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ABSTRACT

This study explores the impact of the bargaining power of venture capital (VC) firms on the valuation of their portfolio companies. VC firm types with greater bargaining power vis-à-vis the entrepreneur are expected to negotiate lower valuations compared with VC firm types with less bargaining power. Consistent with this hypothesis, university and government VC firms, which have comparatively greater bargaining power, negotiate lower valuations compared with 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

1. INTRODUCTION

One of the major concerns of entrepreneurs seeking venture capital (VC) is the equity stake that they retain after the investment, as this equity stake determines their future financial return and their control over the venture. The retained equity crucially depends on the negotiated value of the firm. At investment, a VC firm receives an agreed-upon number of newly created shares of the investee company in return for cash. Thus, 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. Researchers have only recently started to analyse determinants of firm valuations implied in VC investment rounds. Entrepreneurial firm characteristics such as firm accounting information (Hand, 2005; and Armstrong et al., 2006) and market factors (Gompers and 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 affect firm valuations (Cumming and Dai, 2011). For example, Hsu (2004) found that entrepreneurs accept lower valuations from more reputable VC investors, while Cumming and Dai (2011) demonstrated a convex relationship between VC fund size and valuation.

This paper extends this line of research by acknowledging that the type of VC investor and its bargaining power also influences the negotiated value. Building on former theoretical frameworks modelling the negotiation process between entrepreneurs and VC investors (Fairchild, 2004; Cable and Shane, 1997; and 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 may exploit their stronger bargaining position by negotiating lower valuations.

We empirically examine the effects of VC type on valuations 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 pre-investment accounting variables, firm age, size, patent applications and whether the firm is active in a high-tech industry), VC firm characteristics (including VC firm reputation, size and origin) and market conditions (including the Belgian

market return, the inflow of capital in the VC industry and VC investment activity). The results remain robust after controlling for potential selection biases.

We hereby provide further insight into how the heterogeneity of the VC industry affects VC firm behaviour (Mayer et al., 2005; and Bottazzi and 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 affect their relative bargaining power (Cumming and Dai, 2011; Hsu, 2004; and Meuleman et al., 2009). 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 compared with independent VC firms. These results are non-trivial, as independent VC firms are typically more active investors and have a higher reputation compared with government and university VC firms (Bottazzi and Da Rin, 2002), which, following Hsu (2004), would lead entrepreneurs to accept lower valuations. In contrast, our findings indicate that independent VC firms accept higher valuations, which is consistent with the greater competition and hence relatively low bargaining power of independent VC firms compared with university and government VC firms. Therefore, this analysis provides a more complete picture of the bargaining process between VC investors and entrepreneurs.

The remainder of the paper proceeds as follows. Section 2 provides an overview of the relevant literature and develops the hypotheses. Section 3 describes the sample and variables, including descriptive statistics. Section 4 presents the empirical results. The final section discusses the results and conclusions.

2. BARGAINING POWER IN VENTURE CAPITAL INVESTMENTS

(i) Bargaining power in the VC investment process

Valuations in VC investments represent the outcome of lengthy negotiations between VC investors and entrepreneurs, rather than being determined through supply and demand in liquid financial markets. Recently, researchers have modelled the negotiation process between a VC investor and an entrepreneur, incorporating the bargaining positions of both parties. When bargaining power is unbalanced, the party with greater power attempts to achieve an advantage at the expense of the other party (Cable and Shane, 1997; and Chahine and Goergen, 2011).

Differences in the relative bargaining power between VC investors and entrepreneurs are hence expected to affect the outcome, namely, the valuation of the venture. At the macro-economic level, it has been demonstrated theoretically (Inderst and Mueller, 2004) and empirically (Gompers and Lerner, 2000) that an increase in the supply of VC funds positively affects valuations. A larger 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 and decrease the bargaining power of VC firms (Inderst and Mueller, 2004), ultimately leading to higher valuations (Gompers and Lerner, 2000).

Entrepreneurs aiming to raise VC financing compete for funding from the best possible VC investor to which they have access (Sorensen, 2007), while VC investors compete for the most promising entrepreneurial firms. For example, VC investors with the highest reputation have access to the most promising ventures, as entrepreneurs prefer to connect with them (Sorensen, 2007). Entrepreneurs thereby trade off a lower valuation and hence a lower current equity stake with higher expected future value creation (Fairchild, 2004; and Hsu, 2004). Fairchild (2004) shows that economic welfare is maximised when the entrepreneur has the most bargaining power and matches with a superior value-adding VC investor in a market that is reputation-based. Furthermore, the size of a VC fund is also positively related to its bargaining power, thus influencing valuations in VC investments (Cumming and Dai, 2011).

Previous theoretical and empirical papers largely focus on independent VC firms, 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 and Schoar, 2005). They define their investment strategy at fundraising and thereby choose the VC market segment in which to compete with other VC firms (Cumming et al., 2009). The VC industry is heterogeneous, however, featuring different types of VC firms depending on their dominant shareholders (Manigart et al., 2002b; Mayer et al., 2005; Bottazzi et al., 2008; and Hirsch and Walz, 2012). Captive VC firms manage funds fully or partially owned by a parent organisation (typically a corporation or bank) (Bertoni et al., 2012). University VC firms invest mainly university money in university spin-offs to foster innovation and to enhance the reputation of the university (Wright et al., 2006). Finally, governments intervene directly in venture capital markets by funding government VC firms (Manigart et al., 2002a; Leleux and Surlemont, 2003; and Hirsch and Walz, 2012). We argue that the specific investment and deal sourcing strategies of non-independent VC firms may either create a proprietary deal flow or lead to lower levels of competition in the target investment niche. This investment strategy is

expected to lead to differences in the relative bargaining power of different VC firms and hence may affect valuations.

To address these research questions, we compare the valuations of independent VC firms with the valuations of captive VC firms, university VC firms and government VC firms. Independent VC firms are the most widespread type of VC firm and hence are used as the reference group. Independent VC firm managers typically manage funds in a standard dual structure (Kaplan and Schoar, 2005) and are incentivised to create value through carried interests on VC funds' capital gains above a pre-defined threshold. VC managers are typically compensated with a fixed management fee (e.g., 2 per cent of invested capital) and a carried interest performance fee (e.g., 20 per cent of profits). Independent VC investment managers are experts in negotiating contracts with entrepreneurs. They are highly networked value-maximising 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. When we compare the valuations of other VC types with the valuations of independent VC firms, we are interested in the relative bargaining power of other types of VC firms compared with the bargaining power of an independent VC firm rather than the absolute bargaining power of different VC firms versus the entrepreneur. Relative differences in bargaining power will thus determine how valuations are affected. We discuss how captive VC firms, university VC firms and government VC firms differ from independent VC firms and how these differences may affect their relative bargaining position vis-à-vis the entrepreneur.

(ii) 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 and Lenox, 2005; 2006; and Bertoni et al., 2012). 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 IPOs (Hellmann et al., 2008; and González, 2006). Most captive VC firms are structured as subsidiaries of a parent organisation (a corporation or a bank) where investment managers are employees governed by labour contracts.

When searching for investments in unrelated companies, i.e., companies that do not originate from a parent company, captive and independent VC firms are competitive bidders

(Sorensen, 2007). For example, Gompers and Lerner (1998) find that the investment targets of corporate VC firms are comparable to the investment targets of independent VC firms. Bank VC firms invest in larger investment rounds and in industries with more debt (González, 2006) compared with independent VC firms, but their larger networks allow them to have better access to different investment opportunities (Hellmann et al., 2008). Consequently, captive and independent VC firms choose ventures from the same pool (Sahlman, 1990), broadening the supply of VC to entrepreneurial companies and enhancing entrepreneurs' bargaining power (Inderst and Mueller, 2004; and Cable and Shane, 1997). Consequently, captive VC firms will not have more bargaining power compared with independent VC firms when investing in unrelated ventures. Furthermore, given their strategic interest in their portfolio companies, captive VC firms provide portfolio companies access to the parent company's competencies and complementary assets (Dushnitsky and Lenox, 2005). Bertoni et al. (2012) have shown that in the long run, the growth of portfolio companies backed by independent and by captive VC firms is comparable, and the post-investment value-creating activities of both types of investors are also comparable. Hence, valuations will be comparable when captive and independent VC investors compete for unrelated investment targets.

However, captive VC firms may also invest in corporate spin-outs. New products or services developed within a corporation may not be core to the parent company's strategy but nevertheless have the potential to be viably exploited by another company. Rather than selling the intellectual knowledge to another company, the corporate may transfer the intellectual property rights (and potentially invest some cash) to a spin-out company. In return for their intangible and cash investments, corporations may negotiate an equity stake in the corporate spin-out through their corporate VC firm, aiming for a superior financial return in the medium term (Dushnitsky and 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 may therefore have a mix of unrelated investment opportunities for which it has no superior bargaining power compared with independent VC firms as well as opportunities that are generated internally for which it has high bargaining power. Taken together, these opportunities will on average lead to lower valuations from captive VC firms compared with independent VC firms. We hence hypothesise:

H_1: Compared with independent VC firms, captive VC firms value investee firms at a lower level.

