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THE ESSENTIAL ROLE OF VENTURE CAPITAL

The determinants of formal and informal venture capital presence in Swedish entrepreneurial firms at the point of IPO, and investor characteristics

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ABSTRACT

This paper attempts to analyze the determining factors of formal and informal venture capital (VC) in entrepreneurial firms going public in Sweden between the years 1994 and 2005. Further is described each investor type's ex-post investment characteristics; the exit behavior of informal and formal VC. In addition, we examine – and confirm – the complementary between these investors. We find VC investments in IPO-firms to be functions of firm size, firm age, and we find evidence of sector biases. Firms with no VC compared to firms with VC take longer time to be introduced on the equity markets and are remarkably smaller in terms of equity size. VCs board representation is found to increase with firm size and with diminishing asset tangibility, and informal VCs result more represented on the board than formal. We also find indications of small firms more frequently having lock-ups of venture capital, as VCs exits are unusually low in these at the IPO. Venture capital is concluded to be vital for entrepreneurial firms to get relatively well-funded and fast at entering stock markets.

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KEY WORDS
Business angels; Venture Capital; Early-stage investments; Investment preferences

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1 INTRODUCTION AND DEFINITIONS

Venture capital (VC) and its importance to entrepreneurial firms have gained increased attention of researchers and politicians since the late 1970s. In the US and UK the recognition of the informal part of the VC market, as mainly represented by so called business angels, has reached far the last decade, but the studying of this important investor group is still limited and often performed based on the investors perspective, through interviews and qualitative analysis. In this paper we intend to contribute to the field by conducting a quantitative research on the behavior of investors.

The importance of entrepreneurial firms has recently been underlined by the European Commission (1998), with a special emphasis on the financing of these firms. Entrepreneurs are now recognized for their role in driving economic growth and job creation, particularly for the mature markets of the West European countries. In the same process, policy makers and researchers focus on the crucial role that venture capital has for the creation and expansion of these firms at an early-stage (European Commission, 1998). In this paper, we aim to explore the factors determining the presence of venture capital in new firms, with emphasis on the high potential firms that manage to get listed on stock exchanges in Sweden during 1994 and 2005. An attempt is done to build a model reflecting how investor behavior is affected by the firm's size, age, sector, and also macroeconomic factors external to the firm, where the latter is represented by the time period when the firm was listed. Certain characteristics of the investors are also explored, with the purpose to extend the modest amount of present research on the Swedish venture capital market. A unique dataset has been collected for the purpose with information spanning over 71 prospectuses from firms doing an initial public offering (IPO) during the chosen time period.

The listing occasion is an important exit opportunity for investors in entrepreneurial firms – enterprises that are strong creators of economical growth and that account for a substantial part of all net new jobs (Wetzel, 1996; Birch, Haggerny, Parsons and Rossel, 1993; Storey, 1994). For policy issues, understanding the underlying mechanisms that drive VC presence in these firms is important.

We contribute to this with our study, encompassing 289 formal and informal venture capital investments in 71 Swedish companies listed between 1994 and 2005, where the formal VCs are mainly represented by venture capital funds and the informal VCs by private investors, or so called business angels. The lack of digital archive over Swedish venture capital investments turns any research in this field challenging. For the purpose of understanding the characteristics and behavior of venture capitalists, we thus collected an exclusive set of data from issued prospectuses from listed companies in Sweden, with 154 investments performed by informal venture capitalists and 135 by formal. Each prospectus contains an immense amount of information that each firm is required to disclose in order to go public, hence providing us an excellent opportunity to study the characteristics of venture capital for the most innovative companies.

The time period studied surrounds and gives focus to the IT boom at the end of the 1990s. The four proceeding and the four succeeding years are included in order to study a whole cycle of 12 years, where the crescendo of the IT boom has been identified as the years 1998 to 2001. The research thus encompasses macroeconomic changes' affects on the venture capital market as well as venture capital cycle theories (Gompers and Lerner, 1999; Bhide, 1992). Further, the limitation of the data collection to a static point in time, the IPO, offers both the possibility to describe the actual situation of companies and their investors at that event, and singles out the companies that have been successful enough to go public.

The first part of this paper explores the determinants of venture capital presence in the firms, where we find that venture capital seem to be a crucial reason for entrepreneurial firms to prosper. The firms with access to both formal and informal VC were at the point of IPO almost four times as big as firms with no access to venture capital, when size is measured by common equity available to the firm. The firms with no VC are also the firms that struggle the longest time to get listed, taking on average 36 percent longer time to get there in comparison with the whole sample, with respect to the time passing from firm foundation to the point of IPO. The finding of VC's decreasing effect on firm age and increasing effect on firm size at the point of IPO, confirms previous findings on venture capital stimulating start-ups to enter stock markets more rapidly and less underpriced by providing them with expert advice as well as with strict incentives to perform (Barry et al., 1990; Sahlman, 1990, Lerner, 1994b, Kaplan and Stromberg, 2000).

In accordance with theories on a cyclical feature of formal venture capital, we find a somewhat recurring pattern in graphs and descriptive analysis of the sample. However, regression analysis cannot confirm a cyclic aspect of neither formal nor informal investors. Indications show that it seemed more difficult to bring firms to IPO without risk capital before the IT market hit the ceiling in the end of the 1990s.

We also find proof of sector bias as a determinant of VC presence: IT and healthcare are found to be the sectors that VC particularly focuses on.

Finally, it was found that informal and formal VC tends to be complementary, with high rates of coexistence in the same firms. Informal investments are on average 13 percent of the share capital in the sample, while formal investments display an expectedly higher percentage with 22 percent.

The second, more descriptive, part of the paper evolves around post-investment behavior. Building on Sahlman (1990), and Kaplan and Stromberg (2002), we model the relationship between the entrepreneur and the VC as a double-sided incentive problem: A greater fraction of the firm owned by the VC improves the VCs' incentives, but weakens the entrepreneur's, in line with Jensen & Meckling's (1976) agency theory. Efficiency requires balancing the incentives, or rather, the ownership shares. Looking at board representation from an agency-principal perspective, we find

proof for an increase of VC representation on the board with mounting firm size and diminishing asset tangibility (as represented by sector). Surprisingly, informal VC result more represented on the board than formal investors, contradicting previous research and agency theory.

Attention is also given to the exit of each investment, an optional but crucial point for investors to realize a payoff. In small companies, the venture capitalists show surprisingly small will to exit at the point of IPO. This could implicate that small firms show greater information asymmetries and that, according to prior research by Brav and Gompers (1997), so called lock-ups[1] are more extensively used in order to signal commitment. However, only a first analysis of this subject is performed since these lock-ups limit the reach of the data.

This paper is unique since it is based on empirical data from firms rather than being based on qualitative interviews with the investors. Thus, we avoid, or at least alter, biases in results from earlier, similar studies of investor preferences, obtaining a higher degree of calculability. Bhide (1992) used a similar approach on the US venture capital market, looking at American Inc 500-companies from the 1989 years' list. However, he based his study on interviews rather than on publicly available information. A paper by Bottazzi and Da Rin (2002) on the European financing of innovative companies comes close to our own study, with focus on determinants of venture financing as one of the main considerations. However, their research is restricted to the *Euro.nm exchange*, a pan-European network of regulated markets dedicated to growth companies, and includes the years between 2000 and 2002, thus not comprising a study of cyclicality in the same manner as this paper. By primarily geographic limitations, our paper differ from these two, focusing on Sweden and thus drawing on the advantages from a homogenous market perspective, obtaining a relatively reliable control sample.

Implications from our study suggest that venture capital is indeed important for innovative firms to fully reach their capacity in terms of growth. Firms of today seem to more smoothly manage to go public without VC involvement, compared to the time before the 1990s IT boom, but entrepreneurs wishing to list on a stock exchange should still embrace VC if the goal is to move as quickly as possible towards a listing. For policy makers, these results illuminate the need to facilitate for risk capital in order to achieve economical growth. Throughout the 1990s, the situation for Swedish VC investors was facilitated through several reforms, resulting in a larger amount of both listings of start-ups and a larger VC market, underlining the theory of a complementary relationship between stock markets and VC (Black and Gilson, 1998). In our study, entrepreneurial firms doing IPO have both grown since the mid-nineties and the average time passed between foundation and IPO has decreased, demonstrating that their ability to provide society with economic growth and jobs has improved.

[1] What is referred to as a lock-up comes from the rules of stock markets limiting sales at the IPO, but it also includes the IPO-firms own statement of locking up the capital of certain investors for some time, usually 3-12 months after the IPO. The data collected for this paper does not include the time period after the actual IPO occasion and is thus insufficient for a full analysis of the IPO as an exit option.

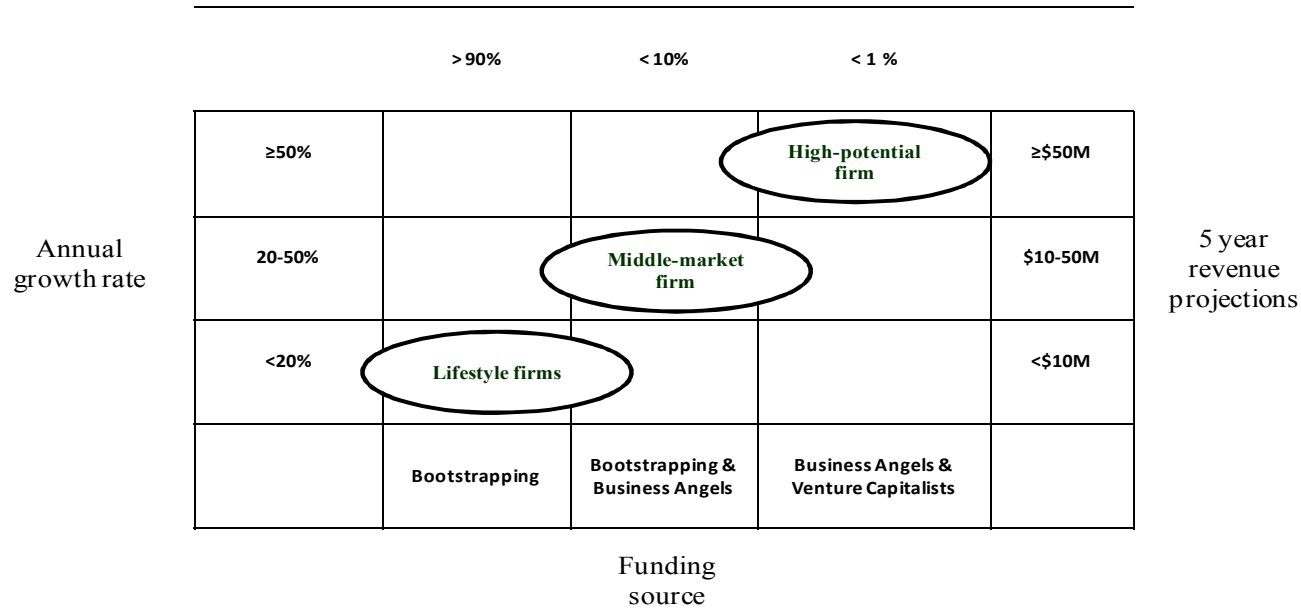
2 BACKGROUND AND THEORETICAL FRAMEWORK

2.1 Entrepreneurs and venture capitalists

The focus of this paper is on firms which could be regarded as entrepreneurial, or "high potential" (see fig. 2.1), (Sohl, 1999) and also important for economic growth and job creation (Werzel, 1996; Birch, Haggerny, Parsons and Rossel, 1993; Storey, 1994).

The terms *enterprise*, *entrepreneurial firm* and *start-up* are used interchangeably for the same phenomenon. The small fraction of truly innovative start-ups are captured by defining entrepreneurs as mainly being people in the pre-start, start-up and early phases of business ownership (Lundström and Stevenson, 2001), coinciding in large with the term "high-potential firms". This definition of the entrepreneurial start-up was interpreted and used in order to create our data sample (see section 4.1).

Fig. 2.1. A categorization of start-up firms



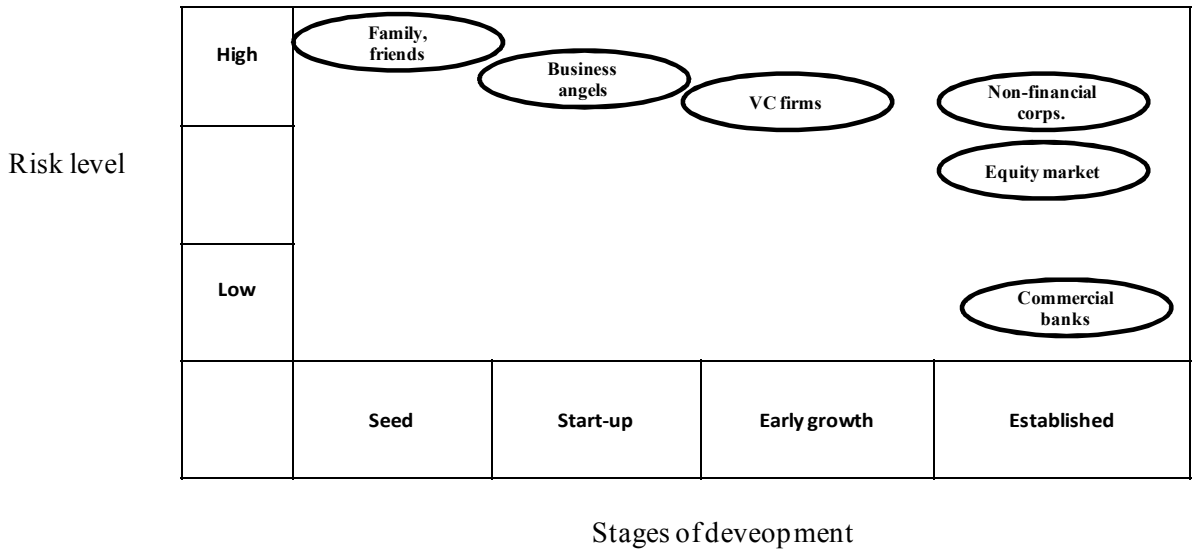
Source: Van Osnabrugge and Robinson (2000)

Entrepreneurial firms often tackle a so called "equity capital gap" during their first years after foundation. This gap is representing a scarcity of financing throughout the seed and start-up stages. It is particularly pronounced for the more innovative, high-risk firms and has been argued to best be filled by informal investors (Mason & Harrison, 1992). This asserts the difference between institutionalized capital, streaming from banks and venture capital funds and informal venture capital in terms of mainly business angels (see fig. 2.2.).

Since heterogeneous investors not only choose firms to invest in based on different foundations, but they also add different values to a firm, we have divided our investigated group of venture capitalists into two – *formal* venture capitalist and *informal* venture capitalists.

