The development of geographical specialization of venture capital

Christensen, Jesper Lindgaard

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Associate Professor

Jesper Lindgaard Christensen

Aalborg University, Denmark[1]

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Abstract

Many regions have realised that access to capital is an important prerequisite for establishment and growth of businesses, and have therefore focused policies to ensure an adequate supply of risk capital. The growth of the venture capital industry in the 1990s put pressure on venture capital firms (VCFs) to act more strategically. Many VCFs have thus specialized along one or more dimensions: certain industries, stages of development of the firm, or geographical areas.
A theoretical dichotomy is developed in this paper to explain regionally focused venture capital. A competence-based theoretical view sees increased competition in the industry as promoting the growth of geographical specialization, while, according to financial theory, it would lead to diversification in order to spread risk.
The empirical analysis illustrates the development in the average distance between VCFs and their Danish portfolio firms. All venture capital investments are included. Findings suggest that the process of geographical specialization follows an inverted v-shaped curve. This is interpreted in light of the developments in competition and in the competencies in the market. VCFs search broadly for investment opportunities in the first phase of the emergence of the venture capital industry, but when competition increases they tend to confine themselves to investments

[1] *Department of Business Studies, Fibigerstraede 4, DK-9220 Aalborg Ø , Fax: 45 98156013 Tel.: 45 96358261, Email: jlc@business.aau.dk*

within a closer geographical distance. The implications of these findings are important both for funds-of-funds, regional governments, and VCFs.

1. Introduction[2]

One of the top priorities of national, regional and EU policies has been to ease firms' access to capital, especially venture capital, and policymakers have introduced several measures to stimulate the development of venture capital markets. The OECD has also advocated this approach (OECD, 1996). The rationale for this policy is a belief that it spurs economic growth and innovation both at a national and regional level. In particular, many regions have realised that access to capital is an important part of the innovation system (Cooke, 2001), and have therefore focused policies to ensure an adequate supply of risk capital. Less favoured regions have also asserted their need for regionally embedded funds to compensate for the tendency of financial institutions to locate in metropolitan areas.

The second half of the 1990s has seen a tremendous growth in the venture capital market in many countries (Martin et al., 2002). The entire venture capital environment underwent dramatic changes during this period of growth: intensified competition resulted not only from the increase in funds raised and a proliferation of new venture capital firms (VCFs), but also from the greater visibility and activity of alternative sources of financing such as corporate venture

[2] I am grateful to former student, now senior analyst at The Danish Growth Fund, Jacob Borup for help with recoding and processing some of the data used in this paper. Also thanks for comments on earlier drafts of the paper to professor Phil Cooke, participants at the Regional Studies Association conference in Angers, France, April 2004, and to participants at an internal IKE seminar at Aalborg University in March 2005. Finally, comments and suggestions from two anonymous referees are gratefully acknowledged. Responsibility for the content is solely the author's.

capital, business angels and other complementary institutions. This development put pressure on VCFs to act more strategically in order to position themselves in the market and acquire a comparative advantage over both other VCFs and other types of financial organisations. In response to this challenge, many VCFs have thus specialized. According to Bygrave (1987, pp.139-140), a majority of VCFs are likely to specialise to a still higher degree. Using the analogy of department stores and boutiques, he claims that only very big VCFs will be able to invest in all types of companies. The bulk of VCFs will be 'boutiques' investing in specific types of firms or geographical regions.

This specialization can be pursued along one or more dimensions - concentrating investments in certain industries, in certain stages of development of the firm, or specialization in geographical areas. This paper, which focuses on the latter, discusses developments in the geographical scope of venture capital in a small, open economy, where the previously underdeveloped venture capital market has grown substantially (Christensen, 2003).

A theoretical dichotomy unfolds in the paper. On the one hand, from a competence-based theoretical view, it can be argued that increased competition in the industry will result in increased specialization, while on the other hand, according to traditional financial theory the appropriate response would be diversification in order to spread risk.

Thus, the question to be answered here is: *How does geographical specialization or diversification take place in an underdeveloped, but booming, venture capital industry? What are the implications for regional development?* Do VCFs, over time, concentrate investments geographically, thus enabling them to acquire more knowledge about the local environment prior to the

investments, and to more easily carry out control and monitoring after them? Or do they diversify in order to spread risk and have more investment opportunities? Traditionally, one of the main problems with focusing venture capital funds in specific regions is that it involves a balance between the size of the region and the critical mass of investment opportunities needed to diversify risk. It is likely that there is a minimum efficient scale of venture capital funds, which is difficult to meet for small, regionally specialised funds (Murray, 1998).

