In Draft

THE SWEDISH VENTURE CAPITAL INDUSTRY - AN INFANT, ADOLESCENT OR GROWN-UP?

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1. INTRODUCTION

For many decades, Swedish industry has been dominated by a handful of multinational corporations, such as Volvo, ABB, Alfa Laval, SKF and Ericsson. With a growing internationalisation of these firms, much attention has recently been given to the role of new technology based firms (henceforth NTBFs) as a source of industrial growth and employment. Such firms, more than other young and smaller firms, are much dependent on a well functioning capital market for their survival and growth. Whereas capital can be sought from a range of sources, large customers, suppliers, banks etc., venture capital is seen as a particularly interesting source of funding as a functioning venture capital market supplements such funds with competence. Up until recently, such a service industry hardly existed in Sweden, which presumably had a negative influence on the growth context for NTBFs.

In the 1990s, we have however witnessed a boom in the broader risk capital market. Does this boom indicate that this growth constraint is largely gone? Clearly, as is well known from the literature on 'infant industries' an industry can well exist without being fully mature and well functioning. The purpose of this paper is to analyse, in a very preliminary way, the evolution of the Swedish venture capital industry and critically assess its present structure with respect to its maturity. The paper is organised as follows. In section 2, we provide some analytical points of departure. These circle around three issues. The first refers to the

determinants of the formation and evolution of a VC industry, how we measure and analyse the formation and whether or not a VC industry has the appropriate structure and finally, the length of the 'learning' period for a VC industry. Section 3 maps the evolution of the Swedish venture capital industry and briefly compares with the case of the US. In particular, we focus on the importance of the institutional set-up and other contextual determinants of the evolution of the VC industries. Section 4 analyses the present structure of the industry whereas section 5 gives some concluding remarks, including what we have learned about the length of the learning period.

2. SOME ANALYTICAL AND METHODOLOGICAL POINTS OF DEPARTURE

This section provides some analytical points of departure for our empirical study. Basically, there are three sets of issues involved; first, what are the determinants, or driving forces, of the evolution of an industry; second; how can we analyse and measure the progress an industry makes towards maturity and, third, what is the time horizon involved from the formation of an industry to the point where it has reached maturity.

2.1. The Determinants of the Evolution of a VC Industry

The VC industry is a service industry, which should supply not only capital but also competence; 'competent capital' is what distinguishes this part of the capital market from other parts, such as banks. The development of the industry can largely be seen as a function of the institutional set-up in a country, determining not only the incentive structure but also the financial resources available, and the stock and flow of competence in the economy. The mere existence of large savings is not enough if they are tied up in pension funds which, for legal reasons, can not be invested by VC firms. Availability of financial resources matters little if the incentive structure, e.g. through the tax system is inappropriate or there is a lack of governance forms, which give appropriate incentives to staff in the VC industry, e.g. limited partnership, or there are inadequate exit opportunities for investors. Finally, without access to competence, technical and industrial, competent capital can not be formed. When we analyse the formation and evolution of the VC industry, we will therefore need to focus our attention on institutional and competence issues.

2.2. Analysing and Measuring the Evolution and Structure of a VC Industry

An analysis and measurement of the progress an industry makes towards maturity requires an appropriate conceptualisation of that process. Within industrial economics, there is very little work done on the evolution of industries with some exceptions such as Saxeninian (1994). Within development economics, the whole debate of infant industries treats, however, precisely this issue. A commonly held view among economists, in the context of development economics, is that the maturation of an infant can be conceptualised as a gradual reduction from the initially high costs of production to a point where the production costs are equal to, or below, the import price of the product. This simplistic view of industrial development was later modified by adding that price is not the only competitive dimensions, performance matters to as does the technological change capability required to modify price/performance (Jacobsson 1993).

In the context of the VC industry price/performance characteristics are not really the appropriate dimensions. We would argue that there are three dimensions, which are more suitable for not only measuring the evolution of the VC industry but also analysing the present structure of it. These dimensions are: the growth rate and size of the industry; the *number* of actors, the diversity and the speed at which it alters within the industry and the level as well as the rate of change of competence that the industry has in a diverse range of industrial and technical fields.

The *growth rate* and *size* of the industry are quite self-evident dimensions. As will be discussed below, the growth rate is constrained by institutional factors and the supply of competence. Although it is impossible to say how much VC is optimal, it is clear that the industry must have some volume in order to fulfil its role as a supporting industry to NTBFs. The *number* of actors may be important for some areas where the lead-time is very long from the initial project to market expansion. This is particularly so in the biomedical field where a project may need to be ‘passed on’ between several VC firms.

The *diversity*, and changes therein, of the industry is perhaps not as self-evident. Diversity is required in the sense that the VC industry should provide adequate services to

firms in a very broad range of industries and technologies. These services should also be available for all stages in the evolution of firms, from seed financing all the way to management buy-outs. Moreover, there should be an adequate amount of funding and competence supplied in each combination of industry/technology and stage.

This presumably requires a great deal of diversity among the VC firms. These firms have to handle risks by either having a diversified portfolio or by developing deep industry/technology specific competencies in a narrow field. The latter strategy is particularly important for firms involved in a significant way in early stage financing where much of the uncertainty is related to the potential of the technology. Indeed, unless the VC firm is very large, it is likely that firms involved in early stage financing are more specialised than other VC firms. As Norton and Tenenbaum (1993: 435) explain:

> " The knowledge base of venture capitalists include technological, market, and product expertise, as well as networks comprising experts and investors with similar interests. Venture capitalists seek to manage operating and technical risks by gaining access, by means of their reputation in their specialisation, to information flows and deal flows in networks…. We posit that venture capitalists that invest in firms involving the greatest amounts of technical and products risks (presumably early stage financing) should be more specialised, should have a more narrow industry focus, and may be less diversified than those who finance later stage deals."