Venture capital can be defined as private capital invested in non-listed firms, mainly without collateral. Typically the investment horizon is limited to a few years and characterized by active investment management (Ehrlich, et al. 1994; Lerner 1995; Sapienza, et al. 1996). The informal venture capitalists differ from the formal by whose money they invest, namely their own, in contrast to the formal venture capitalists who invest the money which in turn belong to their investors. This leads to contrasting incentives for the investors and has a range of implications for the differences in investor behavior, as developed in this section. See fig. 2.2 for a categorization of venture capital categories.

Fig. 2.2. Capital sources at different stages of the entrepreneurial firm's development



Source: Van Osnabrugge and Robinson (2000, p. 37)

There are subgroups within the two above mentioned groups of venture capitalists, i.e. the formal and informal. Bank funds, pure venture capital firms and governmental venture capital funds largely constitute the group of formal venture capital. However, informal investors are less straight-forward to differ between. Business angels constitute the largest subgroup, defined as investors repeatedly making informal capital investments and also supporting the management in the invested firm (NUTEK, 2006).

In this paper, the group *informal* venture capitalists is defined to include business angels and other private investors while the group of *formal* venture capitalists includes VC firms, of course, but also investment firms using venture capital to invest in the firms in our data sample. Investments from

family and friends have been excluded as far as possible from the group (see section 4 on methodology).

Business angels increasingly syndicate investments in networks. The firms they form in order to invest look more like formal venture capital firms from the outside. Theoretically, however, regarding the incentive problems described below concerning the agency-principal relation, they tend to follow the same logic as informal VCs since investments are done with their private resources. We have therefore chosen, as far as possible, to divide business angel network firms into individuals and treat them as informal VC, which can be seen as a necessary simplification.

2.2 The importance of the IPO for the venture capital market

Data collected from prospectuses issued at IPO permits for a quantitative analysis which qualitative, interview approaches may not. The limitation of our study to the static point of the IPO also becomes a tool to select economically important ventures, since an IPO is available to a portfolio company only when it is successful (Black and Gilson, 1998). For VC fund investors, the frequency with which portfolio companies go public is central, in order to measure the VC fund's successfulness (Gompers, 1996).

The phenomenon of IPO is not only important for the data collector, but also a significant factor for determining the maturity of the venture capital market. Black and Gilson (1998) found in their cross-country comparison of venture capital markets that venture capital flourishes when there are strong IPO possibilities in a country. The complementary role of stock exchanges and the venture capital market has also been confirmed by Michelacci and Suarez (2000). From this springs a notion of venture capitalists as selectors and supporters of promising start-ups, contributing to a rapid entrance in stock markets at the optimal moment (Lerner, 1994). However, the relation goes two-ways so that equity markets and their liquidity are also important for venture capitalists. The preference for IPO as an investment exit is underlined by table 2.1 on venture capitalists' favored exit routes in the US – a country with a traditionally strong VC market.

Table 2.1 Distribution of venture capital exit routes and realized gains (US)

Exit Route	Percentage of firms	Average gain (times investment)
IPO	30%	2.95
Acquisition	23%	1.40
Company buyback	6%	1.37
Secondary sale	9%	1.41
Liquidation	6%	-0.34
Write-off	26%	-0.37

Source: Bygrave and Timmons (1992), based on Soja and Reyes (1990)

The complementary relation between venture capital markets and IPO possibilities is also one of our rationales for studying a time period that includes the larger parts of the Swedish 1990s. When a country sees an enhancement of its equity markets in terms of numbers of stock exchanges or liquidity, this also affects the VC market in the country, which was the case of Sweden, as presented below. This also coincides with financial theories of a cyclical feature of the venture capital market (developed in section 2.3.3). The result is that the time period, or more precisely: the market can have a large impact on the financing forms available for start-ups.

In Sweden, by late 1990s, and with the rise of the IT era, the venture capital market had recovered from a low point at the beginning of the decennium. In 1999 alone, the Swedish Venture Capital Association increased its membership number with 40 percent. In 2007, Swedish venture capital firms also invested 33 percent more than in 2001 (Landström and Månsson, 2006). This rise had come with a deregulated investors market regarding state-controlled pension funds and insurance companies, reduced tax rates and new, less regulated secondary markets that were born in Sweden during the 1990s. O-listan and Nya Marknaden were slightly more controlled than other, smaller ones, and hence enjoyed a good liquidity, largely thanks to being managed by the Stockholm Stock Exchange (Månsson and Landström, 2006). These markets are also the focus for our study.

2.3 The entrepreneur as agent

In this thesis we mainly depart from Jensen and Meckling's (1976) framework of the principal-agent problem. Thus we can arrive at modeling the VC behavior before, during and after investing in entrepreneurial firms.

Conflicting incentives, or *moral hazard*, between investor (principal) and entrepreneur (agent), can lead to opportunistic behavior and the pursuing of the entrepreneurs' private interests, destroying value for the owners (Admati and Pfleiderer 1994; Bergemann and Hege 1998; Gompers 1995; Jensen and Meckling 1976). This result in agency costs, are only completely eliminated when the owner and the entrepreneur is the same person which (Bruton, Fried & Hisrich, 2000). Thus the agency costs will decrease the more the entrepreneur invests of his own money, when less is left for outside investors to invest. However, as a consequence from the risks with moral hazard, VCs will also under-invest in new ventures. Additionally, the entrepreneur may have limited ability to manage the start-up, giving rise to further agency problem that need the venture capitalists involvement (Sapienza and Gupta 1994).

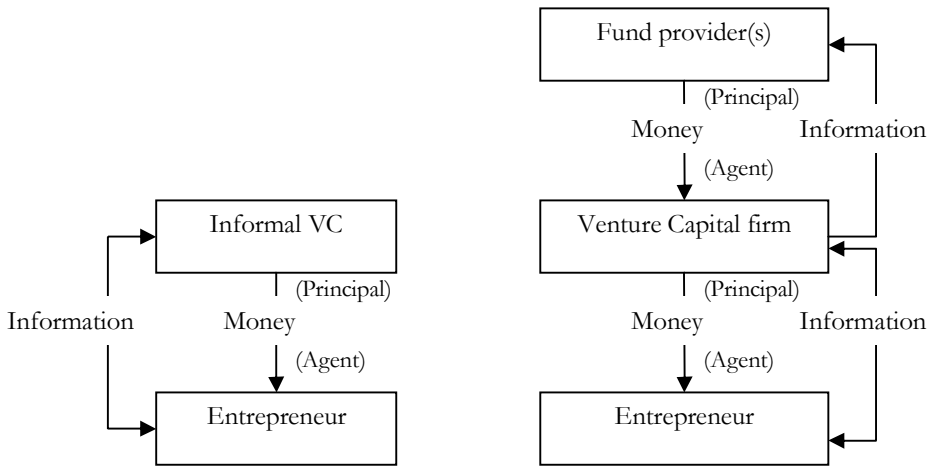
There is a large structural difference between formal and informal venture capitalists; namely their investor bases. The formal VCs face an additional level of the agency relationship since they do not

invest their own private capital but collect funds, illustrated in fig. 2.4. Informal VCs invest their own money, hence eliminating the moral hazard phenomenon.

On the doubled agency-principal level, between fund providers and the formal VC, the agency risks are dealt with through aligning incentives with the help of payment structure. This is made in accordance with option theory, making sure that personal returns of the venture capitalists' are maximized at the same time as the limited partners returns. The general partners of the fund, the venture capitalists, will thus contribute with only some 2 percent of the capital but receive profits of 20-25 percent (Sahlman, 1990). The lifespan of the fund will also be limited so that the general partner cannot hold on to the money forever. Limited partners can withdraw from the fund after their initial contribution, and the venture capitalists are prohibited from self-dealing, i.e. investing on preferential terms with regards to the limited partners (Jeng and Wells, 1998).

In the following sections the agency-principal framework will be used as a foundation to model and draw hypothesis on the differing behavior of formal and informal VCs.

Fig. 2.4. Comparison of business angel and venture capitalist agency relationships



Source: Van Osnabrugge and Robinson (2000)

3 HYPOTHESIS

3.1 Modeling the determinants of venture capital

As previously stated, this thesis has a two-fold purpose. One is to describe the characteristics and drivers of VC investments, including a relationship between formal and informal VC investments, while the other purpose is to explain the differences in post-investment behavior. Thus this section describes the models we construct to explain the drivers of formal and informal VC investments in the IPO-firm, while the sections following will focus on post-investment activities – namely the monitoring of portfolio firms through board representation, and the exit behavior of investors.

The first model attempts to explain the presence of *informal* venture capital in entrepreneurial firms at the point of IPO, and is put against a model explaining the occurrence of *formal* venture capital. As explanatory variables we have chosen firm size (as measured by common equity), age (the time passed between firm registration and listing on a stock exchange), industry and market, where the latter two are included as dummy variables. Part of the regression analysis is also made with a dummy for informal versus formal VC presence, in order to measure the possible effect of one investor type on the other's investment behavior.

Model 1:

$$\begin{aligned} Informal\,VC\,presence = {} & \beta_1 firm\,size_t + \\ & + \beta_2 time - to - IPO_t \\ & + \sum \beta_3 Industry\,dummy_1 \\ & + \sum \beta_4 Market\,dummy_1 \\ & + \beta_5\ Formal\,VC\,dummy_1 \end{aligned}$$

Model 2:

$$\begin{aligned} Formal\,VC\,presence = {} & \beta_1 firm\,size_t + \\ & + \beta_2 time - to - IPO_t \\ & + \sum \beta_3 Industry\,dummy_1 \\ & + \sum \beta_4 Market\,dummy_t \\ & + \beta_5 Informal\,VC\,dummy_t \end{aligned}$$

3.1.1 VC presence as ownership of equity – The dependent variable

For the regression analysis, we use several different dependent variables to look at differences in investor behavior. First we look at whether formal or informal VCs are present as owners in the firm, and we also add them together into a combined variable. We also do regressions on the percentage of equity owned by each investor to see what drives larger investments. The conclusions we draw focus

partly on what drives VCs to invest in a firm, but we also largely use the study of the variables in order to theorize on what implications VC investments may have for the entrepreneurial firm. This two-way reasoning is motivated by our assumption that there is a two-way causality between VC investments and firm development regarding at least firm size - i.e. growth, and firm age – i.e. velocity at which the firm goes public. Below are introduced and motivated our choices of explanatory variables for the models.

3.1.2 Firm size

As one of the explanatory variables, firm size represents the total common equity. The double principal-agency problem that formal VC-firms face result in investment activities that differ from those of informal VCs', which we hypothesize will lead to a positive correlation between the portfolio firms' size and the formal VCs ownership share of it. Since formal VC-firms are normally backed by several individual investors, they have larger funds to invest than informal VCs usually have. There is also a second reason why formal VCs invest larger sums in their portfolio companies, namely that they perform a costlier screening, due diligence and contract writing for each firm they invest in than informal VCs do. The informal VC does not have the same urge to demonstrate credibility with capital providers, and will often place more focus on informal ways to minimize the agency risks of their investments, for example by taking on investments that other informal VCs recommend or by actively monitoring the portfolio company post-investment. Because of the costlier pre-investment activities that formal VCs perform, they will have a reinforced need to invest in fewer, but larger, projects that have a chance to pay back what the pre-investment activities have cost the formal VC. Prior research has also confirmed that venture capital funds typically hold a significant proportion of the shares of portfolio companies, indicating that there is a positive correlation between firm size and formal VC ownership (Sahlman 1990).

However, since we look at the VCs equity share (as approximated by the price of common stock) at the point of IPO, we cannot say exactly how large the initial investment was. The variable will be clouded by the informal or formal VCs capacity to choose good investment objects, as well as by the VCs ability to effectively steer start-ups towards the IPO, in terms of providing good advices and finances that can facilitate the portfolio firms' growth before being introduced on the stock exchange. Several studies have shown that formal venture capital is a source of finance that can be helpful for firms that wants to go public to reach this goal (Busenitz, et al. 1997; Higashide and Birley 2000; Macmillan, et al. 1989; Rosenstein, et al. 1993; Sapienza 1992; Sapienza, et al. 1996). Black and Gilson's (1998) have demonstrated a complementary relation between venture capital and the stock market and also found that start-ups that are backed by formal VC are less underpriced at IPO than the those that are not. So, even if we cannot clearly state what the correlation between the initial

investment and the firm size is, we can still hypothesize that there will be a positive correlation between firm size and formal VC ownership at the point of IPO.

Regarding the informal VCs, we expect them to focus their investments in smaller firms than formal VCs do. This comes from an assumption we do that entrepreneurial firms will grow more the more money they are provided by their investors, and since informal VCs face harsher capital constraints their portfolio firms will also grow less.

H1. Formal VCs invest in larger firms than informal VCs do.

3.1.3 Firm age

We use the variable time-to-IPO (expressed in years passed between start-up and IPO-occasion), to illustrate the firm age's influence on the dependent variable. According to the same reasoning as above regarding firm size as an independent variable, we expect that the complementary relationship between venture capital and stock markets will mean that the entrepreneurial firm will move to IPO faster if there is venture capital present in the firm. With this reasoning, the time passed between start-up and IPO should be the longest for firms lacking VC completely, since these firms do not have the guidance of VCs.

In this thesis we do not try to verify the exact stage when investments have been done or obtain exact information on the investment horizons of the different investors, since we look at the static point of IPO of the entrepreneurial firm and not the investment occasion. However, we do expect to see more informal VC present in the oldest IPO-firms, relative to formal VC, since informal VCs in previous research have shown a more varying investment horizons than formal VCs. Prior studies have shown that successful investments are exited by informal VCs within 5 years, while unsuccessful can be held for 10 years while trying to turn things around and in general the investment horizon is more often left to depend on the performance of the portfolio company than in the case of formal VC investments (Freear, Sohl, & Wetzel, 1990 Formal VCs instead show a medium investment horizon of 4 years (Bygrave and Timons, 1992), having very limited investment horizons (Jeng and Wells, 1998), as they are pressured from short-term fund investors to realize returns.

H2. Firms with VC are younger at the point of IPO than firms with no VC.

3.1.4 Industry biases

We theorize that formal and informal VCs display diversity in their sector biases, which we base on the structural difference between the two investor groups. The industry bias exhibited by formal VCs is assumed to have a basis in their preference for due diligence in order to deal with the contractual problem in its relation with the entrepreneur. The formal VC will run a strict checks and balance system in order to signal his specialization, since he is paid by his capital providers for his

specialization in selecting new ventures for investment and supporting them. Bhide (1992) explains that organizations with a routine of strict checks and balances, can only tolerate a low level of risk if this risk is immeasurable and unquantifiable, i.e. Knightian uncertainty (Knight, 1921). Therefore the VC fund will undertake projects that have a relatively low irreducible uncertainty yet large likely profits – which in turn are assumed to require large investments (Bhide, 1992). The final result is that formal VCs invest more in sectors where significant investments have to be done at the initial start-up phase in order to realize returns (Bhide, 2003), such as medical technology, biotechnology and pharmaceuticals, but also in other high-technology industries (Hustedde & Pulver, 1992) where their investment strategies can provide significant strategic advantages and lead to rapid firm growth. In the US in 1994, for example, no less than 68% of investments went to technology-based companies (Venture Economics, 1995).

