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WORKING PAPER

FIRM VALUATION IN VENTURE CAPITAL FINANCING ROUNDS: THE ROLE OF INVESTOR BARGAINING POWER

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ABSTRACT

This study explores the impact of bargaining power of venture capital (VC) firms on the valuation of their portfolio companies. We argue that VC firm types with greater bargaining power vis-à-vis the entrepreneur negotiate lower valuations compared to VC firm types with less bargaining power. We find that VC firm types with stronger bargaining power, namely university and government VC firms, value investments lower compared to independent VC firms. The valuations of captive VC firms equal those of independent VC firms. Our findings suggest that valuations in the VC contract reflect the relative bargaining power of the VC investor.

Keywords: bargaining power, valuation, venture capital

INTRODUCTION

One of the major concerns of entrepreneurs seeking venture capital (VC) is the equity stake they may retain after the investment, as this determines their future financial return and their control over the venture. This crucially depends on the negotiated value of their firm. At investment, a VC firm receives an agreed-upon number of newly created shares of the investee company in return for cash. Hence the implied value of the investee firm is determined as the price per share paid times the number of shares outstanding. Despite its importance to both entrepreneurs and investors, drivers of entrepreneurial firm value are still poorly understood. Only recently have researchers started to analyze determinants of firm valuations implied in VC investment rounds. Entrepreneurial firm characteristics such as its accounting information (Hand, 2005; Armstrong et al., 2006) and market factors (Gompers & Lerner, 2000) explain a considerable part of firm valuations. In this environment where valuations are negotiated between entrepreneurs and investors (rather than set by a liquid market), VC firm characteristics also impact firm valuations (Cumming & Dai, 2010). For example, Hsu (2004) found that entrepreneurs accept lower valuations from more reputable VC investors while Cumming & Dai (2010) demonstrated a convex relationship between VC fund size and valuations.

This paper extends this line of research by acknowledging that the type of VC investor and its ensuing bargaining power also influences the negotiated value. Building on former theoretical frameworks modeling the negotiation process between entrepreneurs and VC investors (Fairchild, 2004; Cable & Shane, 1997; Kirilenko, 2001), we argue that some VC investors have more bargaining power than others, either because they have a captive deal flow (such as university or captive VC firms) or because they target niche markets with low levels of competition (such as government VC firms). VC investors exploit this stronger bargaining position by negotiating lower valuations.

We empirically examine the hypotheses using a unique, hand-collected and unbiased sample of 362 venture capital investment rounds in 180 Belgian investee firms between 1988 and 2009. We find no

differences in valuation between captive VC firms and independent VC firms. University VC firms and government VC firms, however, exploit their bargaining power by negotiating lower valuations than independent VC firms, after controlling for investee firm characteristics (including entrepreneurial firm's age, size, patent applications, whether it is active in a high-tech industry and pre-investment accounting variables), deal characteristics (including investment round and syndication), and market conditions (including the inflow of capital and the market return during the previous calendar year). The results remain robust after addressing potential selection biases through two-step Heckman procedures and through analyzing post-investment success across types of VC investors.

We hereby provide further insight in how the heterogeneity of the VC industry impacts VC firm behavior (Mayer et al., 2005; Bottazzi & Da Rin, 2002), by focusing on a highly important but rarely researched phenomenon, namely the valuation of VC deals. As the valuation of entrepreneurial companies in VC investments is determined through negotiation between entrepreneurs and VC investors, investor characteristics such as their reputation and size impact their relative bargaining power (Hsu, 2004; Cumming & Dai, 2010). We have extended these insights by showing that the proprietary deal flow of university VC firms and the limited competition in niche markets in which government VC firms compete increase their bargaining power, which they exploit by negotiating lower valuations. We thereby provide a more complete picture of the bargaining process between VC investors and entrepreneurs.

The remainder of the paper is as follows. Section 2 gives an overview of the relevant literature and hypotheses are developed in section 3. Section 4 describes the sample and variables and provides descriptive statistics. Section 5 presents the empirical results. The last section discusses the results and concludes.

BARGAINING POWER IN VENTURE CAPITAL INVESTMENTS

Bargaining power in the VC investment process

Valuations in VC investments are the outcome of lengthy negotiations between VC investors and entrepreneurs, rather than determined in liquid financial markets. Recently, researchers have modeled the negotiation process between a VC investor and an entrepreneur, incorporating the bargaining position of both parties. Differences in the relative bargaining power between VC investors and entrepreneurs are hence expected to impact the outcome, namely the valuation of the venture. Earlier work often assumes that either the manager or the VC investor has the power to decide on the outcome of the contract (Admati & Pfleiderer, 1994; Amit et al., 1990). At the macro-economic level, it is shown theoretically (Inderst & Mueller, 2004) and empirically (Gompers & Lerner, 2000) that increases in the supply of VC positively affect valuations. A higher supply of VC funds is driven by either entry of new VC investors or by an increase in the average fund size of incumbents. Both increase competition in the VC market (Inderst & Mueller, 2004), leading to higher valuations (Gompers & Lerner, 2000).

More recently, researchers have developed a more nuanced view on the VC investment process. The investment of a VC firm in an entrepreneurial company is the outcome of a double selection process (Eckhardt et al., 2006). In a first phase, entrepreneurial companies self-select to apply for VC funding, while VC investors select those companies in which they will invest in a second phase. In the VC selection phase, entrepreneurs compete for an investment from the best possible VC investor (Sorensen, 2007), while VC investors compete for the most promising investment opportunities. For example, VC investors with the highest reputation have access to the most promising ventures, as entrepreneurs have a preference to connect with them (Sorensen, 2007). Entrepreneurs thereby trade off a lower current equity stake with higher expected future value creation (Fairchild, 2004). This suggests that VC investors with a high reputation have a high bargaining power, which they exploit to

negotiate lower valuations: when power is unbalanced, the party with greater power attempts to achieve advantages at the expense of the other party (Cable & Shane, 1997). Fairchild (2004) shows that economic welfare is maximized when the entrepreneur has most bargaining power and matches with a superior value-adding VC investor in an efficient market for reputation. Further, VC fund size is also positively related to its bargaining power, hence influencing valuations in VC investments (Cumming & Dai, 2010).

Foregoing approach suggests a double-sided moral hazard problem in venture capital contracting (Casamatta, 2003; Kaplan & Strömberg, 2004). In contrast to a pure principal-agent model in which VC firms are the principals and entrepreneurs are the agents, both parties face moral hazard problems from the other. Consequently, the allocation of cash flow rights and control rights in the VC contract gives proper incentives to the other party to induce effort (Kaplan & Strömberg, 2003). Greater bargaining power of a VC investor is not only associated with higher cash flow rights (or lower valuations), but also with stronger control rights (Hellmann, 1998; Kirilenko, 2001).

Foregoing theoretical and empirical papers largely focus on independent VC firms, which is the dominant type of VC investor in the U.S.. Independent VC firms raise money from unrelated institutional or other investors and funds are managed by an independent VC management team (Kaplan & Schoar, 2005). They define their investment strategy at fundraising and thereby chose the VC market segment in with they choose to compete other VC firms. The VC industry is heterogeneous, however, featuring different types of VC firms depending on their dominant shareholders (Manigart et al., 2002b; Mayer et al., 2007; Bottazzi et al., 2008). Captive VC firms manage funds fully or partially owned by a parent organization (corporation or bank) (Van Osnabrugge & Robinson, 2001). University VC firms invest mainly university's money in university spin-offs to foster innovation and to enhance their reputation (Wright et al., 2006). Finally, the government may intervene directly in the venture capital market by funding government VC firms

(Manigart et al., 2002a; Leleux & Surlemont, 2003). We argue that differences in dominant owner and hence in investment strategies may lead to differences in relative bargaining power of different VC firm types, induced either by proprietary deal flow or by low levels of competition in the target investment niche. This, in turn, leads to differences in valuations.

