Tore Anstein Dobloug

Venture capital and innovation

Høgskolen i Hedmark
Notat nr. 6 – 2008

Fulltekstutgave

Utgivelsessted: Elverum

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Notat nr. 6 – 2008

ISBN: 978-82-7671-677-1
ISSN: 1501-8555

Høgskolen i Hedmark

Title: Venture capital and innovation			
Author: Tore Anstein Dobloug			
Number: 6	**Year:** 2008	**Pages:** 29	**ISBN:** 978-82-7671-677-1 **ISSN:** 1501-8555
Financed by:			
Keywords: Investment, venture capital, innovation, clusters			

Summary: This paper will describe and discuss the importance of venture capital in relation to the development of entrepreneurship, innovation and clusters. Special problems relating to investment at an early phase and the part which may be played by venture capital companies as active owners in young companies and as developers of innovation will be discussed. This is also illustrated in relation to the geographical characteristics of venture capital and the implications involved for the development of knowledge-related economy. It will be argued that venture capital is of significant importance for the emergence of start-ups and therefore for both the creation and development of industrial clusters.

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Oppdragsgiver:			
Emneord: Finansiering, venture kapital, innovasjon, klynger			

Sammendrag: I dette paperet beskrives og diskuteres venturekapitalens betydning for utviklingen av entreprenørskap og fremveksten av innovasjon og klynger. Det drøftes spesielle problemer ved investeringer i tidlig fase og den rolle venturekapital selskaper kan spille som aktive eiere og innovasjonsutviklere i unge vekstselskaper. Dette belyses også i lys av de geografiske kjennetegnene ved venturekapital og de implikasjoner dette har for fremveksten av kunnskapsøkonomien. Det argumenteres for at venture kapital har vesentlig betydning for utviklingen av start-ups og således både dannelsen og utviklingen av industrielle klynger.

CONTENTS

VENTURE CAPITAL AND INNOVATION

Introduction

A lack of risk capital is allegedly the reason why the results of Norwegian technological research have disappeared from Norway, and we have therefore been unable to make use of these results for industrialisation. Examples of this are GSM, which was 'invented' at SINTEF in Trondheim, the Internet language, Java, with its basis at the University of Oslo, and the gene technology revolution, PCR, which was first described by scientists from the University of Bergen. Today, these technologies form the basis for large international industrial clusters.

This paper will describe and discuss the importance of venture capital in relation to the development of entrepreneurship, innovation and clusters. Special problems relating to investment at an early phase and the part which may be played by venture capital companies as active owners in young companies and as developers of innovation will be discussed. This is also illustrated in relation to the geographical characteristics of venture capital and the implications involved for the development of knowledge-related economy. It will be argued that venture capital is of significant importance for the emergence of start-ups and therefore for both the creation and development of industrial clusters.

The importance of venture capital

In 2004, The Economist referred to the managers within the private equity sector as 'the new kings of capitalism'. The background for this statement was the fact that the global volume of private equity investment has been growing much faster than all other forms of investment. This is related to the development of the knowledge-based economy, as the rapid technological development and changes in consumers' preferences are thought to particularly stimulate the demand for venture capital (Gruenfeldt and Jacobsen, 2007). In 2005, European private equity specialists provided capital equivalent to 45 per cent of all new capital raised through the stock exchanges involved.

Young technology companies are particularly interesting in macro-economic context as they develop radical technologies which may be the trigger for the development of new clusters. This is why they also grow quickly. According to a report from the European Venture Capital Association, EVCA (2006), during the period 2000–2004, companies financed by venture capital posted an annual growth in employment of 30 per cent, as against a 0.7 per cent growth within the overall economy throughout the EU area. The subsidiary group of venture capital-financed companies based on spin-offs from university environments posted an annual growth rate of 60 per cent. The growth of employment involving companies with venture capital investors tends to be higher for the smallest and most knowledge-intensive businesses.

