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WHO GETS PRIVATE EQUITY?

THE ROLE OF DEBT CAPACITY, GROWTH AND INTANGIBLE ASSETS

KATLEEN BAEYENS

SOPHIE MANIGART,

Sophie.Manigart@vlerick.be

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KATLEEN BAEYENS

Ghent University

SOPHIE MANIGART,

Vlerick Leuven Gent Management School

Contact:

Sophie Manigart

Vlerick Leuven Gent Management School

Tel: +32 09 210 97 87

Fax: +32 09 210 97 00

Email: Sophie.Manigart@vlerick.be

ABSTRACT

While informed private equity (PE) investors screen for the most promising ventures, firms may avoid raising of PE for issues of cost and control. A critical question therefore is: which firms get PE? We consider both supply and demande side arguments to study the characteristics of a sample of 231 firms that did receive PE and compare them to those of a matched sample. Supporting the pecking order theory, we show that firms rely on PE funding when there are no alternatives, i.e.when their debt capacity is limited, due to financial and bankruptcy risk and due to important investments in intangibles. PE investors, from their side, select firms with substantial growth options. Further, firms that receive PE have grown more before the funding event than companies that did not receive PE.

1 INTRODUCTION

Informed private equity (PE) [1] is considered to be an important financing source for firms with growth aspirations. Research on PE has received a lot of attention (for example, Wright and Robbie, 1998), because of the role of PE in funding high potential firms and therefore, in enhancing innovation, regional development, economic growth and the emergence of new industries (Kortum and Lerner, 2000;von Burg and Kenney, 2000;Powell et al., 2002).

Up to now, research on PE has mainly focused on the supply side, i.e. how PE investors select and manage their portfolio companies (Manigart and Sapienza, 1999). Little research, however, has been conducted on the demand side, i.e. the decision making process by which firms seek PE (Wright and Robbie, 1998). While PE investors are known to screen for top companies, their choice may be limited to certain types of ventures. Indeed, not all entrepreneurs will consider raising PE. They are likely to be concerned with issues related to the cost of PE funding and the loss of control and independence associated with it. Moreover, most entrepreneurs are not familiar with this type of funding. Therefore, entrepreneurs may try to avoid the use of PE and only get PE funding when there is no other alternative (Howorth, 2001). These demand side issues, however, have been largely neglected in the current literature. PE financing has often been described as *the* financing source for young, high growth oriented companies (e.g. Berger and Udell, 1998) and *the* engine for innovation, growth and employment (e.g. Kortum and Lerner, 2000). Yet, studies have illustrated that the share of IPO firms – which are typically considered to be high growth companies – that have been financed with PE before going public is limited. For example, Field and Hanka (2005) find that only 48 % of the 1,948 U.S. firms that did an IPO between 1988 and 1997 is backed by venture capital, while Bottazzi and Da Rin (2002) show that only 40 % of the firms listed on Euro.Nm is backed by at least one venture capital investor. This raises the question as to which companies opt for PE to fund their growth.

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[1] Since we study firms that get private equity when they are at least 2 years old, we will use the term private equity (PE), rather than venture capital. For some cases, the term 'venture capital' sensu stricto would apply.

There is little research that examines the actual firm characteristics that predict obtaining venture funding (Davila et al., 2003).

For example, while research has shown that PE investors look for high potential firms (Zacharakis and Meyer, 1998), it still remains unclear whether this translates into higher pre-investment growth of PE backed firms (Davila et al., 2003).

The goal of the present study is to provide futher insights in the demand and supply of PE. The central research question in this paper is: which firms get PE funding? We investigate empirically the characteristics of firms that use PE funding and compare them to those of a matched sample of firms without PE funding. More specifically, we examine a number of characteristics that help us to understand some of the important demand and supply side issues. To this end, we compare a unique hand-collected sample of 231 PE backed (PEB) firms with 231 matched non-PEB firms.

The rest of the paper is structured as follows. In section 2 hypotheses are developed on which firms get PE funding. Section 3 presents the research context and describes the data collection. It also describes the method of analysis and defines the variables used in the analyses. Section 4 reports the results. Finally, section 5 discusses the results and concludes.

2   THE ROLE OF RISK, GROWTH AND INTANGIBLE ASSETS

In this section, we develop hypotheses as to which firms are likely to look for and obtain PE (figure 1). We argue that entrepreneurs try to avoid, if possible, the use of PE funding. We argue that firms especially resort to PE funding when high financial risks limit their debt capacity. PE investors, from their side, look for growth oriented firms. Previous growth may therefore be an important selection criterion (Davila et al., 2003). Finally, we look at the role of intangible assets. Intangible assets are typically associated with information asymmetries and lack of collateral and hence, with limited debt capacity. Alternatively, intangibles represent important growth options for the PE investor and therefore signal growth potential.

Insert Figure 1 About Here

2.1   Financial and bankruptcy risk

While PE investors are known to screen for top companies, entrepreneurs may try to avoid the use of PE. First, PE funding is an expensive financing source: required rates of return in Europe vary between 15% and 45% depending on the stage of development of the investee company (Manigart et al., 1997). Therefore, firms that have access to other – cheaper - financing are expected to prefer those cheaper sources of funding. Furthermore, although getting PE backing is often considered to be associated with higher growth of the company and hence greater wealth for the entrepreneur, this is not necessarily the case. Florin (2005) shows that founders that relinquish large parts of their ownership typically generate less personal wealth through their venture. Second, firms may avoid the use of PE due to the loss of control associated with it (Howorth, 2001). Control and independence are important motivators for entrepreneurs, even to the extent that some entrepreneurs would sell the firm rather than give up part of the equity (Cressy and Olofsson, 1997). Getting PE funding can have important control implications as PE investors typically take on an important role in the board of directors (Rosenstein et al., 1993). Moreover, PE funding is often associated with changes in the firm's top management team, among which replacements of the founder by an outside CEO (Mullins and Forlani, 2005;Hellmann and Puri, 2002). Third, entrepreneurs may not be familiar with this type of funding. While most entrepreneurs are accustomed to more traditional financing sources, such as bank debt, they are not used to private equity. As a result, they feel less able to negotiate and price private equity, compared to debt financing (Van Auken, 2001). Moreover, they are sometimes not aware of the possible implications of private equity (Howorth, 2001). Lastly, entrepreneurs may be reludant to pursue an extreme growth strategy, as this increases the chances of bankruptcy (Baeyens et al., 2002). Hence, entrepreneurs may be reluctant to use PE and may only resort to it when debt financing is not an option. Despite the fact that entrepreneurs may try to avoid PE funding, their attitude may change as the situation of their ventures changes. For example, entrepreneurs become more open-minded towards external funding when the financial situation of the firm weakens (Berggren et al., 2000).