A key dimension in analysing the diversity of the VC industry is therefore the existence of specialised firms cover early stage financing, although not necessarily exclusively so. Hence, the structure of a mature VC industry would include specialised as well as diversified firms where a number of particularly the former are involved in early stage financing.

The mere existence of a diversified VC industry does not necessarily mean that it has an adequate *competence*. The VC industry is largely national in nature and is therefore not subjected to international competition to a significant extent. This means that, in principle, a large and diversified VC industry may well be inefficient due to an inadequate competence. An inadequate competence, moreover, act as an obstacle to investment in early stage financing, thereby influencing the degree of diversity of the VC industry. There are at least three issues involved with respect to the growth of competence.

First, as was mentioned above, competence in specific industries/technologies is required to reduce risks and to mobilise networks of investors. The conventional analysis using information asymmetry or genuine lack of information as a justification of the existence of a VC industry provides only part of the picture. Whereas there may, of course, exist a shortage of information, much of the evaluation problem rests of lack of knowledge to not only search for but also most importantly to assess information.

This takes us into the second issue, which is the access to competence in the wider economy. An industry/technology specific competence is, of course, not equally available in all fields as nations and regions specialise. Moreover, that specialisation tends to be 'sticky' (Dalum et al 1999) implying that the profile of competence is strongly path dependent and learning of new competence is constrained by the earlier specialisation profiles. It is therefore not at all self-evident that even if incentives and financial resources are in abundance, that the necessary competence is in place in industrial/technological fields which are distant to those dominating in the prevailing specialisation pattern. This refers also to experience of the particular context of the VC industry. Even in the US VC industry, the fast expansion of the industry in the 1980s led to the inflow of inexperienced people, with consequent failures; as Harvard Business School (1994, p. 13) notes: " Many venture capitalists that received money in the 'boom' of the 1980's had little or no previous industry experience.. experienced venture capitalists are and will be in short supply for some time." A shortage of competence constrains, of course, the rate of expansion possible, given that the VC should be competent.

Third, competence development involve a process of increasing returns which favours nations which initiate experiments earlier than others. Through initial trials and errors, an industrial/technological competence is built up. Some of that competence can, together with capital gained in earlier phases, be invested in new ventures via the formation of a competent capital market. This was allegedly the case of Silicon Valley in the US where early and successful entrepreneurs sold off their firms and became venture capitalists.

2.3 The Time Horizon Involved in the Formation of a VC Industry

The discussion above suggests that the length of the period involved in the formation of a VC industry - the learning period - can be substantial. Not only does an appropriate institutional

set-up be in place but also competence has to be formed. A diversified structure of the VC industry is, moreover, required to be shaped. This must be expected to be a highly complex process involving firms, academia as well as government. Indeed, without the appropriate institutional set-up the learning period may well be infinite.

It is important to understand the length of the learning period for at least two reasons. First, until the industry is mature, NTBFs will face a growth restriction. Unless society is prepared to wait for the maturation of the VC industry, compensation mechanisms have to be set in place. These may be of various types and some may already be in place. For instance, acquisitions of NTBFs by large firms are argued, in the Swedish case, to be an important substitute to a functioning capital market. Other mechanisms can be government participation in the capital market.

Second, patience is needed among policy makers with respect to maintaining a stable and appropriate institutional set-up. The stability may have to be maintained for a period which, perhaps, goes far beyond the expectations of policy makers. If we are to judge from the process of forming new industries, such as the Japanese automobile industry or the Korean machine tool, electronics or excavator industries, the time horizon must be decades rather than years.[1]

3. THE EVOLUTION OF THE SWEDISH VENTURE CAPITAL INDUSTRY

3.1. The Developments in the Swedish VC Industry, 1980-1998

The growth of the Swedish venture capital (VC) industry seems following a similar pattern in the 1980s and 1990s. In both decades, the boom of the VC industry comes after crises and it comes through the initiatives of government decision on supporting small and medium sized companies (SME). This section will attempt to sketch the similarities and differences of these two decades in the history of the VC industry.

[1] As argued in the case of the Korean enginering industry, this was clearly the case for Korean policy makers and economists Jacobsson, 1993).

In the 1970s, as many countries in the world the Swedish economy entered a stagnation due to oil crises. The industrial production in iron mining, shipbuilding, and steel was significantly affected. During the period 1973 and 1982, industrial production fell 25 per cent (Fredriksen, 1997). The Swedish government considered VC as a tool out of the crisis. It particularly supported the establishment of regional development funds in 1978 to support SME businesses with advice and loans.

The oldest Swedish VC firm called Företagskapital was established in 1973. It was owned half by the state and half by merchant banks and initially its aim was to provide financial help for generation changes in family companies. However, it was developed into a VC firm (Olofsson and Wahlbin, 1985).

In the period of 1975-81, government and regional bodies established a number of regional development corporations with special unemployment problems. Regioninvest, Dala invest, Oxelöinvest, AC-Invest, Z-Invest, Malmöhus Invest, Start Invest were the most important regional development corporations established in that period (Fredrikson, 1997). Out of these corporations, in 1998 four of them are still alive, namely AC-Invest, Z-Invest, Malmöhus Invest, Start Invest. These firms are transformed into VC firms. In this process, an important state owned actor was Svetab that was established in 1969 as a subsidiary to Statsföretag, a nationalized corporation. In 1980, Svetab and its sister organization Investkontakt AB identified a need for creative risk financing and it is transformed into a VC company. Svetab invested 6.65 million Swedish krones (SEK) in 13 firms in 1981 and 8 firms in 1982 with approximately 200,000$ per deal. In 1981, government also gave 15 million SEK to Svetab to form 4 regional investment companies (Timmons, 1982).