Studies from Sweden also confirm a pattern according to which companies with private equity grow more quickly. NUTEK (2005) shows that the companies in Swedish Private Equity Funds' portfolios had an annual growth in turnover of 21 per cent during the period from 1999 to 2004. In comparison, quoted companies grew by 7 per cent, whereas the growth for all Swedish companies legally bound to maintain accounting records was 1.5 per cent.

Pottelsberghe and Romain (2004) have done an analysis of venture capital investment in 16 OECD-countries. The results show that the productivity contribution from venture capital is twice large as the contribution from private R&D.

Entrepreneurship, clusters and venture capital

Innovation and cluster concepts can be found in different versions (Malmberg and Power, 2006) which often refer to different things, or, perhaps more frequently, which do not refer to anything at all (Mattson, 2007).

Porter (1990) defines innovation as «an attempt to create competitive advantage by perceiving or discovering new and better ways of competing in an industry and bringing them to market». Put briefly, innovation is the commercialisation of new ideas (Simmie, 2006). The entrepreneur's task is therefore to take the idea from the laboratory to the consumer. However, few good ideas are developed in a vacuum, as innovation is an interactive process which involves different forms of social interaction (Asheim, 2000).

The entrepreneur accordingly plays an important part in an evolutionary economy by breaking down existing patterns in the economy, introducing new combinations which disturb the existing equilibrium and balance in the economy (Schumpeter, 1934). Through such irreversible development processes, new market players emerge whereas old participants disappear from the market. This creative destruction makes the entrepreneur a driving force for development when new and small innovations are commercialised, competitively beating and replacing established products.

It is well documented from research that innovation is closely related to productivity and that innovation is important for competitiveness and therefore for economic growth (Simmie, 2006). In view of the fact that innovation and productivity appear to be important conditions for competitiveness, what is the driving force behind innovation and its impact on productivity and competitiveness? According to Porter, the simple answer to this question is clusters.

Through his theory about clusters and cluster development, Porter (1990, 1998 and 2000) applies an integration of many elements from the literature of strategy, the network theory, economic/geographic theory about agglomerations, and innovation systems. «Clusters are geographic concentrations of interconnected companies, specialized suppliers and service providers, firms in related industries, and associated institutions in particular fields that compete but also cooperate» (Porter, 2000).

According to Porter, «industries cluster for advantage created by the knowledge spillovers more easily captured by the rich 'neighborhood' of firms, universities, and their service industries located in close proximity». Simply put, innovation is the aim, clusters the means (Mattson, 2007).

Unlike Porter, Feldman and Francis (2006) are not focusing on why industries cluster but on how clusters are formed and developed. The main perspective is evolutionary, their point being that entrepreneurs provide the spark for clusters and regional competitive advantage. According to their model, a well developed venture capital system is important in order to nurture and develop new, successful companies, and in order to prevent a stagnation or reduction of clusters. The creation of clusters is a process consisting of three phases: entrepreneurial innovation, development of an environment and a network of related enterprises, and a process of maturing, involving the development of a complete industry with the required infrastructure and support functions. A similar approach is also applied by Wal and Botschma (2007), who divide the last phase into two sequences, the maturing and reduction, or the start of a new cycle.

According to Schumpeter (1939), Knight (1921) and Kirzner (1973), entrepreneurs typically have a greater ability to spot and visualise opportunities, accept challenges and organise the resources required. Blanchflower (2001) further develops this theory, maintaining that the ability to spot and utilise opportunities is of crucial importance for an entrepreneur's success. Furthermore, any geographical region may have within it the basis for entrepreneurship, albeit latent, with people wanting to become entrepreneurs and having the qualifications and abilities needed. However, many fail to realise such an ambition, due to lack of capital or simply lack of courage, or for other reasons. Feldman and Francis point out that different events, either a crisis, unemployment, or a technological innovation, can change latent entrepreneurship into active entrepreneurship. The establishment of a new business, based on a unique idea or a permanent, competitive advantage, represents the trigger for the development of a cluster. The entrepreneur becomes the 'agent of change' in what Feldman and Francis describe as the first phase in the development of an industrial cluster, the emergent phase.

