-backed SMEs are, in average, younger, have a lower level of cash flows and greater level of growth opportunities. Therefore, these firms with lower level of cash flows seem to be forced to rely on debt to fund the investment in fixed assets. Thus, this may explain the lower sensitivity of investment to cash flows and a higher sensitivity of investment to debt in smaller VC-backed SMEs. In smaller VC-backed SMEs, the level of investment of the previous period has a positive effect on the investment of the current period, whereas in larger VC-backed SMEs, there is a negative relationship between the investment of the current period and investment in the previous period.

The interactive variable VC ownership concentration*growth opportunities has a positive impact on the investment of both smaller and larger VC-backed SMEs. A higher level of VC's participation reduces the negative impact of growth opportunities on the investment in both smaller and larger VC-backed SMEs. This result may be a consequence of VC´s objective to conciliate the investment in fixed assets with the exploitation of growth opportunities to promote value-adding in VC-backed SMEs.

The results of the current study are important for SME owners/managers, showing the importance of VC funding for a firm to reach the minimum scale of efficiency and, thereby to grow and succeed through the exploitation of investment in fixed assets and growth opportunities. Additionally, the results of the current study evidence the role of debt for smaller VC-backed SME investment, suggesting the importance of VC participation to reduce the problems of asymmetric information, allowing to obtain credit with more favourable terms.

For policymakers, the results, here obtained, enhance the importance of external financing sources to support SME investment. Therefore, taking measures to promote the VC entry in SMEs is important to these firms, since it allows to contribute for accessing credit on more favourable terms as well as to benefit from the role of management advisor offered by VC's in investee firms.

The results of the current study are important for researchers in the entrepreneurial finance area, given that they evidence the role of VC for SME investment in fixed assets and growth opportunities exploitation after VC entry. In the current study, the percentage of VC participation in investee SMEs is constant during the period of analysis, which may have influenced the results obtained, namely the sensitivity of investment to cash flows of VC-backed SMEs. Therefore, for future research, it is suggested to analyse the sensitivity of investment to cash flows of VC-backed

SMEs through different VC rounds. Also, for future research, it is suggested to analyze the role of VC's for SME investment in research and development (R&D) as well as its relationship to SME performance. Finally, it would be interesting to analyze the impact that thick/thin VC markets would have on the availability of cash flows from SMEs to perform investments.

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