As independent VC firms are the most widespread type of VC firm, independent VC firms are used as the reference group, with which captive VC firms, university VC firms and government VC firms are compared. Independent VC firm managers typically manage funds in a standard dual structure (Kaplan & Schoar, 2005) and are incentivized to create value through carried interests on VC funds' capital gains above a pre-defined threshold. They are typically compensated with a fixed management fee (e.g. 2 percent of invested capital) and a carried interest performance fee (e.g. 20 percent of profits). Independent VC investment managers are experts in negotiating contracts with the entrepreneurs. They are highly networked value-maximizing financial professionals who are likely to be perceived as the most sophisticated investors given their greater experience and their greater involvement with their portfolio companies (Bottazzi et al., 2008). Hence, they are an interesting point of reference. We consecutively discuss how captive VC firms, university VC firms and government VC firms differ from independent VC firms and how this may affect their relative bargaining position vis-à-vis the entrepreneur.

VC firm types and valuation

Captive VC investors are strategic investors that extract benefits from exploiting synergies between the venture investments and their core business. For example, corporate VC firms set up corporate VC programs to create a 'window on new technologies' (Dushnitsky & Lenox, 2005; 2006; Arping & Falconieri, 2010), while bank VC firms seek to establish complementarities between venture capital investments and subsequent lending activities or they attempt to sell fee services e.g. when assisting in acquisitions or an IPO (Hellmann et al., 2008). Most captive VC firms are structured as subsidiaries of

a parent organization (a corporation or a bank) where investment managers are employees governed by labor contracts.

When searching for investments in unrelated companies, captive and independent VC firms are competitive bidders (Sorensen, 2007). For example, Gompers & Lerner (1998) find that the mix of firms in which corporate VC firms invest is little different than that of independent VC firms. Bank VC firms invest in larger investment rounds and in industries with more debt compared to independent VC firms but their larger networks allow them to have better access to different investment opportunities (Hellmann et al., 2008). Consequently, captive VC firms and independent VC firms pick ventures from the same pool (Sahlman, 1990), broadening the supply of VC and enhancing the entrepreneurs' bargaining power (Inderst & Mueller, 2004; Cable & Shane, 1997). Consequently, captive VC firms will not have more bargaining power compared to independent VC firms when investing in unrelated ventures and valuations will be comparable.

Captive VC firms may, however, also invest in corporate spin-outs. New products or services, developed within a corporate, may not be core to the parent company's strategy but nevertheless have potential to be viably exploited in another company. Rather than selling the intellectual knowledge to another company, the corporate may also transfer the intellectual property rights (and potentially invest some cash) to a spin-out company. In return for their intangible and cash investments, corporates may negotiate an equity stake through their corporate VC firm, aiming for a superior financial return in the medium term (Dushnitsky & Lenox, 2005). In this situation, the deal flow of the corporate VC firm is proprietary. Without the explicit consent of the parent company, no intellectual property rights can be transferred and the new company cannot come into existence. Hence, corporate VC firms have a high bargaining power vis-à-vis their spin-outs, leading to low initial valuations for these investments.

A corporate VC firm therefore has a mix of external investment opportunities, for which it has no superior bargaining power compared to independent VC firms, and opportunities that are generated internally, for which it has high bargaining power. Taken together, this will on average lead to lower valuations in captive VC firms compared to independent VC firms. We hence hypothesize:

H1: Compared to independent VC firms, captive VC firms value investee firms lower.

University VC firms invest in university-related startups. In these startups, knowledge and intellectual property rights are transferred from the university to the startup (Wright et al., 2006). Hence, one of the main goals of university VC firms is to commercialize a university's intellectual property and to disseminate knowledge thereby enhancing its prestige (O'Shea et al., 2005). University VC firms are typically managed by academic technology transfer officers who screen the technological and commercial potential of the universities' inventions (Lockett & Wright, 2005). They have access to a proprietary deal flow consisting of all investments in startups that are based on intellectual property rights from the university. University VC investment managers often have a right of first refusal to invest in companies that draw upon technology developed within the university. Consequently, bargaining power shifts strongly in favor of the VC firm during the negotiation process. Entrepreneurs of these ventures are therefore locked-in as they have no other outside options (Inderst & Mueller, 2004).

Further, university VC firms are among the few VC investors who are willing to invest in university startups. University startups are a particular set of high tech companies that focus on radically new and disruptive technologies that may create new industries and refine existing markets (Gompers, 1995). They tend to exploit technologies that are in general radical and tacit (Shane & Stuart, 2002). The technological developments on which these companies are based are mostly legally protected which causes the startup process to be even more complex. Further, given the early stage of development of these startups, their entrepreneurial teams are often comprised of former university employees who are

technology experts but lack industry experience and commercial skills (Wright et al., 2006). Given these characteristics, academic spin-offs may face even more difficulty in attracting VC funding than other early stage high tech firms. This suggests that the supply for financing these ventures might be lower than the demand: there is limited competition in the VC market for this type of deals, further enhancing the bargaining power of university VC firms.

Given that university VC firms have greater bargaining power compared to independent VC investors, they are able to appropriate more of the potential surplus from the investment and obtain a higher equity stake. Hence, compared to independent VC investors, university VC firms will negotiate lower valuations. Our second hypothesis is therefore:

H2: Compared to independent VC firms, university VC firms value investee firms lower.

We further expect differences between government VC firms and independent VC firms with respect to their relative bargaining power. Government VC firms are set up as a policy response to shortages in the supply of risk capital to new technology-based early stage firms (Murray, 1998; Manigart et al., 2002a; Leleux & Surlemont, 2003). Due to capital market imperfections, these early stage ventures are especially vulnerable to capital constraints. They typically do not generate revenues yet, assets are in general illiquid and the entrepreneur's flexibility is a key resource for further development (Manigart et al., 2002a). Further, technology may be complex which makes a formal screening more difficult for the VC investors. Early stage ventures might find it difficult to obtain financing as VC firms prefer investments where monitoring and selection costs are relatively low and the costs of informational asymmetry are less severe (Amit et al., 1998).

Government VC firms especially target these early stage ventures and complement with the existing VC industry as they try to fill the market gap in the supply of VC financing (Cumming & MacIntosh, 2006). Given their focus, government VC firms expand the pool of VC financing and invest in ventures in which other VC firms have lower interest. Consequently, government VC firms will

experience less competition with other VCs while searching for new investment opportunities. This will result in greater bargaining power vis-à-vis the early stage entrepreneur which they will use to push down valuations.

Next to providing VC to young, high technology companies, government-related VC firms may have regional economic development as a major goal (Leleux & Surlemont, 2003). They therefore may also target mature companies which need venture capital to sustain employment rather than to create value. These companies will not be able to raise VC from independent VC firms, however, as their value creation potential is limited. In these situations, government VC firms are investors of last resort, giving them high bargaining power which they may exploit through low valuations.

Given that government VC investors target market niches in which VC is in short supply, either because of high risk or low return potential of the entrepreneurial firm, we propose the final hypothesis:

H3: Compared to independent VC firms, government VC firms value investee firms lower.