Phase two of a cluster development is characterised by increased entrepreneurial activity. The further development of the cluster and its maturing is to a large extent dependent upon the cluster's ability with regard to cooperation and a common vision. Based on the initial start-ups, a successful cluster will, during this phase, be financially viable and sustainable in its own right: Entrepreneurs attract capital and competence to the area involved, public sector- and private networks are established in order to provide support for the businesses in question, infrastructure is developed, as are support functions and services. The success of the original entrepreneurs, coupled with the synergies between them, generates opportunities for new start-ups and new spin-offs. The establishment of venture capital funds or branches of such funds confirms that the region involved has developed into a successful cluster.

The «spawning» of entrepreneurial businesses is crucially important for whether an immature cluster goes on to mature or is impaired. Gompers, Lerner and Scharfstein (2003) have studied entrepreneurial «spawning» within venture capital hubs in Silicon Valley and Boston Route 128 and have found that entrepreneurial experience and networks are critical factors for the establishment of new start-ups. Younger companies financed by venture capital are an important source and a 'greenhouse' for producing new entrepreneurs who leave their jobs in order to establish businesses with the help of venture capital. Valuable experience gained while working at a successful company would include knowledge about the market, customers, technologies, venture capital investors and how to build up a company (Gompers et al., 2003). In this way, growth companies become veritable 'hatcheries' for new businesses, which is typical for phase three or a mature cluster. Gompers et al emphasise the importance of developing venture capital within a cluster in order to be able to bring about new successful spin-offs, thereby preventing the cluster's stagnation or demise.

Investment phases

A company's life cycle may be divided into different phases based on the time of maturity involved (European Venture Capital Association, 2006). The seed phase comprises the establishment phase, during which technology and the business model are developed. This phase would normally involve

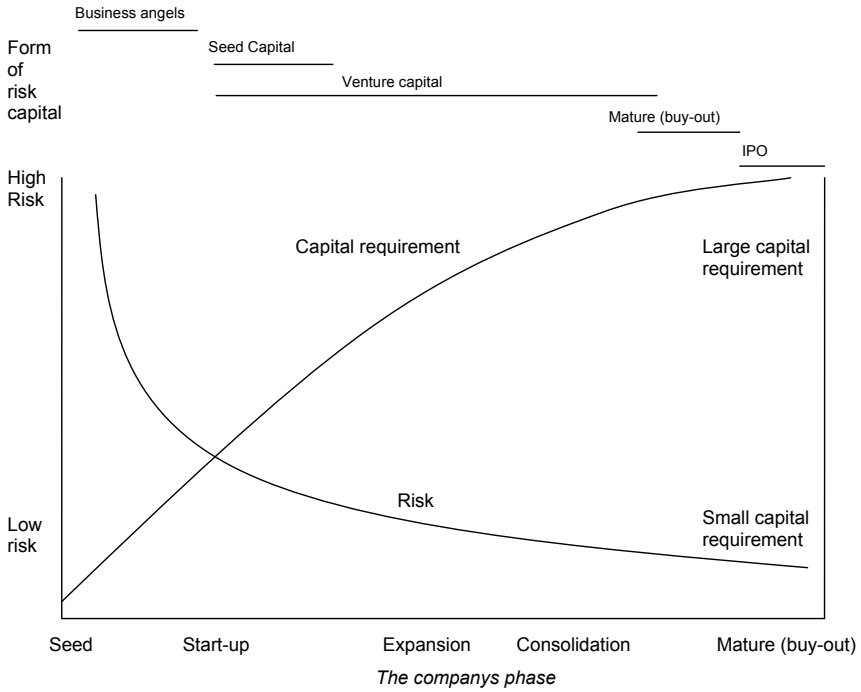
a modest capital requirement, and is often financed by family, friends and so called business angels, i.e. competent managers, who provide capital and competence. Once the core technology and business model have been developed one moves into the start-up phase. During this phase, the technology has to be verified, the product will be subject to pre-launch, and the organisation will be built up with professional management. This phase is often capital-intensive; normally, external, professional owners will join the company, taking an active part in the business.