The critical changes and development in the Swedish private VC industry starts with 1980. In that year, government established a commission called Nodenfalk. This commission published a report in 1981; entitled "Tillväxtkaptial" that was an inquiry into the financial situation of SME companies (Timmons, 1982; Fredrikson, 1997). This report suggested stimulating the creation of private investment companies for small businesses according to the American small business investment company's (SBIC) model. It proposed the establishment of a special investment corporation with favourable financing conditions for

minority share holding in SME, the so-called growth investment companies that should concentrate their activities in a particular region or industry.

Following the proposals of the Nodenfalk commission, in 1982, the first investment company, Wermia, was established in Värmland (Fredrikson, 1997). The same year, OTC (Over-the-counter) market was opened. VC firms were given an opportunity to sell off their holdings. Institutional investors such as insurance companies were allowed to invest in SME. There was a tax reform too. Regarding the company taxes for unquoted companies, part of the dividends were allowed to be deductible from company income. Also wealth taxes for individuals such as holdings in unquoted companies were valued at 30 per cent of the book value of net assets.

The reduction in taxes and the entrance of institutional investors increased the flow of capital into risk capital markets where 20 new VC funds and 30 new regional investment companies are established in the period of 1982 and 1984 (Olofsson and Wahlbin, 1985). This period was the first big VC wave in Swedish history. However, between 1985 and 1989, a shakeout period followed these golden years. During this stagnation period, firms are less interested in minority ownership and high tech; investments shifted to established businesses; risk taking behaviour decreased. According to a study, before 1985, there were 35 VC firms (Olofsson and Wahlbin, 1985). In 1998, out of these 35 firms only four of them still exist as VC firms, namely Skandia, Four Seasons, Euroventures, and Företagskapital.

Even though firms were going through a shakeout period in the late 1980s, the total amount of funds increased. For example, in 1983, there were 13 VC funds with a total of 478 Mkr where government funds were 20 per cent of the total. In 1987 cumulative funds reached to 4 billion Swedish krones (Bkr) where government contributed 1.7 Bkr, corresponding to almost 43 per cent of the total VC (Statens Industriverk, 1990). Considering that private VC firms were failing, only large private VC firms such as Euroventures and Skandia and government funds kept the industry alive. This also explains why the cumulative funds did not show any decrease.

The largest government owned VC investors in the 1980s and 90s were super-annuation and labour funds, namely 4:e AP-fonden, Löntagarfonden, and 6:e AP-fonden of

which particularly last two were effective only in the 1990s (1992 and 1996, respectively) (Isaksson and Cornelius, 1998).

The early 1990s were the start of the second boom period for VC. Since 1992, the Swedish VC reached to a record level of number of VC firms and funds. After the 1989 stock market crash and 1991 economic crisis, the government once again started to promote the growth of SME and VC became once more important tool. Many reforms are introduced in taxes and stock markets, but more importantly new institutions are set and government money pooled into VC market.

Regarding taxes, first the 1990/91 tax reforms are introduced. The personal income tax is reduced to 55-58 per cent from as high as 85 per cent while corporate tax rate kept at 30 per cent, which was lowered to 28 per cent in 1994 (OECD, 1998). This drop facilitated the savings of individuals that later could be transferred into investments in equity markets. Firms are allowed to reduce their tax base through accelerated depreciation of capital stock and inventory and allocations to in-house investment funds. Reforms diminished tax-distortions between different forms of enterprise financing, reducing the prohibitively high marginal tax rate on new share issues in companies owned by households. Moreover, in 1997 a partial exemption for unlisted businesses was re-introduced. Accordingly, all equity listed on the OTC and the O-lists of the stock market, along with equity unlisted altogether is considered as working capital and that is why they are untaxed. Also, firms are allowed to move from the OTC to the A-list while retaining their exemption from wealth taxes (OECD, 1998). As heavy tax burden on SME has been a complaint by small firms, reduced taxes motivated the establishment of small firms and resulted in a creation of new entrepreneurs. This, in turn, has increased demand for VC.

Stock markets have a crucial role in the development of VC industry, since it supplies an exit for VC investments through their portfolio firms' sale in initial public offerings. Swedish stock market is established in 1982 that experienced its first boom during the 1982 and 1984 period and its second boom in 1994. In the late 1980s, the worsened economic situation made long horizon of investments unattractive, leading to short terms and speculative investments. However, as soon as the economy showed signs of recovery and growth, stock markets have become a point of interest. In the US, stock markets showed a significant growth in the 1980s

until 1987 crash that made investments in high tech small firms almost negligible. And it recovered by 1991, where many new high tech small firms are listed in NASDAQ (National Association of Securities Dealers).

Considering the changes in stock markets, the first change took place in 1992 when Stockholm Stock Exchange's monopoly on listing of equity is abolished (OECD, 1998). Individual stockbrokers started listing equity issues by small and unlisted clients on their electronic trading systems. This increased the involvement of individual investors and firms, building up trust on stock markets and making it an attractive investment tool. A second and more important change was the establishment of new development markets, the so-called OTC and O-listings, broadly equivalent to the US NASDAQ. In Sweden, three new markets for small companies are established in the 1990s. The first one, a stock market for smallest companies, is called AktieTorget. The second one is Borsinformation that is a part of Stockholm Bourse Information where listing of unofficial quotations before the company is introduced to the public markets. The last one, IM Innovationsmarknaden (IM innovation markets) is established in 1994 and it serves as a stock market for growth stocks. It is exceptional in the whole world, since it provides a possibility for individual investors to invest into individual company’s stocks. This is a very good development considering that the European version of NASDAQ called EASDAQ is a very weak stock market having 26 firms in 1998 (Cheung, Tat, and Grandinson, 1998).