DATA AND SAMPLE DESCRIPTION

Sample

The hypotheses are tested on a unique hand-collected sample of Belgian VC backed companies that received venture capital financing between 1988 and 2009. The sample includes 362 investment rounds in 180 different investee companies. Belgium was chosen because all firms (even unquoted ones) have a legal obligation to publish information on all capital increases. This information, deposited by an official notary public with the Belgian National Bank and published in the Belgian Law Gazette, allows in many cases to accurately calculate the implied valuations. Given the obligatory character of this information, which is validated by an external official third party – the notary public - the reliability of our data is excellent. This unique institutional setting allows access to information

that is typically only available in commercial databases when companies voluntarily disclose this information.

The sample has hence three important advantages compared to previous VC valuation studies. First, previous studies mainly relied on commercial databases to collect data such as VentureOne, Venture Economics or VentureXpert (Gompers & Lerner, 2000; Cumming & Dai, 2010). While these databases allow for larger and broader samples, they entail concerns with respect to self-reporting biases and the reliability of the often confidential valuation data. For example, Kaplan et al. (2002) report that no valuation information is reported for between 30 percent (VentureOne) and 70 percent (Venture Economics) of all financing rounds, leading severe biases as firms self-select to voluntarily disclose this sensitive information. Further, financing rounds with valuations are noisy with large average absolute errors (Kaplan et al., 2002). A second research strategy taken by some scholars is to analyze samples from proprietary databases with rich, detailed and reliable information from one VC investor or fund-of-fund investor. The drawback hereof, however, is that the data may be biased depending on the investment strategy of the VC investor. Our dataset combines VC investment information retrieved from various sources, including public and commercial databases with VC investments, annual reports and websites of VC firms, press releases and information from the Belgian Venturing Association. It includes therefore investments from different types of VC investors, reducing the threat of biases induced by the use of a single source of data. Third, unlike some U.S. studies (e.g. Hand, 2005), our sample is not restricted to successful pre-IPO firms. We sample firms at the first investment round and follow them over time. The sample hence includes successful as well as less successful unquoted firms; that is firms that did an IPO, that failed, that were taken over or that are still private. As such, any potential survivorship bias is eliminated. Our dataset hence does not suffer from (self-)selection biases, and has highly reliable information on the variable of interest, being the valuation of VC backed companies.

Different sources of public information (press clippings, websites, annual reports of VC companies), combined with the commercial databases Zephyr and VentureXpert, are consulted to find the initial VC investment round in Belgian firms between 1988 and 2009. The sample is limited to firms in which the initial VC investment occurred when they were younger than ten years to ensure a focus on pure VC investments (rather than including more mature private equity investments). Next to the initial investment rounds, all follow-on venture capital rounds are tracked in the Belgian Law Gazette in order to have a complete overview of all financing rounds until the first half of 2009. Based on the total capital increase and the number of newly created shares as reported in the Belgian Law Gazette, the value of an investment round is calculated. The information provided by the Belgian Law Gazette further allows unambiguously identifying all investors in each investment round. This results in a sample of 362 investment rounds in 180 VC backed companies.

The unit of analysis is the investment round and the dependent variable of interest is the premoney value (Hand, 2005; Armstrong et al., 2006), as the postmoney value is influenced by the amount invested in the focal investment round (Lerner, 1994). The premoney value is the total number of shares outstanding prior to the investment multiplied with the price per share paid by VC investors in the focal investment round. Twelve premoney outliers, defined as the median valuation per investment round plus or minus three times the standard deviation, are excluded from the multivariate analysis. The exclusion of outliers has no impact on reported results, however.

Variables

Table 1 presents medians of premoney valuations and investment characteristics, grouped by type of VC firms. In case multiple VC firms invest in an investment round (156 rounds), the investment round is assigned to the lead VC firm, i.e. the VC firm investing the largest amount. It is reasonable to assume that the bargaining position of lead investors will play a dominant role while negotiating the valuation of the firm with the entrepreneurial management team (Wright & Lockett, 2003).

Insert Table 1 about here

Panel A reports the median premoney value, controlling for the investment round. A two-sample Mann-Whitney-Wilcoxon test shows that investee firms receive lower valuations from a captive VC firm in an initial investment round compared to independent VC firms, but captive VC firms value their investee firms significantly higher for all third and higher rounds. University VC firms value their investee companies significantly lower than independent VC firms in a second and third round, while government VC firms value their investee firms lower in the first and a second investment round.

Panel B reports the number of investment rounds in different industries for each type of lead VC firm. The industries are consistent with the European Private Equity and Venture Capital Association (EVCA) (2007) classification. All types of VC firms mainly invest in three industries (in decreasing order of importance): "Computer and Consumer Electronics", "Life Sciences" and "Business and Industrial Products".

Panel C describes investee firm characteristics for each type of VC firm. The first variable is a dummy variable which takes a value of 1 if the firm has at least one patent application (Lerner, 1994) before the investment round. Patent information is retrieved from the European Patent Office (EPO). Firms backed by a university (17 percent) or government VC firm (11 percent) have less patent applications compared to firms backed by a captive or independent VC firm (28 percent). Age is measured as the number of years between the startup of the portfolio company and the first investment round. Government VC firms invest in the oldest investee companies (4.6 years), followed by captive VC firms (3.3 years). Independent VC portfolio companies are relatively younger (1.4 years) at first VC investment. The high tech dummy variable equals 1 if the firm is active in the high tech sector. Firms with NACE-codes 24 (chemicals), 29-35 (high tech materials), 64 (telecommunication), 72 (computer

related) and 73 (biotech) are defined as high tech firms. High tech firms are mainly funded by university VC firms and independent VC firms, representing respectively 80 percent and 60 percent of their investments. Non-high tech firms are mainly funded by government VC firms (64 percent are non-high tech). Firm growth is calculated as the absolute growth in personnel expenses one year relative to two years before the investment (Puri & Zarutskie, 2008). This information is retrieved from the official financial accounts of the portfolio companies, as provided by the National Bank of Belgium. This is obviously only available for firms that were at least two years old at the investment round. Growth is close to zero for government VC firms, the other VC firm types present similar growth in personnel expenses (around € 80,000). Finally, the median amount invested in the initial investment round is retrieved from the Belgian Law Gazette and is highest for captive VC firms (€ 550,000); independent VC firms invest around € 450,000 and government VC firms € 275,000. Taken together, this description suggests that government investments are more likely to occur in older, slower growth and less technological companies.

Panel D shows the legal status of the VC portfolio companies in 2009. Most portfolio firms are still private for all types of VC firms, with percentages varying between 42 percent (captive VC firms) and 68 percent (university VC firms). Next, failures and voluntary liquidations represent between 16% (university VC firms) and 38% (captive VC firms) of the portfolio companies. Between 4% (captive VC firms) and 12% (independent VC firms) of the portfolio companies are acquired. The proportion of IPOs is highest for captive VC portfolio companies (15%) and lowest for university VC portfolio companies (5%).

ANALYSES AND RESULTS

Method of Analysis

To test the hypotheses in a multivariate setting, a log-linear OLS-regression model is used. A log-linear model replaces all continuous variables by their natural logarithm and is relevant when dealing with non-linearities between the dependent variable and independent variable(s).

The main independent variable is the type of lead VC firm. We distinguish between captive, university, government and independent VC firms. Four variables are included to proxy for firm characteristics: the number of patent applications before the investment round, age at investment, a high tech dummy variable and the inflation-adjusted amount invested in previous rounds (2008=100). The absolute growth variable is not included due to missing data.