The idea of equity issues as a financing source of last resort is consistent with the (extended) pecking order theory. According to the traditional pecking order

theory, firms prefer debt financing to equity financing (Myers and Majluf, 1984). The pecking order theory does not entirely reject new equity issues: Chirinko and Singha (2000) argue that firms may choose equity financing when their debt capacity is exhausted.

This suggests that new equity is a last resort for firms that cannot issue new debt because they have depleted their debt capacity. Debt capacity is often described as a situation in which the costs of additional debt become so high that there are important limitations on additional debt issues (Myers, 1984;Chirinko and Singha, 2000). There are two aspects of limitations on debt capacity that may play a role in the decision of a firm to raise PE: the current distance from its maximum debt capacity and the speed with which it expects to attain its debt capacity (Lemmon and Zender, 2004).

The current distance from maximum debt capacity describes how much additional debt a firm can issue without significantly increasing its financial risk. This is likely to depend on its current debt level, firm risk, information asymmetries and the availability of collateral. Firms characterised by high risks, important information asymmetries and lack of collateral may find it very costly or even impossible to get new debt (Carpenter and Petersen, 2002b), making equity funding the only available external financing option. High risks, important information asymmetries and lack of collateral are expected to affect the distance that a firm is removed from its current level of debt capacity. The second aspect of limitations on debt capacity is the speed with which a firm expects to attain its debt capacity. Firms that require substantial amounts of external financing may be pushed very quickly to excessive debt levels and hence high risk. These are firms with either limited or negative cash flows and/or important investment programs. This may, again, incite firms to apply for equity funding on one or more occasions.

Equity investors, from their side, may be willing to fund high risk firms, provided that the firm holds out high growth prospects. PE investors can accept downside risks, because they share the upside as well: PE investors are not so much in the business of reducing risk, but in that of enhancing value through increasing returns in high growth environments (Manigart and Sapienza, 1999). Moreover, PE investors do not manage risk on an individual firm basis, but rather on a portfolio basis (Bygrave and Timmons, 1992).

As long as the entire portfolio generates above average returns, PE investors may be willing to take the risk of bankruptcy of some portfolio firms.

If firms turn to PE when their debt capacity is depleted or likely to deplete, then PE investors can be viewed as financiers of last resort, rather than the preferred investors for growth oriented companies. This would imply that part of the most promising ventures get funding from other sources of financing, reducing the number of firms that PE investors can select from. We argue that especially firms with limited additional debt capacity apply for PE funding.

These arguments lead to the following hypothesis:

Hypothesis 1: PE is used when high financial and bankruptcy risks prevent firms from accessing other types of financial resources

2.2 Growth

PE investors will of course not invest in any firm with high financial and bankruptcy risk. From the firms that seek PE, investors will select those with high growth potential. VC investors typically rely on following criteria to evaluate and select firms: a) entrepreneur/management team, b) product/service, c) market/competition and d) return potential (Macmillan and Narasimha, 1985;MacMillan et al., 1987;Hall and Hofer, 1993;Zacharakis and Meyer, 1998). Earlier studies highlight the importance of the entrepreneurial management team as the most important factor (for example, Macmillan and Narasimha (1985). More recent studies find that VC investors focus instead on growth potential (Hall and Hofer, 1993;Zacharakis and Meyer, 1998). Moreover, they shift their attention depending on the availability of information (Zacharakis and Meyer, 1998). While lack of historical data may force VC investors to rely on qualitative, soft information to evaluate and select start-ups, we expect that, similar to debt providers, PE investors focus more on hard data when assessing later stage companies (Rosman and O'Neill, 1993; Manigart et al., 1997). Assessing a firm's historical growth path may be one way in which PE investors deal with information asymmetries (Davila et al., 2003). The fact that a firm has pursued a high growth path in the past may serve as a signal to a PE investor that it will be willing and able to do so in the future. Moreover, firms

exhibiting high growth prior to PE investment may be looked upon as operating in high potential markets. If PE investors use the firm's growth path as a signal of future growth, then we expect:

> Hypothesis 2: External PE is used by firms that have exhibited high growth in the past.

2.3   Intangible assets

Next to financial risk and historical growth, the level of intangible assets may be a characteristic distinguishing between firms with and without PE. Intangible assets on the one hand decrease the debt capacity of the firm, and on the other hand signal growth options.

As previously mentioned, entrepreneurs may not consider the use of PE funding, unless debt financing is hard to get. We have argued that high financial risks may seriously compromise a firm's ability to get additional debt. The presence of substantial intangible assets is another element that may considerably reduce a firm's debt capacity, and may hence explain why firms raise PE. Intangible assets have low collateral value (Myers, 1977). Further, compared to assets in place, growth options are associated with higher information asymmetries, potentially leading to problems of adverse selection and moral hazard. This makes that intangible assets provide limited additional debt capacity[2].

In contrast to debt providers, PE investors have the incentives and the means to deal with the large information asymmetries associated with intangibles. The equity nature of their claims incites PE investors to reduce information asymmetries (Wright and Robbie, 1998) because equity entails a claim on the firm's residual income in contrast to bank debt. Amit et al. (1998) argue that one of the primary reasons for the existence of PE investors is their information processing capacities, which may reduce information asymmetries, and hence adverse selection and moral hazard problems. PE investors, such as venture capitalists, are inside investors that gain private information

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[2] It has been argued that the debt capacity of growth options (proxied by intangible assets), defined in terms of the incremental debt that is optimally associated with an investment project, is negative (Barclay et al., 2006).

on investment projects during both pre-investment screening and post-investment monitoring, thereby reducing information asymmetries between entrepreneurs and investors (Admati and Pfleiderer, 1994; Reid, 1996).

PE investors are not only able to overcome the information asymmetries associated with intangible assets, but they are also eager to finance intangible assets as they typically represent growth options (Hovakimian et al., 2001;Titman and Wessels, 1988), which is an important criterion in the decision making process of the PE investor (Zacharakis and Meyer, 1998). Gompers (1995) has indeed shown that PE is especially important in sectors where assets are largely intangible and growth options are important.

These arguments lead to the following hypothesis:

Hypothesis 3: PE is used by firms characterised by substantial intangible assets

3   DATA AND METHODS

3.1   Research context and design

Foregoing hypotheses are tested on a sample of unquoted Belgian PE backed (PEB) companies. In contrast with the U.S. where most studies on PE and venture capital have been done, Belgium has a Continental European financial system. While U.S. firms obtain an important share of their external financing from capital markets, this financing source is considerably less important for European firms. Compared to U.S. firms, Continental European firms rely to a much larger extent on bank loans (Hartmann et al., 2003). Only a minority of Belgian firms are quoted on a stock exchange. The PE industry, however, is quite well developed in Belgium. Belgian PE investors are quite active in high tech investments compared to their European colleagues (EVCA, 1987-2003). Still, the role of the PE industry in financing firms remains limited: investments made by Belgian VC and PE investors accounted for only 3.3% of the net issuance of unlisted equities by Belgian firms in the period 1996 – 2000 (ECB, 2002).