H3. Formal VCs invest more than informal VC in technology-based companies (as represented by Healtchcare and ITC).

3.1.5 The market

Jeng and Wells (2002) considered factors external to the firm in their study of venture capital investments, which is the foundation for our use of the variable 'The market', i.e. an approximation for factors external to the firm that may influence the dependent variable. In particular, Jeng and Wells looked at the importance of IPOs, GDP and market capitalization growth, labor market rigidities, accounting standards, private pension funds, and government programs, where IPOs were found to be the strongest driver of venture capital investing. Previous studies on the Swedish VC market show that formal VCs are making fewer investments and in an earlier phase of the firm since the Dot.com-collapse. Not only investment size and phase has shifted, but the industry focus as well – from IT focus towards biotechnology and pharmaceuticals (Landström and Månsson, 2006).

The Market variable's influence on the dependent variable is approximated by the time period when the investment is done, and it is used both in lagged and non-lagged form in regressions. To construct the variable, we have divided the period studied, 1994 to 2005, into three parts. The time period 1994-1997 represents the pre IT era, 1998-2001 represents the IT boom years and finally 2002-2005 represents the market conditions after the IT boom.

Gompers and Lerner (1999) and Inderst and Müller (2003) have brought forward theories on cyclicality of the VC market, where factors external to the entrepreneurial firm determine formal VCs investments. Inderst and Müller (2003) modeled this as an equilibrium model in which capital market characteristics affect the relative supply and demand for capital. When the supply and demand curves move, changes also occur in the level of new entries in the VC market and the level of capital market competition, which comes with rises and falls in valuations and venture capitalists' ownership shares –

as seen clearly during the IT boom and bust. Gompers and Lerner (1999) could even see that changes in the supply and demand conditions of the VC market could give 7 to 21 percent overvaluations of stakes in portfolio companies when formal VC funds were doubled (Gompers and Lerner, 1999).

Hence, the pattern we believe to find regarding this approximation of the influence of factors external to the firm, is a positive correlation between economic upswings and the presence of formal VC investments. During rougher periods, we instead expect that informal VCs would step in and more or less close the financing gap that arises when formal VCs do not invest. In particular, the informal investors' money should be worth more in cooler cycles when they can buy comparably bigger stakes in the invested firms, while they are pressured out of the market during boom periods.

H4. Formal VCs have larger stakes in IPO firms during the IT-boom.

3.1.6 Complementarity – Formal and informal VC as dummy variable

Investments from informal VCs in the start-up phase of a firm tend to have a leveraging effect on the investee firm, since the firm will become more attractive to other sources of potential finance – in particular with regards to venture capital funds (Mason and Harrison, 1996b; Mason, Harrison, and Allen, 1995). Since informal VCs have been shown to often be well-suited to prepare portfolio companies for subsequent formal VC investment (Månsson and Landström, 2005), we search for evidence of this complementarity between formal and informal VC in our dependent variables. Since we look at a static point in time, we do not check for informal VCs precedence of formal VC.

When at descriptive statistics, we look at cases when both investor types are present in entrepreneurial firms. We also do an attempt to include a dummy variable of informal (formal) VC in order to explain our dependent variables of formal (informal) VC, to further assess the complementary relationship. A positive coefficient is expected for the dummy variable, together with an increase in the explanatory value of the regression, as measured by the adjusted R-Square.

H5. There is a positive correlation between formal and informal VC presence in IPO-firms.

3.2 Post-investment behavior: Board representation

Moving outside the modeling of VC investment determinants and over to the post-investment behavior of the investors, we start out with the presence of investors on the board of directors of the entrepreneurial firm.

The relationship between the entrepreneur and the venture capitalist gives rise to the basic level of the agency-principal problem, as described in section 2.3 The entrepreneur as agent. Aligning the incentives of the entrepreneur with those of the owners can be done by basing compensation on equity or convertible securities, or by different forms of monitoring, for example through taking a seat on the firm's board (Gompers, 1995; Lerner, 1995). In this thesis we choose to focus on the investors' option

to monitor the agent's behavior through board representation and we thus examine the level of VC representation on the board for each firm of our data sample. Prior studies confirm that venture capitalists monitor their portfolio firms through board representation (Gorman and Sahlman 1989; Lerner 1995; Macmillan, et al. 1989; Rosenstein, et al. 1993; Sahlman 1990; Sapienza 1992; Sapienza and Gupta 1994; Sapienza, et al. 1996), also because of the non-financial value that can be added from VC involvement and increase the value of the portfolio firm (Busenitz, et al. 1997; Higashide and Birley 2000; Macmillan, et al. 1989; Rosenstein, et al. 1993; Sapienza 1992; Sapienza, et al. 1996). Since the need to supervise portfolio firms increases with growth options, greater R&D spending, and declining asset tangibility (Gompers, 1995; Sapienza & Gupta, 1994), we can expect to see a high degree of monitoring in our sample of firms in their start-up phases since they largely fit in on these conditions. Firms in high-tech industries, which are highly present in our sample, can with this reasoning be expected to show an even more intense degree of monitoring through board representation.

In prior studies in the US, formal VCs have been found to be involved in the board of directors in up to 90 percent of the cases, in comparison to a lower 71% of all business angels (Rosenstein et al., 1989; Freear et al., 1990). In 1991 NUTEK found 90 percent of Swedish venture capital firms to state representation on the board, while business angels stayed at the lower 60 percent. Business angels though did actively participate in some form in portfolio firms in 88.5 percent of the cases – e.g. as managers, board members or consultants. Thus we expect that both investor types will be highly present on the board of directors, with formal VCs more often present than informal VCs.

We further hypothesize that when the firm grows in importance for the investor, i.e. when the firm shows economical growth, the VC will be triggered to take active part in the firm and monitor it more vigorously through taking a seat on the board. Thus we expect to see a positive correlation between firm size and formal and informal VCs' board representation.

We also expect that the board representation increases in the period after the IT boom – a reasonable response to lost revenues and confidence in an IT market that has gone bust.

H6. Formal VC's representation on the board of directors of portfolio companies differs from informal investors, where formal VC are expected to more often possess a seat on the board.

3.3 Post-investment behavior: Exit

Exiting investments is an important mean for both formal and informal VCs to take out the financial and non-financial contributions they have invested in earlier portfolio companies and reinvest it into new, early-stage ventures. We expect to see differences in investor behavior regarding the use of the IPO-occasion as an option to exit portfolio companies. For formal VCs, the IPO as an exit option is supposedly more used than for the informal VCs, largely since formal VCs build their reputation on

concluded investments. Their reputation is of utter importance when they deal with other VCs in syndicating portfolio investments, when negotiating with entrepreneurs concerning new portfolio investments, and when handling existing and future capital providers, (Sahlman, 1990; Lerner, 1994b),. Specifically, it is important for capital providers to receive information on concluded VC investments in order to deal with contracting problems stemming from the agency-principal relation with formal VCs. Since the capital provider hires an intermediary to do venture capital investments, it can be concluded that he does not possess the skills to assess neither the performance of the non-concluded investments with regards to risk and return, nor to evaluate the possibility to withdraw from unsuccessful portfolio companies (Black and Gilson, 1998; Gompers, 1996). So, even though a limited partnership agreement between a VC fund and its investors typically is set to a maximum term of 7 to 10 years (Sahlman, 1990), VC funds have strong incentives to exit from their portfolio companies before the end of the partnership period in order to build a performance record of concluded investments that they can present for potential capital providers (Black and Gilson, 1998). Prior research has consequently found VC funds to reduce their share holdings in portfolio companies with on average of 28 percent within a year after the IPO (Barry et al, 1990).

Both formal and informal VCs can use the IPO as a call option for entrepreneurs to regain control over their own firm, i.e. the IPO can be used as an incentive to make the entrepreneur work hard to reach the point of IPO and then be able to buy back the company from its investor (Black and Gilson, 1998). However, formal VCs also tend to have a stronger preference for IPO as an exit opportunity than informal VCs because of the high returns associated with IPO, and the formal VC is normally more return-oriented than the informal investor since he have higher pre-investment costs to pay back and is under higher pressure from short-sighted fund providers to realize returns (Bygrave and Timons, 1992; Gompers and Lerner 1999). Adding this to the limited investment horizons that prior studies has found that formal VCs face (Jeng and Wells, 1998), we expect the formal VC level of exit to be higher than that of the informal VCs.

Another theory regarding the sums exited at the IPO is that informal VCs are more volatile in how often and how much they exit at IPO. This stems from the notion that informal VCs more often than formal VCs take on an active, managerial role in the company and spend relatively more time managing their portfolio companies post-investment than formal VCs do, in order to minimize agency costs without doing expensive screening or due diligence (NUTEK, 2006). Therefore we hypothesize that informal VCs gain a higher degree of "insider information" which they in turn can utilize to guide their exit behavior, which should result in a larger volatility in amounts sold off at the moment of IPO.

Other differences we expect to see in investor behavior considering the exit, regards the time period. During years of high stock valuations and increased liquidity, such as the years of the IT boom, we believe that investors stayed put with their portfolio companies in hope for excess returns after the portfolio company's entrance on the equity markets. The bust of the IT market in 2001 should instead

have increased both informal and formal VCs' concern on exiting their investments early, resulting in high exits in the following period.

A factor influencing the decision to exit is the period of lock-up. Investors undertake to not sell their share of the portfolio company during a certain period of time, usually 3 to 12 months, as a way to signal their commitment to outsiders of the firm. Brav and Gompers (2001) found the lock-up period prolonged the greater the informational asymmetries, which includes firms that are unprofitable, have lower quality underwriters, or are not backed by venture capitalists (Lerner, 1994a). Firms with intangible assets, representing a substantial part of our sample, also confront large information asymmetries. This means that for a substantial amount of the firms included in our study, the exit at the IPO could be limited, why future research papers on this topic could preferably include data on ownership for up to one year after the IPO occasion in order to increase the accurateness by reducing the lock-up effects. Because of the lock-ups, we expect lower degree of exits in firms with large informational asymmetries, i.e. firms that are in high-technology industries and healthcare. The reasoning above regarding the influence of the time period on amounts exited at IPO also makes us expect lower amounts of exits during the IT-boom, since the new IT market arguably contained large amounts of information asymmetries – there was no track record for this market and risks were therefore difficult to calculate.

H7. The amount of capital exited at IPO differs according to investor, time period and industry.

4 METHODOLOGY AND DATA SET

Regression models are estimated in order to explain the level of ownership of informal and formal investors in entrepreneurial firms at IPO. Board representation and exit behavior are descriptively explored together with their correlation with ownership of equity.

4.1 Data collection and sampling

The main part of data corresponding to the defined variables was extracted from firm prospectuses. There exists no digital storage for market introduction prospectus information in Sweden up until today. However, scanned prospectuses from 1996 and onward are stored by the Swedish Financial Supervisory Authority. The data collection consequently covered these added with hard-copied prospectuses from 1994 to 1996.

Prospectuses published as of the point of IPO comprise the first detailed information made publicly available of ownership levels. Hence, it is an information source providing us with an excellent opportunity to study the presence of VC in start-up companies.

4.1.1 Long-list of IPO firms

The time period chosen for the study stretches from January 1994 to December 2005. Consequently, the cycle around the IT boom, which here is defined as the years 1998-2001, and the high private equity activity during these years, can be depicted.

Identifying and defining high-potential start-ups was made by recognizing them as start-ups as a first step, since these firms all reached the point of IPO. Nya Marknaden (or O-listan) and First North were the markets decided as the most important to identify the high-potential firms, since they show better liquidity and thus better exit possibilities, as confirmed by the Swedish Financial Supervisory Authority.

The data collection up until this step resulted in a list of 188 potential entrepreneurial firms (see appendix 4).

4.1.2 Short-list of IPO firms

The following criteria were used in order to exclude firms that were not in line with the definition of the entrepreneurial firm resulting in a short list of 71 IPO firms.

Age of the company. Firms where more than 30 years had passed between foundation and IPO were excluded. Older firms were approximated as no longer under the capital and managerial constraints characterizing entrepreneurial firms.

Spin-offs from existing companies. These do not reasonably face the same capital constraints as entrepreneurial start-ups according to the definition.

Holding companies, companies buying up mining prospectuses, and venture funds. Different forms of asset management and facing a different type of capital collection.

Foreign companies. They do not enter into the geographical limitation of the thesis. En plus, they normally have their initial listing in their home country.

Incomplete prospectus. A number of prospectuses were either badly scanned, or impossible to recover from the archives of the Swedish Financial Supervisory Authority.

4.1.3 Definition of investors

Formal and informal venture capitalists have been singled out from other investors in the IPO firms in order to assess the dependent variables of formal and informal venture capital ownership of the common equity. Several factors and their possible coincidence have been used for the assessment.

The entrepreneur's investments were specified. Next, excluding capital belonging to family provided a challenge where surnames were almost the only clue for distinguishing them from informal VCs. Cases where it was clear that the firm had used equity in employee option programs or equal, where also excluded from the sample.

A large part of observed investments made by informal VCs were registered as companies. Information on these was found mainly in the prospectuses, from the databases Capital IQ, Affärsdata, and on the company homepages. A handful of cases also required general Internet and yellow pages research. Many investments done by firms are also judged to represent either single informal investors (particularly if the firm invest its founder's assets, but in a couple of cases they were very small, foreign registered firms with no public information available) or as syndicates of informal VCs. The latter were at times demanding to distinguish clearly from formal VC.

The final classification of the different investors was discussed with a source at the Swedish Financial Supervisory Authority to reconsider classifications and assumptions. Realistic categories could thereafter be formed for classifying each investor's ownership and test in regressions with the dependent variables, as presented in the next chapter.

We have chosen to measure only common stock ownership in the firm. Venture capitalists have been shown to often receive convertible debt or convertible preferred stocks carrying the same voting rights as if already converted into common stock (Benton and Gunderson, 1993; Kaplan and Stromberg, 2000; Gilson and Schizer, 2002), explained by Gompers (1997) as a response to adverse selection problems in early-stage financing. This both means that some VC investments might have been excluded from our sample and that some board members have incorrectly been counted as non-VC.