The previous literature on venture capital and geography has primarily focused on the distribution of the investments and the possible mis-match between the location of the VCFs and demand, rather than the development of specialization[3]. This paper takes a dynamic approach in that it analyses the *development* of geographical specialization. Moreover, it sees this development in light of the context in which it is evolving, i.e. the development of the market.

The empirical analysis is based primarily on a detailed mapping of the development of all venture capital investments in Danish firms made during the boom in the industry in 1994-1999[4]. These data are re-coded according to the road distance in kilometres between the VCF and the firm invested in.

This research is relevant for several reasons. In particular, it has been discussed whether venture capital investments tend to transform savings that are widely dispersed throughout the economy into investments mainly in metropolitan areas, where VCFs tend to cluster (Murray,

[3] However, the demand for venture capital may differ from, for example, the share of the national population of firms in a region. A possible uneven distribution may thus be explained by differences in start-up rates or high-tech industries.

[4] This period can be characterised as a second take-off, inasmuch as the venture capital industry initially started and rapidly expanded in the mid-1980s alongside other venture capital markets in Europe. However, in the late 1980s and beginning of the 1990s there was a serious decline of activities, resulting in only two active VCFs in

1998; Mason and Harrison, 1998; Mason and Harrison, 2002). An unresolved issue in this literature is the dynamics behind the processes leading to a spatially uneven distribution of venture capital.

Conversely, there has been little interest in the specialization of VCFs, regardless of the actual location of the VCF and the firm invested in. Gupta & Sapienza (1992) also noted this in their article on venture capital firms' preferences regarding industry diversity and geographical scope. However, Gupta & Sapienza's article was based on venture capital firms' preferences, as reported in the Pratt Guide to venture capital, rather than the actual investment pattern, which is the focus of this paper [5].

Moreover, most of the studies that have focused specifically on the specialization of venture capital are empirical, with only a limited theoretical foundation[6]. At first sight, it could be argued that this problem can be explained by portfolio theory. However, traditional financial theories are largely inadequate for explaining this phenomenon, as will be elaborated below. Furthermore, standard financial theory such as portfolio theory is most often presented in a static version. An important point of this paper is that the portfolio strategies of VCFs are subject to change according to the dynamics of the venture capital market. An alternative theoretical outline is therefore presented. In other words, this paper tries to provide a theoretical explanation

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1992. A detailed account of the development of the Danish venture capital industry can be found in Christensen (2003).

[5] De Clercq et al. (2001) is another study based on realized rather than intended strategies. This study is also similar to the present study in being able to identify all venture-backed firms in the population.

[6] See Mason and Harrison (2002) for one of the few articles to refer to the theoretical rationale for the specialization of VCFs (referring to Thompson, 1989). However, apart from this reference to Thompson's view on the development of specialization, this article only takes a distributional approach. Sorenson and Stuart (2001) develop theoretical arguments for the development of geographical specialization using insights from sociology. Furthermore, they use the pairing of VCF and target firm and the actual distance between the two in their empirical analysis. Thus, this approach resembles that of the present paper.

as to why VCFs specialize geographically. It then investigates the specialization pattern of Danish venture capital.

The paper is structured as follows: Section 2 presents a theoretical discussion of the rationale for the geographical focus of venture capital investments, as well as reasons for diversifying investments geographically. Both traditional financial theory and an alternative theoretical framework are discussed. Section 3 describes the data used. Section 4 report results on the specialization process of venture capital firms, and links these findings to similar studies. Finally, section 5 contains concluding remarks on the implications of the results and the limitations of the analyses. It also discusses possible interactions between geographical specialization and other types of specialization strategies.

2. Theoretical explanations of the geographical specialization of venture capital

2.1. Diversification and specialization of venture capital

The literature on venture capital has pointed to an uneven geographical distribution of venture capital (Martin et al., 2003, Powell et al., 2002, Mason and Harrison, 2002). As in many other countries, venture capital in Denmark is also concentrated. This also includes the majority of venture funds, which are located in greater Copenhagen (The Growth Fund, 2002). More precisely, 90.6% of capital under management was located in this area in 2000, a share that has

been fairly constant in the period 1998-2004 (The Growth Fund, 2004)[7]. In the same period, roughly 65% of all investments were made in the Copenhagen region (ranging from 57% to 67%), despite the fact that this region accounts for a much lower share of the total number of firms (around 40% of all Danish limited firms) R&D, or economic activity. The question arises, therefore, what are the dynamics behind not only the geographical distribution as such, but also, and in this paper in particular, the dynamics in specialization?