The financial statement variables are lagged variables measured in the year before the investment is made (Hand, 2005) and are taken from financial statements supplied by the National Bank of Belgium[1]. All financial statement variables (in thousands of Euros) are inflation-adjusted (2008=100). Including the accounting variables results in a loss of 87 observations, as no prior accounting information is available for investments at start-up (77 rounds) while ten investment rounds have missing accounting information.

Four variables are included as control variables: the investment round, a syndication dummy variable as syndication may lead to a better selection process (Brander et al., 2002) and therefore potentially to higher values, the inflation-adjusted inflow of capital in the venture capital industry in the year before the investment (t-1) (following Gompers & Lerner, 2000) and the Belgian Industry Index as a capital market index suggesting that private valuations follow public valuations. We explicitly control for inflow of capital to exclude the potential macro-level impact of cyclical movements in the VC industry

on the VCs bargaining position (Inderst & Mueller, 2004). Pearson correlation coefficients and Variance Inflation Factors (VIF) for all regressors (unreported analyses) reveal no severe collinearity problems: the highest VIF is 4.8 which is far below the threshold of ten (Gujarati, 2003).

Results of the multivariate regressions

Table 2 presents the results of the multivariate regressions with standard errors clustered on the investee firm level. Model I includes only firm characteristics. Model II adds dummy variables for VC firm type, with independent VC firms serving as the reference category. Model III includes all regressors, including accounting variables. Given the loss of 87 observations, the accounting variables are only included in the last model.

Insert Table 2 about here

Two firm characteristics are significantly associated with valuations: younger firms are valued lower (< 0.10) and firms that received higher investment amounts in previous rounds are valued higher (< 0.01). The number of patent applications (+) and the high tech dummy variable (-) are not significant. None of the firm characteristics are significant when adding accounting variables (Model III), however. A later investment round (< 0.01 in Models I and II) and a higher inflow of capital in the VC industry the year before the investment (t-1) (< 0.05) are associated with a significantly higher valuation. The significant impact of inflow of capital in the VC industry is in line with Gompers & Lerner (2000): higher competition between VC firms leads to increased valuations. The value in syndicated investment rounds is only significantly higher (< 0.10) in Model I and changes in the Belgian stock market index are not associated with changes in private firm valuations. Further, the coefficients of cash assets and non-cash assets (Model III) are significantly positive (< 0.01), while the

[1] While the financial statement information of unquoted companies is in general of lower quality than that of quoted companies, Beuselinck et al. (2009) have shown that the quality of the financial statement information significantly improves once firms start searching for VC.

coefficient of intangible fixed assets is marginally significantly negative (< 0.10). This is broadly consistent with previous research (Hand, 2005; Armstrong et al., 2006).

There is a significant (< 0.01) increase in model fit (3 percent) moving from Model I to Model II,, hinting that investor type explains valuations. The first hypothesis proposes that captive VC firms value firms lower than independent VC firms. While the regression models show a positive coefficient for captive VC firms, the coefficients are not significant. Hypothesis H1 is hence not supported. The second hypothesis proposes that university VC firms value firms lower compared to independent VC firms. The coefficient is negative and significant in Models II (< 0.01) and III (< 0.05), providing support for the second hypothesis. Hypothesis 3 proposes that government VC firms value firms lower than independent VC firms. Models II and III show a negative and significant coefficient for government VC firms (<0.01 in model III), supporting hypothesis 3. Finally, all main relations remain qualitatively unchanged when including growth in personnel expenses as an additional firm characteristic (unreported analyses). As pre-investment personnel growth is not a significant driver of portfolio firm valuation and as adding this variable reduces the sample size with 90 observations, we prefer to focus on the previously reported models.

Potential impact of VC selection

The finding that university VC firms and government VC firms value their portfolio companies lower than independent VC firms might suffer from endogeneity problems. For example, different VC firm types might select different investee firms or, vice versa, investee firms might select different VC firm types. It is impossible to say who selects whom in the venture capital market (Hellmann et al., 2008). What really matters to address our research question is that the self-selection between venture capital firms and investee firms is taken into account. We deal with potential selection biases in two different ways: a Heckman two-stage approach and probit regressions analyzing the likelihood of investing in a

successful firm. The Heckman procedure is an ex-ante correction method while probit regressions are ex-post analyses, analyzing the outcome of the investment.

Heckman (1979) suggests a two-step correction for endogeneity. A first regression, the selection equation, models the likelihood that a specific type of VC firm will invest in a firm. The empirical specification of the probit regression includes variables that are expected to influence the presence of a specific type of VC firm. The inverse Mills ratio obtained from the first stage regression is incorporated as an additional regressor in the second stage log-linear regression. A significant coefficient of the inverse Mills ratio suggests that there exists a selection bias in the sample, leading to endogeneity problems. The Heckman-correction procedure is repeated for the two types of VC firms with significant coefficients: university VC firms and government VC firms. The results of the first step (selection regression) of the Heckman procedure are discussed in the following paragraphs.

The probit regressions model the likelihood that a particular type of VC firm will invest in a particular firm, by including firm and investment round characteristics. Two firm characteristics are included that proxy for its maturity as an indicator of risk: the inflation-adjusted cumulative invested amount (in millions of euros) and age (in years). Younger firms are riskier than later stage firms, as they have no track record and only few tangible assets. VC firms focusing on early stage (resp. mature) firms might therefore apply lower (resp. higher) valuations, everything else equal. Further, investee firm risk may be reflected by the number of patent applications. Intellectual property is often an important asset for VC backed firms. Patents are the most effective way for these firms to protect their intellectual property (Lerner, 1994). Therefore, firms with more patent applications are expected to have a higher chance to survive. Finally, a dummy variable indicating whether the firm is active in a high tech sector is included. Compared to non-high tech firms, high tech firms have more growth potential in the long run but are more risky.

Two investment round characteristics are included. VC firms may invite other VC firms to join the equity syndicate in order to ensure improved future access to more and better quality deals (Sorenson & Stuart, 2001). Having more firms involved in the investment decision is expected to improve the quality of the decision, hence to lower the risk. Therefore, the number of VC firms in the investment round is included. Further, the amount invested in the current round (expressed in million euros) is included as non-risk variable. High growth firms have large financing needs. However, not all VC firms are equally willing or able to invest the same amount of cash in a firm. VC firms might forego interesting opportunities because of financing constraints (Brander et al., 2002), hence it is relevant to include the amount invested in the current round.

Unreported results of the selection regressions show that university VC firms invest lower amounts in high tech firms that did not previously receive VC financing. Government VC firms mainly invest in a first investment round in older non-high tech firms that are marginally likely to have more patent applications. Government VC firms further typically invest alone and higher amounts compared to other VC investors.

The results of the second step of the Heckman procedure are presented in Table 3. The second stage represents a log-linear regression of inflation-adjusted (2008=100) premoney valuations on the VC firm type, investee firm characteristics and control variables, adding the inverse Mills ratio as an additional regressor.

Insert Table 3 about here

The inverse Mills ratio for university VC firms is significant (<0.01) and positive, indicating that the error terms in the selection equation are positively related to the error terms in the valuation equation. That is, unobserved factors that determine whether a university VC firm will invest or not are positively related to the unobserved factors that determine valuation. This indicates that selection bias

is present for this type of VC firm. University VC firms select portfolio companies with more risk. For government VC firms, the inverse Mills ratio is not significant, suggesting that no selection bias exists. After controlling for the selection effect, university VC firms (<0.05) and government VC firms (<0.05) still value firms lower than independent VC firms. The results for university VC firms and government VC firms remain robust after including the accounting variables to the Heckman model (unreported analyses).