3.2 Regression analysis

3.2.1 Probit regression: Firms with at least one formal or informal VC present

In this model, Y is a binary outcome variable (i.e. zero for no VC investor, one for at least one formal or informal VC presence), with vector of regressors X including firm size and age, four sector dummies and three market dummies. Probit regressions are performed since they capture the binomial distribution of Y. The error terms will then follow a normal distribution and the test variables are estimated through maximum likelihood (Finney, 1947)

3.2.2 OLS versus Tobit regression

Here Y is instead a continuous outcome variable. The regression analysis is performed with both ordinary multiple regression and Tobit regression. Tobit is judged to be a more suitable regression model since the dependent variables formal and informal VC are left-censored and can take only values between 0 and 1, i.e. 0 – 100 percent ownership of the equity in a firm, i.e. a dataset for which the Tobit model is designed. The OLS regression is performed nonetheless, for comparative purposes, even though our data violates the OLS assumptions when the outcome variable is restricted to an interval (Amemiya, 1973).

5 DESCRIPTIVE RESULTS & VC BEHAVIOR

5.1 General descriptive results: Where is the venture capital?

As stated, one important purpose of this thesis is to expand the understanding of the circumstances under which VCs invest and how they act ex-post investment, in order to improve financing options for entrepreneurial firms. This section consequently examines the characteristics of the firms that formal and informal venture capitalists invest in – with respect to both their presence and their stakes in the firms. After this section on general characteristics of investors, follows the descriptive and regression results from our modeling of the determinants of formal and informal VC investments.

Noteworthy is that we have investigated investment cases, meaning that e.g. the 135 formal VCs in our study are not represented by 135 physically different formal VCs, but by 135 cases of investments by formal VCs[2].

Table 5.1 Venture capital frequency* in Swedish IPO firms 1994 – 2005[3]

	Formal VC		
Informal VC	No	Yes	Total
No	10	13	23
Yes	12	36	48
Total	22	49	71

* Absolute number of firms

To begin with, it is useful to have a notion of how common VC financing is in Swedish, entrepreneurial firms during the period studied. Formal and informal venture capitalists occur in the same firms in 36 out of 71 cases, i.e. 51 percent (table 5.1), implicating a complementary connection between the investors, as put forward by Black and Gilson (1998) – more on this in section *5.2.5 Complementarity*. Separately, they result almost equally frequent in Swedish start-ups at the point of IPO, while only ten of all IPO firms have no venture capital at all, representing 14 percent of the firms studied.

On average the formal and informal VCs together represents a large part of the firms' ownership, with an average total stake of 35 percent of common equity (table 5.2), a number that is hardly affected by outliers since the median is 31 percent. In table 5.2 we can also see that there are 1.9 formal VC investors per IPO-firm, owning 21.6 percent of firm shares, while informal VCs show up in 2.2 investors per IPO-firm and with only 13 percent of shares (table 5.2). This reflects the double

[2] However, plural investments in a firm that are done by the same formal VC but under somewhat differing legal names, due to administrative and legal advantages, have been counted singolarly.
[3] Data sample

incentive problem formal VCs face, as discussed in section *3.1.2 Firm size*, driving them to invest larger sums in fewer companies than informal VCs.

When looking at the absolute amount of money (in MSEK) that the VC ownership represents, the image of formal VC investing larger sums of money is enhanced. Formal VCs have on average investments of 284 MSEK at the IPO, which is roughly three times that of informal VCs.

Median investments of formal and informal VCs are much lower than the average investments, amounting to a combined 102 MSEK per firm, meaning that there are several firms that are extremely highly valuated in comparison to the large part of all firms. This appears in figure 5.3b to be particularly the case with firms introduced on the stock exchange during the IT boom when over-pricings were common (in line with the reasoning in section *3.1.5 The market* on the cyclicality of the VC market leading to formal VCs over-valuating their investments). The figure graphs the time period against the absolute values of formal and informal VCs stakes in portfolio firms, and the pattern of high firm values during the IT-boom can clearly be seen.

Table 5.2 Venture capital characteristics in Swedish IPO firms

		Inf. VC	F. VC	TOTAL
Number		154	135	289
Number of investors/IPO-firm		2.17	1.90	4.07
No. investors/IPO-firm with investor present		3.21	2.76	-
Average investment size per individual investor		83.915.612 SEK	160.193.085 SEK	96.225.820 SEK
Venture capital available to firm	Average	106.647.423 SEK	283.597.377 SEK	390.244.800 SEK
	Median	*25.096.500 SEK*	*44.912.500 SEK*	*102.289.000 SEK*
Ownership percentage of firm capital	Average	13,0%	21,6 %	34.6%
	Median	*8.1%*	*13.8%*	*31.2%*

Investment size and firm size are sensitive to over-pricing of the common stock at IPO.

5.2 Modeling VC behavior – Regression results

On the following pages are presented, together with descriptive results, the outcome from the regression results (see tables 5.4 a-d). Probit regressions are used when the outcome variable has a binary distribution, i.e. when we examine which variables explain whether there exists VC, formal and/or informal, or not. As to the degree of presence, i.e. the level of ownership, we use two different

regression models, OLS and Tobit, to find factors affecting, not only the presence of VC per se, but also the level of ownership[4].

The regressions often end up having relatively high adjusted R-square, i.e. quite high explanation value for our models (as seen in tables 5.4 a-d). The Probit regressions, with binary outcome for VC presence, show lower R-square for informal VCs around 12 percent and increases to 20 percent for their formal counterparts. The fit of the explanatory variables increases to 43 percent when the dependent variable instead represents both investor groups added together. When looking at levels of ownership, the Tobit regressions show higher R-square than the Probit. Here the formal VCs owned stake in the IPO-firms remains at approximately 20 percent, while the informal VCs stake here is much better accounted for by the independent variables than in the Probit regressions, with an R-square at 48 percent. The OLS regressions are less well-fit, which is expected since they are not suited for the data. Including a dummy for formal VC only slightly increases the R-square for the informal VC, while a dummy for the informal VC presence more markedly enhances the formal VC Tobit regressions, raising the R-square from 19 percent to almost 23 percent. Informal VC presence is thus an important, determinant factor for formal VC investments and should be included in the formal VC-model.

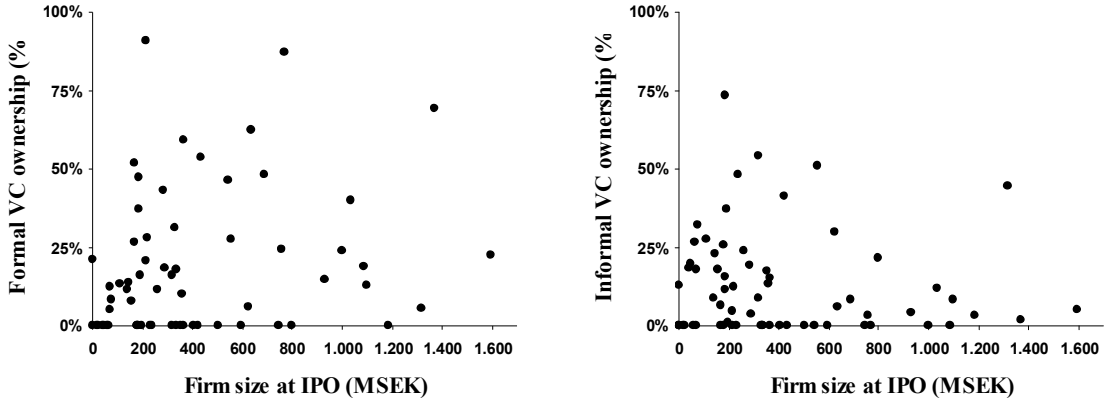
5.2.1 Model component 1. The firm size

Our data indicate that the portfolio firm size is highly important for determining VC investments. Most clearly this is shown in how firms absent of VC financing tend to be substantially smaller than those that have some kind of VC present. These firms' common equity is on average worth 309 MSEK, in comparison to the total average of 651 MSEK (when excluding an extreme outlier). This could implicate that these firms are more indebted than the others; however these firms are also the oldest in our sample. Our supposition is thus that firms with no VC financing find it more difficult to rapidly grow to full potential and that formal and informal VCs can be concluded as crucial for corporate growth during entrepreneurial firm's youth.

The size of the company clearly distinguishes formal and informal venture capitalists when looking at both scatter plots (fig. 5.1a) and descriptive results. As expected, a tendency is shown for larger presence of informal investors in the smaller companies, while the formal have larger stakes in the larger companies (see table 5.3b). This confirms the reasoning around formal VCs not only being able to invest larger sums than business angels and, thus investing in companies with larger capital needs and size, but also the idea that formal venture capital-backed companies grow faster and larger when injected with the large capital amounts, something that mainly formal VCs have the capacity to provide.

[4] The OLS is included only for comparative purposes since our data violate its underlying assumptions. The regressions are performed with the dependent variables informal VC, formal VC, and formal combined with informal VC, respectively.

Fig. 5.1a Explaining formal and informal VC presence with firm size[5]



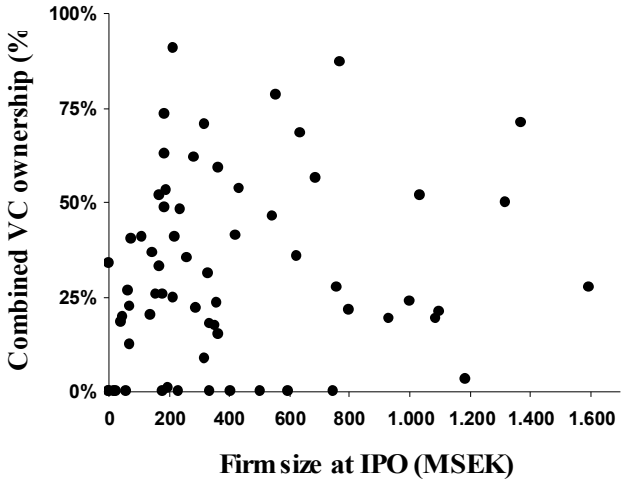
The differences between formal and informal VCs are evident both when looking at the average size of the firms where they are present, and when looking at how much they own in firms of different sizes. Firms with only informal VC present are roughly a third of the size of firms with only formal VC present when looking at average values, with 337 MSEK versus 924 MSEK, even if the difference decreases for the median values to 239 MSEK versus 434 MSEK (as seen in table 5.3a), revealing that there are more outliers in our sample of formal VC-backed firms. In most firms they own roughly equal amounts, but for the largest third of firms informal VCs have much smaller stakes than the formal VCs, with 9 percent ownership against 33 percent (according to table 5.3b).

Funding firms with both types of VC seem to be an effective means to reach a large firm size at IPO, as the firms where both kinds of investors are present have a higher value of common equity than both informal VC-backed and formal VC-backed firms, with 1204 MSEK in average terms (however with a very extreme outlier distorting results) and 555 MSEK in median terms. Formal VC seems to be a good substitute for having combined formal and informal VC ownership, since formal VC-backed companies are bigger than firms financed with both informal and formal VC (when excluding the extreme outlier), which reveals that it could be more important for entrepreneurial firms to try to complement their informal VC with formal VC, than the other way around.

Lack of VC appears, as expected, to be an ineffective means of financing an entrepreneurial venture, since these firms are the smallest firms in our sample with an average value of 309 MSEK. However, in median figures they are not behind the firms with only informal VC present, but are instead a bit larger with 284 MSEK against 239 MSEK.

[5] An extreme outlier of SEK 15B has been excluded from the plot.

Fig. 5.1b Explaining combined VC presence with firm size[6]



In the regressions, the positive relationship between firm size and VC investments is to some extent confirmed.

Informal VC presence, as analyzed by the Probit regression, cannot be confirmed to be determined by firm size. Looking instead at the determinants of the level of common equity ownership, the coefficient of firm size results significant, but very small in the OLS regression. We did not expect a positive sign either, so the low reliance on this variable to explain informal VC is not surprising.

When instead looking at formal VC, the firm size is significant with a small, positive sign in the Probit regression. Hence, formal VC presence in firms tend to be a positively correlated with firm size. However, we would have expected a stronger positive effect. When restricting the regression to look at firms with informal VC present, as represented by a dummy variable, this relationship still holds. Levels of ownership in the IPO-firms can also be determined by firm size. Adding a dummy for informal VC, this time the coefficient and the significance are enhanced, which could be interpreted as informal VCs encouraging formal VCs to invest more in firms that reach a larger valuation at the point of IPO.

The total amount of VC ownership in IPO-firms, is also significantly dependent on firm size, but with a much lower coefficient, close to zero. Thus the combined formal and informal VC does not show as clear relation to firm size as it does for formal VC separately.

6 An extreme outlier of SEK 15B has been excluded from the plot.

Table 5.3a Formal and informal VC presence and firm characteristics

		Only informal VC present	Only formal VC present	Both	None	Total
Number of firms		12	13	36	10	71
% of firms		15,5%	18,3%	52,1%	14,1%	100,0%
Firm size	Average	336.999.007 SEK	924.961.730 SEK	1.204.230.227 SEK	308.888.414 SEK	868.294.944 SEK
				Excl extreme outlier 739.963.950 SEK		Excl extreme outlier 650.690.731 SEK
	Median	239.320.000 SEK	434.112.896 SEK	554.832.672 SEK	284.006.400 SEK	350.000.000 SEK
Venture capital part of EQ	Average	24,6%	46,2%	43,9%	-	34.6%
	Median	19.6%	47.1 %	40.6 %	-	
Firm age	Average	10,65	10,71	9,49	14,42	10,62
	Median	8.97	10.61	8.44	14.0	9.98
Industry (% of all firms)						
- IT Consultancy	Average	21.9 %	32.2 %	45.9%		35.5 %
	Median	18.1 %	39.0 %	45.1%		36.5 %
- ITC	Average	31,5 %	46.8 %	43.2%		36,5 %
	Median	23.5 %	47.1%	40.6 %		33.1 %
- Healthcare	Average	19.6 %	69.5 %	40.7%		44.4 %
	Median	19.6 %	69.5 %	35.1%		43.4 %
- Other	Average	1,1 %	35.7 %	46.2%		19.2 %
	Median	1,1 %	35.7 %	34.9 %		1.1%
Market (% of all firms)						
- Before IT boom (1994-07)	Average	25.9%	49.4%	46.1 %		39.4 %
	Median	25.5 %	49.6%	44.6 %		33.4%
- During IT boom (1998-2001)	Average	23.8 %	46.5 %	43.4 %		33.6 %
	Median	18,.9 %	44.7 %	40.7 %		32.1%
- After IT boom (2002-05)	Average	0 %	0 %	40.4 %		24.2%
	Median	0 %	0 %	35.9 %		19.2 %

Note: As measured *before* IPO.