Generally, barriers to financing new ventures can be ascribed to the lack of information, trust, and competencies between the parties. Venture capital is characterized by illiquid equity investments involving high degrees of information asymmetries. Financing new, risky ventures requires relatively intense monitoring, which in the literature has been pointed to as one explanation why venture capital firms exist: due to their specialized ability to screen potential deals and to cope with asymmetric information, venture capital firms can invest in firms with a high risk/high return profile, where returns are highly uncertain (Amit et al., 1998; Fredriksen, 1997). Thus, the combination of superior ex ante screening capabilities and ex post value-adding services enables VCFs to perform better than other financial intermediaries. Specialization enhances both these competencies.

This involves a dilemma: while specialization increases the ability to take decisions, it can also be said that, inevitably, the venture capital firm is more vulnerable to fluctuations in narrow segments, the burst of the IT bubble being the most obvious example.

[7] In the proceeding period, 1994-1997, our data also show a remarkable concentration, ranging from 94.4% to 98% of Danish venture capital in the Copenhagen area.

2.2. Traditional theoretical explanations of the development of geographical specialization

Various parts of traditional financial theory have been used to explain the above-mentioned specialization/diversification dilemma. Traditional corporate finance theories focus either on investments themselves or the financing of investments. The former analyses decisions on whether funds are allocated to investments in securities, acquisitions, valuation models, etc., while the latter is more concerned with implicit and explicit ways of organising the payback to shareholders, including management incentives to act in accordance with shareholder interests. Portfolio theory generally assumes the perfect functioning of markets, implying that information asymmetries are absent. This is clearly not applicable to venture capital investments, however. The VCF is typically involved in, and assists, the portfolio firm, which alters the risk-return mix. Classical portfolio theory is largely inadequate for explaining the trade-off between specialization and diversification of venture capital funds, since it is based on the absence of transaction costs and market friction, and complete information (Bodie and Merton, 2000), something clearly not applicable to venture capital. The information and economics literature, on the other hand, is generally based on the assumption that asymmetric information between a lender and a borrower may have deterrent effects on loan markets because of moral hazards and adverse selection effects (Stiglitz and Weiss, 1981, Leland and Pyle, 1977, Myers and Majluf, 1984. Generally, financial theory implies that, in order to minimise risks, it is important to diversify investments. An increase in the competition for investment opportunities will result in diversification.

2.3. Alternative theoretical explanations

Other types of theories can be used to explain the dynamics behind the evolution of venture capital markets. Resource-based theory and the dynamic capability view of the firm is one example of an alternative theoretical understanding. This strand of theory focuses on the resources and capabilities of the firm, and argues that firms may have unique ways of learning and knowledge accumulation, which results in so called "firm-specific capabilities (Teece et al., 1990), "core competencies" (Prahalad and Hamal, 1990), and "firm-specific competencies" (Pavitt, 1991). According to Penrose, an essential requirement for being an entrepreneur is to be able to present ideas convincingly to potential financiers (Penrose, 1959, p.37-39, 220). Other studies pointing to alternative theoretical avenues include Barney et al., 1996, Shepherd and Zacharakis, 2001, de Clercq and Sapienza, 2001, and Manigart et al., 2002.

The implications of this view are that the degree of specialization of venture capital firms is closely linked to the building up of competencies. The ability to carefully assess investment proposals, and especially to monitor and assist management, requires the building up of skills, and one way of doing this is to specialize in particular segments of the market. Specific capabilities of this kind are only generated as a result of specialization. The reverse may also be true, however, i.e. a broad scope will increase the ability to interact with many types of people. However, as venture capital firms experience an increasing degree of specialization in a number of markets, they increase not only their knowledge of the market and the technologies involved but also their ability to interact with certain types of firms. Thus, whereas traditional financial theory would prescribe

diversified investments to reduce risks, the character of venture capital investments implies that risk reduction can be achieved by specialising in a few focused investment areas[8].