The sample of PEB companies is constructed using secondary sources. Yearly accounts of PE investors, press clippings, press releases and websites are used to

identify Belgian companies that received PE between 1987 and 1997. The total sample is composed of 553 companies, excluding companies in the financial sector and holding companies. Following Megginson and Weiss (1991) and Lerner (1999), each PEB company is matched with a non private equity backed (NPEB) company on following criteria, measured in the year before the PE funding: activity (NACE-code), size (with total assets as proxy), and stage. The pre-investment situation of the PEB companies is used, so as not to introduce a size bias caused by the funding itself. The main data for the study are the yearly accounts of the companies - collected by the National Bank of Belgium -, up to 2002. For each company-year, more than 50 variables from the financial accounts (balance sheet, profit and loss statement, and additional information) are recorded.

Insert Table 1 About Here

The sample used in this study is a subsample of 231 PEB companies and 231 comparable NPEB companies for which we have at least 2 years of data at the time of the initial PE investment[3]. Table 1, panel A shows the age and industry distribution (using 1-digit NACE codes) of the firms in our sample. About one quarter of the firms in our sample is less than 5 years old. 28% of the firms are between 6 and 10 years old and 20% of the firms are between 11 and 20 years old. The firms in our sample are on average 17 years old (table 1, panel B). 22% of the firms in our sample are active in NACE industry 3 ("Metal manufacture; mechanical and instrument engineering") and another 22% in NACE industry 6 ("Distributive trades, hotels, catering, repairs"). 20% of the firms in our sample are active in NACE industry 4 ("Other manufacturing industries") and 16% in industry 8 ("Business services). As shown in table 1, panel B, median total assets equals € 2.3 mio while the average size amounts to € 10.5 mio.

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[3] At least 2 years of data are required to study pre-investment characteristics, including growth characteristics. Outliers (more than 9 standard deviations from mean) and observations with missing values are removed from the sample.

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3.2 Method of analysis and variables

We study which firms apply for and obtain PE funding by carefully analysing the characteristics of PEB firms and by comparing them to those of NPEB firms. Various variables (defined in appendix 1) are included in the multivariate analyses. The Wilcoxon test is used to compare the pre-investment characteristics of PEB and matched NPEB firms. We apply principal component analysis to reduce the number of variables in the logit analyses. Differences in pre-investment characteristics of PEB and NPEB firms are further studied using multivariate logit analyses.

Financial and bankruptcy risk[4]

We take into account the current distance from debt capacity by including a number of variables that proxy for financial risk and (resulting) bankruptcy risk: total debt ratio, long term debt ratio, interest coverage, cash flow coverage of debt and short term bankruptcy indicator.

Two types of debt ratios are included in the analyses: the "Total Debt Ratio" and the "long term debt ratio", measured respectively as total debt to total assets and long term debt to total assets. A high debt ratio indicates that the firm has extensively used debt in the past, thereby possibly reducing its additional debt capacity. A higher debt ratio presents smaller protection of present or future debt providers, because of the smaller buffer of equity that debt providers can depend on in case of liquidation. The debt ratio gives an indication of how the firm has been financed in the past. It is a snapshot of a firm's complete history of financing choices (de Haan and Hinloopen, 2003).

Two solvency measures are used to account for the financial obligations associated with the use of debt. "Interest coverage" is measured as the coverage of financial costs of debt by the net result after non-cash costs, before financial costs and after taxes. "Cash flow coverage of debt" is calculated as the ratio of cash flow to total

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[4] All pre-investment characteristics are measured one year prior to PE funding. The situation one year before PE participation may be slightly 'biased' by pure accounting activities of the PEB firms. A recent study (Beuselinck et al., 2004) has shown that in anticipation of PE funding, firms tend to embellish their balance sheet, an effect which manifests itself from one year before PE funding on. If we are unable to reject hypothesis 1 (w.r.t. financial and bankruptcy risk) based on the results one year before PE participation, this would indicate that 'unbiased' results w.r.t. this hypothesis would be even

debt. Difficulties in meeting current debt obligations are indicative of financial problems and may hamper the search for additional debt financing.

Finally, we include a measure of "short term bankruptcy risk": the Ooghe – Joos – De Vos score is a short term bankruptcy indicator developed for Belgian companies. It includes financial risk, but also takes into account the risk that is inherent in the operations of the firm and caused by non financial factors, the operational risk.

It is a multivariate logit score for short term failure prediction developed in a Belgian context and therefore an appropriate alternative risk indicator for Altman's Z score (Ooghe et al., 1995)[5]. The risk indicator varies between zero (financially healthy firm) and one (firm in financial distress).

Growth path

We include two relative growth variables: "total assets growth" and "gross added value growth". Total assets growth measures how much firms grow in size, while gross added value growth focuses on the growth in added value. Both are measured as …

Intangible assets

We use two variables that proxy for the importance of intangible assets: the "intangible assets ratio" and the "investments in intangible assets ratio", which are calculated respectively as the ratio of intangible assets and of investments in intangible assets to total assets[6]. The intangible assets ratio measures the stock of intangible assets and takes into account intangible investments in previous years, while the investments in intangible assets ratio measures the flow of new intangible assets.

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stronger. Anyhow, the results are robust to using variables measured three years and two years before PE participation.

[5] The Ooghe-Joos-De Vos score is computed using 8 of the firm's variables: (1) direction of financial leverage, (2) accumulated profits and reserves to total liabilities, (3) cash to total assets, (4) overdue short term priority debt, (5) operational net working capital to total assets, (6) net operating result to working assets, (7) short term financial debt to short term liabilities and (8) amounts payable guaranteed by public authorities and real securities to total amounts payable

4   RESULTS

4.1   Wilcoxon tests

Table 2 provides a detailed analysis of the characteristics of the PEB firms in our sample and of their matched counterparts. We stress that a majority of the matched NPEB firms also exhibits a demand for external financing. Unreported analyses show that more than 70% of the NPEB firms obtain external financing, especially bank financing, within 3 years after the PE participation of their matched counterpart.

We examine whether firms that rely on PE funding are different in terms of financial and bankruptcy risk (limited debt capacity), in terms of realized growth before PE funding (growth aspirations) and in terms of intangibles (limited debt capacity and growth aspirations).

Insert Table 2 About Here

Financial and bankruptcy risk

As shown in table 2, PEB firms face higher financial and bankruptcy risks, compared to NPEB firms. This suggests that limitations on debt capacity due to important risks may be important in explaining why firms resort to PE funding.