Table 5.3b Formal and informal VC ownership levels and firm characteristics

FIRM SIZE	**15- 217MSEK**	**217-625MSEK**	**625-15.450MSEK**		**Total**
Number	23	24	24		71
% of cap owned by inf. VC	15.2%	14.7%	9.2%		13.0%
% of cap owned by f. VC	15.1%	16.0%	33.3%		21.6%
% of cap owned by both inf. & f. VC	30.3%	30.8%	42.6%		34.6%
FIRM AGE	**2-8**	**8-13**	**13-27**		**Total**
Number	23	24	24		71
% of cap owned by inf. VC	15.1%	14.8%%	8.6%%		13.0%
% of cap owned by f. VC	25.8%	24.9%	13.6%		21.6%
% of cap owned by both inf. & f. VC	41.4%	39.7%	22.2%		34.6%
INDUSTRY	**IT Consult**	**ITC**	**Healthcare**	**Other**	**Total**
Number	23	27	10	11	71
% of cap owned by inf. VC	17.1%	14.5 %	10.3 %	3.4 %	13.0%
% of cap owned by f. VC	18.4 %	22.0 %	34.1 %	15.8 %	21.6%
% of cap owned by both inf. & f. VC	35.5%	36.5%	44.4%	19.2%	34.6%
MARKET	**Before IT Boom**	**During IT Boom**	**After IT Boom**		**Total**
Number	20	46	5		71
% of cap owned by inf. VC	15.1%	12.3%	11.5%		13.0%
% of cap owned by f. VC	24.3%	21.3%	12.7%		21.6%
% of cap owned by both inf. & f. VC	39.4%	33.6%	24.2%		34.6%

*Average ownership percentage in each firm size/age/industry/market group. As measured *before* IPO.

What may distort, or rather enhance, results is that larger investments ought to increase firm growth. The consequence can be an overly evident connection between firm size and VC. Another factor of distortion is overvalued share prices at IPO, which could make firm size a graceless proxy for initial investment size. Dividing the sample into sectors and time periods could possibly reveal and reduce misrepresentations in the analysis, our sample is however somewhat small to effectively perform such an analysis.

H1. Formal VCs invest in larger firms than informal VCs.

- Descriptive results and regression analysis confirm a positive correlation between formal VC presence and firm size.

- No clear sign of a negative correlation between informal VC presence and firm size, but average portfolio firm size is lower than for formal VCs. The variable cannot be concluded to explain informal VC presence.

5.2.2 Model component 2. The firm's age

Firm age at the IPO-event does not single out clear differences between investors, at least not when looking at the percentage of formal and informal venture capital present in the firm plotted against firm age. For informal VCs, it looks as if it is a decreasing function of firm age, but with a few mid-size firms showing extremely high informal VC ownership (fig. 5.2a). We expected to find more informal VC in the oldest firms since informal VCs are expected to have softer investment horizons, but instead we find that they are much less present in the oldest third of firms than formal VCs are (table 5.3b). The pattern for the formal VCs is also hard to distinguish, even if it does look decreasing from the graph in fig. 5.2a. and descriptive results in table 5.3b. The difficulty to distinguish a pattern could be the result from two contradictory forces, namely that formal VCs might come in at a later stage in firm life, but they may also have stricter investment horizons and thus exit earlier

A clear pattern in the data is also that both informal and formal investors are much less present in the oldest firms, which range from being 13 to 27 years old at the IPO occasion. The percentage owned by venture capitalists drops to nearly the half in comparison to the younger firms. The firms with no VC funding are thus the oldest in the sample, with an average age of 14,4 years at the point of IPO. This indicates the difficulty for these firms to develop quickly enough to get listed on a stock exchange.

Fig. 5.2a Explaining formal and informal VC presence with firm age

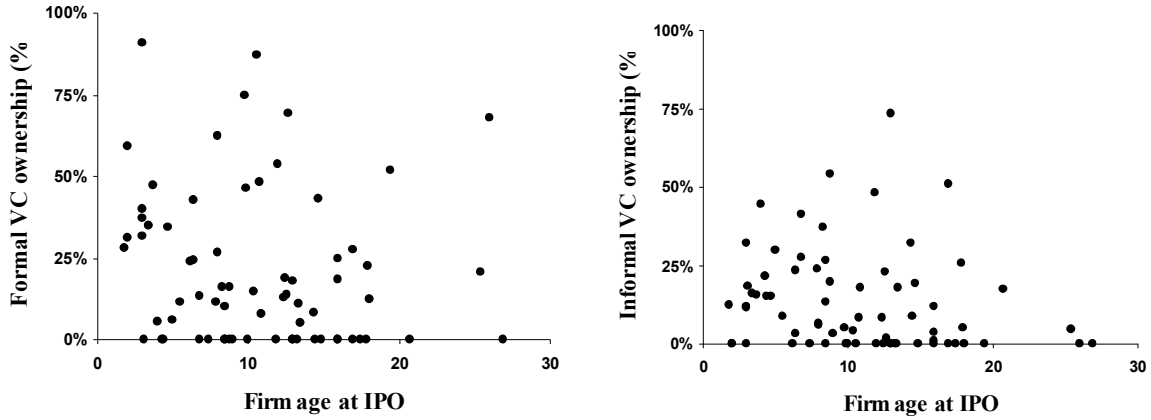
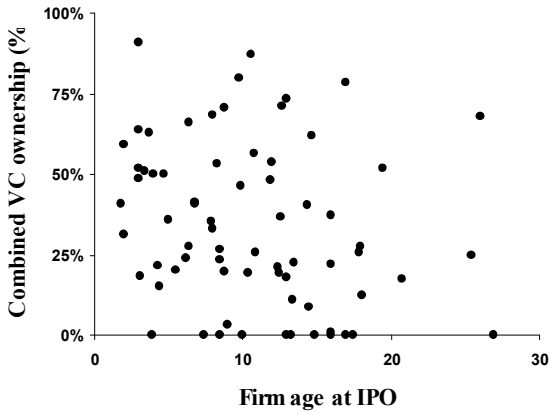


Fig. 5.2b Explaining combined VC presence with firm age



In the regressions the relationships between firm age and formal and informal VCs (as seen in tables 5.4 a-d) are significant, however with coefficients very close to zero. The formal VC presence is established as decreasing with firm age and this persists when looking at levels of ownership in the Tobit and OLS regressions.

Informal VC also shows a negative correlation with firm age when looking at the levels of ownership, but not when explaining the informal investors' existence in the IPO-firms by the Probit regression. The coefficient is as low as for the formal investors'.

The combined, i.e. informal plus formal, VC ownership as a dependent variable, also results negatively correlated with firm age. The coefficient, however, is somewhat larger this time for the binary outcome variable as analyzed by the Probit regression.

We can thus conclude that age is a determinant for VC ownership in IPO-firms, which is a sign that firms with no VC investments take longer time to reach the point of IPO. Another, less likely,

explanation to the results could also be that VCs have sold off their investments when the IPO as an exit opportunity arrives late in firm history. To verify this more exactly, further research should be done, following the IPO firms back in time to the start-up occasion.

H2. Firms with VC are younger at the point of IPO than firms with no VC

- It cannot be confirmed that informal VC would be relatively more present in firms with a higher age at IPO.
- Firms with no VC presence are confirmed by regressions and descriptives to be relatively older at the IPO, with an average age of 14.4 years in comparison the rest of the sample showing 10.6 years.

5.2.3 Model component 3. The industry

Most of the firms in our sample, or 49 out of 71, are found to be in IT related businesses, showing similarities even when separated into the two subgroups of IT Consultancy and IT Software. They have been put into two different sets of firms mainly since we argue that underlying characteristics may result in different risks for investors and thus in diverging behavior. Apparently this possible variation is rather small.

IT Consultancy, a group of firms that cannot be considered in great need of external financing is less backed by formal and informal VC than ITC also in our sample. As expected, the capital intense industry group of Healthcare instead shows the largest amount of formal venture capital and a somewhat lowered amount of informal VC. This reflects the reasoning around the possibility for venture capital firms to invest larger amounts of money. Healthcare also remains strongly significant in the regressions, indicating that formal VCs are both more present in this industry and are larger owners in healthcare firms. However, the Wald test for the significance of dummies, does not turn out significant regarding any of the regressions.

Informal VC show significant, positive coefficients for IT related sectors and healthcare regarding levels of ownership. The same goes for the regression regarding informal VC presence, but the Wald-test does not confirm the significance. Adding a dummy for formal VC presence does not alter the results, as expected.

When adding formal and informal VCs together as one dependent variable, more explanatory variables become significant. IT consultancy and ITC are positive, meaning that IT related businesses draw more attention from all kinds of venture capitalists than other industries. The Healthcare variable, however, shows the greatest coefficient throughout the regressions, even if the significance is somewhat lower. The Wald test holds for all but the Probit regression regarding the industry dummies.

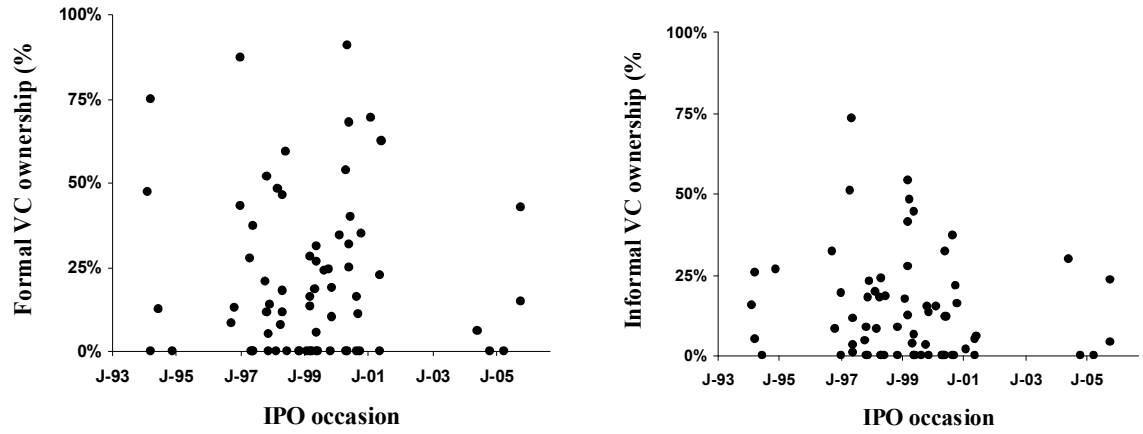
H3. Formal VC invest more than informal VC in technology-based companies (as represented by Healtchcare and ITC)

- Sector biases are confirmed by descriptive statistics and regressions, where formal VCs have larger investments in Healthcare and ITC

5.2.4 Model component 4. The market

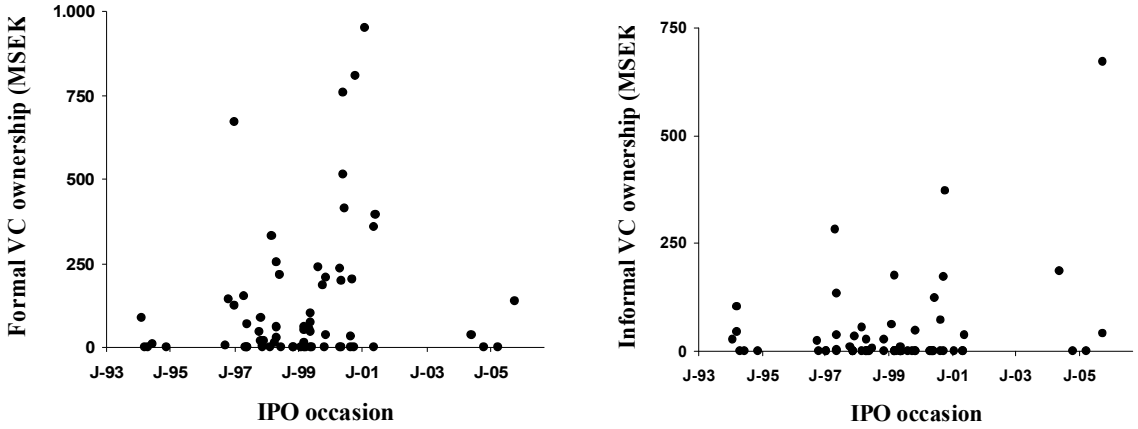
There are some variations for informal VCs regarding time period; their ownership levels decrease with 24 percent after the IT boom compared to before. Formal investors show a strongly decreased amount of capital invested after the IT boom, which was expected, where the decline is almost by half with respect to the amounts owned before the boom.

Fig. 5.3a Explaining formal and informal VC ownership (%) with the market conditions as approximated by the time-period



As to the effect of market, a cyclical feature cannot be immediately confirmed, since ownership levels do not increase during the boom, as expected. It could thus be necessary to also look at the value of the ownership in monetary terms, since overvaluations of stocks at IPO most likely were common during the IT boom. Graphing this, in figure 5.3b we find evidence of formal VC ownership tending to a cyclical behavior when measured in monetary terms.

Fig. 5.3b Explaining f. & inf. VC ownership (MSEK) with the market conditions as approximated by the time-period



None of the regressions show any sign of significance regarding the time-period of the IPO, except for when the informal and formal VCs are combined as a dependent variable. In that case, the period before the IT-boom becomes positive, with strong coefficients.

The period during the IT-boom also verifies as significant for VC presence in IPO firms, even if the levels of ownerships are not proved dependent regarding this time period. Implications are hence that the time period does matter for determining how much VC is available to IPO-firms.

The significance of the period before the IT boom as determining factor for VC ownership levels and presence, indicate that before the IT boom it was harder to push a firm towards IPO without having some kind of venture capitalist involved. It is not, however, possible to confirm the hypothesis of a cyclical VC market from this result.

H4. Formal VCs have larger stakes in IPO firms during the IT-boom.

- The number of firms increased during the IT boom, while the ownership increased in monetary, but not percentage, terms. The relationship is not confirmed by regression results.

5.2.5 Complementarity

In a large part of the sample, 36 out of 71 firms, both formal and informal VCs have invested, indicating a complementary relation between the two. When including informal and formal VC as dummy in the regressions, we do not get significant coefficients. However, including an informal VC dummy in the formal VC regression as tested through Tobit analysis, the fit of the model is increased..

H5. There is a positive correlation between formal and informal VC presence in IPO-firms.

- The descriptive results confirm a complementarity, however the regression with dummy variables does not directly support it, even if the fit of the model increases.