A second type of VC firm is the university investment fund, which typically invests exclusively 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 commercialise a university's intellectual property and disseminate knowledge, thereby enhancing the university's 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 university's inventions (Lockett and 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 firms often have the right of first refusal to invest in companies that draw upon technology developed within the university. Consequently, bargaining power shifts strongly in favour of the university VC firm during the negotiation process. Entrepreneurs of these ventures are therefore locked-in as they have no other outside options (Inderst and Mueller, 2004).

Furthermore, university VC firms are among the few VC investors 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 and Stuart, 2002). The technological developments on which these companies are based are mostly legally protected. Furthermore, given the early stage of development of these startups, their entrepreneurial teams often comprise former university employees who are technology experts but lack industry experience, commercial skills and financial sophistication (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. These difficulties suggest that the supply of financing for these ventures may be lower than the demand, and that the limited competition in the VC market for this type of deal further enhances the bargaining power of university VC firms.

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

H_2: Compared with independent VC firms, university VC firms value investee firms at a lower level.

We finally expect differences in bargaining power between government VC firms and independent VC firms. Government VC firms are typically set up as a policy response to a shortage in the supply of risk capital to new technology-based early stage firms (Murray, 1998; Manigart et al., 2002a; and Leleux and Surlemont, 2003). As a result of 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). Furthermore, technology may be complex, making formal screening more difficult for the VC investors. Early stage ventures may 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 target these early stage ventures and complement the existing VC industry as they try to fill the market gap in the supply of VC financing (Cumming and 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 levels of interest. Consequently, government VC firms will experience less competition with other VCs while searching for new investment opportunities. Less competition 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 VC firms may further have regional economic development as a major goal (Leleux and Surlemont, 2003). Therefore, government VC firms also target mature companies that need funding to sustain employment rather than to create value. These companies will be unable to raise VC financing from independent VC firms, however, as their value creation potential is limited. In these companies, 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 because of either the higher risk or the lower return potential of the entrepreneurial firm, we propose the final hypothesis:

H_3: Compared with independent VC firms, government VC firms value investee firms at a lower level.

3. DATA AND SAMPLE DESCRIPTION

(i) The research context

The hypotheses are tested on Belgian companies that received venture capital financing between 1988 and 2009. Belgium was chosen because all firms (even unquoted ones) have a legal obligation to publish information on all capital increases in the Belgian Law Gazette, and this official information is externally validated by a third party. The obligatory nature of this information enables accurate calculation of the implied valuations, leading to highly reliable data. This unique institutional setting allows access to information that is typically confidential and unavailable in commercial databases, making the Belgian setting appropriate to test the hypotheses.

Insert Figure 1 about here

Figure 1 shows the investment activity of the Belgian VC industry as a percentage of GDP relative to European and US VC investment activity during the period of our study. In the early years of the study, the VC industry was emergent (Ooghe et al., 1991), but it strongly developed starting from 1995. The Belgian VC industry has always been characterised by heterogeneity among VC firm types, including mainly independent, government and corporate VC firms (Ooghe et al., 1991; and Manigart et al., 2002b). University VC firms emerged during the high technology bubble period (1999-2001) when VC investment activity peaked in the US (1 per cent of GDP), Europe (0.27 per cent of GDP) and Belgium (0.21 per cent of GDP). After the burst, activity dropped to about 0.10-0.20 per cent of GDP with a small European revival in 2006. From 2007, the credit crunch resulted in a lower level of VC investment activity. VC is relatively more important in the US compared with Europe and Belgium, but Belgian VC investment activity is quantitatively comparable with European VC investment activity. Furthermore, the VC investment activity consistently generates the same pattern over time on the various continents. Hence, Belgian VC competition as measured by VC investment activity is expected to develop similarly over time compared with European and US VC competition. Figure 1 suggests that Belgian VC competition increased significantly during the bubble years. After the burst, VC

competition dropped again but remained on average larger compared with the years before the bubble.

(ii) Sample

The sample includes 362 investment rounds in 180 different investee companies. The sample has three important advantages compared with previous VC valuation studies. First, previous studies mainly relied on commercial databases to collect data, such as VentureOne, Venture Economics or VentureXpert (Gompers and Lerner, 2000; and Cumming and Dai, 2011). While these databases allow for larger and broader samples, they give rise to 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 per cent (VentureOne) and 70 per cent (Venture Economics) of all financing rounds, leading to severe biases as firms self-select to voluntarily disclose this sensitive information. Furthermore, financing rounds with valuations are noisy with large average absolute errors (Kaplan et al., 2002). A second research strategy is to analyse samples from proprietary databases with rich, detailed and reliable information from one VC investor or fund-of-fund investor. The drawback of this approach, 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, VC firm annual reports and websites, press releases and information from the Belgian Venturing Association. Therefore, this dataset includes 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 thus includes successful as well as less successful unquoted firms, that is, firms that did an IPO, that failed, that were acquired or that are still private. This database thus eliminates any potential survivorship bias. Our dataset hence does not suffer from (self-)selection biases and contains highly reliable information on the variable of interest which is the valuation of VC backed companies.

Different sources of public information (press clippings, websites, annual reports of VC firms) combined with the commercial databases Zephyr and VentureXpert are consulted to identify 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 the entrepreneurial companies were younger than ten years to ensure a focus on pure VC investments (rather than including

more mature private equity investments). In addition to the initial investment rounds, all follow-on venture capital rounds are tracked in the Belgian Law Gazette to obtain a complete overview of all financing rounds until the first half of 2009. The value of an investment round is calculated on the basis of the total capital increase and the number of newly created shares as reported in the Belgian Law Gazette. The information provided by the Belgian Law Gazette further allows the unambiguous identification of all investors in each investment round. This research strategy 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; and 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 by 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, but the exclusion of outliers has no impact on reported results.

(iii) Variables

Table 1 presents sample descriptives grouped by VC firm type. When multiple VC firms invest in an investment round (156 out of 362 rounds), the investment round is assigned to the lead VC firm, i.e., the VC firm that invests the largest amount in a given round. This practice was adopted on the basis of the argument that the bargaining position of the lead investors will be more important than the bargaining position of co-VC investors during negotiations of the firm valuation with the entrepreneurial management team, as the lead investor typically negotiates the specifics of the transaction on behalf of the co-investors (Wright and Lockett, 2003; and Chahine and Goergen, 2011). To account for potential biases in the valuations of syndicated investment rounds, however, the empirical analyses are performed on both the full sample and the subsample of 206 investment rounds in which only one VC firm invests.

Insert Table 1 about here

Panel A 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 system. All VC firm types mainly invest in three industries

(in decreasing order of importance): 'Computer and Consumer Electronics', 'Life Sciences' and 'Business and Industrial Products'. University VC firms invest most in 'Life Sciences' and the other VC types in 'Computer and Consumer Electronics'.

Panel B shows the number of investment rounds for different types of lead VC firms over different time periods. For conventional reasons, we distinguish between the pre-bubble, bubble and post-bubble periods. In the pre-bubble period, there are no university VC firms as lead VC investors in our sample. The nascent Belgian VC industry at that time was mainly represented by independent, captive and government VC firms. During the bubble period the VC industry grew rapidly, mainly giving rise to new independent VC firms and university VC firms, with independent VC firms becoming the dominant type of VC firm in Belgium, leading a larger fraction of investments.

Panel C describes investee firm characteristics. The first variable is a dummy variable that equals one if the firm has at least one patent application before the investment round and zero otherwise (Lerner, 1994). Patent information is retrieved from the official European Patent Office (EPO) organisation. Interestingly, firms backed by a university (17 per cent) or government VC firm (11 per cent) have fewer patent applications compared with firms backed by a captive or independent VC firm (28 per cent). 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 one if the firm is active in a high-tech industry. Firms with NACE codes 24 (chemicals), 29-35 (high-tech materials), 64 (telecommunication), 72 (computer related) and 73 (biotech) are identified as high-tech firms. High-tech firms are mainly funded by university VC firms and independent VC firms, representing 80 per cent and 60 per cent of their investments, respectively. Non-high-tech firms are mainly funded by government VC firms, which invest 64 per cent of their funds in non-high-tech companies. Firm growth is proxied by the growth in personnel expenses over one year before the investment relative to two years before the investment (Puri and Zarutskie, 2011). This information is only available for firms that were at least two years old at the time of the investment round. Personnel expenses are retrieved from the financial accounts provided by the National Bank of Belgium. Growth is close to zero for portfolio companies of government VC firms, while the portfolio companies of other VC firm types present similar levels of growth in personnel expenses. Finally, the amount of initial VC financing is retrieved from the Belgian Law Gazette. The median VC investment is highest for captive VC firms (€ 550,000); independent VC firms invest around € 450,000, university VC firms €

360,000 and government VC firms € 275,000. Taken together, Panel C suggests that government VC firms are more likely to invest in older companies and less likely to invest in fast-growing high technology companies.