There are significant differences between PEB and NPEB firms in terms of debt financing. Before getting PE, PEB firms have typically used more debt, compared to firms in the same size class, industry and stage of development. Both samples differ significantly with respect to their debt ratio (significant at the 5% level). Total debt amounts to 78% of total assets for the median PEB firm, compared to 73% for the median counterpart. One year before the initial PE funding, 25% of the PEB firms have a debt ratio of 88% and higher. Firms that rely on PE funding also exhibit extensive use of long term debt, in comparison with similar NPEB firms. 15% of the total assets of PEB firms consist of long term debt, compared to 10% for comparable firms. This indicates that, one year before the initial PE participation,

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[6] Intangible assets consist mainly of R&D expenses, patents and licenses.

PEB firms have accumulated relatively more debt and especially more long term debt compared to a sample of matched firms. As the PEB firms get PE funding later on, they apparently have a need for future external funding. However, given their high debt ratios, these firms may find it difficult to get additional debt funding.

PEB firms are typically less solvent, compared to their matched counterparts. Indeed, the results in table 2 show that PEB firms are more likely to incur problems in meeting their current interest obligations. The interest coverage ratio is significantly smaller for PEB firms in comparison with matched firms (significant at 1% level). A median PEB firm has an interest coverage of less than 1.6, whereas coverage is 1.9 for its median counterpart. Almost one third of the PEB firms (67 of 231 firms) exhibits an interest coverage lower than one, one years prior to PE funding. Firms that rely on PE funding do not differ significantly from comparable firms in terms of their cash flow coverage of debt. However, the finding with respect to interest coverage suggests that PEB firms are more likely to incur problems in servicing their debt obligations before PE financing, in comparison to similar firms. As lenders typically investigate firms' past payment experiences before deciding to grant a loan, firms with previous problems in meeting interest payments may find it hard to secure additional debt from debt providers. Moreover, unless a considerable increase in net results is expected, additional debt financing will make it even harder for the firm to sustain its debt load, thereby increasing the chances of default.

Table 2 also shows that higher financial risks, possibly combined with more important operational risks, cause PEB firms to exhibit a higher risk of bankruptcy compared to matched firms (significant at the 1% level). 52 PEB firms are classified as failing, one year before PE funding, compared to only 28 NPEB firms.

Growth path

As shown in table 2, PEB firms typically follow a more aggressive growth path before obtaining PE funding. The growth path of PEB and NPEB firms differs significantly (significant at the 5% level) both in terms of total assets and added value. For example, a median PEB firm exhibits a total assets growth of 13%, compared to only 7% for a median NPEB firm. These suggest that PE investors might use growth as a selection criterion.

Intangible assets

Finally, the results in table 2 also suggest that intangible assets are more important in PEB firms, compared to NPEB firms, both in terms of stock and flow (significant at the 1% level). PEB firms typically have large ratios of intangibles to total assets and invest more in intangibles prior to PE funding. This suggests that a number of PEB firms may only have limited or even no collateral available for future debt issues, making it hard to obtain (further) debt.

To sum up, bivariate analyses suggest that the financial health before PE participation is so deteriorated and the bankruptcy risk so high that it is highly unlikely that debt providers will be willing to extend more debt to the firms. Equity therefore seems to be the only external funding option for a considerable number of firms that resort to PE. There is, moreover, evidence that PE backers from their side, consider previous growth as a signal for future growth.

It is therefore an important criterion to identify high potential firms. Finally, PE is important for firms that seek to fund large investments in intangible assets, such as large R&D projects.

4.2 Principal component analysis

The hypotheses are tested using multivariate logit analyses. Correlations between independent variables may cause collinearity problems in multivariate analyses. Therefore, we first transform the original variables into a smaller set of factors by means of a principal component analysis[7]. Details of the principal components analysis are provided in table 3. Three factors are extracted by the principal components analysis. The factor identification is based on factor loadings, which measure correlation between factors and original variables.

Insert Table 3 About Here

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[7] Principal components corresponding to eigenvalues larger than one are retained. To facilitate identification, a varimax orthogonal rotation is performed.

The original variables total debt ratio, long term debt ratio and short term bankruptcy risk exhibit a strong positive correlation with factor 1, while interest coverage and cash flow coverage of debt exhibit a strong negative correlation with factor 1. This factor is clearly related to limitations of debt capacity due to financial and bankruptcy risk. Factor 2 exhibits a strong positive correlation with total assets and gross added value growth; it is labelled "growth". Factor 3 is highly positively correlated to both the intangibles and investments in intangibles ratio. Hence, factor 3 represents the importance of intangibles in the firm.

4.3   Logit analysis

Insert Table 4 About Here

The results of the bivariate analyses are confirmed in the multivariate logit analysis. The logit results in table 4 show that significantly more firms with high financial and bankruptcy risk issue PE (significant at the 1% level). Moreover, a high growth track record increases the likelihood of getting PE (significant at the 5% level). Hence, our findings suggest that PE backers interpret historic growth as a signal for future growth potential. Finally, information asymmetries and lack of collateral further explain why firms use PE funding, as the likelihood of getting PE funding increases with the importance of intangibles (significant at the 1% level).

4.4   Post-investment evolution

In this section, we describe how the firms evolve after having received PE, in order to have further evidence on whether debt capacity was exhausted pre-investment, whether PEB firms exhibit higher growth and whether they invest more in intangible assets. We do not make any claims about the direction of causality in the relation between receiving PE and the post-investment characteristics of PEB firms, as there are problems of endogeneity. For example, firms may resort to PE funding to finance future investments in R&D. On the other hand, investments in R&D may only be possible after the firm has obtained PE.

Notional debt ratio

Firms with high levels of financial risk typically have limited possibilities of obtaining additional debt, inciting them to issue PE. However, firms may also decide to issue PE not because current debt ratios are be too high, but because they want to maintain financial flexibility in the future (Fama and French, 2002). In this case, firms resort to PE funding because additional debt financing would push them to excessively high debt levels and preventing them to raise additional debt. That is, by issuing equity and hence by lowering their debt ratios, firms have the financial flexibility to issue debt later on. Following Mayer and Sussman (2005), we compute a hypothetical debt ratio, the "notional debt ratio". This measure indicates what the firm's maximum leverage would have been in case the firm would not issue equity, but debt instead. Notional debt ratio is measured as follows: if debt is issued, then the notional debt ratio equals the debt ratio; if equity is issued, then the equity issue is added to debt to compute the hypothetical debt ratio. The notional debt ratio is examined in the year of PE participation and the following year, since under this explanation PE is issued in anticipation of future excessive debt levels.