A second method to further analyze potential selection bias is to use exit outcomes as a proxy for firm risk, hence acknowledging unobserved variables that may affect the risk of investee companies of different types of VC firms. An overall higher risk might explain the lower valuations observed for university VC firms and government VC firms. If some types of VC firms mainly select firms with lower risk or vice versa, we expect to see ex-post a high proportion of successful investments (or unsuccessful investments). IPOs and acquisitions are classified as successful outcomes, while failures and voluntary liquidations are classified as unsuccessful outcomes. Further, firms that are still private are considered as successful if their value increased constantly over all follow-on financing rounds. Twenty-five private firms with only uprounds are classified as successful. In a similar vein, private firms are considered as unsuccessful if their value constantly decreased over follow-on financing rounds. Twenty-one private firms with only downrounds are classified as unsuccessful. Private firms with only one investment round or with both up- and downrounds are excluded from this analysis. In order to reduce the potential misclassification of firms in successful firms and unsuccessful firms, the sample is limited to firms that received an initial VC investment before 2003. This is consistent with assuming a typical holding period for a VC investor of six years and therefore excludes 59 investment rounds in 30 firms. Panel D of Table 1 indicates that captive VC firms, independent VC firms and government VC firms have more investments in unsuccessful firms. In contrast, university VC firms have more investments in successful firms. When private firms are classified into successful and unsuccessful firms, we find that captive VC firms have 18 percent, independent VC firms 14 percent

and government VC firms 7 percent more unsuccessful rounds compared to successful investment rounds. In contrast, university VC firms have 16 percent more successful rounds compared to unsuccessful investment rounds.

Insert Table 4 about here

Table 4 shows the results of multivariate probit regressions modelling the likelihood of successful investments. High tech firms have a higher probability of being more successful (< 0.10) compared to non-high tech firms. The probability of success also increases with a higher number of VC investors (< 0.05). Finally, more successful investments are made when the Belgian economy is strong (< 0.05). None of the investor type variables is significant, however. Ex-post, there are neither more failures, liquidations or private firms with downrounds, nor IPOs, acquisitions and private firms with uprounds in the portfolio of a specific type of VC firm compared to independent VC firms. This implies that there is no significant ex-post selection bias. Before the investment, VC firms select different portfolio firms or firms select different VC firms but their probability of success after the investment is not different. Hence, it is unlikely that the observed differences in valuations between VC firm types are driven by selection bias.

Robustness checks

Several robustness checks were performed. First, the results remain robust when the syndication dummy variable in the regressions is replaced by the logarithm of the number of investors in each investment round. Second, including growth in relative or in absolute terms has no impact on the reported results. Third, standard errors are clustered on the VC firm level rather than on the portfolio firm level, as the same VC may be the lead investor in multiple investment rounds. The results remain robust. Fourth, when we exclude the potential impact of non-lead investors on the negotiated value by focusing only on standalone investments, the results remain again robust. Fifth, we include a dummy variable equal to one for cross-border VC investors. Lead investors that are located in other countries

than Belgium may bring more certification value to portfolio companies, hence they are a proxy for VC reputation that drives lower valuations (Hsu, 2004). Surprisingly, we find that cross-border VC investors value firms higher compared to domestic VC investors. All other results remain robust. In a final robustness check, rather than clustering standard errors on the VC firm level or portfolio firm level, Generalized Estimating Equations (G.E.E) are used (Ballinger, 2004). G.E.E are an extension to Generalized Linear Models in which the structure of the within-panel correlation can be modeled. In a first model, the within-subject observations are expected to be equally correlated; in a second model, all possible correlations are included. Neither G.E.E models have an impact on the reported results.

DISCUSSION AND CONCLUSIONS

This paper studies how differences in VC firm type affect valuations in VC investment rounds. Based on bargaining models (Kirilenko, 2001; Cable & Shane, 1997; Fairchild, 2004), we argue that the relative bargaining power of the VC investor impacts investee firm valuation. VC firm types with more bargaining power relative to the entrepreneur use their negotiation power to obtain higher equity stakes, or equivalently, lower valuations compared to VC firm types with less bargaining power.

The hypotheses are tested on a sample including 362 investment rounds in 180 Belgian investee firms. The results indicate that while controlling for firm specific and market characteristics, university VC firms and government VC firms value firms lower than independent VC firms. The valuations from captive VC firms are not significantly different from independent VC firms. The lower valuations by university VC firms are partially driven by their selection behavior. After controlling for selection bias, however, government VC firms and university VC firms still value firms lower compared to independent VC firms. These empirical results suggest that different types of VC investors shape different valuations in VC investment rounds.

The findings are consistent with bargaining power arguments. VC firms with higher bargaining power exploit this power to negotiate lower valuations. A higher bargaining power may be embedded in the strategy of the VC firms, e.g. by relying on a captive deal flow as university VC firms do. Targeting niche markets with low levels of competition from other VC firms is an alternative strategy to increase bargaining power. This strategy is followed by government related VC firms, who either target high technology seed investments or more mature, less growth oriented companies. Our results hence provide an indirect empirical test of the theoretical model developed by Fairchild (2004). While we expected that corporate VC firms would also exploit the captive deal flow they have when investing in their spin-outs, our results do not suggest that they do so. This might be due to the fact that the major part of their investments occurs in unrelated companies, in which they face the same competition as independent VC firms. A more fine-grained analysis of captive VC firm investments might help to understand their investment and valuation processes in greater detail.

Our findings are far from trivial, as there are various reasons why to expect higher valuations from university and government VC firms. First, earlier research has established that VC firms with a higher reputation negotiate lower valuations (Hsu, 2004; Cumming & Dai, 2010). Independent investors are, however, in general more sophisticated and more reputable investors (Bottazzi et al., 2008). Solely focusing on investor reputation as a determinant of valuation would therefore suggest university and government VC firms to have lower bargaining power leading to higher valuations. Our results point in the opposite direction, suggesting that reputation is only one element that shapes a VC firm's bargaining power. Next to reputation, a VC firm may enhance its bargaining power by creating captive deal flow or by targeting low-competition niche markets. While the present study focused on specific types of VC firms which are shielded from competition given their reason of existence, independent and captive VC firms might also consider alternative strategies to enhance their bargaining power, next to building a strong reputation in the VC market. For example, building strong links with research institutions, intermediaries or potential VC syndicate partners might give a first

view on dealflow that is originated by or passes through these organizations. Reputation is difficult and takes time to develop; alternative bargaining power strategies might hence be especially important for young VC firms to establish themselves in the VC market.

Second, the goals of university and government VC firms are not only to earn a financial return, but also to enhance a university's reputation or to sustain economic development (O'Shea et al., 2005; Murray, 1998; Manigart et al., 2002b). One might hence expect that those firms would trade off financial returns against their other goals, and hence accept higher valuations. We have shown that this is not the case: these investors fully exploit their higher bargaining power and negotiate lower valuations.

In general, we contribute to the VC literature by showing that VC investor heterogeneity goes beyond differences in value-added support and governance structure but also affects valuations in investment rounds (Bottazzi et al., 2008; Mayer et al., 2005). We further show that bargaining power in the VC industry is not only determined by a VC firm's reputation, but also by its investment strategy. We also add to the finance literature by analyzing determinants of valuation of private companies which are often neglected in the current literature and show that not only firm characteristics but also investor characteristics determine the value of private companies.

Our results are not only important for VC firms, but also for entrepreneurs. We highlight that, in order to maximize firm valuations, enhancing their negotiation power is key. If entrepreneurs are locked in, or if they are unable to generate sufficient interest from diverse VC investors, then they are unable to negotiate higher valuations, ultimately affecting their potential financial returns and the control they may retain over their venture. Further, entrepreneurs should understand that it is not because some VC firms having other goals next to realizing financial returns, that they are willing to accept higher valuations, on the contrary. Again, securing sufficient financing options is crucial to enhancing bargaining power and ultimately firm value.