Table 5.4a Determinants of f. & inf. VC in IPO firms – Regression results

	Percentage of inf. VC ownership (OLS)	Percentage of inf. VC ownership (Tobit)	Percentage of firms with inf. VC present (Probit)	Percentage of f. VC ownership (OLS)	Percentage of f. VC ownership (Tobit)	Percentage of firms with f. VC present (Probit)
Observations	All observ.	All observ.	All observ.	All observ.	All observ.	All observ.
	N = 71	*N = 71*	*N = 71*	*N = 71*	*N = 71*	*N = 71*
Constant	0.08 (5.09e-12)	-0.04 (0.05)	-0.08 (0.64)	0.12 (0.11)	-0.014 (0.10)	-0.21 (0.66)
Firm size	-3.01e-12 (5.09e-12)	-7.65e-13 (-)	6.65e-11 (7.90e-11)	2.62e-11 (1.87e-11)	3.61e-11 (-) *	9.61e-10 (3.87e-10)**
Firm age	-0.005 (0.0024)**	-0.008 (0.002)*	-0.05 (0.03)	-.007 (0.006)	-.0116494 (0.01) *	-0.06 (0.03)*
Industry dummies						
IT Consultancy (dummy)	0.14 (0.04)***	0.25 (0.04)***	1.06 (0.48)**	0.02 (0.07)	.09 (0.07)	0.48 (0.49)
ITC (dummy)	0.10 (0.045)**	0.19 (0.04)**	0.77 (0.46)*	0.02 (0.08)	.065 (0.07)	0.21 (0.47)
Healthcare (dummy)	0.07 (0.04)*	0.18 (0.04)*	1.16 (0.63)*	0.17 (0.10)*	.280 (0.09) **	1.16 (0.67)*
Other (dummy)	-0,14 (0.04)***	-0.25 (0.04)	-1.06 (0.48)**	-0.02 (0.07)	-0.09 (0.07)	-0.48 (0.49)
Market dummies						
Before IT boom	0.05 (0.06)	0 .10 (0.06)	0.65 (0.62)	0.17 (0.09)*	.25 (0.08)	0.82 (0.63)
During IT boom	-0.01 (0.05)	0.01 (0.05)	0.09 (0.52)	0.10 (0.07)	.137 (0.07)	0 .28 (0.55)
After IT boom	-0.05 (0.06)	-0.10 (0.06)	-0.65 (0.62)	-0.17 (0.09)*	-0.25 (0.08)	-0.82 (0.63)
Wald test Industry	$F(3, 62) = 6.22$ [0.00]***	$F(3, 64) = 2.75$ [0.05]**	$\chi2(3) = 5.47$ [0.14]	$F(3, 63) = 1.12$ [0.35]	$F(3, 64) = 1.65$ [0.19]	$\chi2(3) = 3.53$ [0.32]
Wald test Market Prob > F	$F(2, 63) = 0.57$ [0.57]	$F(2, 64) = 1.34$ [0.27]	$\chi2(2) = 1.86$ [0.39]	$F(2, 63) = 1.90$ [0.16]	$F(2, 64) = 1.47$ [0.24]	$\chi2(2) = 2.08$ [0.35]
Adj. / Ps. R2	0.0325	0.4805	0.1171	0.05	0.19	0.2016

Regression of presence and level of informal and formal venture capital as part of equity in 71 entrepreneurial firms doing IPO during 1994 and 2005. The sample is split into three time periods(1994-1997; 1998-2001; 2002-2005) and in four industries (IT Consultancy, ITC, Healthcare and Other). Huber-White robust standard errors are in parentheses. Asterisks *, ** and *** indicate statistical significance at the levels 10%, 5% and 1% respectively.

Table 5.4b Inf. VC dummy added to determinants of f. & inf. VC in IPO firms – Regression results

	Percentage of inf. VC ownership (OLS)	Percentage of inf. VC ownership (Tobit)	Percentage of firms with inf. VC present (Probit)	Percentage of f. VC ownership (OLS)	Percentage of f. VC ownership (Tobit)	Percentage of firms with f. VC present (Probit)
Observations	All observ. *N = 71*	All observ. *N = 71*	All observ. *N = 71*	All observ. *N = 71*	All observ. *N = 71*	All observ. *N = 71*
Constant	.010 (0.06)*	-0.02 (0.05)*	-0.13 (0.65)	0.18 (0.12)	0.07	-0.25 (0.67)
Firm size	-1.06e-12 (4.69e-12)	5.17e-13 (-)	5.94e-11 (7.63e-11)	2.84e-11 (1.80e-11)	3.76e-11 (0.11)**	9.58e-10 (3.87e-10)**
Firm age	-0.01 (0.00)**	-0.01 (0.002)*	-0.05 (0.03)	-0.01 (0.01)*	-0.01 (0.005)**	-0.06 (0.03)*
Industry dummies						
IT Consultancy (dummy)	0.15 (0.04)***	0.25 (0.04)***	1.04 (0.49)**	0.07 (0.08)	0.14 (0.08)	0.43 (0.52)
ITC (dummy)	0 .11 (0.05)**	0.19 (0 .05)**	0.77 (0.47)*	0.06 (0.08)	0.10 (0.08)	0.17 (0.49)
Healthcare (dummy)	0.08 (0.05)*	0.19 (0.04)*	1.12 (0.65)*	0.23 (0.10)**	0.33 (0.09)**	1.10 (0.69)
Other (dummy)	-0.15 (0.04)***	-0.25 (0.04)***	-1.04 (0.49)**	-0.07 (0.08)	-0.14 (0.08)	-0.43 (0.52)
Market dummies						
Before IT boom	0.06 (0.07)	0.11 (0.06)	0.63 (0.62)	0.20 (0.09)**	0.26 (0.09)*	0.77 (0.63)
During IT boom	0.002 (0.05)	0.01 (0.05)	0.08 (0.51)	0.10 (0.08)	0.13 (0.08)	0.27 (0.54)
After IT boom	-0.06 (0.07)	-0.11 (0.06)	-0.63 (0.62)	-0.20 (0.09)**	-0.26 (0.09)*	-0.77 (0.63)
Inf.VC/ f.VC dummy	-0.04 (0.05)	-0.03 (0.04)	0.10 (0.35)	-0.14 (0.07)**	-0.13 (0.06)	0.12 (0.37)
Wald test INDUSTRY	$F(3, 62) = 4.53$ [0.00]***	$F(3, 63) = 2.86$ [0.04]**	$\chi2(3) = 4.95$ [0.18]	$F(3, 62) = 2.09$ [0.11]	$F(3, 63) = 2.16$ [0.10]*	$\chi2(3) = 3.12$ [0.37]
Wald test MARKET	$F(2, 62) = 0.63$ [0.54]	$F(2, 63) = 1.42$ [0.25]	$\chi2(2) = 1.75$ [0.42]	$F(2, 62) = 2.46$ [0.09]*	$F(2, 63) = 1.93$ [0.15]	$\chi2(2) = 1.78$ [0.41]
Wald test BA/VC dummy	$F(1, 62) = 0.78$ [0.38]	$F(1, 63) = 0.30$ [0.59]	$\chi2(1) = 0.08$ [0.78]	$F(1, 62) = 4.15$ [0.04]**	$F(1, 63) = 2.73$ [0.10]*	$\chi2(1) = 0.10$ [0.75]
Adj. / Ps. R2	0.0318	0.4914	0.1178	0.1107	0.2273	0.2026

Regression of presence and level of informal and formal venture capital as part of equity in 71 entrepreneurial firms doing IPO during 1994 and 2005. The sample is split into three time periods (1994-1997; 1998-2001; 2002-2005) and in four industries (IT Consultancy, ITC, Healthcare and Other). Huber-White robust standard errors are in parentheses. Asterisks *, ** and *** indicate statistical significance at the levels 10%, 5% and 1% respectively.

Table 5.4c Determinants of combined f. & inf. VC in IPO firms – Regression results

	Percentage of inf. + f. VC ownership (OLS)	Percentage of inf. + f. VC ownership (Tobit)	Percentage of firms with both inf. & f. VC present (Probit)
Observations			
	N = 71	*N = 71*	*N = 61*
Constant	0.20 (0.12)	0.09 (0.11)	-0.46 (0.80)
Firm size	2.32e-11 1.59e-11	2.61e-11 (-)*	1.03e-09 (4.27e-10)**
Firm age	-0.01 (0.01)**	-0.01 (0.005)***	-0.13 (0.04)**
Industry dummies			
IT Consultancy (dummy)	0.16 (0.08)*	0.24 (0.08)**	1.22 (0.74)*
ITC (dummy)	0.12 (0.08)	0.18 (0.08)*	1.22 (0.65)*
Healthcare (dummy)	0.24 (0.09)*	0.32 (0.08)***	*Dropped* [a)]
Other (dummy)	- 0.16 (0.08)*	-0.24 (0.08)**	-1.22 (0.74)*
Market dummies			
Before IT boom	0.22 (0.10)**	0.30 (0.10)**	3.25 (1.00)***
During IT boom	0.10 (0.09)	0.14 (0.09)	1.38 (0.58)**
After IT boom			
Wald test INDUSTRY	$F(3, 63) = 2.50$ [0.07]*	$F(3, 64) = 2.98$ [0.04]**	$\chi2(2) = 3.77$ [0.15]
Wald test MARKET	$F(2, 63) = 2.47$ [0.09]*	$F(2, 64) = 3.74$ [0.03]**	$\chi2(2) = 12.70$ [0.00]***
Adj. / Ps. R2	0.1357	0.5508	0.4325

Regression of presence and level of informal and formal venture capital as part of equity in 71 entrepreneurial firms doing IPO during 1994 and 2005. The sample is split into three time periods (1994-1997; 1998-2001; 2002-2005) and in four industries (IT Consultancy, ITC, Healthcare and Other. Huber-White robust standard errors are in parentheses. Asterisks *, ** and *** indicate statistical significance at the levels 10%, 5% and 1% respectively. a) Healthcare variable was since it predicts success in the dependent variable, along with it dropped 10 observations. This means that the effective coefficient on the dropped variables is infinity. This will have no effect on the likelihood or estimates of the remaining coefficients; it increases also the numerical stability of the optimization process.

Table 5.4d Determinants of combined f. & inf. VC in IPO firms with lagged market variables – Regression results

	Percentage of inf. + f. VC ownership (OLS)	Percentage of inf. + f. VC ownership (Tobit)	Percentage of firms with both inf. & f. VC present (Probit)
Observations			
	N = 71	*N =71*	*N = 71*
Constant	0.27 (0.12)**	0.53 (0.08)***	1.46 (0.89)*
Firm size	-.01 (0.01)	2.15e-11 (-)	8.41e-10 (5.08e-10)*
Firm age	-0.01 (0.01)*	-0.01 (0.05)**	-0.08 (0.04)**
Industry dummies			
IT Consultancy (dummy)	0.16 (0.08)*	-0.09 (0.09)	0.99 (0.64)***
ITC (dummy)	0.13 (0.09)	-0.13(0.06)	0.69 (0.60)***
Healthcare (dummy)	0.24 (0.10)**	0.11(0.09)	*Dropped*
Other (dummy)	-0.24 (0.10)**	-0.33 (0.08)***	-6.44 (0.89)***
Market dummies			
Before IT boom_lag	0.10 (0.11)	0.17 (0.11)	*Dropped*
During IT boom_lag	0.01 (0.08)	0.40 (0.12)	-0.49 (0.71)
After IT boom_lag	-0.09 (0.12)	-0.14 (0.12)	-1.49(0.81)*
Wald test INDUSTRY	$F(3, 63) = 1.98$ [0.13]	$F(3, 64) = 2.60$ [0.06]*	$\chi2(2) = 55.54$ [0.00]***
Wald test MARKET_lag	$F(2, 63) = 0.42$ [0.66]	$F(2, 64) = 0.61$ [0.054]	$\chi2(2) = 4.15$ [0.13]
Adj. / Ps. R2	0.0788	0.3980	0.3202

Regression of presence and level of informal and formal venture capital as part of equity in 71 entrepreneurial firms doing IPO during 1994 and 2005. The sample is split into three time periods (1994-1997; 1998-2001; 2002-2005) and in four industries (IT Consultancy, ITC, Healthcare and Other. Huber-White robust standard errors are in parentheses. Asterisks *, ** and *** indicate statistical significance at the levels 10%, 5% and 1% respectively.

5.3 Post-investment behavior

5.3.1 Post-investment behavior 1. Board representation

We expected to find more formal VC than informal on the boards of directors of the IPO-firms, however the opposite is found in our sample. In firms where both investor types are present, informal VCs tend to be on the board much more frequently than the formal VCs. This indicates that the informal VCs presence on the board could be judged as a sufficient control mechanism for formal VCs when they invest in a portfolio company.

A total of 39 percent of all informal VCs in our sample take a seat on the board, while the lower 34 percent of formal VCs do so. Informal VCs also dominate the boards they sit in much more, taking almost 15 percent of the board seats in the companies they invest in, against VCs being represented on 11 percent of all the seats (as seen in table 5.5b). When looking at the firms, formal VCs have roughly as often a seat on boards in firms where no informal VCs have invested, as informal VCs have in firms where no formal VCs have invested (as seen in table 5.5a). However, the informal VCs remain much more present on firm boards, namely 50 percent more often than formal VCs, when including firms where both investor types have invested.

Larger firms draw more of the attention of both informal and formal VCs in terms of board presence and domination, while firm age does not offer clear distinctions between investors. The only visible difference is that the older firms tend to have larger boards and thus provide less opportunity for VCs to dominate them, and they are also less often present on these boards (which is also explained by the fact that both VC types less often have investments in the older firms)..

Table 5.5a Board representation on the firm level

	Only inf. VC present	Only f. VC present	Both	None	Total
Number of firms	*12*	*13*	*36*	*10*	*71*
Inf.VC represented on board, in companies where they have invested.	75.0%		69.4 %		70.8 %
F. VC represented on board, in companies where they have invested.		76.9%	50.0%		46.9 %
BOARD REP & FIRM SIZE	**15-217MSEK**	**217-625MSEK**	**625-15.450MSEK**		**Total**
Number of firms	*24*	*23*	*24*		*71*
Inf. VC represented on board	52.9 %	53.8 %	100 %		70.8 %
F. VC represented on board	57.1 %	46.7 %	65.0 %		57.1 %
BOARD REP & FIRM AGE	**2-8 yrs**	**8-13 yrs**	**13-27 yrs**		**Total**
Number of firms	*23*	*24*	*24*		*71*
Inf. VC represented on board	76.5 %	80.0 %	46.2 %		70.8 %
F. VC represented on board	72.2 %	63.9 %	38.5 %		57.1 %
BOARD REP & INDUSTRY	**IT Consult**	**ITC**	**Healthcare**	**Other**	**Total**
Number of firms	*20*	*26*	*11*	*13*	*71*
Inf. VC represented on board	57.1 %	73.7 %	88.9 %	66.7 %	70.8 %
F. VC represented on board	26.7 %	76.5 %	70.0 %	57.1 %	57.1 %
BOARD REP & MARKET	**Before IT Boom**	**During IT Boom**	**After IT Boom**		**Total**
Number of firms	*21*	*45*	*5*		
Inf. VC represented on board	56.3 %	75.9 %	100 %		70.8 %
F. VC represented on board	66.7 %	51.6 %	66.7 %		57.1 %

Board seat representation expressed in percentage of firms with VCs on the board out of total number of VC present in the group. Looking at firm size and informal VCs for example, 52.9% stands for the relationship between the numbers of firms with informal VCs on the board in relation to total number of firms with informal VCs in companies between 15 – 217 MSEK.