The results for notional debt ratio in table 5 do confirm that PEB firms resort to PE funding when future issues would distort the firms' liabilities structure in case only debt were to be used. The maximum notional debt ratio amounts to more than 85% for half of the PEB firms, of which one quarter has a notional debt ratio larger than 95%. These results clearly show that using exclusively debt to satisfy external funding needs would push PEB firms very quickly to excessive debt levels, thereby increasing their risk of default.

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Investments in intangible assets

Future investments in intangible assets are also studied to examine whether these may explain why firms resort to PE funding. We include the average investments in intangible assets to total assets in the year of the PE investment and the year thereafter. Table 5 shows that PEB firms invest significantly more in intangible assets after PE participation (significant at 1% level). While intangibles may seem relatively small compared to total assets, this is not the case when investment in intangible assets are compared to the initial amount of intangible assets. If, for example, we use a threshold of 20% gross investment rate (Cooper et al., 1999) or a minimum absolute investment in intangible assets of € 250,000 for firms for which intangible assets in the previous year are zero or unknown to identify so-called investment spikes, we find that 57% of the PEB firms show an investment spike in intangible assets in the year of the PE investment or the year thereafter. Raising debt to fund such large investments in intangibles would be difficult or even impossible, since it provides debt financiers with little collateral value and carries high information asymmetries (Ueda, 2004).

Growth

We further check whether the PEB firms do indeed grow faster after PE participation by looking at average "total assets growth" and average "gross added value growth" in the year of the PE investment and the year thereafter. As shown in table 5, PEB firms grow faster immediately after obtaining PE funding (year 0 and year 1). Total assets of PEB firms grow on average 27%, compared to 9% for NPEB firms (significant at the 1% level). Gross added value growth amounts to 12% for a median PEB firm, compared to 4% for a median NPEB firm (significant at the 5% level). The mere fact of having received PE may, of course, impact growth rates.

The post-investment analyses confirm the pre-investment findings. After having received PE, firms grow faster and invest more in intangible assets. This confirms the role of PE investors as enablers of growth, allowing firms to invest in assets with low collateral value and high information asymmetries. Not all growth oriented firms raise PE, however, as the post-investment analyses also confirm that especially firms with potentially too high levels of debt rely on PE.

In order to understand which firms receive PE, both demand and supply side have to be taken into account.

5   DISCUSSION AND CONCLUSION

An important role of PE investors as financial intermediaries is to select the most promising ventures, by carefully screening potential investments. PE investors are considered to have stringent investment criteria, withholding only ventures with the highest potential. However, due to demand issues, PE investors may be denied the opportunity to select from a broad set of high potential ventures. Demand constraints may make PE a financing source of last resort, rather than the preferred source of funding for top companies. In this study, we try to get a better insight into which type of firms obtain PE funding and how this can be explained taking into account the perspectives of both the demand and supply side of financing. We study the characteristics, financing and investment strategies of a sample of 231 PEB firms and position these characteristics by comparing them to the characteristics of a matched sample of firms.

Our results show that limitations on debt capacity due to high financial risk are an important reason for firms to resort to PE financing. Most PEB firms have accumulated debt before getting PE and exhibit high risk, both in terms of financial and bankruptcy risk. Consistent with Baum and Silverman (2004), we find that the characteristics that lead to PE financing are typically also the characteristics that trigger failure. In addition, we find that firms are forced to use PE not (only) because of the level of debt capacity, but (also) because of the speed with which debt capacity is attained. In other words, our findings suggest that firms use PE because additional debt funding would push them to excessive debt levels. Hence, PE allows firms with limited internally generated funds to grow beyond the limits of their debt levels.

PE investors, from their side, face the challenge of selecting the most promising ventures. Unlike for start-ups, PE investors might use the historical growth path as a signal to identify growth oriented ventures. In contrast to the results of Davila et al. (2003) which study employment growth during the months before VC funding, our findings do suggest that growth is a predictor of obtaining PE funding.

Finally, our results suggest that firms opt for PE when they have substantial investments in intangible assets. This hints at the role of PE in reducing information asymmetries between entrepreneurs and investors, but also at the role of PE in funding firms with limited debt capacity. As intangibles also typically represent growth options, this result, again, suggest that that PE investors are both investors of last resort and enablers of growth. First, most companies that apply for PE do so because there are no alternatives. Second, from those companies that seek PE, investors select those with higher growth rates in the past and with more growth options.

Our results are important for entrepreneurs. Our findings suggest that many firms only turn to PE investors when their financial situation is so deteriorated that it is almost impossible to get funding from other sources. This may considerably reduce the strength of entrepreneurs' negotiation positions when they turn to PE investors. Entrepreneurs may, therefore, need to consider applying for PE funding earlier on. Our results show, furthermore, that PE investors select firms based on their historical growth path. This suggests that firms may pursue a growth strategy to signal their growth orientation to PE investors.

Moreover, for PE investors it is important to know how firms that apply for PE funding differ from firms that apply for other sources of funding. The results of our study strongly suggest that the set of firms from which PE investors can select is to a substantial extent limited to those firms that do not get funding elsewhere. It might, for example, be a worthwhile strategy for PE investors to try to increase deal flow from companies that are not in imminent financial distress by stressing their non-financial contributions, such as their certification role and their post-investment value adding. This might increase the investment capacity of the PE industry.

Moreover, our results are also important for policy makers. All over the world, governments have set up programs to enhance financing of entrepreneurial firms. One of the main rationales of government intervention in the PE market is the role of PE in providing funds for firms that may have difficulties in getting funding from other sources and hence, in diminishing perceived funding gaps (Lerner, 1999;OECD, 1997). Our study, indeed, confirms that PE is important for firms with limited internal funding sources that wish to grow beyond the limits of their debt capacity and for firms undertaking substantial R&D projects. However, our results indicate that demand side issues need to be taken into account. In particular, we find that a lot of

entrepreneurial firms only consider using PE when debt financing is hard or even impossible to get. Consistent with Mason and Harrison (2002), our results suggest that entrepreneurs might need to be educated on the advantages of PE financing, so that the need for equity funding is translated into demand. So far, little research has been done on demand issues in the PE sector. It is therefore not clear whether our findings are typical for the PE industry in a debt oriented economy or whether the importance of debt capacity in the demand for PE is a common feature of the PE industry all over the world. We therefore call for future research on the decision making processes of entrepreneurial ventures in different institutional and financial settings.

REFERENCES

Admati, A. R., P. Pfleiderer, 1994. Robust financial contracting and the role of venture capitalists. Journal of Finance 49, 371-402.

Amit, R., J. Brander, C. Zott, 1998. Why do venture capital firms exist? Theory and Canadian evidence. Journal of Business Venturing 13, 441-466.