As in all research, this paper may have some limitations. First, the external validity of the results may be limited given the focus on Belgium. However, the focus on Belgian companies allowed access to the Belgian Law Gazette, which reports official information on all capital increases, even for unquoted companies. Hence, the reliability and completeness of the data is excellent which is for most other studies relying on commercial databases often a serious concern. Further, Belgian VC investors are likely to be comparable to other Continental European companies, as the Belgian VC industry is equally developed and functions in a broadly comparable legal and institutional setting. Belgian VC investors also frequently co-invest with international VC firms, enabling them to learn from best practices abroad and incorporate these into their functioning. Hence, it is likely that our findings extend at least to other VC firms in Continental Europe. Whether our results are transferable to Anglo-Saxon or Asian markets remains an empirical question. Anglo-Saxon markets are more mature and are governed by a more investor-friendly institutional environment. Asian markets, in contrast are in full development and their institutional environment is very different. VC valuation and negotiation processes might hence be different in different parts of the world.

Second, our data do not allow accounting for other contractual clauses that may affect differences in valuation. As a result, the differences between venture capital investor type may be influenced by differences in the complexity of the contracts they negotiate, next to differences in relative bargaining power. Our approach is nevertheless consistent with earlier studies on the valuation of VC investments (e.g. Hand, 2005; Armstrong et al., 2006; Cumming and Dai, 2010).

Foregoing shortcomings obviously suggest interesting avenues for future research. Further, there remain many unanswered questions relating to VC portfolio firm valuation. It would be interesting to understand which other factors affect the bargaining outcome in the entrepreneur-venture capitalist relationship. For example, are VC firms willing to pay a premium for the experience of an entrepreneur or is a more experienced entrepreneur able to negotiate better investment terms? It might

also be interesting to extend these insights to other settings where the value of a company is negotiated between a limited number of parties, for example in mergers or acquisitions of unquoted companies.

REFERENCES

Admati, A., and P. Pfleiderer (1994), 'Robust financial contracting and the role of venture capitalists', The Journal of Finance, Vol.49, No.2 (June), pp.371-402.

Amit, R., J. Brander and C. Zott (1998), 'Why do venture capital firms exist? Theory and Canadian evidence', Journal of Business Venturing, Vol.13, No.6 (November), pp.441-66.

Amit, R., L. Glosten and E. Muller (1990), 'Entrepreneurial ability, venture investments, and risk sharing', Management Science, Vol.36, No.10 (October), pp.1232-43.

Armstrong, C., A. Davila and G. Foster (2006), 'Venture-backed private equity valuation and financial statement information', Review of Accounting Studies, Vol.11, No.1 (March), pp.119-54.

Arping, S., and S. Falconieri (2010), 'Strategic versus financial investors: the role of strategic objectives in financial contracting', Oxford Economic Papers, Vol.62, No.4 (October), pp.691-714.

Ballinger, G. (2004), 'Using generalized estimating equations for longitudinal data analysis', Organizational Research Methods, Vol.7, No.2 (April), pp.127-50.

Beuselinck, C., M. Deloof and S. Manigart (2009), 'Private equity involvement and earnings quality', Journal of Business Finance and Accounting, Vol.36, Nos.5&6 (June/July), pp.587-615**.**

Bottazzi, L. and M. Da Rin (2002), 'Venture capital in Europe and the financing of innovative companies', Economic Policy, Vol.17, No.34 (April), pp.230-69.

Bottazzi, L., M. Da Rin and T. Hellmann (2008), 'Who are the active investors? Evidence from venture capital', Journal of Financial Economics, Vol.89, No.3 (September), pp.488-512.

Brander, J., R. Amit and W. Antweiler (2002), 'Venture capital syndication: Improved venture selection versus the value-added hypothesis', Journal of Economics and Management Strategy, Vol.11, No.3 (Fall), pp.423-52.

Cable, D. and S. Shane (1997), 'A Prisoner's Dilemma Approach to Entrepreneur-Venture Capitalist Relationships', The Academy of Management Review, Vol.22, No.1 (January), pp.142-76.

Casamatta, C. (2003), 'Financing and Advising: Optimal Financial Contracts with Venture Capitalists', The Journal of Finance, Vol.58, No.5 (October), pp.2059-86.

Cumming, D. and N. Dai (2010), 'Fund size, limited attention and valuation of venture capital backed firms', Journal of Empirical Finance, forthcoming.

Cumming, D. and J. MacIntosh (2006), 'Crowding out private equity: Canadian evidence', Journal of Business Venturing, Vol.21, No.5 (September), pp.569-609.

Dushnitsky, G. and M. Lenox (2005), 'When do incumbents learn from entrepreneurial ventures? Corporate venture capital and investing firm innovation rates', Research Policy, Vol.34, No.5 (June), pp.615-39.

---------- ---------- (2006), 'When does corporate venture capital investment create firm value?', Journal of Business Venturing, Vol.21, No.6 (November), pp.753-72.

Eckhardt, J., S. Shane and F. Delmar (2006), 'Multistage selection and the financing of new ventures', Management Science, Vol.52, No.2 (February), pp.220-32.

Fairchild, R. (2004), 'Financial contracting between managers and venture capitalists: the role of value-added services, reputation seeking, and bargaining power', The Journal of Financial Research, Vol.27, No.4 (December), pp.481-95.

Gompers, P. (1995), 'Optimal investment, monitoring, and the staging of venture capital', The Journal of Finance, Vol.50, No.5 (December), pp.1461-89.

Gompers, P. and J. Lerner (1998), 'The determinants of corporate venture capital success: organizational structure, incentives and complementarities', NBER Working Paper (Harvard Business School).

---------- ---------- (2000), 'Money chasing deals? The impact of fund inflows on the valuation of private equity investments', Journal of Financial Economics, Vol.55, No.2 (February), pp.281-325.

Gujarati, D. (2003), Basic econometrics (New York: McGraw-Hill).

Hand, J. (2005), 'The value relevance of financial statements in the venture capital market', The Accounting Review, Vol.80, No.2 (April), pp.613-48.

Heckman, J. (1979), 'Sample selection bias as a specification error', Econometrica, Vol.47, No.1 (January), pp.153-61.

Hellmann, T. (1998), 'The allocation of control rights in venture capital contracts', RAND Journal of Economics, Vol.29, No.1 (Spring), pp.57-76.

Hellmann, T., L. Lindsey and M. Puri (2008), 'Building relationships early: banks in venture capital', The Review of Financial Studies, Vol.21, No.2 (February), pp.513-41.

Hsu, D. (2004), 'What do entrepreneurs pay for venture capital affiliation?', The Journal of Finance, Vol.59, No.4 (August), pp.1805-44.

Inderst, R. and H. Mueller (2004), 'The Effect of Capital Market Characteristics on the Value of Start-up Firms', Journal of Financial Economics, Vol.72, No.2 (May), pp.319-56.

Kaplan, S. and A. Schoar (2005), 'Private equity performance: Returns, persistence and capital flows', The Journal of Finance, Vol.60, No.4 (August), pp.1791-1823.

Kaplan, S. and P. Strömberg (2003), 'Financial Contracting Theory Meets the Real World: An Empirical Analysis of Venture Capital Contracts', Review of Economic Studies, Vol.70, No.2 (April), pp.281-316.