Table 5.5b Board representation on the investor level

BOARD REP & FIRM SIZE	15-217MSEK	217-625MSEK	625-15.450MSEK		Total
Number (%) of all inf. VC with board seat	16/46 34.8%	14/53 26.4%	30/55 54.5%		60/154 (39.0%)
Number (%) of all f. VC with board seat	9/25 36.0%	12/41 29.3%	25/69 36.2%		46/135 (34.1%)
Board domination inf.VC	11.4%	9.9%	18.1%		14.7 %
Board domination f. VC	5.4%	8.3%	12.7%		10.8 %
BOARD REP & FIRM AGE	**2-8 yrs**	**8-13 yrs**	**13-27 yrs**		**Total**
Number (%) of all inf. VC with board seat	23/66 34.8%	28/61 45.9%	9/27 33.3%		60/154 (39.0%)
Number (%) of all f. VC with board seat	23/62 37.1%	17/54 31.5%	6/19 31.6%		46/135 (34.1%)
Board domination inf.VC	14.6%	18.8%	6.1%		14.7 %
Board domination f. VC	14.6%	8.9%	3.2%		10.8 %
BOARD REP & INDUSTRY	**IT Consult**	**ITC**	**Healthcare**	**Other**	**Total**
Number (%) of all inf. VC with board seat	11 /41 (26.8%)	25/60 (41.7%)	14/33 (42.4%)	10/20 (50.0%)	60/154 (39.0%)
Number (%) of all f. VC with board seat	4 /22 (18.2%)	24/50 (48.0%)	12/38 (31.6%)	6/25 (24.0%)	46/135 (34.1%)
Board domination inf.VC	9.8 %	17.1 %	19.9 %	12.2 %	14.7 %
Board domination f. VC	2.7 %	16.1 %	19.0 %	6.8 %	10.8 %
BOARD REP & MARKET	**Before IT Boom**	**During IT Boom**	**After IT Boom**		**Total**
Number (%) of all inf. VC with board seat	12/38 (31.6%)	44/104 (42.3%)	4/12 (33.3%)		60/154 (39.0%)
Number (%) of all f. VC with board seat	16/36 (44.4%)	27/93 (29.0%)	3/6 (50.0%)		46/135 (34.1%)
Board domination inf.VC	11.9%	15.9%	13.2%		14.7 %
Board domination f. VC	13.0%	10.2%	10.4%		10.8 %

Board seat representation as measured per investment occasions divided by total number of investment occasions in this group. Looking at firm size and informal VCs for example, 16/46 - 34,8% stands for 16 informal VCs on the board in relation to 46 total informal VCs in companies between 15 – 217 MSEK in firm size; corresponding to 34,8 percent.

When at firms in ITC and healthcare industry respectively, the board presence increases. This is in accordance with Gompers' (1995) and Sapienza and Gupta's (1994) findings on the need to supervise increasing with decreasing asset tangibility and increasing weight on R&D – which these two industries arguably endure.

The market, however, does not tend to largely affect board representation. It is not clear whether there was an increase in the board representation after the IT bubble's burst (possibly due to increased suspiciousness) – the sample from after the IT boom is too small to state anything securely.

H6. Formal VC's board representation differs from informal investors, where formal VC are expected to be more represented

- Against expectations, informal VCs are found to more often sit on board than formal VCs.
- Both formal and informal VCs are more represented on boards in high-tech industries, where assets are more intangible and the need to supervise is higher.
- Board representation is higher for both investor groups in the largest third of all firms, as expected.

5.3.2 Post-investment behavior 2. Exit behavior

The hypothesis on formal VCs exiting a larger amount at the IPO than the informal investors cannot be confirmed. The formal VCs sell on average 12 percent of their shares, but this is not even 2 percentage points more than informal investors do. Comparing the volatility of formal and informal VCs should give a hint to the hypothesis on informal VCs either selling off much more or much less than formal VCs at the IPO. However, the volatility is less for the informal investors than for the formal, which turns down the premise.

Smaller companies show surprisingly small exits where particularly formal VCs sell off very small fractions, possibly in expectance for higher returns after the stock exchange introduction. It is also likely that the small exits have a correlation with lock-ups. The small companies may have a bad profitability record, thus showing greater information asymmetries, as reasoned by Brav and Gompers (2001) and Lerner (1994a). In that case the venture capital might be locked-up in the firm as a signal of commitment, important to increase these firms credibility to the new, external investors at the stock exchange.

During the IT boom few shares were sold, but afterwards investors have become more cautious on selling off., as expected. These activities are enhanced for the ITC and IT consultancy sector, implicating a larger attention to exit routes in the sectors that were hardest hit by the IT bust. The fact that IT related businesses generally show larger amounts exited could also mean that Healthcare and other industries are more driven by long-term investors. In healthcare many firms are dependent on investments during longer periods in order to realize returns, which could be reflected in a pull effect on investors with long investment horizons.

H7. The amount of capital exited by formal VC is larger than by informal VC .

- The hypothesis that formal VCs do larger exits at IPO than informal investors cannot be confirmed by descriptive results or regression analysis.

- No clear indications on informal VCs being more volatile in amounts sold off at IPO.
- According to descriptive results, exits are smaller during the IT boom and larger after the bust, as expected.
- Indications found that exits are larger in sectors with less tangible assets, in particular in healthcare.

Table 5.6 Exit behavior - Percentage of the firm's VC investment sold off at IPO

EXIT & FIRM SIZE	**15-217MSEK**	**217-625MSEK**	**625-15.450MSEK**		**Total**
Average amount exited by (%) inf. VC	11.7%	6.5%	8.5%		8.8%
St dev	17.7%	18.4%	23.0%		20.0%
Average amount exited by (%) f. VC	3.4%	16.6%	12.5%		*12.1%*
St dev	6.7%	34.4%	28.8%		28.5%
Average amount exited by all (%)	8.7%	11.1%	10.8%		10.4%
St dev	15.3%	27.3%	26.4%		24.4%
EXIT & FIRM AGE	**2-8**	**8-13**	**13-27**		**Total**
Average amount exited by (%) inf. VC	8.5%	12.7%	1.1%		8.8%
St dev	19.3%	24.1%	4.0%		20.0%
Average amount exited by (%) f. VC	12.0%	8.3%	22.0%		*12.1%*
St dev	28.0%	24.4%	37.1%		28.5%
Average amount exited by all (%)	10.1%	10.5%	10.8%		10.4%
St dev	24.7%	24.2%	27.3%		24.4%
EXIT & INDUSTRY	**IT Consult**	**ITC**	**Healthcare**	**Other**	**Total**
Average amount exited by (%) inf. VC	9.9%	9.7%	6.4%	3.3%	8.8%
St dev	19.7%	21.6%	19.9%	6.3%	20.0%
Average amount exited by (%) f. VC	20.0%	12.6%	2.9%	5.1%	12.1%
St dev	35.9%	30.2%	6.2%	15.6%	*28.5%*
Average amount exited by all (%)	14.3%	11.0%	4.8%	4.6%	10.4%
St dev	28.2%	25.9%	15.2%	13.5%	24.4%
EXIT & MARKET	**Before IT**	**During IT**	**After IT**		**Total**
Average amount exited by (%) inf. VC	12.5%	6.2%	22.4%		8.8%
St dev	21.2%	17.0%	32.9%		20.0%
Average amount exited by (%) f. VC	19.7%	8.3%	27.0%		*12.1%*
St dev	38.2%	22.1%	39.3%		28.5%
Average amount exited by all (%)	16.3%	7.2%	23.9%		10.4%
St dev	31.4%	19.6%	34.0%		24.4%

The percentage represents the portion of the VC investment sold off at the point of IPO.

Each firm's exited VC capital (the relation between the amount of VC capital sold to VC capital owned before IPO) is shown in different dimensions in the table, such as by size, age, industry and market.

6 CONCLUSION & AREAS OF FURTHER STUDIES

Research on venture capital has largely focused on formal venture capital, including VC funds, but less has been studied on the informal venture capital market, where business angels comprise the main part. Increasingly attention is shifting towards a more inclusive view of the investor types and recognition of their complementary roles of different forms of venture capital for innovative companies.

In this paper, we have investigated factors determining formal and informal VCs investments in some of the most successful start-ups – those that manage to go public in Sweden between 1994 and 2005.

One conclusion with major implications is the importance of venture capital for IPO-firms in terms of growth options and speed to reach the stock exchange. Firms with no venture capital revealed the most inferior conditions when going public. They were the slowest to perform IPO and the same firms had the lowest value in the sample, at the point of IPO. In prior studies, firms with venture capital have been concluded to be less under-priced at the IPO than other start-ups, due to the financial and non-financial value added by venture capitalists. Our findings support that notion, at the same time as it opens up for a discussion of a possible lack of growth when firms do not take in venture capital.

Another noteworthy finding is the complementary relationship between formal and informal venture capital. In our sample, roughly half of the firms demonstrated presence of both formal and informal VCs, indicating a complementary relation between the two forms of VC. Start-ups that look for a correct pricing of their stock at the IPO occasion and possibly a healthy growth up until then, should thus attempt to find both formal and informal VCs that can provide the financial and non-.financial means necessary.

To sum up results, our modeling shows that firm age and firm size are important variables for explaining VC presence. We also find, as expected, that formal VCs have biases towards sectors requiring large investments, such as Healthcare. Some evidence of cyclicality in formal VC investments is also found, supporting earlier findings by Gompers and Lerner (1999) and Inderst and Müller (2003).

In order to contribute further to the scarce research on informal venture capitalists and their relationship to formal venture capital funds, we have also looked at some ex-post investment behaviors, namely involvement in the portfolio company's board of directors, and exits of investment at the point of IPO. As to the board representation, an important mean for VCs to deal with agency-principal problems with respect to the entrepreneur, informal VCs were found to more often sit on board than formal VCs, contrary to what previous studies have found. As expected, board representation is higher for both investor groups in the largest firms and in high-tech industries, where the need to supervise is larger.

Regarding the exit behavior between the VC investors, exits were smaller during the IT boom but larger after the bust. Finally, indications found that exits are larger in sectors with less tangible assets, in particular in Healthcare.

6.1 Suggestions for further research

One suggestion for further research concerns the extension of the time period for which investment and exit behavior of investors is studied. Expanding the time period researched for each firm beyond the IPO moment is another. This single moment has given us investment information from two events – the ownership right before the IPO and the ownership right after the IPO. Ideally, information from earlier stage (which is not public) could be extracted and included in a study. Investment details after IPO are also interesting, particularly in order to capture all of the IPO-related exits that formal and informal VCs perform when the so called lock-ups expire.

The research could be expanded to a Nordic perspective, adding value because of the generally increased focus on the Nordic market as an entity. Comparing the private equity presence and investment behavior, entrepreneurship and the differing tax policies in these countries could be of value.

Further comparisons should be made between Sweden and UK (or US) using a similar quantitative model. UK and US have more mature venture capital markets, which could provide Swedish policymakers with interesting "benchmark" information on how to support entrepreneurs and business angels in the aspiration to create economic development.

REFERENCES

Amemiya, T. 1973. *Regression analysis when the dependent variable is truncated normal*. (Econometrica 41 (6), 997–1016)

Barry, C., Muscarella, C., Peavy, J. and Vetsuypens, M. 1990. *The role of venture capitalists in the creation of public companies*. (Journal of Financial Economics2, 7(2), 447-471).

Bhide, A. 1992. *Bootstrap Finance: The Art of Start-ups.* (Harvard Business Review, 70(6): 109.)

Bhide, A.V. 2003. *The Origin and Evolution of New Businesses*. (Oxford University Press)

Birch, D., Haggerty, A., Parsons, W., and Rossel, C. 1993. *Entrepreneurial hot spots.* (Boston: Cognetics)

Black, B., and Gilson, R. 1998. *Venture capital and the structure of financial markets: Banks versus stock markets.* (Journal of Financial Economics, 47(1), 243-277).

Bottazzi, L. and Da Rin, M. 2002. *Venture Capital in Europe and the Financing of Innovative Companies.* (Economic Policy, Vol. 17, pp. 229-269)

Brav, A., and Gompers, P. 1997. *Myth or reality? The long-run underperformance of initial public offering: evidence from venture and non-venture-backed companies.* (Journal of Finance, 52(4), 1791-1820)

Bygrave, W. and Timmons, J. 1992.*Venture capital at the crossroads*. (Harvard Business School Press, Cambridge, MA)

Erlich, S.B., Noble, A.F., Moore, T., and Weaver, R.R. 1994. *After the cash arrives: A comparative study of venture capital firms and private investor involvement in entrepreneurial firms. (*Journal of Business Venturing, 1994, 9, pp. 67-82)

European Commission. 1998. *Risk Capital: A key to job creation in the European Union*. (Enterprise Directorate-General, Brussels: European Commission)

Finney, D.J. 1947, *Probit Analysis*. (Cambridge University Press, Cambridge, UK.)

Freear, J., Sohl, J. E. and Wetzel, W. E. Angels. 1994. *Personal Investors in the Venture Capital Market*. (Entrepreneurship and Regional Development, 7/1995, pp. 85-94)

Freear, J., and Wetzel, W. E. 1989. *Equity capital for entrepreneurs.* (In Frontiers of Entrepreneurship Research. Babson Park, Mass.: Babson College)

Gilson, R J., and Schizer, D. 2002. *Understanding Venture Capital Structure: A Tax Explanation for Convertible Preferred Stock* (Working Paper, March 2002, Harvard L. Rev.).

Gompers, P. 1995. *Optimal investment, monitoring, and the staging of venture capital. (*Journal of Financial Economics, No 50, pp. 463-498)

Gompers, P. and Lerner, J. 1999. *The Venture Capital Cycle.* (Cambridge, MA: MIT Press)

Gorman, M., and Sahlman, W.A. 1989. *What do venture capitalists do?* (Journal of Business Venturing, 4/1989, pp. 231-248)

Hustedde, R. and Pulver, G. 1992. *Factors affecting equity capital acquisition: the demand side*. J. Bus. Venturing **7** 5, pp. 363–374.