Besides regulations, government actively involved in the revival of VC market in Sweden. First, in 1992, government created two investment corporations: Atle and Bure. By dissolving the labour fund, government transferred 6.5 billion SEK in one year to these two investment companies. Later in 1995, Swedish government’s holdings in Atle and Bure were sold out, only keeping ~10 per cent indirectly, via its pension funds involvement in these firms (Isaksson and Cornelius, 1998). Both Atle and Bure are traded on the Stockholm stock exchange and they have become later stage investors. In 1996, 6:e AP fund, a pension fund, was formed basically to supply money to equity market in Sweden. This fund manages 12 billion SEK of which 10 per cent is directly used to support VC market. Even though the fund management does not directly invest in high tech small firms, it puts money into various VC firms' funds that are invested in this type of risky SME.

In addition to creating VC firms, government set up new institutions or transformed existing ones into new forms so that it could give soft money to potential entrepreneurs or SME (OECD, 1998; NUTEK, 1997). The most important one of such institutions is ALMI. Even though this organisation existed in various forms, it became a loan supplier company in 1994. It provides new firms with soft loans with a maturity of 6-12 years, covering up to 30 per cent of total capital requirements. These loans are interest-free and not amortised during the first two years. In addition to it, another existing government institution, namely NUTEK, has introduced new programs in the 1990s to finance technical innovation at an early stage. The supply of seed money by NUTEK, basic science and product development activities are supported. Support is provided in various forms such as loans, capital against royalty, or project guarantees to a maximum of 50 per cent of the cost of the project. Another government institution is the Swedish Industrial Development Fund that manages various programmes in favour of smaller enterprises. For example, it gives: loans for specific projects (maximum 50 per cent of total costs); capital against royalty (maximum 50 per cent); credit guarantees (maximum 80 per cent of the loan); and VC in exchange for shares or convertible loans. A final example of the government support for SME is the Innovation Centre. This centre supports the early stages of the innovation process, such as technical and commercial licenses. In addition to all these, there are some other government supports that has been active for a long time, such as medium and long-term export credits or special schemes for loans to enterprises wholly owned by women or minorities.

Due to all these changes in the early 1990s, the VC industry boomed in Sweden. In 1995, for example, a record high of 4.1 billion SEK ($482 million) is raised in one year, that resulted in high level of investments in 1996. According to the statistics of the Swedish Venture Capital Association (SVCA, 1998), in the end of 1998, the risk capital market size became 55 billion SEK ($6.8 billion) in Sweden of which 20 billion SEK ($2.5 billion) is considered as VC market. Out of this available VC, only half is invested, the rest is waiting to be invested in portfolio firms.

3.2. Comparison of the Swedish Experience with the Development of the US VC Industry

A comparison of the evolution of the Swedish VC industry with the most advanced US case will help us to identify the similarities and differences that will form the basis for evaluating the maturity level of the Swedish VC industry. We will first start with a summary of the evolution of the US VC industry. Then, we will highlight the similarities and differences of these two countries industrial structure.

The VC idea started in 1946 by the establishment of American Research & Development Company in Boston (Bygrave and Timmons, 1992). This is the starting date for the first stage in the evolution of the US VC industry. This initial period covers the period between 1946 and 1959. A few professors from MIT initiated this VC firm. This company later became the grandfather of many US innovation centres, especially Route 128 in the Massachusetts region. Although the firm had problems, it managed to raise funds to support many small high tech companies such as Digital Equipment Company. Towards the end of this initial period, the US government established the Small Business Investment Company (SBIC) program in 1958. It aimed to fund private organisations that make equity and debt investments into young firms. Many founders of pioneering independent venture firms in the 1960s received their initial experience in SBICs.

The second period in the US VC industry ranges between 1960 and 1979, representing a stagnation period (Bygrave and Timmons, 1992). Although Route 128 and Silicon Valley have become world models for industrial growth based on high tech commercialisation, only a few new VC firms are established with low VC funds. The annual flow of money into new venture funds between 1946 and 1977 never exceeded a few hundred million dollars and usually was much less.

The takeoff of the US VC industry took place in the 1980s. This third period, years between 1980 and 1987 is the rapid growth period. Between 1978 and 1987, the industry experienced nearly an 800 per cent increase in total capital under management, from $3.5 billion to $31.1 billion. Annual capital commitments increased 700 per cent, from $600 million to $4.9 billion, while annual disbursements also increased nearly 600 per cent (from $550 million to $3.8 billion) (NVCA, 1998).

The growth of the US VC industry in the 1980s was an outcome of several factors (Bygrave and Timmons, 1992). First of all, small business investment act redefined venture firms as business development companies, freeing them from the troublesome need to register as investment advisors with the securities exchange commission. Reducing the regulatory risks that VC managers face in accepting corporate pension funds as investor. Second and most important factor for the increase in money flowing into the venture capital sector was the 1979, the Employee Retirement Income Security Act. Thanks to this act, pension funds are allowed to invest substantial amounts of money into venture capital. In 1978, out of the total VC funds, which was $424 million, individuals accounted for the largest share with 32 per cent and pension funds supplied 15 per cent. In 1986, pension funds accounted for more than half of the total $4 billion VC fund.

After the stock market crises in 1987, the VC industry has slowed down but it started to rise again since 1991. Business Week calls the 1990s as "IPO Venture Capitalism," since in these years technology and its commercialisation have become "America's most potent economic weapons" (The Economist, 1997: 20). In 1996, the amount of professionally managed private equity capital outstanding exceeded $100 billion, of which 30 per cent is VC. Since 1991, US VC investments per year have gone from $3.3 billion to an estimated $10 billion in 1996 (Fenn and Liang, 1995; NVCA, 1998).