The difficulties of providing financing are probably greatest during this phase (Harding, 2000; Treasury and Small Business Services, 2002; 2003). Oakey (2003) calls this the capital problem, at the transition from idea to product or the transition from product to market, the equity gap.

Furthermore, these problems are typically greatest for businesses with high knowledge intensity, where the product or the manufacturing process has not been tested in the market, where a rapid development of new and competing technology makes the product's life cycle brief, and where there is often an inexorable learning process involved in an uncertain environment (Moore, 1994; Oakey, 1995; 2003). This also has implications in relation to the establishment and development of clusters, as a lack of capital can reduce or completely eliminate the possibilities of an entrepreneur's success. This would perhaps in particular apply to any unique and radical ideas. This is related to the fact that early phase investment involves significant information problems.

First, an asymmetric information relationship between entrepreneur and investor involves a comprehensive examination of the company and its opportunities, a process which is both complicated, time-consuming and costly, irrespective of the amount of investment in question. It would be difficult for investors to decide on which of the entrepreneurs involved would have the best project to offer. This problem of selection is described in more detail by Myers and Majluf (1984).

Illustration 1: EVCA: Maturing phase and capital requirements relating to innovative growth companies



Secondly, all investments require active follow-up and monitoring by the investor, and this makes smaller investments less attractive. Thirdly, it is more risky to invest in companies which are in the early phase of their development than in companies which have tested their technology and which have more experienced management. There is a greater likelihood of 'moral hazard'-related- or behavioral risk in view of the fact that the entrepreneurs involved may not be sufficiently competent or 'manageable', which could mean that the capital provided is not applied as intended. Fourthly, exit possibilities are more uncertain as far as this type of investment is concerned. Fifthly, the growth in investment funds' size has brought about larger individual investments, both due to the fact that the number of managers in the funds has not increased correspondingly, and because the funds have a limited life cycle. Sixthly, and finally, the highest return has been achieved from investments

which have been made during a later phase; this has also made it more difficult to raise funds for early phase investments (Murray, 1999).

Financing through banks involves even bigger problems than those which have been described above. Gompers and Lerner (2000) draw attention to four aspects which reduce borrowing possibilities: uncertainty, asymmetric information, a high portion of intangible assets and the general situation in the financial markets.

The question of mortgage-related security is particularly problematical. In view of the fact that this form of security is rarely available from a knowledge-based company or in connection with technology development, and as the likelihood of the company being unable to repay the loan is very high, the risk for the banks is too high in relation to the interest rate-related return on assets provided by a bank loan. In the old economy, bank financing often functioned well because loans were always made on the basis of collateralised assets pledged as security. Equipment and other physical assets could be mortgaged. In the knowledge-based industry, things are very different – the larger the capital requirement is, the smaller the mortgage-related security is.

Variations in the capital markets could also be an important aspect. Such variations are likely to have a larger impact on young, innovative companies than on industry and commerce in general.

Authorities in different countries have chosen different strategies in order to solve the problem relating to the equity gap. Countries which have succeeded in establishing international growth businesses have very effective state-funded risk relief mechanisms and tax incentives which make seed phase investments attractive to private investors. In Great Britain and Germany, the financial contribution from the state is significant. In USA, where framework conditions for industry and commerce are more liberalised than in the Nordic countries, considerable state funds are used in order to support the seed phase. As recently as in 1995, state financing amounted to 60 per cent of the total early phase investments involved. SBIC in USA contributes with capital for seed environments, supporting more than 5,000 projects in 2005, providing in excess of US$ 3.6 billion. Well-known companies such as Apple, Compaq and Intel were built up with SBIC-financing at the outset.