---------- ---------- (2004), 'Characteristics, Contracts and Actions: Evidence from Venture Capitalist Analyses', The Journal of Finance, Vol.59, No.5 (October), pp.2177-2210.

Kaplan, S., B. Sensoy and P. Strömberg (2002), 'How Well Do Venture Capital Databases Reflect Actual Investments?' Working Paper (University of Chicago).

Kirilenko, A. (2001), 'Valuation and Control in Venture Finance', The Journal of Finance, Vol.56, No.2 (April), pp.565-87.

Leleux, B. and B. Surlemont (2003), 'Public versus private venture capital: seeding versus crowding out? A pan-European analysis', Journal of Business Venturing, Vol.18, No.1 (January), pp.81-104.

Lerner, J. (1994), 'The importance of patent scope: an empirical analysis', RAND Journal of Economics, Vol.25, No.2 (Summer), pp.319-33.

Lockett, A. and M. Wright (2005), 'Resources, capabilities, risk capital and the creation of university spin-out companies', Research Policy, Vol.34, No.7 (September), pp.1043-57.

Manigart, S., K. De Waele, M. Wright, K. Robbie, P. Desbrières, H. Sapienza and A. Beekman (2002a), 'Determinants of required return in venture capital investments: a five-country study', Journal of Business Venturing, Vol.17, No.4 (July), pp.291-312.

Manigart, S., K. Baeyens and W. Van Hyfte (2002b), 'The survival of venture capital backed companies', Venture Capital, Vol.4, No.2 (April), pp.103-24.

Mayer, C., K. Schoors and Y. Yafeh (2005), 'Sources of funds and investment activities of venture capital funds: evidence from Germany, Israel, Japan and the United Kingdom', Journal of Corporate Finance, Vol.11, No.3 (June), pp.586-608.

Murray, G. (1998), 'A policy response to regional disparities in the supply of risk capital to new technology- based firms in the European Union: the European seed capital fund scheme', Regional Studies, Vol.32, No.5 (July), pp.405-20.

O'Shea, R., T. Allen, A. Chevalier and F. Roche (2005), 'Entrepreneurial orientation, technology transfer and spinoff performance of U.S. universities', Research Policy, Vol.34, No.7 (September), pp.994-1009.

Puri, M. and R. Zarutskie (2008), 'On the lifecycle dynamics of venture-capital- and non-venture-capital-financed firms', Working Paper (US Census Bureau Center for Economic Studies).

Sahlman, W. (1990), 'The structure and governance of venture-capital organizations', Journal of Financial Economics, Vol.27, No.2 (October), pp.473-521.

Shane, S. and T. Stuart (2002), 'Organizational endowments and the performance of university start-ups', Management Science, Vol.48, No.1 (January), pp.154-70.

Sorensen, M. (2007), 'How smart is smart money? A two-sided matching model of venture capital', The Journal of Finance, Vol.62, No.6 (December), pp.2725-62.

Sorenson, O. and T. Stuart (2001), 'Syndication networks and the spatial distribution of venture capital investments', American Journal of Sociology, Vol.106, No.6 (May), pp.1546-88.

Van Osnabrugge, M. and R. Robinson (2001), 'The influence of a venture capitalist's source of funds', Venture Capital, Vol.3, No.1 (January), pp.25-39.

Wright, M. and A. Lockett (2003), 'The structure and management of alliances: syndication in the venture capital industry', Journal of Management Studies, Vol.40, No.8 (December), pp.2073-2102.

Wright, M., A. Lockett, B. Clarysse and M. Binks (2006), 'University spin-out companies and venture capital', Research Policy, Vol.35, No.4 (May), pp.481-501.

Table 1 : Sample description

Panel A: Premoney valuations by series and type of VC firm				
Premoney (in 1000 EUR)	**Captive VC**	**University VC**	**Government VC**	**Independent VC**
Series A	548 †	963	486 **	1,250
N	*25*	*6*	*52*	*65*
Series B	4,321	651 **	894 **	2,763
N	*23*	*14*	*26*	*50*
Series C	8,367 *	1,213 †	4,084	3,479
N	*12*	*3*	*10*	*32*
Series D	16,041 *	1,491	/	2,881
N	*4*	*1*	*0*	*17*
Series ≥ E	43,757 *	/	5,216	12,904
N	*6*	*0*	*1*	*15*
N (Total)	**70**	**24**	**89**	**179**
# different VCs	**17**	**5**	**7**	**46**

Panel B: Industry preference of # types of VC firms								
# Sectors	**Captive VC**		**University VC**		**Government VC**		**Independent VC**	
Computer & Consumer Electronics	25	*35.7%*	9	*37.5%*	28	*31.5%*	92	*51.4%*
Life Sciences	15	*21.4%*	12	*50.0%*	6	*6.7%*	35	*19.6%*
Business & Industrial Products	16	*22.9%*	0	*0.0%*	22	*24.7%*	6	*3.4%*
Chemicals & Materials	3	*4.3%*	3	*12.5%*	8	*9.0%*	17	*9.5%*
Communications	3	*4.3%*	0	*0.0%*	5	*5.6%*	13	*7.3%*
Other	8	*11.4%*	0	*0.0%*	20	*22.5%*	16	*8.9%*
N	**70**	*100.0%*	**24**	*100.0%*	**89**	*100.0%*	**179**	*100.0%*

Panel C: Investee firm characteristics by type of VC firm				
Investee firm characteristics	**Captive VC**	**University VC**	**Government VC**	**Independent VC**
Firms with patent applications (in %)	28.57%	16.67%	11.24%	27.37%
Age (in years) at Series A	3.26	2.06	4.55	1.36
High tech firms (in %)	54.29%	79.17%	35.96%	60.34%
Firm growth (in 1000 EUR) (N)	83 *(56)*	82 *(18)*	0 *(71)*	76 *(128)*
Amount invested in initial round (in 1000 EUR)	548	360	275	455
N	**70**	**24**	**89**	**179**

Panel D: Legal status by type of VC firm								
Legal Status	**Captive VC**		**University VC**		**Government VC**		**Independent VC**	
Failure	19	*28.8%*	2	*10.5%*	14	*17.1%*	41	*30.1%*
Voluntary Liquidation	6	*9.1%*	1	*5.3%*	3	*3.7%*	6	*4.4%*
Private	28	*42.4%*	13	*68.4%*	49	*59.8%*	61	*44.9%*
Acquisitions	3	*4.5%*	2	*10.5%*	9	*11.0%*	16	*11.8%*
IPO	10	*15.2%*	1	*5.3%*	7	*8.5%*	12	*8.8%*
N	**66**	*100.0%*	**19**	*100.0%*	**82**	*100.0%*	**136**	*100.0%*

Table 1 presents medians of premoney valuations and investment characteristics of different types of (lead) VC firms. Panel A reports median premoney valuations clustered by investment round and type of VC firm. All medians are inflation-adjusted (2008=100) and in thousands of euros. **,*, † denote mean values which are statistically different from those of independent VC firms within the same investment round at respectively the 0,01; 0,05 and 0,10 level. The number of observations refers to the number of investment rounds with that specific type of VC firm as the lead investor. The total number of different VCs that belong to the same type of VC firm are also reported. Panel B reports the industry preference of each type of VC firm. The industries are consistent with the EVCA (2007) sectoral classification. The number of observations (in absolute and relative terms) refer to the number of investment rounds in firms categorized into those sectors. Panel C records key characteristics of the investee firms for each type of VC firm. Five variables are included: the percentage of *firms with patent applications* before a particular Series (A, B,..) (a), the median investee *firm age* in years at the initial investment round (Series A) (b), the percentage of *high tech firms* in the sample for each type of VC firm (c), the *median growth* in personnel expenses (in 1000 EUR) (d) and the inflation-adjusted (2008=100) *amount (in thousands of euros) invested* in a Series A financing round. The high tech classification scheme is based on two digit industry codes and is provided by the Flemish government. Growth is defined as the absolute growth in personnel expenses (in 1000 EUR) one year before the investment (t-1) compared to two years before the investment (t-2). The corresponding number of observations is given in brackets. Panel D refers to the legal status of investee firms for each type of VC firm. The number of observations (in absolute and relative terms) refer to all corresponding investment rounds which are labeled into the same category. Investee firms are restricted in this panel to those having a Series A financing round no later than 31/12/2002 and their legal status is representative for the period of data collection.