Now, we can start our comparison of the VC industries in both countries. We frame our comparison on the bases of sizes of the industries, origins, infrastructure, and entrepreneurial culture.

In terms of sizes, if we consider 1996 data, compared to the US VC that consists of 760 firms and manages around $110 billion, Swedish VC embodies 60 firms with $2 billion (16 billion SEK). However, we need to correct the numbers with population, since Swedish population is 8.8 million, while the US population is 260 million. Then Swedish VC funds correspond to a US equivalent of $59 billion, while the number of Swedish VC firms corresponds to 1772 firms. These numbers show that VC firms per capita is higher in Sweden but their total funds is around half of the US amount.

Regarding the industrial origins, we see that the US VC industry has started in 1946, while the Swedish VC industry had its first firm in 1973. There is a time lag of 27 years, almost three decades delay. Another important difference between two countries is the initial actor. In the US, we see that professors from a high tech university initiate the establishment of a financial company. In Sweden, government together with a private bank started the process of VC formation. And further, if we leave aside this first VC firm, government was the active actor in establishing a private equity market in Sweden through regional funds and state owned VC companies or funds. Governmental lending institutions also play a major part in the supply of risk capital to SME in Sweden.

In fact, Swedish government like many European countries took the US model as an example for its VC industry. During the 1970s, many state officials and university researchers came into contact with the US VC market. Based on this exploration, the Nodenfalk commission prepared a report that suggested to apply the US's SBIC model. Following this advice, Sweden established many regional development corporations in the second half of the 1970s. For example, Svetab, a state owned company, is based upon a US VC firm's approach, namely Venture Founders Corporation in Massachusetts (Timmons, 1982). The only difference from the US was Swedish development corporations were limited with region.

Swedish government not only took an active place in the establishment of the Swedish VC industry in the 1980s but also in the 1990s and still active. The role of the US government in VC market might be insignificant. However, its role as soft loan supplier is significant. For example, in 1982 the government started the SBIC program. This program uses various federal agencies such as the National Science Foundation and the Department of Commerce to fund more than $100 million in academic research per year. In 1997, the SBIR program is planning to invest about $1 billion, which is a significant amount when compared with the approximately $4 billion per year invested on average by the entire VC industry (SBIC, 1999).

Regarding the infrastructure, we see that the US is far ahead of Sweden. We consider stock markets, household savings, and taxation as infrastructure elements of the VC industry. If we start with stock market, the US stock market for small innovative firms, NASDAQ, is established in 1971 and reached to a significant size in 1996 with the listing of 4902 firms (OECD, 1998). In Europe, this type of stock market, EASDAQ, is established in

the 1980s and still very small with 26 firms (Fredrikson, 1997). In Sweden, the special stock market for small innovative firms is established in 1994, with a 23 years of lag compared to the US market. From the point of second infrastructure element, household savings, we see that Swedish household net financial assets are very low compared to many advanced countries (OECD, 1998). While this rate is 80 per cent of GDP in Sweden, it is 200 per cent and 275 per cent in the UK and US, respectively. As household savings are low, the inflow of capital into VC industry is also low. Finally, taxes, particularly the double taxation phenomenon (55-58 per cent tax rate for personal wealth) is shown as a weakness for the Swedish financial markets. Due to the tax system, VC firms are taxed at 3 levels. The company pays taxes for its business income. Second, VC fund pays taxes for the dividends it receives. Third, the investor pays taxes for the dividends it gets from the fund. This reduces the incentives to invest in VC business. In contrast to the case in Sweden, the US taxes are in favour of small firms and keeps personal and firm capital gain taxes low, around 20 per cent. Overall, considering that taxes are high; household savings are low; and the stock markets that are one of the most important factors in the development of VC industry are very new, it is no surprise that the Swedish VC industry is in its early phase.

A final dimension to compare the US and Swedish VC markets is entrepreneur culture (Timmons, 1982; OECD, 1998). The existence of large industry and public administration in Sweden is considered as the basis of a wage earner culture that leads individuals to search long term jobs in large firms. The failure of individual efforts in small firms is not appreciated in the society. Even the bankruptcy of firms is made difficult by laws. This culture also decreases competition among individuals. In contrast, the US laws support start-ups and makes bankruptcy easy. Entrepreneurs that fail continue with new businesses and society does accept them, since entrepreneurship is highly valued and supported. Competitiveness and individuality are very strong among people. This mentality is widely diffused in many institutions too. For example, the US universities are much more open to relationships with industry and actively involved in commercial activities. As researchers are supported to establish start-up firms and conduct consulting activities, the US culture creates a good environment for the establishment of small innovative firms. Even though it is changing in recent years, in Sweden, universities are mainly basic research institutions and the commercial activities of researchers are not supported.

Furthermore, the US has 260 million people, talking same language and sharing same culture. Due to its large size, the likelihood of new ideas and diversified pool of skilled labour force are much higher than a country like Sweden having 8.8 million inhabitants. Again related to the size of the country, the US has many industrial activities that build up a rich industrial experience both in terms of products and labour force. That is particularly important for informal VC market. US small business administration estimates that in 1993 250,000 angles are active in the country and they feed in capital into 30,000 small companies a year for a total investment of $20 billion (House of Representatives, 1993). This is twice of what the professional VC industry invested in 1996. In Sweden, however, the actual number of business angels is not known yet but ALMI tries to bring together a number of 50 individuals into a network, which is a very small number compared to the US.