Mason & Harrison (2002), among others, have pointed out that the equity gap is not necessarily due to investors' behavior or lack of capital, but to the fact that the company involved has failed to make itself 'investment ready'. This involves working out a business plan which is reliable and well formulated, based on real assumptions, coupled with well thought out content. In addition, it is important to be able to communicate and sell oneself and one's concept, projecting a talented and attractive image for the would-be investor.

The third phase in a growth business's life cycle comprises the expansion phase, which consists of the introduction of the product to the market, and deciding on the scale of the production. This phase is also capital-intensive, but the risk is reduced as the technology has been tested and accepted by the market, and as, at the same time, an organisation has been established for production, sale, financial- and strategic management. Another typical feature of this phase is speed, as global markets, continuous innovation and new concepts challenge the company's patented technology. The competition is about being first in the market with a new product – 'first mover advantage' is of crucial importance for the company's further development.

Once the company moves into the consolidation phase the growth curve starts levelling out, the business has a stable, positive cash flow, and the challenges now involve the maintenance of market positions, and making the company's operations more effective overall. At this stage, the risk is therefore reduced to a completely new level, and the investors will want to relinquish their interests, through a sale of their equity stake, through a IPO or a merger of the company, in order to realise any profit from their investment. This is normally formally agreed at the outset, when the investment is first made, in order to make sure that the entrepreneurs involved are prepared for this process. At the exit stage, the company accordingly moves into the 'buy-out' phase, which clearly shows that the company has now entered a more mature phase, and that the risk capital is now replaced by traditional investors.

A typical feature of companies which have reached the mature phase of their development is that they now to a larger extent also function as 'hatcheries' for spin-offs and corporate managers who leave their companies and start related or competing businesses. These are the first signs of something which might develop into a cluster.

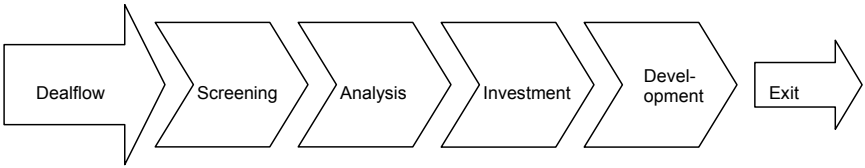
The investment process

In Kaplan's (1999) analysis of the emergence of companies in Silicon Valley, amongst others Cisco, Netscape, Yahoo and Oracle, the importance of venture capital is emphasised. Among the most important investors, Kaplan mentions Kleiner Perkins, with investments in some 200 companies, involving an aggregate market value of US$ 125 billion and a total of 162,000 employees. Through aggressive 'hoovering' of research laboratories looking for new and good ideas, Kleiner Perkins introduced a new form of entrepreneurial innovation. Immediately after their establishment, the companies involved were 'packaged' into 'factories', clusters of start-up companies, where people worked together in an environment largely similar to Japan's «keiretsu».

One of the reasons for the introduction of this type of methodology is that the financing of young companies is very risky as uncertainty and information gaps are involved, as previously mentioned. This makes it difficult to select the right companies in which to invest and to make sure that the capital which has been provided is used in an effective and appropriate manner.

In order to solve the information problems, venture capital investors generally apply different mechanisms which would appear of critical importance in order to promote innovation (Lerner, Moore and Shepherd, 2005). This is more generally referred to as the investment process:

Illustration 2: The investment process for venture capital investors



The first selection of the investment projects takes place during the screening phase. This is a more effective process than that which is applied by research-based departments of larger companies. The most important criteria for a venture capital investor to know about during the screening process

are as follows: Does the business concept consist of a permanent, competitive advantage? Does it have a unique advantage? Does it have a global market and a big profit potential? (Lerner et al., 2005). In the case of technology-related companies, in which venture capital investors are primarily interested, permanent, competitive advantages are normally related to intellectual rights and innovative abilities. If the venture capital investor sees no potential for patents or other forms of protected intellectual property there is a great likelihood of the investment process discontinuing at that stage.