Jeng, L., and Wells, P. 2000. *The determinants of venture capital funding: Evidence across countries.* (Journal of Corporate Finance, 6 (1), 241-289)

Jensen, M.C. and Meckling, W.H. 1976. *Theory of the firm: Managerial behavior, agency costs and ownership structure.* (Journal of Financial Economics, no. 3, pp. 305-360)

Kaplan, S. and Stromberg, P.J. 2000. *Financial contracting theory meets the real world: An empirical analysis of venture capital contracts.* (The Review of Economic Studies, Vol. 70(2), No. 243, pp. 281-316)

Kaplan, S. and Strömberg, P. J., 2002. *Characteristics, Contracts and Actions: Evidence from Venture Capitalist Analyses*, (CEPR Discussion Papers 3243, C.E.P.R. Discussion Papers.)

Knight, F. H. 1921. *Risk, Uncertainty and Profit.* (New York: Houghton Mifflin)

Landström, H. and Månsson, N. 2006. *Business angels in a changing economy: the case of Sweden* (Venture Capital, Vol. 8, No. 4, p. 281-301, 2006)

Lerner, J. 1994a. *The syndication of venture capital investments.* (Financial Management, No 23, pp. 16-27)

Lerner, J. 1994b. *Venture Capitalists and the Decision to go Public*. (Journal of Financial Economics, No. 35)

Lerner, J. 1995. *Venture capitalists and the oversight of private firms.* (Journal of Finance, No 50, pp.301-318)

Lundström, A. and Stevenson, L. 2001. *Entrepreneurship Policy for the Future* (Stockholm: Swedish Foundation for Small Business Research).

MacMillan, I.C., Kulow, D.M., and Khoylian, R. 1988. *Venture capitalists' involvement in their investments: Extent and performance.* (Journal of Business Venturing, 1988, 4, pp. 27-47)

Mason, C. and Harrison, B. 1992. *The Supply of Equity Finance in the UK: A Strategy for Closing the Equity Gap.* Entrepreneurship and Regional Development (4/1992, 357-380)

NUTEK. 2006. *Riskkapitalbolagens aktiviteter och annan investering i tidiga skeden: Fjärde kvartalet 2006* (NUTEK), p. 15.

Rosenstein, J., Bruno, A.V., Bygrave, W.D., and Taylor, N.T. 1989. *Do venture capitalists on boards of portfolio companies add value besides money?* (In Frontiers of Entrepreneurship Research. Babson Park, Mass.: Babson College)

Sahlman, W. 1990. *The structure and governance of venture-capital organizations.* (Journal of Financial Economics, 27(2), 273-321)

Sapienza, H. 1992. *When do venture capitalists add value?* (Journal of Business Venturing 7, 9-27.)

Sapienza, H., Manigart, S., and Vermeir, W. 1996. *Venture capitalist governance and value added in four countries,* (Journal of Business Venturing 11, 439-469.)

Sohl, J.E. 1999. *The early-stage equity market in the USA.* (Venture Capital, 1999, 1(2), pp. 1-20)

Storey, D. 1994. *Understanding the Small Business Sector* (London: Routledge)

Tyebjee T. T. and Bruno A. V. 1984. *A model of venture capitalist investment activity.* (Management science, Vol. 30, no9, pp. 1051-1066)

Van Osnabrugge, M. and Robinson, R.J. 2000. *Matching start-up funds with start-up companies – The guide for entrepreneurs, individual investors, and venture capitalists*. (San Francisco: Jossey Bass, 1st ed.)

Wetzel, W.E. and Freear, J. 1994. *"Promoting informal venture capital in the United States: Reflections on the history of the venture capital network."* (In R. Harrison and C.M. Mason (eds.), *Informal venture capital: Information, networks, and public policy*. Hemel Hempstead, England: Woodhead-Faulkner)

Wetzel, W.E. 1996. *"Economic policy in an entrepreneurial world: Seven treacherous misconceptions and half-truths."* (Venture Capital Report, Apr. 1996, pp. 1-4)

App. 1. Appendix - Definitions

The different stages of start-up financing

Different stages of start-up financing, according to Sohl (1999):

Seed finance
Small investment allowing the entrepreneur to verify whether the project is feasible and economically attractive. Venture capitalist is a helpful source in understanding if the project is viable.

Start-up finance
Investment that allows for rending a firm operational. Company organization and corporate strategy are areas where the venture capitalist may be helpful.

Early stage finance, or expansion finance
Investment to reach industry-scale production, upgrade production facilities and attract more employees. The venture capitalist may help in finding clients, suppliers and financing. The company's growth and increased revenue requirements may raise needs for help to recruit marketing and other non-technical executives.

Later stage finance
Investment to help the company become a market leader and fulfil its earning potential, and prepare for trade sale or IPO. Venture capitalists can help in setting the stage for the trade sale or the IPO.

Definition of industry groups

IT Consultancy. IT Consultancy

ITC IT Software, Telecom, IT Business Systems, IT Other

Healthcare. Pharma, Biotech

Other. Media & Entertainment, Other services, Education, Retail, Industrial

App. 2. Definition of variables

In order to model the part of entrepreneurial start-ups owned by formal and informal venture capitalists, the following variables are used:

Ownership informal VC. A dependent variable, describing the percentage ownership of informal VC out of the total equity before the IPO. The data is also used in an aggregated manner when analyzing from a firm perspective rather than the individual investors' ownership level.

Ownership of the informal VCs after the IPO was also extracted, giving information on exit behavior.

Ownership VC. Same as above, but for VCs.

Firm size. An independent variable measuring the equity size of the firm in SEK just before the IPO and thus approximating firm size. Using common equity as a size measure instead of total assets is reasonable both since the dependent variables are based on equity and since common equity reflects value in the market place and thus the value at which INFORMAL VCs and VCs can sell their firms shares.

Firm age. An independent variable expressing the time to IPO, i.e. the time passed between firm foundation and IPO, in discrete years. The exact date of the IPO is known for all the firms in the sample, but regarding the date of firm foundation information on exact date is not available but only the year of the foundation. 1 July of each foundation year is used as an approximation in order to leverage up until the date of IPO.

The market. Independent dummy variables that are used for the three subsequent time periods that the sample is split into, namely the before the IT-boom, during the IT-boom and finally after the IT-boom:

D_before: The dummy is set to 1 if the firm was listed between 1994 and 1997.

D_during: The dummy is set to 1 if the firm was listed between 1998 and 2001 – the period referred to as the IT-boom.

D_after: The dummy is set to 1 if the firm was listed between 2002 and 2005.

The sector. Independent dummy variables (X_industry) for four sectors. The 15 industries found in the data sample of 71 firms were reclassified down to these four.

D_IT_consultancy: The dummy is set to 1 if the firm is considered part of IT consultancy industry, characterized by a large ratio of human capital and lower on capital intensity.

D_ITC: The dummy is set to 1 if the firm can be viewed as part of ITC (information technology and communication), for example IT software, telecom, media and entertainment. Firms producing business software programs constitute a large part of the group.

D_Helthcare: The dummy is set to 1 when healthcare is judged an appropriate category. Life science and biotechnology takes part of this set.

D_Other : If the firm was not decide part of any of the other classifications, this dummy is set to 1. Retail businesses, educational firms, recruitment agencies and other services are found here.

Informal VC presence. An independent dummy variable (D_BA) set to 1 if the firm has at least one informal VC investment. This variable is used in regressions explaining the ownership of venture capitalist firms.

Formal VC presence. Same as above, but for formal VCs and put into regressions where INFORMAL VC ownership is the dependent variable (D_VC).

The dependent variables, BA_% and VC_%, are left censored. This means that the value will always be zero or above and gravitate towards a lower level, i.e. to the left when depicted in a graph. Both of the dependent variables will be found in the interval of 0 to 100 percent ownership. In order to improve estimates, Tobit and Probit models are used and designed for left censored data. OLS regression is also performed, but rather for comparative purposes since censored outcome variables break against assumptions of OLS.

Other extraction of data

Additional data was collected from the IPO prospectuses, apart from that relating to the variables described above.

Exit. Ownership of the investors just after the IPO, used together with ownership data from before IPO as to build variables around exit behavior.

Board of directors. Information on individuals with seats on the firm boards. The presence of formal and informal VC on the board was investigated through this information. This section of the prospectuses was also used to some extent to define informal for its often rich information content.

Minority owners are usually added to a sum of "Other shareholders" in the prospectuses. This limits data collection to some extent, but at the same time the low ownership levels come with a low level of importance for the observations. The loss of important observations of formal and informal VCs is hence judged minimal.

The entrepreneur and founder. Extorted in order to exclude entrepreneur ownership when defining private investors, but also helpful for understanding which investors to exclude for family connections. Hence a step in defining the informal VCs

Share data. Price and voting characteristics of the A and B shares respectively, useful for defining capital ownership.

App. 3. Firms included in the sample

Included in the study:

Company name	Year of foundation	Date of IPO
A-Com	1993	04/11/1999
Advise	1989	27/03/1998
Adera	1983	10/06/1999
Arete	1980	19/12/1997
Audiodev	1987	20/09/2000
AU-System	1974	21/06/2000
Axis	1984	21/06/2000
BioGaia	1990	28/05/1998
BioInvent	1983	12/06/2001
Biora	1986	07/02/1997
Boss Media	1997	24/06/1999
BTS Group	1985	06/06/2001
Citymail	1996	24/06/1998
Clock	1976	08/07/1994
Connecta	1993	16/09/1999
ConNova	1992	09/12/1997
Cyber Com	1995	01/12/1999
Dimension	1988	20/02/2001
Effnet Group	1997	06/04/1999
Entra Data	1982	14/02/1997
Framtidsfabriken	1995	23/06/1999
Frango	1987	23/04/1999
Gandalf	1984	18/12/1997
Guide	1988	27/05/1998
HiQ International	1992	12/04/1999
IAR Systems	1983	07/06/2000
Impact Coating	1997	16/11/2004
IMS-Data	1986	21/12/1994
Information Highway	1994	19/06/1997
Intentia International	1984	22/11/1996
Jeeves	1992	09/04/1999
Jobline International	1997	14/11/2000
Karobio	1987	03/04/1998
Kipling	1995	29/07/1998
Lindvallen	1961	08/07/1994
Louise Gibeck	1978	11/12/1997
Luvit	1997	15/06/2000
M2S	1991	06/12/1999
Mekonomen	1973	29/05/2000
MSC Konsult	1987	19/05/1998
Neonet	1996	20/10/2000
Netwise	1990	
New Wave Group	1990	11/12/1998

Nilörngruppen	1972	19/11/1997
Nocom	1985	04/01/1998
Note	1999	23/06/2004
Novotek	1986	30/06/1999
ORC Software	1987	19/10/2000
Orexo	1995	09/11/2005
Owell Svenska	1990	08/03/1994
PCQT Holding	1990	25/04/2005
Poolia	1989	23/06/1999
Prevas	1985	29/05/1998
Profilgruppen	1981	19/06/1997
Prosolvia	1988	18/06/1997
Pyrosequencing	1997	30/06/2000
Q-med	1987	06/12/1999
Readsoft	1991	22/06/1999
Resco	1982	31/10/1996
Scandinavian PC Systems	1984	06/06/1997
Sectra	1978	03/03/1999
Semcon	1980	26/05/1997
Softronics	1984	03/12/1998
Synectics Medical	1976	22/04/1994
Tele1 Holding Europe	1995	16/03/2000
Teligent	1990	12/04/1999
TradeDoubler	1999	08/11/2005
Tripep	1997	14/07/2000
TV4	1984	15/04/1994
Viking Telecom	1988	30/05/2000
Vitrolife	1993	26/06/2001

App. 4. Long-list of firms

1994
AssiDomän AB
Autoliv AB
Brukens Nordic AB
Clock AB
Cloetta AB
Consilium AB
Elekta AB
Fastighetspartner NF AB
Frigoscandia AB
Fristads AB
HEBA AB
Hemstaden AB
Höganäs AB
IMS Data AB
Kalmar Industries AB
Kjessler & Mannerstråle AB
Klippan AB
Lindvallen AB
Matteus AB
Nobelpharma AB
Nordic Tel AB
Nordifa Gruppen AB
Norrporten AB
Owell AB
Senea AB
Stancia AB
Synectics Medical AB
TV 4 AB
Verimation AB

1995
Meda AB
Althin Medical AB
BT industries AB
Caran AB
Cardo AB
Fagerlid Industrier AB
Frontec AB
IRO AB Lindex AB
PLM AB
Segerström & Svensson AB
The Empire AB

1996
Resco AB
Biacore AB
Dahl AB
Intentia AB
Medivir AB
Nefab AB
OXiGENE AB
Peak Performance AB
Scandic Hotels AB
Scania AB

1997
Alfaskop AB
Arete AB
Arkivator AB
Artimplant AB
Biora AB
Castellum AB
ConNova AB
Daydream Software AB
Entra Data AB
FB Industri AB
Gandalf AB
Gibeck AB
Handskmakarn AB
Hemköpskedjan AB
Information Highway AB
Karlshamn AB
Linné Group AB
Mandator AB
Maxim Pharaceuticals AB
MTV Produktion AB
Munters AB
New Wave Group AB
Nibe AB
NK CityFastigheter AB
North Atlantic Natural AB
Pandox Hotellfastigheter AB Partnertech AB
ProAct IT Group AB
Profilgruppen AB
Prosolvia AB
Sardus AB
Scandinavia PC System AB
Semcon AB
Sigma AB
Svedbergs AB
Svenska Orient Linien AB
Ticket AB
TMT One AB
Wedins Norden AB

1998
Affärsstrategerna AB BioGaia Biologics AB
Bröström AB
Citymail Sweden AB
Fingerprint Cards AB
Guide Konsult AB
Karo Bio AB
MSC Konsult AB
Nilörngruppen AB
Opcon AB
Prevas AB
Saab AB
Softronic AB
Tryckinvest i Norden AB

1999
A-Com AB
Adera AB
Boss Media AB
Clas Ohlson AB
Connecta AB
Cyber Com AB
Digital Vision Sweden AB
Enlight Interactive AB Framtidsfabriken AB
Frango AB
HiQ International AB
Jeeves AB
Kungsleden AB
M2S AB
Malmbergs Elektriska AB
Naturkompaniet AB
Nocom AB
Novotek AB
Poolia AB
Proffice AB
Q-Med AB
Readsoft AB
RKS AB
Sectra AB
Sorb Industri AB
Telelogic AB
Teligent AB

2000
AudioDev AB
AU-System AB
Axis AB
Beijer Electronics
Eniro AB
IAR System AB
JC AB
Jobline International AB Mekonomen AB
Micronic Laser Systems AB
Mind AB
Neonet AB
Netwise AB
Orc Software AB
Pyrosequencing AB
Scandinavia Online AB
Tele1 Europe Holding AB
Telia AB
Tripep AB
Viking Telecom AB

2001
BioInvent International AB
BTS Group AB
D. Carnegie & Co AB
Dimension AB
Retail and Brands AB
Vitrolife AB

2002
Alfa Laval AB
Ballingslöv International AB
Intrum Justitia AB
Nobia AB