Panel D shows the legal status of VC portfolio companies in 2009. Most portfolio firms are still private for all types of VC firms, with percentages varying between 42 per cent (captive VC firms) and 68 per cent (university VC firms). Next, failures and voluntary liquidations represent between 16 per cent (university VC firms) and 38 per cent (captive VC firms) of the portfolio companies. Between 4 per cent (captive VC firms) and 12 per cent (independent VC firms) of the portfolio companies are acquired. The proportion of IPOs is highest for captive VC portfolio companies (15 per cent) and lowest for university VC portfolio companies (5 per cent). Overall, Panel D shows that our sample does not suffer from survivorship bias.

4. ANALYSES AND RESULTS

This section starts with a brief discussion of the bivariate analyses related to the main variable of interest, the premoney valuation. Thereafter, variables used in the multivariate analyses are defined and discussed. As the results might suffer from endogeneity problems, special attention is paid to potential selection effects. Finally, robustness tests are presented and potential alternative explanations discussed.

(i) Bivariate analyses

Table 2 presents detailed summary statistics of mean and median premoney valuations according to VC type, highlighting significant differences with independent VC firms. Panel A reports the overall premoney valuations according to VC firm type. Valuations of university VC firms and government VC firms are significantly lower (< 0.01) than those of independent VC firms. The median premoney valuation of firms backed by independent VC firms is € 2.3 million, of firms backed by university VC firms € 828,000 and of firms backed by government VC firms € 700,000. Firms backed by captive VC firms have the highest valuations (median value of € 4.3 million), but this value is not significantly different from that of independent VC firms.

Insert Table 2 about here

Panel B reports the mean and median premoney values according to VC firm type for each investment round. Investee firms receive lower valuations from a captive VC firm in an initial investment round compared with independent VC firms, but captive VC firms value their investee firms significantly higher for all third and later rounds. University VC firms value their investee companies significantly lower than independent VC firms in second and third rounds, while government VC firms value their investee firms lower in the first and second investment rounds. These differences are statistically significant and economically large compared with the valuations of independent VC firms.

Panel C reports premoney valuations within different time periods. Valuations in the pre-bubble period were lower than in the bubble period for all VC firm types. During the bubble years from 1999 to 2001, stock prices increased rapidly and VC valuations were inflated. Interestingly, valuations remain equally high in the post-bubble period. Firms backed by captive VC firms report lower valuations compared with independent VC firms in the pre-bubble period and higher valuations in the post-bubble period. Valuations by university and government VC firms are significantly lower in each period compared with those of independent VC firms.

Panel D compares valuations between VC firms differentiating between standalone and syndicated investment rounds. Valuations in syndicated investment rounds are higher for all types of lead investors compared with valuations in standalone investment rounds. Interestingly, captive VC firms value firms lower compared with independent VC firms when they invest alone but higher when they invest as the lead investor in a syndicated deal. University and government VC firms always report lower valuations compared with independent VC firms.

Panel E reports premoney valuations according to VC type and industry. Captive VC firms value biotech and pharmaceutical firms ('Life Sciences' industry) higher compared with independent VC firms. University VC firms report significantly lower valuations for the 'Computer and Electronics' industry and the 'Life Sciences' industry, while government VC firms report lower values relative to independent VC firms for the 'Computer and Electronics' industry. In some industries, the low number of observations may mask significant differences in valuation.

Taken together, Table 2 shows that university and government VC firms value firms lower compared with independent VC firms. These differences are both statistically and economically significant, consistent with the predictions of Hypotheses 2 and 3. The differences between the valuations of captive and independent VC firms are smaller and less consistent.

(ii) Variables used in the multivariate analyses

The independent variable is the type of lead VC firm. Dummy variables are included for captive, university and government VC firms. Independent VC firms are the base category and hence excluded. In syndicated deals only the firm type of the lead VC investor is included.

Investee firm variables that may determine valuation are included as control variables. Four variables are included to proxy for investee 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 because of the non-availability of these data for startups.

Lagged financial statement variables are also included, as financial accounting information is informative and relevant in investors' valuation expectations, even in extreme settings, such as for Internet IPO firms during the high-tech bubble (Bhattacharya et al., 2010). These variables are recorded 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) and ten investment rounds report no previous accounting information. Consistent with Hand (2005), balance sheet data (cash assets, non-cash assets, intangible assets, accumulated gains or losses, long term debt) and income statement data (operating revenues and operating costs) are included.

Investment round variables are included as control variables. First, the investment round number is included, as investments in later rounds typically occur in more mature and hence more valuable companies (Hand, 2005). Furthermore, the number of investors or a syndication dummy variable are included in the analyses of the full sample, as syndication may lead to a better selection process (Brander et al., 2002; and Meuleman et al., 2009) and therefore potentially to higher values. We further control for investor characteristics. A dummy variable indicates whether the (lead) investor is non-Belgian. As most investors prefer to invest locally to reduce asymmetric information and moral hazard problems (Cumming and Dai, 2010; and Devigne et al., 2012), competition between local investors is expected to be higher. VC firms located in another country typically have more investment options and hence more bargaining power compared with local investors. Furthermore, cross-border investors are also likely to be more reputable investors (Cumming and Dai, 2010). Both arguments suggest that valuations may

[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 financing.

be lower for cross-border VC firms compared with local VC firms. Another proxy for VC reputation is the VC IPO market share (Nahata, 2008; Cumming and Dai, 2011; and Chahine and Goergen, 2011). We define the IPO market share of VC firm X at the time of investment as the proportion of Belgian IPO investments of VC firm X in the total number of Belgian VC backed IPOs over a period of five years preceding the investment. This information is collected from all Belgian IPO prospectuses between 1983 and 2008. Following Cumming and Dai (2011), an inverse U-shaped relationship between VC IPO market share and valuations is expected. We also control for VC firm size as Cumming and Dai (2011) report a convex relationship between VC fund size and valuations. VC firm size is measured as the inflation-adjusted cumulative amount of capital managed by the VC firm in VC funds that are less than ten years old. This information is available in VentureXpert. For VC firms without a closed-end fund structure, VC firm size is identified from the EVCA directories as the inflation-adjusted market value of all portfolio firms at the time of investment. To control for changes in the macro-economic environment, the inflation-adjusted inflow of capital in the venture capital industry in the year before the investment (following Gompers and Lerner, 2000) and the Belgian Industry Index as a capital market index are included, suggesting that private valuations follow public valuations. We explicitly control for the inflow of capital to exclude the potential macro-level impact of cyclical movements in the VC industry on the VCs bargaining position (Inderst and Mueller, 2004).[2] Finally, we add a pre-bubble dummy variable in our regression model to control for the lower valuations during the pre-bubble years.

Insert Table 3 about here

Pearson correlation coefficients (reported in Table 3) and Variance Inflation Factors (VIF) for all regressors (unreported analyses) reveal no severe collinearity problems: the highest VIF is 4.8, far below the suggested threshold of ten (Gujarati, 2003). Premoney valuations are positively correlated with successful exits. Captive VC firms report higher valuations while university and government VC firms report lower valuations. Furthermore, premoney valuations are positively correlated with the number of patent applications, previous invested amount, cash and non-cash assets, operating revenues and costs, accumulated losses, intangible assets, round series,

[2]Although we acknowledge that the characteristics of the entrepreneur may affect the bargaining power (e.g., Cumming and Johan, 2008; and Han et al., 2009) and hence valuations, we unfortunately lack information on the entrepreneur and so we cannot take these considerations into account.

number of investors and cross-border VCs, reputable VCs and larger VCs. Pre-bubble valuations are lower compared with bubble and post-bubble premoney valuations.

(iii) Results of the multivariate regressions

To test the hypotheses in a multivariate regression framework, 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).

Table 4 presents the results of the multivariate regressions with standard errors clustered on the investee firm level (Petersen, 2009). The dependent variable is the log-transformed premoney value. Model I and Model IV include only firm characteristics. Model II and Model V add dummy variables for VC firm type, with independent VC firms serving as the base category. Model III and Model VI include all explanatory variables. Given the loss of observations, the accounting variables are only included in the final models. To fairly control for the potential confounding impact of non-lead investors in syndicated deals, especially when investor type differs between lead and other VC investors, we repeat all multivariate analyses for a subsample of 206 standalone investment rounds and report them in Model IV-VI. In standalone investment rounds the lead VC investor can be unequivocally determined as there is only one investor.