Barclay, M., E. Morellec, and C. Smith, forthcoming. On the debt capacity of growth options. Journal of Business.

Baum, J. A., B. S. Silverman, 2004. Picking winners or building them? Alliance, intellectual and human capital as selection criteria in venture financing and performance of biotechnology startups. Journal of Business Venturing 19, 411-436.

Berger, A. N., G. F. Udell, 1998. The economics of small business finance: the roles of private equity and debt markets in the financial growth cycle. Journal of Banking and Finance 22, 613-673.

Berggren, B., C. Olofsson, L. Silver, 2000. Control aversion and the search for external financing in Swedish SMEs. Small Business Economics 15, 233-242.

Beuselinck, C., M. Deloof, S. Manigart, 2004. Private equity and earnings quality. Working Paper Ghent University. AANVULLEN !!

Bottazzi, L., M. Da Rin, 2002. Venture capital in Europe and the financing of innovative companies. Economic Policy 34, 229-269.

Bygrave,W.D., Timmons,J.A., 1992. Venture capital at the crossroads. Boston: Harvard Business School Press.

Carpenter, R. E. and B. C. Petersen, 2002b. Capital market imperfections, high-tech investment, and new equity financing. Economic Journal 112, F54-F72.

Carpenter, R. E. and B. C. Petersen, 2002a. Is the growth of small firms constrained by internal finance? The Review of Economics and Statistics 84[2], 298-309.

Chirinko, R. S., A. R. Singha, 2000. Testing static trade off against pecking order models of capital structure: a critical comment. Journal of Financial Economics 58, 417-425.

Cooper, R., J. Haltiwanger, L. Power, 1999. Machine replacement and the business cycle: lumps and bumps. American Economic Review 89, 921-946.

Cressy, R., C. Olofsson, 1997. The financial conditions for Swedish SMEs: survey and research Agenda. Small Business Economics 9, 179-194.

Davila, A., G. Foster, M. Gupta, 2003. Venture capital financing and the growth of startup firms. Journal of Business Venturing 18, 689-708.

de Haan, L., J. Hinloopen, 2003. Preference hierarchies for internal finance, bank loans, bond and share issues: evidence for Dutch firms. Journal of Empirical Finance 10, 681.

ECB, 2002. Report on financial structure. European Central Bank, Frankfurt.

EVCA, 1987. EVCA Yearbook.

Fama, E. F., K. R. French, 2002. Testing trade-off and pecking order predictions about dividends and debt. Review of Financial Studies 15, 1-33.

Field, L. C., G. Hanka, 2005. The expiration of IPO share lockups. Journal of Finance 56, 471-500.

Florin, J., 2005. Is venture capital worth it? Effects on firm performance and founder returns. Journal of Business Venturing 20, 113-135.

Fulghieri, P., D. Lukin, 2001. Information production, dilution costs, and optimal security design. Journal of Financial Economics 61, 3-42.

Gompers, P., 1995. Optimal investment, monitoring, and the staging of venture capital. Journal of Finance 50, 1461-1489.

Hall, J., C. W. Hofer, 1993. Venture capitalists' selection criteria in new venture evaluation. Journal of Business Venturing 8, 25-42.
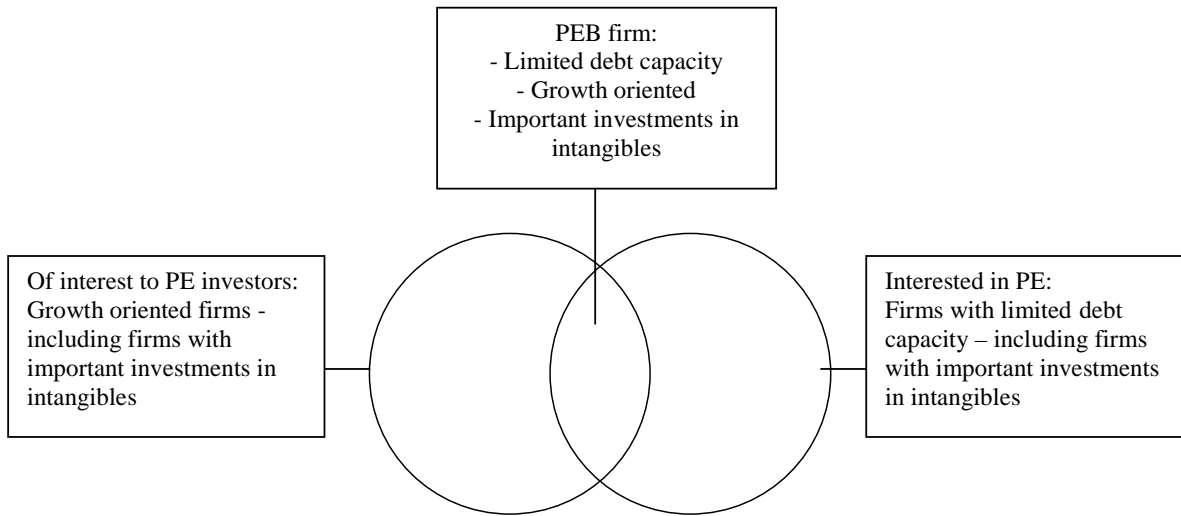
Hartmann, P., A. Maddaloni, S. Manganelli, 2003. The Euro area financial system: structure, integration and policy initiatives. European Central Bank Working Paper No.230.

Hellmann, T., M. Puri, 2002. Venture capital and the professionalization of start-up firms: empirical evidence. The Journal of Finance 57, 169-198.

Hovakimian, A., T. Opler, S. Titman, 2001. The debt-equity choice. Journal of Financial and Quantitative Analysis 36, 1-24.

Howorth, C. A., 2001. Small firms' demand for finance: A research note. International Small Business Journal 19, 78-86.

Janney, J. J., T. B. Folta, 2003. Signalling through private equity placements and its impact on the valuation of biotechnology firms. Journal of Business Venturing 18, 361-380.

Kortum, S., J. Lerner, 2000. Assessing the contribution of venture capital to innovation. RAND Journal of Economics 31, 674-692.

Lemmon, M. L., J. F. Zender, 2004. Debt capacity and tests of capital structure theories. University of Utah and University of Colorado Working Paper.

Lerner, J., 1999. The government as venture capitalist: the long-run impact of the SBIR program. Journal of Business 72, 285-319.

Macmillan, I. C., S. P. Narasimha, 1985. Criteria used by venture capitalists to evaluate new venture proposals. Journal of Business Venturing 1, 123-137.

MacMillan, I. C., L. Zemann, B. N. Subbanarasimha, 1987. Criteria distinguishing succesful from unsuccessful ventures in the venture screening process. Journal of Business Venturing 2, 123-137.