There is a limit to how far this competence building/specialization process can go, however. The nature of venture capital investments, which are often attracted by the possibility of high-yields and innovative firms, implies that some part of the information and monitoring process is unique to each investment. Therefore, the venture capital firm may be able to use some of the experiences in subsequent investments, although a substantial part of the learning in venture capital investments is bound to be sunk.

In principle, it is possible for the VCF to simultaneously build up competencies in, for example, geographical specialization and stages of investment. However, the investments involved in building up such competencies are substantial, and should be balanced against the risk reduction achieved through diversifying into a new segment. While there is likely to be a reduction in initial costs when diversifying into another area of investment many costs cannot be eliminated, and some of these costs are not only fixed, once and for all investments, but continuous costs. This may explain why larger VCFs may have a more diversified profile than smaller funds - they may benefit from scale effects in the diversification process. It may also explain why cross-border venture capital investments are primarily made through local venture capital funds rather than directly; costs associated with access to local information, the building up of networks, local market knowledge, etc. (as elaborated below), do not match the benefits derived from such diversification.

[8] De Clercq et al. (2001) discuss specialization strategies versus risk reduction using a more differentiated concept of risk, where risk relates to both agency risk, market risk, business risk and systematic risk. The authors hypothe-

2.4. Proximity-related competencies

It could be argued that specialization in industry segments or development stages may be more competence-based than geographical specialization, and that such competencies can be used in all geographical contexts. However, as indicated in the discussion above, there are still costs and competence building up involved in geographical specialization, which may influence the strategic considerations of VCFs.

The obvious question now is what competencies do venture capital firms obtain by focusing on a limited geographical area? How do these competencies distinguish themselves from other types of competencies, and what are the reasons for a geographical focus?

The answer can perhaps be divided into reasons related to the advantages of proximity and reasons related to specific competencies. The former include the easing of monitoring and involvement due to spatial proximity to the business invested in. This also has a qualitative side where interaction occurs over a short distance. The fact that this results in more frequent face-to-face contact, means that information flows are not only quantitatively improved, but it also facilitates transfer of tacit knowledge and build trust among the parties. The latter concerns the specific competencies resulting from geographical specialization. While, for example, industry specialization may generate competencies related to the technical features of the products and market, geographical specialization will generate other types of competencies, such as access to local networks and the ability to interpret information into the local business environment. Industry specialization may not be the only type of specialization to influence the competence-building process. The literature on the

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size that VCFs will specialize geographically in order to control for agency risk and business risk.

value-added of venture capital states that early-stage investments require more hands-on involvement, which in turn may imply that the spatial aspect is particularly important in such ventures and less so in later stage investments (Gupta and Sapienza, 1992, Mason and Harrison, 2000).

Spatial proximity may be important because the networks among VCFs themselves are also important sources of information, and this type of information is not publicly available (Shane and Cable, 2002). This may contribute to further spatial clustering if the VCFs co-locate. However, the widespread use of syndicated investments often transcends geographical distance, thus expanding the geographical radius of the venture capital activity (Sorenson and Stuart, 2001; Florida and Kenney, 1988).

It can be concluded that venture capital investments involve far more than a monetary aspect. VCFs are dependent on information for monitoring and guiding portfolio firms both in the screening and post-investment phase. VCFs rely heavily on knowledge that is often network-based, personalized and informal, sometimes even tacit, which explains why venture capital activities tend to be localized, especially when monitoring is intense, as in seed or early-stage investments.

2.5 Regional disparities in the demand for venture capital

Venture financing also has a demand-side aspect, which is relevant in a regional context. Different regions can have different levels of entrepreneurship, technological development, clusters, etc., and both firms and intermediaries can also differ in their awareness of venture capital from region to region (Mason and Harrison, 1998). Stuart and Sorenson (2003) discuss determinants of founding rates, including the impact of available venture capital. Their study raises the question about

the direction of causality – whether it goes from the availability of venture capital to the development of high-tech firms and high start-up rates in a region, or whether high start-up rates and concentrations of high-tech industries, lawyers, consultants and other infrastructures attract VCFs. At the same time as VCFs may have a preference for investing in firms near their own location, there is often a demand-induced pattern: VCFs concentrate their investments where economic activity is high.

Another aspect of the demand side is whether firms are open to investments. One side of this is the aversion of some firms to let in equity investors and thus lose some of their influence. Another side is that, even firms which actively seek venture capital are not always 'investment ready', by which is meant that suggested projects are not sufficiently developed in terms of information, business plan, organisation and management (Mason and Harrison, 2001, 2003). Moreover, many entrepreneurs lack the skills to present the business plan convincingly to investors. In consequence, public policy programmes have now begun to address this problem, for example, DTI in the UK sponsored 7 such investment-readiness programmes in 2002-2003.