Insert Table 4 about here

A later investment round (< 0.01 in Models I-II), a cross-border VC investor (<0.01 in Model IV) and a higher inflow of capital in the VC industry the year before the investment (<0.05 or <0.10) are associated with significantly higher valuations in all models except Model VI. VC reputation proxied by IPO Market Share shows the anticipated inverted U-shape relationship with valuation in Model IV. The effects are also economically significant. Valuation increases approximately 130 per cent with each investment round. Cross-border VC investors value investee firms at least 61 per cent (Model II) higher compared with Belgian VC investors, all else remaining equal. If the inflow of capital increases by 10 per cent the year before the investment then valuations increase between 2 and 3 per cent. The significant impact of the inflow of capital in the VC industry is in line with Gompers and Lerner (2000): higher competition between VC

firms leads to increased valuations. In Model IV, a one per cent increase in VC reputation first increases valuations by 5 per cent. More reputable VC investors select better and hence more valuable companies. Consistent with Cumming and Dai (2011) and Hsu (2004), we find that beyond a certain threshold, highly reputable VC investors exploit their higher bargaining power and invest at lower prices. We then find a 3.7 per cent discount per one per cent increase in VC reputation. The value in syndicated investment rounds is not significantly higher, changes in the Belgian stock market index are not associated with changes in private firm valuations and pre-bubble valuations are not significantly lower compared with bubble and post-bubble valuations, controlling for other factors. Furthermore, the coefficients of cash assets and non-cash assets (Model III and Model VI) are significantly positive (< 0.01), while the coefficient of intangible fixed assets is marginally significantly negative (< 0.10). These results are broadly consistent with previous research (Hand, 2005; and Armstrong et al., 2006), but these effects are small. Ten per cent more cash leads to valuations that are 0.8 per cent higher[3]. Ten per cent more non-cash assets leads to valuations that are 4 per cent higher, and 10 per cent more intangible assets lowers valuations by 0.3 per cent.

There is a significant increase in model fit moving from Model I to Model II (< 0.01) and moving from Model IV to Model V (< 0.10), indicating that VC investor type is an important determinant of premoney valuations regardless of whether they invest alone or in a syndicate. The first hypothesis proposes that captive VC firms value firms lower relative to independent VC firms, but no significant differences are found between the valuations of independent and captive VC firms. Hypothesis 1 is hence not supported. The second hypothesis proposes that university VC firms value firms lower relative to independent VC firms. The coefficient is negative and significant in all Models (< 0.05), providing support for the second hypothesis. The premoney value of an average company, backed by a university VC firm, is estimated as € 922,305, while the same company would have a premoney value of € 1,498,804 if backed by an independent VC firm. Hypothesis 3 proposes that government VC firms value firms lower relative to independent VC firms. All Models show a negative and significant coefficient for government VC firms (< 0.01 or < 0.05), supporting hypothesis 3. The premoney value of an average company, backed by a government VC firm, is estimated as € 888,044, while the same company would have a premoney value of € 1,202,067 if backed by an independent VC firm. 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

[3] Economic effects relate to the full model (Model III) unless otherwise specified.

driver of portfolio firm valuation and as adding this variable reduces the sample size, we prefer to focus on the previously reported models.

(iv) Potential impact of VC selection

The finding that university and government VC firms value their portfolio companies lower relative to independent VC firms may suffer from endogeneity problems. Following Eckhardt et al. (2006), the matching between a VC investor and the entrepreneur is a two-stage selection process where VC investors select entrepreneurial companies from a population of entrepreneurs that first selected themselves as candidates for VC financing. It is impossible to determine whether the selection bias occurs in the first stage or second stage of the selection process between the entrepreneur and the VC investor (Hellmann et al., 2008). What really matters in relation to the endogeneity concern 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: first, a Heckman two-stage approach is estimated, and second, a probit regression predicting the likelihood of a successful outcome of the investment is applied. The Heckman procedure is an ex-ante correction method while probit regressions are ex-post analyses analysing the outcome of the investment.

Heckman (1979) suggests a correction for potential endogeneity in two steps. A first regression, the selection equation, predicts the probability that university and government VC firms will invest. The empirical specification of the probit regression model includes explanatory variables that are expected to determine the investment likelihood of university and government VC firms. The inverse Mills ratio obtained from the first stage regression is incorporated as an additional regressor in the second stage log-linear regression to control for potential endogeneity. A significant coefficient of the inverse Mills ratio suggests that a selection bias exists in the sample. The results of the first step (selection regression) of the Heckman procedure are discussed in the following paragraphs.

Two probit regression specifications model the likelihood that university and government VC firms invest, including investee firm characteristics, investment round characteristics, VC firm characteristics and a time dummy variable. Two investee 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 few tangible assets. VC firms focusing on early stage (or mature) firms may therefore apply lower (or higher) valuations, all else remaining equal. Furthermore, 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 of survival. Bigus (2006) further argues that patents limit VC bargaining power in the venture financing process because the VC investor may otherwise steal the idea for his own purposes. Finally, a dummy variable indicating whether the firm is active in a high-tech industry is included. Compared with non-high-tech firms, high-tech firms have more growth potential over the long run but present a greater risk.

Two investment round characteristics are included in this analysis. VC firms may invite other VC firms to join the equity syndicate to ensure improved future access to more and better quality deals (Sorenson and Stuart, 2001). Having more investors involved in the investment decision is expected to improve the quality of the decision and thus to lower the risk. Therefore, the number of VC investors in the investment round is included as a variable. Furthermore, the amount invested in the current round (expressed in million euros) is included. 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 may forego interesting opportunities because of financing constraints (Brander et al., 2002), hence it is relevant to include the amount invested in the current round.

VC IPO Market Share as a proxy for VC reputation and VC firm size (expressed in billion euros) are added as VC firm characteristics. More reputable VC investors may attract better companies either because of improved screening mechanisms or because of the entrepreneurs' preference to be linked with reputable investors. VC firms with deeper pockets may have better access to better quality deals given that they reduce the risk for follow-on financing (Cumming and Dai, 2011). Finally, the pre-bubble dummy variable controls for the emerging nature of the VC industry.

Unreported results of the probit selection regressions show that university VC firms are more likely to invest in firms that receive first-time VC financing. University VC firms started with their investment activity in the bubble years and are on average smaller compared with other VC firms. Government VC firms are more likely to invest in a first investment round in older non-high-tech firms. Government VC firms further typically invest alone. They are larger relative to other VC firms and they invest more money in their companies. Finally, government VC firms were more likely to invest in the pre-bubble period.

Table 5 presents the results of the second stage of the Heckman procedure. 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. Models I and II report results for the full sample. Models III and IV report results for the subsample of investment rounds with one VC investor. Models II and IV include the financial statement control variables. Standard errors are clustered on the investee firm level (Petersen, 2009).

Insert Table 5 about here

The inverse Mills ratio for university VC firms is positive and significant in most models (< 0.01 in Models I and III), indicating that unobserved factors that determine whether a university VC firm will invest are positively related to the unobserved factors that determine valuation. The significant inverse Mills indicates that selection bias is present for this type of VC firm. For government VC firms, the inverse Mills ratio is only significant (<0.05) and negative in Model III, suggesting that no severe selection bias exists. After controlling for the selection effect, university VC firms (<0.05 or <0.10) and government VC firms (<0.05) still value firms lower than independent VC firms. The effects of the control variables are not affected by the inclusion of the inverse Mills ratio.

A second strategy to analyse the endogeneity problem is to study exit outcomes as a proxy for firm risk, acknowledging the impact of unobserved variables that may affect the risk of investee companies of different types of VC firms. An overall higher risk investment strategy may 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 higher 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. Furthermore, firms that are still private are considered 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 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 removed from the sample for this analysis. To reduce the potential misclassification of firms in successful and unsuccessful firms, the sample is limited to firms that received an initial VC investment before 2003. This limitation is consistent with the assumption of a typical holding period for a VC investor of six years and

therefore excludes 59 investment rounds in 30 firms. Given these restrictions and the ensuing reduction in sample size, we are unable to present results for the subsample of standalone investment rounds, as the resulting sample is too small.