Manigart,S., Sapienza,H., 1999. Venture capital and growth. In: Sexton,D.L., Landström,H. (eds.), The Blackwell handbood of entrepreneurship, 240-285. Oxford (UK): Blackwell Publishers.

Manigart, S., M. Wright, K. Robbie, P. Desbrières, and K. De Waele, 1997. Venture capitalists' appraisal of investment projects: An empirical European study. Entrepreneurship: Theory & Practice 21[4], 29.

Mason, C. M., R. T. Harrison, 2002. Barriers to investment in the informal venture capital sector. Entrepreneurship & Regional Development 14, 271-287.

Mayer, C., O. Sussman, 2005. A new test of capital structure. American Finance Association (AFA) 2005 Philadelphia Meetings 1.

Megginson, W. L., K. A. Weiss, 1991. Venture capitalist certification in initial public offerings. Journal of Finance 46, 879-903.

Mullins, J. W., D. Forlani, 2005. Missing the boat or sinking the boat: a study of new venture decision making. Journal of Business Venturing 20, 47-69.

Myers, S. C., 1977. The determinants of corporate borrowing. Journal of Financial Economics 5, 147-175.

Myers, S. C., 1984. The capital structure puzzle. Journal of Finance 39, 575-592.

Myers, S. C., N. S. Majluf, 1984. Corporate financing and investment decisions when firms have information that investors do not have. Journal of Financial Economics 13, 187-221.

OECD, 1997. Government venture capital for technology-based firms. OCDE/GD(97)201 1-34.

Ooghe, H., P. Joos, C. De Bourdeaudhuij, 1995. Financial distress models in Belgium: The results of a decade of empirical research. the International Journal of Accounting 30, 245-274.

Powell, W. W., K. W. Koput, J. I. Bowie, L. Smith-Doerr, 2002. The spatial clustering of science and capital: Accounting for biotech firm-venture capital relationships. Regional Studies 36, 291-305.

Reid, G. C., 1996. Fast growing small entrepreneurial firms and their venture capital backers: an applied principal-agent analysis. Small Business Economics 8, 235-248.

Rosenstein, J., A. V. Bruno, W. D. Bygrave, N. T. Taylor, 1993. The CEO, venture capitalists, and the board. Journal of Business Venturing 8, 99-113.

Rosman, A. J., H. M. O'Neill, 1993. Comparing the information acquisition strategies of venture capital and commercial lenders: A computer-based experiment. Journal of Business Venturing 8, 443-460.

Stiglitz, J. E., 1985. Credit markets and capital control. Journal of Money, Credit and Banking 17, 133-152.

Titman, S., R. Wessels, 1988. The determinants of capital structure choice. Journal of Finance 43, 1-19.

Ueda, M., 2004. Banks versus venture capital: project evaluation, screening and expropriation. Journal of Finance 59, 601-621.

Van Auken, H. E., 2001. Financing small technology-based companies: The relationship between familiarity with capital and ability to price and negotiate investment. Journal of Small Business Management 39, 240.

von Burg, U., M. Kenney, 2000. Venture capital and the birth of the local area networking industry. Research Policy 29, 1135-1155.

Wright, M., K. Robbie, 1998. Venture capital and private equity: a review and synthesis. Journal of Business Finance and Accounting 25, 521-570.

Zacharakis, A. L., D. G. Meyer, 1998. A lack of insight: do venture capitalists really understand their own decision process? Journal of Business Venturing 13, 57-76.

FIGURE 1

Characteristics of PEB firms

PEB firm:
- Limited debt capacity
- Growth oriented
- Important investments in intangibles

Of interest to PE investors: Growth oriented firms - including firms with important investments in intangibles

Interested in PE: Firms with limited debt capacity – including firms with important investments in intangibles

TABLE 1

Description of the sample (N= 462; 231 PEB & 231 NPEB firms)

Panel A: Distribution of the sample by age and industry

Age [at the time of PE investment]	# firms	% firms
Start-up & Early stage (age ≤ 5)	120	26%
Later stage (5 < age)	342	74%
- 5< age ≤10	132	28%
- 10 < age ≤20	92	20%
- 20 < age ≤30	64	14%
- 30 < age	54	12%
Industry (1 digit NACE code)	# firms	% firms
0: Agriculture, hunting, forestry and fishing	0	0%
1: Energy and water	2	0%
2: Extraction and processing of non-energy-producing minerals and derived products; chemical industry	22	4%
3: Metal manufacture; mechanical and instrument engineering	100	22%
4: Other manufacturing industries	92	20%
5: Building and civil engineering	26	6%
6: Distributive trades, hotels, catering, repairs	102	22%
7: Transport and communication	20	4%
8: Banking and finance, insurance, business services, renting	72	16%
9: Other services	26	6%
Total	462	100%

Panel B: Descriptive statistics of age and size

Variable	Q1	Median	Q3	Mean	St. Dev.
Age	5	10	22	17	16
Size (th €)	827	2,276	6,178	10,509	56,263

This table reports the description of the sample used in this study.
Panel A represents the age and industry distribution of the 231 PEB firms and 231 matched NPEB firms in our sample. Using secondary data, PEB firms are identified as firms which get PE between 1987 and 1997 and for which are at least 2 years of data before PE investment are available.
Panel B reports the descriptive statistics of age and size of the 462 firms in our sample.

TABLE 2

Pre-investment characteristics of PEB firms, compared to matched firms

Variable	PEB	Q1	Median	Q3	Significance (2-sided)
Total debt ratio	1	0.64	0.78	0.88	**
	0	0.57	0.73	0.86	
Long term debt ratio	1	0.05	0.15	0.28	***
	0	0.02	0.10	0.25	
Interest coverage	1	0.72	1.56	3.51	*
	0	0.86	1.89	4.82	
Cash flow coverage of debt	1	0.04	0.11	0.21	
	0	0.05	0.11	0.21	
Short term bankruptcy risk	1	0.17	0.37	0.64	***
	0	0.09	0.26	0.47	
Total assets growth	1	-0.02	0.13	0.44	**
	0	-0.03	0.07	0.21	
Gross added value growth	1	-0.06	0.10	0.40	**
	0	-0.13	0.03	0.20	
Intangible assets ratio [a]	1	0.00	0.00	0.00	***
	0	0.00	0.00	0.01	
Investments in intangible assets ratio [a]	1	0.00	0.00	0.00	***
	0	0.00	0.00	0.01	

[a] PEB > NPEB

Significance level of Wilcoxon rank sum test (two tailed): * $0.05 \leq p < 0.10$. ** $0.01 \leq p < 0.05$; *** $p < 0.01$;

This table reports the firm characteristics of 231 PEB firms and 231 matched NPEB firms. PEB firms are identified as firms which get PE between 1987 and 1997 and for which are at least 2 years of data before PE participation are available. We report first quartile, median and third quartile values for several characteristics that are expected to affect the use of PE. Also reported are the results from a Wilcoxon – Rank Sum test between PEB and NPEB firms.