In short, the entrepreneurial culture of the US is an important source for entrepreneurs and commercialisation of technologies. It creates entrepreneurs demanding capital for start-ups, in other words the demand side of the VC market. But more importantly, it creates experienced managers whose active involvement either as business angles or as managers for new start-up firms guarantees a well functioning VC market, a market integrating technology, management talent (both entrepreneurial and experienced executive skills), and capital.

4. THE PRESENT STRUCTURE OF THE SWEDISH RISK CAPITAL INDUSTRY

In this section, we will use two different data sources to analyse the Swedish VC industry. The first source is the EVCA Yearbook, which is used to do international comparisons as regards the size of the VC industry and as regards its emphasis on various investment phases. As the EVCA compiles its data from its members we would expect that the procedure is standardised, and that the data is reasonably reliable. However, upon closer scrutiny of the Swedish VC industry, we have found that the data is questionable in several ways. First and foremost, it includes a set of actors, which are not venture capital firms proper. Second, the association does not have some important firms in the industry as its member. We have therefore collected our own database of 96 firms in Sweden, in contrast to the much

smaller number of firms listed by EVCA. We will use this database for our analysis of the diversity of the Swedish VC industry (section 4.2.).

4.1. The Size of the Swedish VC Industry and its Stage Distribution

The EVCA statistics, see table 1, suggests that Sweden have the fourth largest stock of cumulative VC funds in Europe, relative to the size of the GDP. It is also clear that the growth rate in the size of the industry has been phenomenal in the 1990s. Indeed, in the period 1995, which is the latest data in table 1, and 1998 the growth was 181 per cent; from 16 billion SEK to 45 billion SEK (SVCA, 1998).

Table 1. Venture capital: Cumulative funds (ECU millions and per cent of GDP)

	1991		***1995***	
France	6528	0.67	10590	0.89
Germany	3008	0.22	4714	0.25
Sweden	750	0.39	1655	0.95
United Kingdom	16272	1.93	21517	2.56

Source: EVCA (1992, 1996).

As shown in table 2, the Swedish VC industry is strongly oriented towards later stages, in particular buy-outs and very little of the now very large capital funds are oriented towards early stages. Hence, the very rapid growth of the Swedish VC industry has predominantly been in firms oriented toward trade in more developed firms. This is clearly in contrast to the US where 37 per cent of the (larger) funds were invested in early stages (source).[2] This may, of course, be expected. As noted in section 2, there is likely to rise a competence restriction to a very rapid growth of the VC industry, if it is to be a competent industry. Most likely, and we will come back to this later, large parts of the Swedish VC industry lacks sufficient competence.

Table 2. Stage distribution of venture capital investments 1996 (Relative distribution of amount)

	Seed Capital	***Start-up***	***Expansion***	***Replacement capital***	***Buy-out***
France	0%	6%	36%	21%	40%
Germany	3%	10%	66%	0%	20%
Sweden	3%	4%	19%	13%	61%
United Kingdom	0%	1%	25%	4%	70%

Source: EVCA (1996).

[2] In Europe, the corresponding figure was 12 per cent.

Another characteristic of the VC industry in Sweden (which it shares with Europe) is that it is not primary oriented towards 'high-tech' industries. In Sweden in 1996, much of the investment went to construction, transportation and other industries whereas in the US (in 1994) two thirds went to 'high-tech' (Cheung, Tat, and Grandinson, 1998). The picture that emerges is therefore that the Swedish VC industry, as the European, so far has grown a lot but the bulk of it does not work with the task of supporting NTBFs.[3]

4.2. The Diversity of the Swedish VC Industry

As mentioned above, we assembled our own database using a range of sources.[4] We ended up in 96 firms, which we classified as VC firms proper or simply risk capital firms. The difference between these groups is that the latter invest in late stages whereas the former invests in early stages. We also distinguished between private and government owned firms.

As is shown in table 3, over 60 per cent of the private firms are VC firms proper but they account for less than 20 per cent of the funds. On top of these, we need though to add Government owned VC firms. Altogether they account for more than 20 per cent of the funds. This is much more than the share of early stage finance as reported by the EVAC, see table 1, which may mean that our database includes a range of VC firms which are not members of the Association. Government firms are fewer and their funds are less than a fourth of the private VC funds. Hence, they could only be seen as a supplement to the private VC industry. In general, our data base gives the same message as that of the EVCA, most of the 'VC industry's' activities are in late stages are not VC activities proper.

Table 3. Number of firms, Per cent of firms, Total VC funds, and Per cent of funds in the Swedish VC industry (1998).

	Number of firms	***% of firms***	***Total VC funds (M SEK)***	***% of funds***
Total firms	**96**		**50688**	
VC firms	59	61,5 %	9538	18,8 %

[3] Insert the next para 'Although this actural….. plus add that this may reflect a competence shortage or perhaps a lack of invesmten objects.

[4] We compiled data from various sources, SVCA Directory (SVCA, 1998), web, Industrifonden study (Industrifonden, 1998), Affärsdata database, newspaper articles, and academic surveys. By bringing all these data together, we were able to have a list of risk capital firms.

Non VC firms	37	38,5 %	41150	81,2 %
Government	18	18,8 %	2829	5,6 %
VC firms	13		2179	

Still though, in terms of number of firms, there are a fair number of actors in the VC industry, about 72. In table 4, we can see that there has been a significant growth in the number of specialised VC firms in the 1990s. Note that in the table we have included all currently existing risk capital firms for which we have the establishment date. This means that we have both VC firms proper and investment companies.