Insert Table 6 about here

Table 6 shows the results of the probit regression models predicting the likelihood of successful investments. Model I includes only firm characteristics. Model II adds dummy variables for VC firm type, with independent VC firms as the base category. Model III includes all explanatory variables, including accounting variables. All standard errors are clustered on the investee firm level (Petersen, 2009). The results suggest that high-tech firms have a higher probability of being more successful (<0.05 or <0.10) compared with non-high-tech firms. Successful firms have more cash (<0.05). The probability of success also increases with a higher number of VC investors (<0.05 or <0.10). Finally, more successful investments are made when the Belgian economy is stronger (< 0.05). However, none of the investor type variables has a significant effect. Ex-post, there are on average neither more failures, liquidations or private firms with downrounds, nor IPOs, acquisitions or private firms with uprounds in the portfolio of captive, university or government VC firms compared with independent VC firms. Thus, there is no significant ex-post selection bias. Before the investment, a selection bias exists for university VC firms but the probability of success after the investment is not significantly different between different types of VC firms. Therefore, the observed differences in valuations between VC firm types are unlikely to be driven by selection bias.

(v) 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 absolute terms has no impact on the reported results. Third, IPO market share as a proxy for VC reputation was measured from the VentureXpert database as the market value of all companies taken public by the VC firm proportional to the market value of all VC backed companies over a period of five years before the investment (Cumming and Dai, 2011; and Nahata, 2008). The conclusions remain unaffected. Fourth, 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. Alternatively, rather than clustering standard errors on the VC firm level or portfolio firm level, Generalised Estimating Equations (G.E.E.) are used (Ballinger, 2004). G.E.E. are an extension of Generalised Linear Models in which the structure of the within-panel correlation can be modelled. 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. model has an impact on the reported results.

(vi) Alternative Explanations

Recent research has highlighted two phenomena in venture capital investing that could potentially explain our results: overvaluation (Cumming and Walz, 2010) and style drift (Cumming et al., 2009). We discuss both of these issues and relate them to our results. Overvaluation occurs when an investor pays a price that is higher than the economic value of an investment. In general, overvaluation is more prevalent when stock market conditions are weak and when investments are made during the company's early stage but are less prevalent in syndicated investments (Cumming and Walz, 2010). Our models control for these variables. Cumming and Walz (2010) further suggest that VC firm characteristics are also associated with overvaluation: VC firms tend to overvalue their investments when they have an incentive to signal their quality with higher valuations. We find that independent VC firms assign higher valuations compared with university and government VC firms. Independent VC firms are typically more reputable investors with more reputational capital at stake (Bottazzi et al., 2008) as they need to raise follow-on funds. Furthermore, the investment managers of independent VC firms are compensated with stronger profit-based incentives compared with government or university VC firms (Leleux and Surlemont, 2003). Both arguments suggest that independent VC firms have fewer incentives to overvalue investments compared with university or government VC firms, as overvaluation would hamper the future performance of the VC fund and subsequently their personal incentives and their ability to raise future funds. It is hence unlikely that overvaluation drives our results.

Second, some VC investment managers deviate from their initial stated investment preferences in a phenomenon termed 'style drift' (Cumming et al., 2009). Style drifting is typically associated with higher valuations and with a higher probability of an IPO, suggesting that investment managers only drift style for investments that are more likely to have favourable outcomes and hence are more valuable (Cumming et al., 2009). Style drift could thus account for

higher valuations in independent VC firms, as university and government VC investment managers often have strict investment policies. The former invest solely in university spin-offs while the latter are often prohibited to invest in companies that do not correspond to specific investment criteria. The greater freedom of independent VC firms to invest in companies outside their initial target segment could explain their relatively higher valuations. The impact of this phenomenon on valuations in our sample will be limited, however. If style drift were a frequent phenomenon among independent VC firms, independent VC firms would have a higher proportion of successful investments and exits. However, Table 6 shows that independent VC firms do not have more successful exits compared with university and government VC firms, nor do they invest more frequently in firms that eventually go public through an IPO (Table 1- Panel D).

5. DISCUSSION AND CONCLUSIONS

This paper studies how differences in VC firm type affect valuations in VC investment rounds. Utilising bargaining models (Kirilenko, 2001; Cable and Shane, 1997; and Fairchild, 2004), we argue that the relative bargaining power of the VC investor affects investee firm valuation. VC firm types with more bargaining power obtain higher equity stakes, or equivalently, value firms at a lower level compared with 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 when firm-specific and market characteristics are controlled for, university and government VC firms value firms at a lower level than independent VC firms. The valuations of captive VC firms are not significantly different from those of independent VC firms. The lower valuations of university VC firms are partially driven by the selection behaviour of the entrepreneur and/or VC investor. After controlling for selection bias, however, government and university VC firms still value firms lower compared with independent VC firms. The empirical results suggest that different types of VC investors shape different valuations in VC investment rounds.

The findings of this paper 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 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 that they have when investing in their spin-outs, our results do not suggest that they do so. This result may be because the major portion of their investments occurs in unrelated companies, in which they face the same competition as independent VC firms. The bivariate analyses indicate that captive VC firms value investee firms at a lower level compared with independent VC firms when they invest alone and at a higher level when they invest as the lead investor in syndicate rounds. The bivariate analyses may indicate that investments in unrelated companies have a higher probability of being syndicated, while captive investments have a higher probability of being standalone investments. A more fine-grained analysis of captive VC firm investments may help to understand their investment and valuation processes in greater detail.

Our findings are far from trivial, as there are various reasons 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; and Cumming and Dai, 2011). However, independent investors are in general more sophisticated and more reputable investors (Bottazzi et al., 2008; and Hirsch and Walz, 2012). Solely focusing on investor reputation as a determinant of valuation would therefore suggest that university and government VC firms have a 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 that are shielded from competition given their reason of existence, independent and captive VC firms may also consider alternative strategies to enhance their bargaining power in addition to building a strong reputation in the VC market. For example, building strong links with research institutions, intermediaries or potential VC syndicate partners may provide a first view on deal flow that is originated by or passes through these organisations. Reputation is difficult and takes time to develop; alternative bargaining power strategies may thus be especially important to enable 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; and 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.

Third, university and government VC firms are less well equipped to provide high level services to their portfolio companies compared with independent VC firms. The incentive schemes in the former are less geared towards active involvement (Hirsch and Walz, 2012; and Murray, 1998). Furthermore, given their lower level of expertise, it is even argued that it is optimal for university and government VC firms to remain rather inactive and limit their engagement to monitoring activities. As a result, these VC firms' contracts incorporate fewer mechanisms that induce active intervention (Hirsch and Walz, 2012). The lower levels of post-investment services provided by government and university VC firms make their funding less valuable, which would induce entrepreneurs to negotiate higher valuations. Our findings suggest that valuations are lower, however, again corroborating the bargaining power theory rather than the value-adding and reputation theories.

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; and Mayer et al., 2005). We further show that bargaining power in the VC industry is not determined only by a VC firm's reputation or by whether the firm is a local or cross-border investor, but also by its investment strategy. We also add to the finance literature by analysing determinants of the valuation of private companies that 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 important not only for VC firms but also for entrepreneurs. We highlight that enhancing negotiation power is key to maximising firm valuation. 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 that they may retain over their venture. Furthermore, entrepreneurs should understand that VC firms are not willing to accept higher valuations because they have other goals in addition to realising financial returns. Again, securing sufficient financing options is crucial for entrepreneurs to enhance bargaining power and ultimately firm value.

As with all research, this paper has 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 are excellent, which is often a serious concern for most other studies relying on commercial databases. Furthermore, the Belgian VC industry is likely to be comparable to those in other Continental European countries, supported by Figure 1 showing that the Belgian VC investment

activity developed similarly over time as compared with the European VC activity. Second, the Belgian VC industry 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. Therefore, 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 active and mature and are governed by a more investor-friendly institutional environment. In contrast, Asian markets are under development and their institutional environment is very different. VC valuation and negotiation processes may 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 in addition 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; and Cumming and Dai, 2011). Furthermore, we control for the significantly greater likelihood of larger VCs in Europe to implement sophisticated contractual terms, including liquidation preferences, anti-dilution protections, vesting provisions and redemption rights (Chahine et al., 2007).

The shortcomings discussed above suggest interesting avenues for future research. Furthermore, many questions remain related 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? Cumming and Johan (2008) find that more experienced entrepreneurs are more likely to get financed with common equity and less likely to receive preferred equity, suggesting that they have more bargaining power. 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.