This approach is very different to that which is applied by the large and mature multinational companies, which tend to look at existing business segments when selecting projects in which to invest. Financial support is rarely given to technologies which do not form part of the company's core operations, or to ideas which are regarded as limited, peripheral and being in direct conflict with internal, cultural opinions. A great many successful venture capital-backed start-ups have in fact been initiated by managers in large companies who have failed to get internal backing for their ideas (Lerner et al., 2005).

In addition to the actual selection process, the venture capital investor's contribution as an owner, after the investment has been made, is absolutely central as far as further support for the best possible innovation during the company's development is concerned.

As active owners, venture capital investors will take much more notice of other potential, future applications for the technology involved than large, mature companies (Lerner et al., 2005). On the other hand, it may possibly be the case that, in their eagerness and pressure for a good return on their investment, venture capital investors might not be prepared to provide the company with the financial resources required for the level of innovation activity which in the long run would be best for the company.

However, venture capital investors' livelihood is largely dependent upon their reputation, and a high level of conflict and bad cooperation with entrepreneurs could have an adverse impact on the investors' reputation, reducing the number of investment opportunities in promising companies in the future, probably both within and outside the cluster involved. A study by Hsu (2004) illustrates the importance of reputation. Hsu looked at early phase companies

which had received several offers from venture capital investors and discovered that the companies involved were willing to sell equity stakes 10–14 per cent more cheaply to venture capital investors whose reputation was good.

Lerner points out that the way in which venture capital investors provide companies with capital normally enhances the level of effectiveness. In large companies, the research- and development budgets are typically decided at the start of the project in question, with little internal follow-up or few adjustments going forward. In other words, average and mediocre projects would be fully financed and then placed on an equal footing with extremely promising projects which might require more capital. Venture capital, on the other hand, is provided at different stages, based on the various corporate milestones reached. In view of this, therefore, only innovative ideas which develop according to plan, towards eventual commercialisation, will survive.

Venture capital as knowledge capital

It has been suggested that venture capital is 'more than money'. MacMillan and others (1989) differentiate between three different involvement strategies relating to venture capital: laissez faire, moderate involvement and close trackers.

The venture capital companies' involvement happens through directorships on companies' boards and through active follow-up of the management in question. This puts pressure on management, but at the same time provides support as far as strategic choices are concerned. To what extent venture capital may actually be 'knowledgable' capital is naturally dependent upon how it is in fact provided.

According to a Norwegian analysis (Langeland, 2005) of Norwegian companies financed by venture capital, some 60 per cent of the companies involved said that the venture capital company's contribution to strategy and networks was important or very important. Although the investors were thought to have done a good job as members of the Boards of Directors of the companies involved, their other forms of contribution were deemed to be average or mediocre. 40 per cent of the companies were not very pleased with the venture companies' support for day-to-day management. An obvious con-

clusion is therefore that Norwegian venture capital funds, despite the fact that they would themselves maintain that the opposite were the case, still have some way to go before they would be regarded as innovation promoters within the knowledge economy.

This is very different from, amongst others, Fried & Hisrich's (1994) study of US venture capital, which concludes that the entrepreneur can regard the venture capital investor as a de facto partner in the company.

During the last decade, there has been a development towards increased specialisation of the funds in as much as they specialise within certain industrial and commercial sectors and more specifically, from an investment point of view, in the different stages of a company's development (Sjögren and Zackrisson, 2005). It is reasonable to assume that this would result in a more competent ownership involvement, coupled with increased technical understanding. The two lastmentioned authors have compared the financing of small high-tech companies in Linköping and Silicon Valley and found that the businesses in Linköping prefer venture capital to other capital, i.e. banks and other investors, even though bank financing is cheaper and simpler.