TABLE 3

Classification pattern of variables by means of principal component analysis

Variables	Factor 1	Factor 2	Factor 3
Total debt ratio	*0.72*	0.26	0.08
Long term debt ratio	*0.33*	0.25	0.19
Interest coverage	*-0.74*	0.03	0.00
Cash flow coverage of debt	*-0.83*	0.06	-0.04
Short term bankruptcy risk	*0.73*	-0.06	0.15
Intangible assets ratio	0.11	-0.01	0.91
Investments in intangible assets ratio	0.09	0.00	0.90
Total assets growth	-0.01	*0.71*	-0.03
Gross added value growth	0.03	*0.73*	-0.01
Eigenvalues	2.65	1.16	1.51
Interpretation	Limited debt capacity –Risk	Growth	Importance of intangible assets

This table reports the classification pattern by means of principal component analysis of the variables used in this study. Principal components corresponding to eigenvalues larger than one are retained. To facilitate identification, a varimax orthogonal rotation is performed.

TABLE 4

PEB versus matched firms: logit analyses

Model (PEB = 1)	Coefficient	Significance
Intercept	-0.66	***
Factor 1: Limited debt capacity – Risk	1.66	***
Factor 2: Growth	0.17	**
Factor 3: Importance of intangible assets	6.32	***
Number of observations	462	
Likelihood ratio	20.37	***

Significance level: * $0.05 \leq p < 0.10$. ** $0.01 \leq p < 0.05$; *** $p < 0.01$;

This table presents logit estimates of the determinants of obtaining PE or not, using 231 PEB firms and 231 matched NPEB firms. Factor loadings are calculated based on the principal component analysis presented in table 3. PEB firms are identified as firms which get PE between 1987 and 1997 and for which at least 2 years of data before PE participation are available.

TABLE 5

Post-investment characteristics of PEB firms, compared to matched firms

Variable	PEB	Q1	Median	Q3	Significance (2-sided)
Limited debt capacity (speed)					
Notional debt ratio (maximum year 0 & year 1)	1	0.73	0.85	0.95	***
	0	0.61	0.77	0.89	
Importance of intangibles					
Investments in intangible assets ratio (average year 0 & year 1)	1	0.00	0.00	0.01	***
	0	0.00	0.00	0.00	
Growth					
Total assets growth (average year 0 & year 1)	1	0.06	0.27	0.73	***
	0	-0.10	0.09	0.34	
Gross added value growth (average year 0 & year 1)	1	-0.14	0.12	0.57	**
	0	-0.19	0.04	0.29	

Significance level: * $0.05 \leq p < 0.10$. ** $0.01 \leq p < 0.05$; *** $p < 0.01$;

This table presents the post-investment characteristics of the firms in our sample. PEB firms are identified as firms which get PE between 1987 and 1997 and for which are at least 2 years of data before PE participation are available. We report first quartile, median and third quartile values for several characteristics. Also reported are the results from a Wilcoxon – Rank Sum test between PEB and NPEB firms.

Definition of independent variables

Dependent variable	
PE	= 1, if firm has received PE funding = 0, otherwise (matched NPEB firm) • Year 0: year in which PE funding of PEB firm is received
Independent variables measured in year before PE participation (PRE INVESTMENT)	
Total debt ratio$_{-1}$	= Total liabilities$_{-1}$ /Total assets$_{-1}$
Long term debt ratio$_{-1}$	= Long term liabilities$_{-1}$ /Total assets$_{-1}$
Interest coverage ratio$_{-1}$	= Coverage of financial costs of debt by net result after non-cash costs, before financial costs and after taxes In general: (net result before financial costs and before taxes – operational taxes)/(financial costs of debt – tax advantage of financial costs of debt) • If net result < 0, then there are no taxes due on the net result and hence there is no tax advantage of debt: net result before financial costs and before taxes/financial costs of debt • If net result > 0, but $<$ financial costs of debt, then the tax advantage of financial costs of debt is limited to operational taxes on the net result before financial costs: [net result before financial costs and before taxes * (1- tax rate)]/[financial costs of debt – tax rate* net result before financial costs and before taxes] • If net result $>$ financial costs of debt then: [net result before financial costs and before taxes * (1 – average tax rate)]/[financial costs of debt * (average tax rate)] or net result before financial costs and before taxes/financial costs of debt
Cash flow coverage of debt$_{-1}$	= Cash flow$_{-1}$ /Total debt$_{-1}$
Short term bankruptcy risk$_{-1}$	= multivariate logit score for short term failure prediction developed in a Belgian context varying between 0 (financially healthy firm) and 1 (firm in financial distress) and computed using 8 of the firm's financial variables: (1) direction of financial leverage, (2) accumulated profits and reserves to total liabilities, (3) cash to total assets, (4) overdue short term priority debt, (5) operational net working capital to total assets, (6) net operating result to working assets, (7) short term financial debt to short term liabilities and (8) amounts payable guaranteed by public authorities and real securities to total amounts payable.
Intangible assets ratio$_{-1}$	Intangible assets$_{-1}$ /Total assets$_{-1}$
Investments in intangible assets ratio$_{-1}$	Investments in intangible assets$_{-1}$ /Total assets$_{-1}$
Total assets growth	(Total assets$_{-1}$ – Total assets$_{-2}$)/Total assets$_{-2}$
Gross added value growth	(Gross added value$_{-1}$ – Gross added value$_{-2}$)/Gross added value$_{-2}$ • Gross added value: value of products/services produced and sold – value of products/services purchased and used

Independent variables measured in year of and one year after PE participation (POST INVESTMENT)	
Notional debt ratio (maximum year 0 & year 1)	Maximum hypothetical debt ratio over years 0 - 1: if debt is issued: debt ratio; if equity is issued, then the equity issue is added to debt to compute the hypothetical debt ratio
Investments in intangible assets ratio (average year 0 & year 1)	Average ratio investments in intangible assets over years 0 – 1: $(\text{Investments in intangibles}_0 + \text{Investments in intangibles}_1)/[(\text{Total assets}_0 + \text{Total assets}_1)/2]$
Total assets growth (average year 0 & year 1)	Average total assets growth over years 0 – 1: $(\text{Total assets}_1 - \text{Total assets}_{-1})/(\text{Total assets}_{-1})/$
Gross added value growth (average year 0 & year 1)	Average added value growth over years 0 – 1: $(\text{Gross added value}_1 - \text{Gross added value}_{-1})/(\text{Gross added value}_{-1})/$