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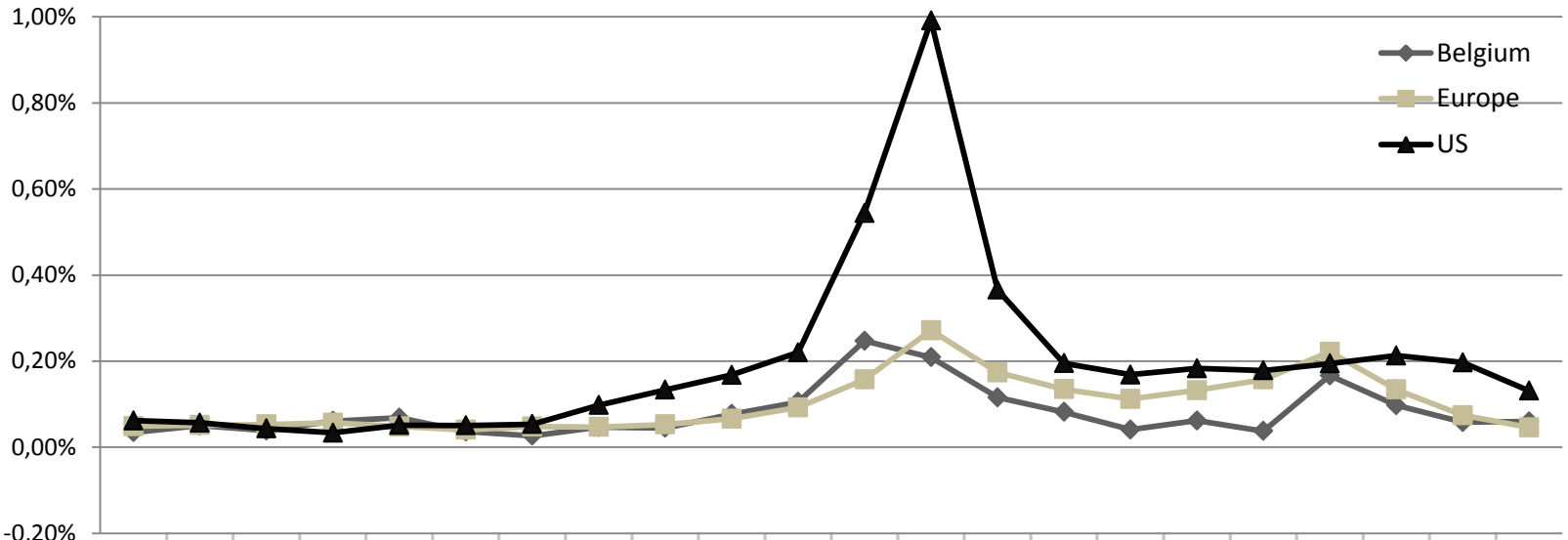
FIGURE 1

VC Investments as a % of GDP



	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Belgium	0,03%	0,05%	0,04%	0,06%	0,07%	0,04%	0,03%	0,05%	0,04%	0,08%	0,10%	0,25%	0,21%	0,12%	0,08%	0,04%	0,06%	0,04%	0,17%	0,10%	0,06%	0,06%
Europe	0,05%	0,05%	0,05%	0,06%	0,05%	0,04%	0,05%	0,05%	0,05%	0,07%	0,09%	0,16%	0,27%	0,17%	0,13%	0,11%	0,13%	0,16%	0,22%	0,13%	0,07%	0,05%
US	0,06%	0,06%	0,04%	0,03%	0,05%	0,05%	0,05%	0,10%	0,13%	0,17%	0,22%	0,54%	0,99%	0,37%	0,19%	0,17%	0,18%	0,18%	0,19%	0,21%	0,20%	0,13%

Notes:
Figure 1 presents yearly VC investments as a percentage of GDP for Belgium, Europe and the US. This figure is the result of our own calculations based on publicly available data. The official European Venture Capital and Private Equity Association (EVCA) Yearbooks report VC investments in Belgium and Europe and the US National Venture Capital Association Yearbook 2011 reports US VC investments. Belgian and European GDP figures are from the OESO website and US GDP figures are from the Bureau of Economic Analysis.

TABLE 1

Sample Description

	Captive VC		*University VC*		*Government VC*		*Independent VC*	
Panel A: Industry preference by VC firm type								
	N	*%*						
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%*
Total	**70**	*100.0%*	**24**	*100.0%*	**89**	*100.0%*	**179**	*100.0%*
Panel B: Investment timing by VC firm type								
Pre-bubble period	**20**	*28.6%*	**0**	*0.0%*	**44**	*49.4%*	**25**	*14.0%*
Bubble period	**23**	*32.9%*	**6**	*25.0%*	**21**	*23.6%*	**60**	*33.5%*
Post-bubble period	**27**	*38.6%*	**18**	*75.0%*	**24**	*27.0%*	**94**	*52.5%*
Total	**70**	*100.0%*	**24**	*100.0%*	**89**	*100.0%*	**179**	*100.0%*
Panel C: Investee firm characteristics by VC firm type								
Firms with patent applications (in %)	28.6%		16.7%		11.2%		27.4%	
Age (in years) at Series A	3.26		2.06		4.55		1.36	
High-tech firms (in %)	54.3%		79.2%		36.0%		60.3%	
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	
Total	**70**		**24**		**89**		**179**	
Panel D: Legal status by VC firm type								
	N	*%*						
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%*
Total	**66**	*100.0%*	**19**	*100.0%*	**82**	*100.0%*	**136**	*100.0%*

Notes:
Table 1 presents the investment characteristics of different types of (lead) VC firms. Panel A reports the industry preference of each VC firm type with industries categorised according to the EVCA (2007) sectoral classification. The number of observations (in absolute and relative terms) refers to the number of investment rounds in firms active in those sectors. Panel B shows the number of investment rounds for different VC types in different time periods. The pre-bubble period covers the years from 1988

to 1998, both included. The bubble period covers the years from 1999 to 2001. The post-bubble period includes all years after 2001. 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 proxied by the absolute growth in personnel expenses (in 1000 EUR) over one year before the investment (t-1) relative 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 labelled in the same category. Investee firms are restricted in panel D to those having a Series A financing round no later than 31/12/2002 and their legal status is representative of the period of data collection.

Table 2

Summary Statistics

	Captive VC			*University VC*			*Government VC*			*Independent VC*		
	N	*Mean*	*Median*	*N*	*Mean*	*Median*	*N*	*Mean*	*Median*	*N*	*Mean*	*Median*
Panel A: Premoney valuations by VC firm type												
N° of investment rounds	**70**	9,242	4,288	**24**	918**	828**	**89**	1,632**	695**	**179**	5,318	2,299
N° of different VCs	**17**			**5**			**7**			**46**		
Panel B: Premoney valuations by series												
Series A	**25**	1,930†	548†	**6**	798	963	**52**	1,327**	486**	**65**	2,062	1,250
Series B	**23**	6,236	4,321	**14**	868**	651**	**26**	1,412**	894**	**50**	3,880	2,763
Series C	**12**	9,316*	8,367*	**3**	1,205†	1,213†	**10**	3,428	4,084	**32**	4,467	3,479
Series D	**4**	17,947*	16,041*	**1**	1,491	1,491	**0**	/	/	**17**	6,827	2,881
Series ≥ E	**6**	45,273*	43,757*	**0**	/	/	**1**	5,216	5,216	**15**	24,326	12,904
Panel C: Premoney valuations by investment period												
Pre-bubble period	**20**	3,024†	509*	**0**	/	/	**44**	1,308**	505**	**25**	3,894	1,872
Bubble period	**23**	11,049	6,709	**6**	659**	601**	**21**	1,976**	860**	**60**	4,935	2,703
Post-bubble period	**27**	12,308**	4,613**	**18**	1,005*	855*	**24**	1,925†	902*	**94**	5,941	1,891
Panel D: Premoney valuations by number of investors												
Standalone rounds	**29**	5,792	655*	**16**	874**	808**	**74**	1,352**	553**	**87**	2,937	1,851
Syndicated rounds	**41**	11,681*	6,776*	**8**	1,007*	855**	**15**	3,016	1,800†	**92**	7,570	3,164
Panel E: Premoney valuations by industry												
Computer & Consumer Electronics	**25**	10,477	4,352	**9**	891**	1,075**	**28**	1,084**	664**	**92**	5,677	2,271
Life Sciences	**15**	14,409*	9,596*	**12**	653*	744*	**6**	2,689	2,864	**35**	5,659	1,872
Business & Industrial Products	**16**	5,719	1,215	**0**	/	/	**22**	1,874†	511	**6**	6,917	3,609
Chemicals & Materials	**3**	4,612	1,160	**3**	2,062	2,265	**8**	1,559*	1,288	**17**	5,718	4,034
Communications	**3**	9,650	4,810	**0**	/	/	**5**	3,806	1,008	**13**	3,141	3,409
Other	**8**	4,320	1,799	**0**	/	/	**20**	1,301*	553	**16**	3,253	2,059

Notes:

Table 2 presents summary statistics of premoney valuations according to different (lead) VC firm types and different round and investee characteristics. The number of observations refers in all panels to the number of investment rounds within each category. All mean and median values are inflation-adjusted (2008=100) and reported in thousands of euros. Panel A reports mean and median premoney valuations clustered by VC firm type. The number of investment rounds is reported together with the number of different VCs that belong to the same type of VC firm. Panel B reports mean and median premoney valuations broken down by investment round and VC firm type. Panel C reports valuations negotiated during three different time periods: the pre-bubble period, bubble period and post-bubble period. The pre-bubble period covers the years 1988-1998, both included. The bubble period covers the years from 1999 to 2001 during which stock prices increased rapidly. The post-bubble period includes all years after 2001. Panel D breaks premoney valuations down according to VC type and standalone versus syndicated investment rounds. Investment rounds where there is only one VC investor are classified as standalone rounds and rounds with more than one VC investor are classified as syndicated investment rounds. In all syndicated rounds, the type of lead VC investor is reported. Panel D reports different sectors in which the investee firms are classified. The industries are consistent with the EVCA (2007) sectoral

classification. **,*, and † denote values that are statistically different from those of independent VC firms at the 0.01, 0.05 and 0.10 levels, respectively.