To sum up, traditional finance theories were found inadequate to explain the dynamics behind the specialization process, which in turn was found to be closely related to the building up of competencies. Some of the monitoring, networks and learning in VCFs, which specialize in several dimensions - stage, industry, geography - is facilitated by spatial proximity. Even if competencies are strongly related to a stage and industry focus, geographical specialization would still be part of VCFs' strategic considerations, since the ability to invest in a new geographical area may require specific competencies, which can only be built up at a cost.

3. Data on the location of venture capital investments

The theoretical considerations above linked the development of geographical specialization to especially competence building and the character of investments in local ventures and regions. Much of that discussion ignored the macro–environment, however. An empirical investigation of the geographical specialization of venture capital in Denmark during the 1990s will help increase our understanding of the dynamics behind this aspect of market evolution.

The data for the analysis were collected by first identifying all venture capital investors in Denmark, using different sources such as the European Venture Capital Association (EVCA), the business press, The Danish Growth Fund and various homepages. Next, we collected information about portfolio firms. This information was provided through a questionnaire to the venture capital firms, and supplemented with information from their annual reports. Finally, financial data from a commercial business register for the period 1990 – 1999 was added. The selection of VCFs focused on "true" venture-backing (Bygrave & Timmons, 1992), thus excluding buy-out funds and other funds whose main activities were not in venture capital, i.e. hands-on investments – mainly equity - in young, un-listed firms with high risk and a high growth potential.

The venture capital firms were asked to provide information on existing venture-backed firms and firms no longer in the portfolio. In case of a merger or acquisition, the continuing firm is included in the sample. Based on this procedure, and after a first filtering of the data, we identi-

fied approximately 300 venture-backed firms in Denmark. This is as close as we can get to the total number of venture-backed firms in Denmark up to the year 2000[9], which is rather unusual.

Investments by venture capital funds for the explicit purpose of investing in a limited geographical area may disturb the analysis, since over time these funds may not be flexible enough to change the geographical scope of their investments. Consequently, these VCFs were omitted from the calculations. We considered excluding cross-border investments, although this could be said to be a mistake since this type of investment is surely a geographical diversification. However, one could fear that even one such overseas investment might seriously affect the results. But even if there were only a few cross-border investments, we tried re-coding these investments to the maximum distance. This did not have an influence on the results. We also focused the analysis on new investments, so follow-up investments in the same firm were excluded[10]. Where there was more than one VCF among the owners, the distance to the one with the largest ownership share was included. VCFs often leave most of the monitoring, etc., to the VCF with the largest share, which thus acts as lead investor[11]. Finally, investments in other VCFs were also excluded [12].

[9] Manigart, et al. (2002) selected a sample of 565 venture-backed firms in Belgium for the period 1987-1997. They estimate that their sample covers 57% of venture investments in Belgium. Since we focus on a relatively narrow definition of venture capital (e.g. excluding MBO funds), and for a smaller country in a shorter period, it seems fair to conclude that the number of venture capital-backed firms we found in Denmark is a realistic reflection of the total.

[10] Again, it can be argued that follow-up investments are also part of the diversification-specialization decisions of VCFs. This would be difficult to handle in the data, since several of the VCFs in the dataset use milestone payments, which make it difficult to distinguish lump-sum payments from follow-on investments. For example, one of the VCFs lists 20 separate investments in one firm. Theoretically, using new investments makes a stronger case for decisions on specialization.

[11] Gorman and Sahlman (1989) find that VCFs use ten times as much time on an investment when the VCF is the lead investor compared with a syndicated, late-stage investment.

[12] Even if the number of cases is small, it is fair to say that there has been an increase in these strategic investments in the Danish venture capital market. This may be seen as an outsourcing of competencies in areas where the costs of building up such competencies are substantial.

After this second filtering of the data, we ended up with a total of 170 firms with venture capital backing. These investments, i.e. the location of the 170 venture-backed firms and the corresponding venture capital firms, were then entered into software able to calculate the exact road distance in kilometres between the two. This (tedious) process enabled us to calculate both the distance between financiers and their portfolio firms to the nearest 100 metres and the development in the aggregate average of that distance over time[13]. Thus, our data does not differentiate whether the investment location is in a peripheral or urban area.