20 of the 35 firms established in the 1990s were specialised. Indeed, 23 out of the currently existing 34 privately owned and specialised (must explain how you classify these) VC firms were established after 1990, as was 3 out four government owned. Also, the volume of funds is increasing for the specialised firms, from 1.2 billion SEK in the 1980s to 3.6 billion in the 1990s.[5] Yet in terms of volume of funds, they are quite small; in the 1990s only 3.5 billion SEK of funding as compared to the non-specialised firms' funds of 22 billion. In spite of the relatively small funds, it is clear that we have seen a structural change, as well as a growth, in the VC industry with the emergence of a significant number of specialised firms.[6]

Table 4. The Distribution of Risk Capital Firms and their Funds According to the Establishment Period and Industrial Specialisation -1998

Establishment Period	***Characteristics***	***Total***	***Specialized***	***Non-Specialized***
<1980	Number of firms	8	3	5
	Government firms	5	1	4
	VC firms	5	1	4
	Funds (M SEK)	1900	1650	250
1980-1990	Number of firms	22	8	14
	Government	2	0	2
	VC firms	12	5	7
	Funds (M SEK)	20455	1250	19205
>1990	Number of firms	54*	23	29

[5] The data for the firms established in the 1980s show the cumulative funds acquired by 1998. Some of it may of course have been acquired in the 1990s, which would tend to play down the growth rate.
[6] The bulk of the firms established in the 1990s, 61 per cent, were VC firms proper, which again points to structural change in the industry.

	Government	11	3	8
	VC firms	35*	20	14
	Funds (M SEK)	25935	3591	22344
Total **	**Number of firms**	**84***	**34**	**48**
	Government firms	**18**	**4**	**14**
	VC firms	**52**	**26**	**25**
	Funds (M SEK)	**48290**	**6491**	**41799**

*Some firms had no industry specialisation information.
** 12 firms whose establishment year is unknown are excluded.

As mentioned in section 2, the number of firms is important per se as in some areas, there is a need to pass the project to a number of VC firms. Hence, the growth in the number of VC firms is a positive sign of the maturation, as is the structural change.

Combining the stages of investment with a specialised or non-specialised strategy of the VC firms, we end up in table 5. We have tried to distinguish between firms investing in early stages only, in late stages only or in all stages. In the latter category we also placed firms which were not very clear about the stages they favoured.

Table 5. The Distribution of Risk Capital Firms According to the Establishment Period, Investment Phase and Industrial Specialisation -1998

Establishment Period	***Industrial Specialization***	***Total***	***Early Phase***	***Across Phases***	***Late Phase***
<1980	Specialized	3	0	2	1
	Non-specialized	5	0	5	0
		8	0	7	1
1980-1990	Specialized	8*	4	3	0
	Non-specialized	14*	2	6	5
		22*	6	9	5
>1990	Specialized	23*	6	14	2
	Non-specialized	29	8	8	13
		54*	14	22	15
Total **	Specialized	34*	10	19	3
	Non-specialized	48*	10	19	18
		84*	20	38	21

*Some firms had no investment phase information.
** 12 firms whose establishment year is unknown are excluded.

Perhaps the most interesting observation from the table is that the number of specialised firms with a presence in early stage financing has increased a great deal; from 2 prior to 1980 through 7 in the 1980s and 20 in the 1990s.[7] A second observation is that there is a strong relationship between specialisation strategy and presence in early or late stages. As was argued in section 2, a firm can reduce risks in early stage investments by developing deep industry/technology specific competence. A firm can still further reduce the risk by having a portfolio of investment objects, which vary across the stages, but largely being within the same industry/technology field. (Reference to specific firms). If we then add the firms with a presence in early stages (columns 4 and 5) we can see that 7 out of the 8 firms established in the 1980s are specialised; in the 1990s, its was 20 out of 23 and in total, the figures are 29 out of 34. On the other hand, for the non-specialised firms, a significant share operates in late phases only; 5 out of 14 in the 1980s and 13 out of 29 in the 1990s. Hence, we can clearly see the expected pattern where a specialisation supports early phase investments. It is an open question though whether or not the competence among those firms has reached an adequate level. For example, an in-depth study on information technology regarding the relationship between competence and capital has clearly shown that the VC firms specialised in this sector are not competent (E-chron, 1998).

5. A DISCUSSION OF THE MATURITY OF THE SWEDISH VENTURE CAPITAL INDUSTRY

We started our paper indicating the need to analyse the developments in the Swedish VC market from an industrial structure perspective. As risk capital market is a service sector, the relevant dimensions in analysing the maturity are not easy to identify. Considering that there are no studies in literature regarding this topic and our study is one of the early studies tackling with the issue, its findings and discussions are more of an exploratory and tentative nature.

In this paper, we focused on the in-depth analysis of size and diversity dimensions of the Swedish VC industry, leaving the detailed analysis of competency dimension for a follow-up study. According to size, our paper shows that the Swedish VC industry managed to

[7] Again, we should note that the data is based only on those firms that existed in 1998 which means that firms exited, particularly in the 1980s, are not included.

reach to a critical mass in terms of both cumulative venture capital amount and the number of firms. Regarding the diversity, we again see a development towards the heterogeneity of the industry, since the distribution of firms according to their industrial specialisation and investment phase has shown a variety across categories in the 1990s. It seems that the Swedish VC industry is still in its infancy but showing a significant progress in becoming an adolescent industry.

Then, the question becomes whether the VC industry in Sweden will succeed in the 1990s and avoid the failure followed the VC boom in the 1980s. By evaluating the evolution of the Swedish case in 1980s and 1990s in a comparative fashion, we are able to identify some positive changes that make us optimistic. These changes might be classified under six categories: the type of investors, competence, regulations, stock markets, culture, and government involvement.