TABLE 3

Correlation Matrix

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	Dependent variables																					
1	Premoney value																					
2	Successful exit	0.14*																				
	Type of VC firm																					
3	Captive VC	0.22**	-0.05																			
4	University VC	-0.11*	0.10	-0.13*																		
5	Government VC	-0.19**	0.02	-0.28**	-0.15**																	
6	Independent VC	0.05	-0.02	-0.48**	-0.26**	-0.57**																
	Firm Characteristics																					
7	N° of patent apps.	0.42**	0.15*	0.04	-0.02	-0.09	0.05															
8	Age (in years)	0.07	-0.02	0.08	-0.03	0.19**	-0.22**	0.04														
9	High-tech	0.06	0.20**	-0.00	0.13*	-0.21**	0.12*	0.19**	-0.06													
10	Previous investment	0.75**	0.08	0.13*	-0.09	-0.17**	0.08	0.38**	0.12*	0.03												
	Financial Statement Variables																					
11	Cash Assets	0.77**	0.19**	0.16**	-0.06	-0.17**	0.05	0.48**	-0.06	0.12*	0.66**											
12	Non-Cash Assets	0.32**	0.06	0.09	-0.08	0.08	-0.10	0.04	0.23**	-0.13*	0.34**	0.20**										
13	Long Term Debt	-0.00	0.10	0.23**	-0.07	-0.05	-0.10	-0.00	0.16**	-0.16**	-0.04	-0.02	0.30**									
14	Operating Revenues	0.17**	0.06	0.20**	-0.07	-0.02	-0.11	0.03	0.30**	-0.09	0.11	0.07	0.58**	0.47**								
15	Operating Costs	0.42**	0.08	0.25**	-0.10	-0.11	-0.06	0.26**	0.20**	-0.04	0.39**	0.35**	0.57**	0.41**	0.91**							
16	Accum. Gains/Loss	-0.71**	-0.04	-0.13*	0.07	0.21**	-0.12*	-0.53**	0.04	-0.07	-0.82**	-0.63**	-0.17**	0.06	-0.05	-0.39**						
17	Intangible Assets	0.35**	-0.03	0.12*	0.03	-0.16**	0.03	0.36**	0.05	0.15*	0.45**	0.27**	0.15*	-0.00	0.08	0.22**	-0.47**					

TABLE 3 (CONTINUED)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	Control Variables																					
18	Series	0.60**	0.07	0.06	-0.03	-0.24**	0.17**	0.44**	0.23**	0.15**	0.71**	0.43**	0.23**	-0.01	0.11	0.31**	-0.65**	0.50**				
19	Number of investors	0.52**	0.17**	0.15**	-0.07	-0.27**	0.15**	0.45**	-0.08	0.12*	0.56**	0.53**	0.13*	-0.05	0.01	0.27**	-0.61**	0.32**	0.48**			
20	Syndication	0.27**	0.06	0.15**	-0.05	-0.30**	0.17**	0.25**	-0.08	0.17**	0.31**	0.28**	0.07	0.05	0.01	0.16**	-0.34**	0.29**	0.35**	0.75**		
21	Cross-border VC	0.21**	0.13*	0.04	-0.08	-0.17**	0.16**	0.10	-0.05	0.05	0.25**	0.19**	-0.03	-0.07	0.00	0.11	-0.28**	0.05	0.20**	0.33**	0.26**	
22	IPO Market Share	0.16**	0.06	-0.04	-0.07	0.01	0.06	0.04	-0.07	0.14**	0.13*	0.18**	0.16**	0.01	0.01	0.10	-0.16**	0.09	0.08	0.16**	0.13*	-0.06
23	VC Firm Size	0.38**	-0.05	0.18**	-0.11*	0.07	-0.14**	0.09	0.05	-0.01	0.32**	0.26**	0.12	-0.04	0.09	0.19**	-0.30**	0.18**	0.21**	0.17**	0.10*	0.26*
24	Inflow of capital	0.04	-0.15*	0.03	0.01	-0.14*	0.08	-0.09	-0.12*	-0.03	-0.06	-0.03	-0.05	0.04	0.00	-0.00	0.05	0.04	-0.01	-0.07	-0.03	0.03
25	Belgian Ind. Index	0.10	0.27**	0.04	0.23**	-0.17**	-0.00	0.41**	-0.00	0.24**	0.06	0.23**	-0.05	-0.07	-0.09	-0.02	-0.11	0.15*	0.11*	0.23**	0.19**	0.06
26	Pre-Bubble	-0.15**	-0.05	0.05	-0.15**	0.33**	-0.24**	-0.17**	0.09	-0.06	-0.20**	-0.16**	-0.10	0.06	0.03	-0.07	0.25**	-0.21**	-0.33**	-0.23**	-0.24**	-0.07

		22	23	24	25
23	VC Firm Size	0.19**			
24	Inflow of capital	-0.06	0.09		
25	Belgian Ind. Index	-0.02	-0.08	0.02	
26	Pre-Bubble	0.12*	-0.01	-0.43**	-0.20**

Notes:

Table 3 provides a Pearson correlation matrix of the main dependent and independent variables used in the regression analysis. ** and * denote significance at the 0.01 and 0.05 levels, respectively, (2-tailed). Premoney valuations are reported in thousands of euros; successful exit is a dummy variable equal to 1 for all investee firms that went public or were acquired and private firms with persistent uprounds, and zero otherwise.

The VC firm type variables are dummy variables equal to one if that type of VC was the lead investor in a certain round of investment. The high-tech dummy variable is equal to one if the firm is active in the high-tech industry and zero otherwise; all other firm characteristics (patent applications, age and amount invested) are continuous variables. The amount invested in previous rounds is expressed in millions of euros like all financial statement variables. Syndication is a dummy control variable equal to one if the investment round was syndicated and zero otherwise, and cross-border VC is a dummy variable equal to one for non-Belgian VC investors. IPO market share is the cumulative number of IPO investments by the VC five years before the investment divided by the total number of VC backed IPOs over the same period. VC firm size is expressed in millions of euros and the inflow of capital in the VC industry is expressed in hundred millions of euros. The pre-bubble period covers the years from 1988 to 1998, both included.

TABLE 4

Multivariate OLS Regression Model Explaining Premoney Valuations

		Full sample			*Standalone investment rounds*		
	Exp. Sign	*Model I*	*Model II*	*Model III*	*Model IV*	*Model V*	*Model VI*
Constant		7.428 **	7.821 **	2.821	7.573 *	7.787 *	4.413
Type of VC firm (dummy)							
Captive VC	-		0.247	0.048		-0.202	-0.609
University VC	-		-0.636 *	-0.626 *		-0.755 *	-0.899 *
Government VC	-		-0.572 *	-0.717 **		-0.676 *	-0.876 *
Firm Characteristics							
Ln (1+ n° of patent applications)	+	0.212	0.204	0.242	0.261	0.257	-0.149
Ln (1+ Age) (in years)	+	-0.167	-0.116	-0.131	-0.037	0.033	0.031
High-tech (dummy)	+	-0.199	-0.222	0.051	-0.213	-0.284	-0.036
Ln (1+ Amount invested in previous rounds)	+	0.049 *	0.042 *	0.030	0.033	0.027	0.017
Financial Statement Variables							
Ln (1+ Cash Assets)	+			0.084 **			0.100 **
Ln (1+ Non-Cash Assets)	+			0.449 **			0.416 **
Ln (1+ Long Term Debt)	-			-0.022			-0.026
Ln (1+ Operating Revenues)	+			-0.006			-0.020
Ln (1+ Operating Costs)	-			-0.086			-0.025
Ln (1+ Accumulated Gains/Losses)	+			-0.001			0.005
Ln (1+ Intangible Fixed Assets)	+			-0.034 †			-0.038 †
Control Variables							
Ln (1+ Series)	+	1.237 **	1.284 **	0.767 †	0.762	0.833	0.799
Syndication (dummy)	+	0.206	0.058	-0.021			
Cross-border VC(dummy)	-	0.830 *	0.610 †	0.661 *	1.119 **	0.756 †	0.105
VC IPO Market Share	+	1.949	0.576	1.792	5.373 **	2.930	-2.694
VC IPO Market Share squared	-	-0.031	1.712	-1.861	-3.732 †	-1.232	9.578
Ln (1+ VC Firm Size)	-	-0.135	0.125	0.088	-0.769	-0.086	0.167