Table 2 : Multivariate OLS regression model

	Exp. Sign	**Model I**	**Model II**	**Model III**
Constant		7.855 **	8.455 **	3.257
Type of VC firm (dummy)				
Captive VC	-		0.286	0.148
University VC	-		-0.756 **	-0.746 *
Government VC	-		-0.472 *	-0.693 **
Firm Characteristics				
Ln (1+ # patent applications)	+	0.205	0.180	0.190
Ln (1+ Age) (in years)	+	-0.231 †	-0.176	-0.218
Hightech (dummy)	+	-0.156	-0.153	0.077
Ln (1+ Amount invested in previous rounds)	+	0.053 **	0.045 *	0.030
Financial Statement Variables				
Ln (1+ Cash Assets)	+			0.084 **
Ln (1+ Non-Cash Assets)	+			0.453 **
Ln (1+ LT Debt)	-			-0.021
Ln (1+ Operating Revenues)	+			-0.004
Ln (1+ Operating Costs)	-			-0.072
Ln (1+ Accumulated Gains/Losses)	+			0.003
Ln (1+ Intangible Fixed Assets)	+			-0.033 †
Control Variables				
Ln (1+ Series)	+	1.334 **	1.360 **	0.888 *
Syndication (dummy)	+	0.321 †	0.176	0.029
Ln (1+ Inflow of capital)	+	0.243 *	0.215 *	0.234 *
Ln (1+ Belgian Industry Index)	+	0.005	0.017	0.015
# observations		**362**	**362**	**275**
# firms		**180**	**180**	**153**
Adjusted R^2		31.6%	34.7%	50.8%
F-statistic		21.3	17.0	18.2
p-value (F-statistic)		0.000	0.000	0.000

Table 2 reports the results from multivariate log-linear regressions of premoney valuations on VC investor dummies, investee firm characteristics, financial statement variables and control variables. Premoney valuations and financial statement variables are inflation-adjusted (2008=100). All standard errors are clustered on the investee firm level. **,* , † denote significance at respectively the 0,01; 0,05; 0,10 level. *Captive VCs, government VCs and university VCs* are expected to value private firms lower than independent VCs. The log-transformed firm characteristics (number of patent applications before the investment round, age (in years) and the inflation-adjusted amount invested in previous rounds) are expected to be positively related to the value of the firm. Hightech is a dummy variable equal to 1 if the firm is active in the high tech sector, zero otherwise. The value of high tech firms is expected to be higher. *(Non)-Cash assets, Operating Revenues, Accumulated Gains/Losses and Intangible Fixed Assets* are expected to have a positive sign; *LT Debt* and *Operating Costs* a negative sign. Three log-transformed variables and one dummy variable are included as control variables : *the investment round* (a), a *syndication* dummy variable (b), *the inflow of capital* in the venture capital industry the year before the investment (t-1)(c) and *the Belgian Industry Index* as a capital market index (d). Syndicated investors have a better selection process (Brander et al., 2002), therefore higher valuations are expected from syndicated investment rounds. Gompers and Lerner (2000) show that higher inflows of capital in the venture capital industry, result in inflated valuations of these funds' new investments. We therefore include the inflation-adjusted inflow of capital in Belgium (in euros) at time (t-1) from the EVCA Yearbooks. The Belgian Industry Index is retrieved from the Thomson Datastream database and added as a capital market variable following Armstrong et al. (2006), suggesting that private valuations follow public valuations. As such, we expect that these variables together with investment round are positively related to the value of the venture.

Table 3 : OLS regression controlling for potential selection bias

	Exp. Sign	
Constant		7.407 **
Type of VC firm (dummy)		
Captive VC	-	0.219
University VC	-	-0.571 *
Government VC	-	-0.503 *
Firm Characteristics		
Ln (1+ # patent applications)	+	0.062
Ln (1+ Age) (in years)	+	-0.225
Hightech (dummy)	+	0.382
Ln (1+ Amount invested in previous rounds)	+	0.045 *
Financial Statement Variables		
Ln (1+ Cash Assets)	+	
Ln (1+ Non-Cash Assets)	+	
Ln (1+ LT Debt)	-	
Ln (1+ Operating Revenues)	+	
Ln (1+ Operating Costs)	-	
Ln (1+ Accumulated Gains/Losses)	+	
Ln (1+ Intangible Fixed Assets)	+	
Control Variables		
Ln (1+ Series)	+	0.757 †
Syndication (dummy)	+	0.158
Ln (1+ Inflow of capital)	+	0.236 **
Ln (1+ Belgian Industry Index)	+	0.025
Inverse Mills ratio University VC		0.684 **
Inverse Mills ratio Government VC		-0.347
# observations		**361**
# firms		**179**
Adjusted R^2		43.0%
F-statistic		30.4
p-value (F-statistic)		0.000

Table 3 shows the results of the second stage of the Heckman correction procedure for a sample of 362 investment rounds and 180 Belgian VC backed firms. All standard errors are clustered on the investee firm level. **,*, † denote significance at respectively the 0,01; 0,05; 0,10 level. The second stage represents a log-linear regression of inflation-adjusted (2008=100) premoney valuations on the VC firm type, investee firm characteristics and control variables. The inverse Mills ratio is estimated from the first stage regression and added as an additional regressor. A significant coefficient of the inverse Mills ratio indicates that there exists a significant selection bias.

Table 4 : Probit regression modelling successful firms

Constant	-0.815 *
Type of VC firm (dummy)	
Captive VC	-0.171
University VC	0.265
Government VC	0.322
Firm Characteristics	
Number of patent applications	0.047
Age (in years)	0.010
Hightech (dummy)	0.495 †
Amount invested in previous rounds (in mio euros)	0.006
Investment Round Characteristics	
Series	-0.117
Number of investors	0.201 *
Control Variables	
Inflow of capital (in 100 mio euros)	-0.031
Belgian Industry Index	0.163 *
# observations	**228**
# firms	**109**
Adjusted R^2	13.0%
χ^2-statistic	23.1
p-value (χ^2-statistic)	0.017

Table 4 shows the results of the probit regression that models the likelihood of investing in successful firms. All standard errors are clustered on the firm level. **,* ,† denote significance at respectively the 0,01; 0,05; 0,10 level. The dependent variable is a dummy variable equal to 1 for all investee firms that went public or were acquired and private firms with persistently uprounds, zero otherwise. Private firms with only one investment round or with both up-and downrounds are excluded from the analysis. Further, all firms and corresponding rounds with initial (Series A) investment rounds after 2002 are excluded from the analysis. *Cumulative invested amount* in earlier rounds (in millions of euros) and *inflow of capital* (in 100 millions of euros) are inflation-adjusted (2008=100). The VC firm type variables are all dummy variables, none of the coefficients is expected to be significant if there exists no sample selection bias ex-post.