The type of investors changed in the 1990s. Our interviews with ALMI and Euroventures venture capital firms had pointed out that large companies set up VC firms in the 1980s, since they considered VC business profitable. That is why when the economy changed more to a bubble economy where real estate and other areas became more profitable, large companies investing in VC shifted their investments away from VC. This fact to some extent explains why out of 35 firms established in the 1980s, only four firms stayed in business as mentioned above. In the 1990s, we see that pension funds have become main investors. Like in the US, through the inflow of large amounts of money from pension funds, VC firms are flourished. However, pension funds demand high returns in shorter periods. That explains why the majority of VC firms established in the 1990s are non-VC type of risk capital firms, namely firms focusing on buy out activities.

The involvement of pension funds coupled with government push helped to the formation of professional VC. Particularly, the type of investment managers employed in VC firms changed. In the 1980s, as our interviews with venture capitalists showed, the management of the VC was inexperienced investment managers. Large companies that owned VC in most of cases assigned one or two employers from their own financial departments. That is why the Swedish VC firms in the 1980s were very small and their inexperienced investment managers to a large extent relied on outside resources in the identification as well as evaluation

of potential prospects (Olofsson and Wahlbin, 1985). Moreover, they were not motivated as investment managers in limited partnerships, because they were employees in VC firms not partners. In the 1990s, we see a shift towards limited partnership model of VC firms.

When limited partnerships became dominant, the competence of industry started to change also. For one thing, this company model attracted many talented investment managers and experienced managers to become venture capitalists, increasing the level of competence in the VC industry. There is a trend in employing a mixture of people with industrial experience and financial or economic education. Many studies in VC literature show that VCs with operating experience in the venture's focal industry added significantly more value than those with less industry-specific experience (Sapienza, Manigart, and Vermeir, 1996). That is why the Swedish VC firms' new orientation shows that they are becoming competent.

Another important change regarding the competence of VC firms is related to the increased co-operation among VC firms. While in the 1980s, many firms preferred to work by themselves, in the 1990s VC firms tend to syndicate with each other. As co-operation helps firms to exchange knowledge and broaden their networks, it increases the competence of VC firms. The communication increased significantly through the activities of SVCA. Through this professional organisation, they can act together as interest group and influence government decisions regarding the industry. By one venture capitalist's definition, Swedish VC industry is in a phase where it tries to find its identity among other industries.

A second good sign about the 1990s is that many regulation changes took place. The regulations that transformed the US VC industry and created a strong growth industry dated back the late 1970s, while similar type of regulation changes are set in Sweden in the early 1990s with at least a decade delay. The early starting gave much more time to the US VC firms to accumulate industrial experience. Realising importance in this area, the Swedish government is trying to introduce changes into regulations. There are still many changes waiting to be realised like double taxation problem that prevents individuals to invest in equity markets.

Another positive development in the 1990s is the growth in the Stockholm stock market and new stock markets created for small high tech firms. This made several impacts on the growth of VC industry. Individual investors earned money that led to a confidence to stock

markets. It changed the culture of people towards stock market investments and holding equity shares. But more importantly, it became an attractive place for firms to be listed in order to raise money. This created a good exit mechanism for VC firms. In addition, thanks to stock market developments, VC firms received high returns through IPO sales of their portfolio firms. This in turn developed the image of VC firms as a profitable investment tool.

The era of 1990s is also an era of cultural changes, particularly entrepreneurial culture. For example, stock market successes in the early 1990s created some young entrepreneurs eager in investing in high tech companies or VC firms. Universities have started to involve in commercialisation activities through incubators and science parks. Even there are three VC firms actively initiated by universities aiming to commercialise their technologies.

In 1990s, the government involvement in the VC industry has changed too. In the 1980s, government itself established regional investment companies similar to the investment companies in the US. Although both the US experience and Swedish in being active venture capital were not so successful, they served as an important training role. A study about the US small business investment companies has shown that these firms helped the US VC industry in two ways (SBIC, 1999). First, they gave the industry a big boost with a fair amount of government money. Second, people learned by doing, spun off, and started other private institutional VC firms remaining in business today. It is probable that the government involvement had such an impact in Sweden too. But more than that when the private VC firms failed in the 1980s, government funds continued to flow into industry to keep it alive. Then in the 1990s, more structural changes are introduced as mentioned above that led to the revival of the private VC industry. Also the emphasis of government shifted from being a direct VC firm to being supporter to these firms. The best examples are Atle, Bure, and 6:e AP fund. First two companies are established in 1992 as government VC firms, but later privatised in 1995 while 6:e AP fund is a pension fund with 12 billion SEK budget that invests in private VC firms in addition to its own investments. That is why it seems government involvement in the 1990s is following a different and professional way in the 1990s.

Although positive developments, there is still a need for important institutional changes such as changing double taxation laws. High effective taxes facing households as investors discourage them in the equity market. This in turn impedes the supply of risk capital,

affecting listed and unlisted SME that rely on domestic equity finance. Moreover, due to double taxation, firms are encouraged to reinvest corporate earnings through either spin-offs or acquisitions. This might partly explain why the role of VC industry is to some extent supplied by large companies.

As a final note, it is important to highlight that the developments in VC industries are very much depended on the health of economy and stock markets. Although there are positive developments in the Swedish VC industry in the 1990s, it is still likely that there might be failures and some shakeouts. This is because many young firms are established in a very short period and these firms' investments are not finalised yet as IPO or trade sales. Majority of the Swedish VC firms is in the first cycle of their investments. When some portfolio firms fail, the successful VC firms will carry on while failed ones will disappear. This will not be a sign of disaster but stabilisation of the VC industry, since the succeeded VC firms and portfolio firms will become the base of a healthy entrepreneurial economy to come.

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