Ln (1+ VC Firm Size) squared	+	0.055	0.007	0.016	0.140 †	0.049	0.015
Ln (1+ Inflow of capital)	+	0.253 *	0.236 *	0.252 †	0.289 *	0.277 †	0.180
Ln (1+ Belgian Industry Index)	+	0.033	0.044	0.042	-0.023	0.002	-0.014
Pre-Bubble (dummy)	-	0.130	0.118	0.241	-0.185	-0.165	-0.050
N° of observations		**362**	**362**	**275**	**206**	**206**	**154**
N° of firms		**180**	**180**	**153**	**135**	**135**	**108**
Adjusted R^2		32.8%	35.2%	48.3%	24.7%	27.1%	41.2%
F-statistic		52.0	34.0	25.4	200.8	155.4	104.2
p-value (F-statistic)		0.000	0.000	0.000	0.000	0.000	0.000

Notes:

Table 4 reports the results from log-linear OLS regressions of premoney valuations on VC investor dummies, investee firm characteristics, financial statement variables and control variables. The first three models (Models I-III) present the results for the full sample including 362 standalone and syndicated investment rounds. Models IV-VI present the results for the subsample of 206 investment rounds with only one VC investor. All standard errors are clustered on the investee firm level. **,*, and † denote significance at the 0.01, 0.05, and 0.10 levels, respectively. Captive VCs, government VCs and university VCs are expected to value private firms at at lower level compared with 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. High-tech is a dummy variable equal to 1 if the firm is active in the high-tech industry and 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; Long Term Debt and Operating Costs a negative sign. Several control variables are included: the investment round (a), a syndication dummy variable (b), a cross-border dummy variable (c), IPO market share (d), VC firm size (e), the inflow of capital in the venture capital industry the year before the investment (t-1) (f), the Belgian Industry Index as a capital market index (g) and a Pre-Bubble Dummy variable. The Pre-Bubble variable is equal to one in the investment years before 1999 and zero otherwise. Syndicated investors have a better selection process (Brander et al., 2002), therefore higher valuations are expected from syndicated investment rounds. Cross-border VC investors may have more bargaining power compared with domestic VC investors leading to lower valuations. Cumming and Dai (2011) report a concave relationship between IPO market share and valuations and a convex relationship between VC fund size and premoney valuations. 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. In the pre-bubble years, the Belgian VC industry was nascent and mainly dominated by captive and government VC firms, potentially leading to more bargaining power for those VC firm types in the pre-bubble years relative to the bubble and post-bubble years.

TABLE 5

Multivariate OLS Regression Controlling for Potential Selection Bias

	Exp. Sign	Full sample		Standalone investment rounds	
		Model I	*Model II*	*Model III*	*Model IV*
Constant		8.271 **	4.070	8.638 **	5.501
Type of VC firm (dummy)					
Captive VC	-	0.012	-0.104	-0.273	-0.664
University VC	-	-0.540 *	-0.588 †	-0.703 *	-0.889 *
Government VC	-	-0.678 *	-0.649 *	-0.798 *	-0.891 *
Firm Characteristics					
Ln (1+ n° of patent applications)	+	0.142	0.197	-0.016	-0.309
Ln (1+ Age) (in years)	+	-0.120	-0.089	-0.242	-0.173
High-tech (dummy)	+	0.282	0.222	1.057 †	0.786
Ln (1+ Amount invested in previous rounds)	+	0.045 *	0.032	0.015	0.012
Financial Statement Variables					
Ln (1+ Cash Assets)	+		0.082 **		0.098 **
Ln (1+ Non-Cash Assets)	+		0.384 **		0.370 **
Ln (1+ Long Term Debt)	-		-0.011		-0.019
Ln (1+ Operating Revenues)	+		-0.004		-0.020
Ln (1+ Operating Costs)	-		-0.081		-0.001
Ln (1+ Accumulated Gains/Losses)	+		-0.001		0.005
Ln (1+ Intangible Fixed Assets)	+		-0.032 †		-0.037
Control Variables					
Ln (1+ Series)	+	0.465	0.352	0.714	0.649
Syndication (dummy)	+	0.128	-0.073		
Cross-border VC (dummy)	-	0.400	0.584 *	0.452	-0.003
VC IPO Market Share	+	4.421 *	4.229	9.198 **	1.083
VC IPO Market Share squared	-	1.311	-2.888	-1.044	10.490
Ln (1+ VC Firm Size)	-	-1.196 **	-0.650	-2.088 **	-1.327
Ln (1+ VC Firm Size) squared	+	-0.017 *	-0.004	-0.020	-0.007
Ln (1+ Inflow of capital)	+	0.232 *	0.223 †	0.304 *	0.186
Ln (1+ Belgian Industry Index)	+	0.039	0.047	-0.013	-0.009
Pre-Bubble (dummy)	-	-0.127	0.167	-1.024 †	-0.611
Inverse Mills ratio University VC		0.675 **	0.332 †	1.116 **	0.693
Inverse Mills ratio Government VC		-0.435	-0.084	-1.969 *	-1.231
N° of observations		**349**	**263**	**205**	**153**
N° of firms		**179**	**152**	**134**	**107**
Adjusted R^2		36.7%	46.2%	26.6%	38.1%
F-statistic		19.1	20.5	12.2	10.5
p-value (F-statistic)		0.000	0.000	0.000	0.000

Notes:
Table 5 shows the results of the second stage of the Heckman correction procedure. Models I and II present the results for the full sample including both standalone and syndicated investment rounds. Models III and IV present the results for the subsample of investment rounds with only one VC investor. All standard errors are clustered on the investee firm level. **,*, and † denote significance at the 0.01,

0.05, 0.10 levels, respectively. 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 a significant selection bias exists.

TABLE 6

Probit Regression Modelling on Successful Firms

	Model I	*Model II*	*Model III*
Constant	-0.595	-0.741	-0.868
Type of VC firm (dummy)			
Captive VC		-0.076	-0.179
University VC		0.312	0.472
Government VC		0.477	0.244
Firm Characteristics			
Number of patent applications	0.058	0.054	0.121
Age (in years)	0.018	0.011	0.014
High-tech (dummy)	0.421	0.476 †	0.686 *
Amount invested in previous rounds (in mil euros)	0.012	0.016	-0.026
Financial Statement Variables (in mil euros)			
Cash Assets			0.676 *
Non-Cash Assets			0.017
Long Term Debt			0.255
Operating Revenues			0.225
Operating Costs			-0.246
Accumulated Gains/Losses			-0.043
Intangible Fixed Assets			-0.604
Control Variables			
Series	-0.158	-0.165	-0.173
Number of investors	0.155 †	0.195 *	0.224 †
Cross-border VC(dummy)	0.467	0.648	0.474
VC IPO Market Share	0.945	1.104	0.809
VC Firm Size (in bil euros)	-0.239	-0.372	-0.381
Inflow of capital (in 100 mil euros)	-0.033	-0.031	-0.009
Belgian Industry Index	0.164 *	0.160 *	0.065
Pre-Bubble (dummy)	-0.006	-0.071	-0.022
N° of observations	**228**	**228**	**173**
N° of firms	**109**	**109**	**92**
Adjusted R^2	12.6%	14.1%	18.3%
χ^2-statistic	23.2	28.9	30.6
p-value (χ^2-statistic)	0.026	0.016	0.105

Notes:
Table 6 reports the probit regression models that predict the likelihood of a successful outcome for investee firms. All standard errors are clustered on the firm level. **, * , and † denote significance at the 0.01, 0.05, and 0.10 levels, respectively. The dependent variable is a dummy variable equal to 1 for all investee firms that went public or were acquired and private firms with persistent uprounds, and zero otherwise. Private firms with only one investment round or with both up-and downrounds are excluded from this analysis. Firms with an initial (Series A) investment round after 2002 are excluded from the analysis. Cumulative invested amount in earlier rounds (in millions of euros), financial statement variables, the inflow of capital (in 100 millions of euros) and VC firm size (in billions of euros) are inflation-adjusted (2008=100). The VC firm type variables are all dummy variables, and none of these coefficients is expected to be significant in the absence of a sample selection bias ex-post.