The companies in Linköping are to a large extent financed through banks due to the fact the venture capital is not available, unlike in the case of Silicon Valley. Furthermore, the companies based in Silicon Valley enjoy a broader structure of ownership, coupled with a larger degree of satisfaction with their owners, who are active venture capital investors. This further confirms the concept of 'more than money' mentioned earlier, and Sjögren and Zackrisson conclude as follows: «Our results on…competent capital indicate that the Swedish financial system is not providing high technology small firms with the financing they want».

Venture capital and innovation

Venture capital is today the dominant form of equity capital financing of technology companies in USA, and interviews with entrepreneurs suggest that venture capital plays an important part in the development of innovation (Lerner, 2005). Its contribution has two dimensions: to accelerate growth

and secure long-term success. With reliable, predictable capital, start-ups – independent of the general economic situation – are able to invest in research, marketing and strategic positioning to an extent which is necessary in order to achieve the required company size for a IPO. As a result of this, companies backed by venture capital are considerably younger than other companies when they get listed on a stock exchange. For a venture fund, this is also a necessity, as its corporate purpose is to deliver the highest possible return for its investors, as quickly as possible.

According to Kaplan (1999), typical characteristics of venture capital investors' presence and methodology in Silicon Valley have been incubators, extremely professional structuring of companies, synergies between the investments and the ongoing follow-up involving the companies' management and results. Such processes for the creation of new, technology-based growth companies are described by Cook, Davis and Wilson (2002) as a 'generic private system of innovation'. This is in contrast to the regional innovation system (RIS), which has emerged in support of old economy regions, many of which being in economic crisis. The private innovation system, or the venture capital-based innovation model, is characterised by hands-on, investor-lead- and return-focused clusters with related incubators.

In a similar way, Israel built up its Yozma-environment through a risk relief mechanism which attracted substantial amounts of foreign capital (Cooke et al., 2002). Yozma was introduced as a new part of Israel's system for innovation based on the realisation that other important assumptions and conditions for an innovation system existed, but not venture capital. This was regarded as a barrier for innovation as far as the authorities were concerned, since it had not been possible to commercialise new knowledge developed on the basis of the country's defense industry. In this case, the authorities' intervention through the establishment of venture capital funds and instruments helped compensate for innovation infrastructure deficits.

Illustration 3: Regional and private venture capital innovation systems

Regional innovation system	Private (venture capital) system of innovation
Research and development driven	Venture capital driven
User-producer relations	Serial start-ups
Technology-focused	Market focused
Incremental innovation	Incremental and disruptive
Bank borrowing	Initial public offerings
External supply-chain networks	Internal EcoNets
Science park	Incubators

Agglomerations and venture capital

Venture capital investors look for arenas where the supply of exciting investment projects is largest. Such investors are therefore often attracted to cities or urban areas. The mutual attraction between entrepreneurs and venture capital investors gets stronger due to the fact that industrial and commercial clusters are often characterised by a high level of knowledge-based investment, coupled with the rapid spreading of knowledge. These mechanisms mean that the rate of innovation increases and that commercialisation happens more quickly. Furthermore, large and growing environments improve the opportunities for further specialisation among the market players. As an example, it will be easier to become a serial or parallel entrepreneur as the exit opportunities are greater. The implication of the mutually strengthening cluster mechanisms is that, by stimulating the venture capital sector, clusters are also indirectly stimulated (Grünfeldt and Jacobsen, 2007).

Amin (2002) points out that venture capital is an industry which to a large extent is dependent upon non-codified, tacit knowledge (Florida and Kennedy, 1988), comprising companies which require close and often face-to-face contact with the different partners throughout the value chain, involving monitoring and follow-up of the companies in which investment has been made, with a general requirement for joint ventures. Venture capital

investors will for example have a need for contact with other capital- and financial environments which are typically found in large centres.

In view of this, it is reasonable to assume that the cities' and clusters' function as meeting places for venture capital companies and knowledge-intensive service industries reduces the transaction costs relating to the creation and financing of new businesses (Cooke, Davis and Wilson, 2002).

In view of the abovementioned factors one would also think that knowledge companies located in cities would have easier access to capital and therefore experience smaller financing problems than companies situated elsewhere in the country. However, this is not the case according to a study completed by Norsk Institutt for By- og Region-forskning (NIBR, 2004). Financing problems appear to be unrelated to geographical location. This may be because demand for venture capital is so much larger in the cities than elsewhere in the country; in relative terms, therefore, the provision of financial investment is no better in central- than in less densely populated areas. In view of the fact that such a large part of the knowledge-based companies is located in the cities, the competition for risk capital will also be greater there than elsewhere in the country.

The need for contact between investor and company will be dependent upon the stage of development at which the company finds itself; the more immature, the more need for assistance and follow-up (Gupta and Sapienza, 1992). This means that closeness and proximity are important for early phase companies, and that investors with a high proportion of investments in such companies ought to invest in local areas (Mason and Harrison, 1999, 2000). The alternative to this is to participate in syndications, in which one of the partners is close to the company in question and therefore takes care of that requirement through its role as lead investor (Wright and Lockett, 2003). A German study (Fritsch and Schilder, 2006), based on interviews with 85 German investors, indicates, however, that the importance of closeness and proximity between investor and company is widely overestimated in the literature. A conclusion from this survey is therefore that the absence of venture capital investors in an area does not represent a bottleneck for innovative entrepreneurs in Germany. Fritsch and Schilder conclude that from the investors' point of view the biggest bottleneck is simply the existence of sufficiently good investment opportunities.

Conclusions

Venture capital investors' ability to add value in portfolio companies would primarily appear to be related to the provision of three distinct factors: fuel, management and complementary input.

- Competent owners provide capital in the right amounts at the right time, – the rate of innovation and growth increases.
- Competent owners provide strategic and financial competence and manage portfolio companies, – this enhances overall effectiveness and increases the rate of growth.
- Competent owners communicate closely with management in the portfolio companies, providing relevant competence and networks – this strengthens companies' ability to realise their strategies.

However, there is not enough venture capital available during the companies' first phase, paradoxically the phase during which the value of such an investor is greatest. This system-related weakness can only be lessened through policy measures or public sector funding.

The relationship between access to capital and entrepreneurship is an example of mutually strengthening mechanisms within industrial and commercial development, formulated in the theory of industrial clusters (Krugman, 1991; Porter, 1998). There exists a mutual attraction between competent people seeking career opportunities and knowledge companies seeking competence, and, in the same way, between venture capital funds looking for projects and entrepreneurs requiring opportunities for commercialisation. This relationship is also referred to by Feldman and Francis (2006) as being an important condition for stopping clusters from stagnating or disappearing.

A cluster always has a beginning, consisting of an entrepreneur and an idea. Feldman and Francis argue that the existence and location of entrepreneurs with abilities and opportunities for taking advantage of new technologies have a large impact on where high-tech clusters are going to be developed. Simmie (2006) refers to the fact that innovation results in clusters rather than the other way around. Functional, local innovation systems benefitting from an entrepreneurial culture and sophisticated technical and management-

related competence will therefore lead to competitive export. In addition, the activities within such a system will sometimes develop into a cluster in the way described by Porter.

It is nevertheless quite obvious that some of the purpose of clusters is to bring about innovation, i.e. the commercialisation of new ideas. This is how clusters are reproduced. The venture capital's contribution during this process is to accelerate innovation and to secure long-term growth. The venture capital-based innovation system is such an engine: batch production of new ideas, hands-on owners, a rapid tempo, an aggressive approach in the market, keiretsu-style and the maximisation of profit.

Against this background, therefore, one would argue that the access to venture capital is a condition for the development of a cluster in the new economy. However, it should be mentioned that incompetent venture capital investors are probably worse than no investors.

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