4. The development of geographical specialization of venture capital in Denmark

Figure 1, which shows the key results of the analysis, presents the average distance between venture financiers and their portfolio firms in the period 1994-99.

Figure 1 about here

[13] It can be argued that a more relevant measure would be the travel time between the parties. Using the physical distance does not greatly affect our argument, however, because we are primarily interested in the *development* in proximity. However, the geography of Denmark means that travel distances and travel times are not the same throughout the country. A map of travel times is shown in appendix 1.

The figure shows a spatial diversification until 1996, followed by specialization in the following years. The distances range from means of 71 to 153 kilometres. Section 2 above presented a theoretical explanation of why investments can be spatially limited. However, a specific measure for how far away investments are located must be explained in a geographical context. Even if the literature does point to generic limits for investments, such as a one-hour drive from office (or home in the case of a business angel) (Zook, 2002; Mason and Harrison, 1996), the distance in kilometres may mean something else in Denmark. This has to do with Danish physical conditions and infrastructure. In Denmark, the average distance in kilometres corresponds to between one and three hours' travel time, depending to a large degree on whether part of the journey is by sea. Furthermore, there may be cultural differences between countries with respect to perceptions of distance[14]. Since the majority of venture capital funds under management are located in the Copenhagen area, the higher and lower ends of the range (153 and 71 kilometres respectively) should be seen in this perspective. Copenhagen is located in the eastern corner of Denmark, and a distance of 71 kilometres would not only be within an hour's drive from Copenhagen, but would also cover most of the island of Zealand. So even if the infrastructure was fairly good, a geographical broadening of the investment focus outside the Copenhagen/Zealand area would lead to a steep increase in travel time, due to having to cross the Great Belt [15]. This not only adds to the kilometre distance to the invested firm, but it also imposes extra travel time when having to go by ferry. This in turn may persuade some venture capital firms to invest in firms close to major provincial airports such as Aalborg and Århus, which keeps travel time down but kilometre distances up. This may be reflected in the higher standard deviation in the peaks.

[14] Even within Denmark there are huge regional differences in how people think about distance and travel time.
[15] A bridge was completed in June 1998, but this was partly after the period studied.

Although the theoretical discussion in section 2 and the more specific explanation above provide us with some framework for understanding this development, it should also be interpreted in light of the general development of the venture capital market in Denmark. This is illustrated in figure 2 and 3, which show the development in investments and number of venture capital firms respectively in the relevant period.

Figure 2 about here

Figure 3 about here

It is clear from these data that, from 1994 and onwards, there has been a steep increase in both yearly investments and the number of venture capital firms. Figure 3 only shows the share of venture capital firms that could be classified according to the narrow definition above. If a broader approach is taken, including venture capital firms, which specialize in buy-outs, etc., then the increase in figure 3 becomes even clearer[16]. Even given an improvement in business cycles and business opportunities in the period, then competition among venture capital firms has undoubtedly increased. The fact that the majority of VCFs are located in the greater Copenhagen area, cf. section 2.1, may in itself enhance competition even further. After a virtual collapse at the beginning of the 1990s, the venture capital industry followed the general upswing of the economy in the mid-1990s. As the amount of funds raised increased and the pace

[16] The Danish Growth Fund (2002) estimates that the number of venture capital and private equity firms combined totalled 37 in 1999.

of actual investment began slowly to regain momentum, the number of venture capital firms increased. Venture capital firms searched for business opportunities in the period, and were to a large extent in a search and learning process. From 1994 to 1995 the number of new investments more than doubled. One of the reasons for the re-vitalisation of the market was a government guarantee to selected venture capital companies. The government has generally been active in stimulating the market, with a combination of direct participation and arm's length inducements. Furthermore, complementary sources of finance emerged at the same time as the development of venture capital, notably corporate venture capital, and, to some extent, business angel financing. Subsequently, a division of labour was established at the market during the second part of the 1990s; this was a long-term process, which took a long time to manifest itself, but was spurred by the increasing number of VCFs.

The search for investment opportunities, competition, and the subsequent division of labour may be interpreted in a specialization perspective. This can be described in three phases. The first phase saw an upswing of economic activity, investment opportunities being relatively easily available in close geographical proximity. In a second phase, competition among VCFs increased and they began to look for investment opportunities farther afield. Conversely, up till 1996, VCFs still had a fairly broad geographical investment focus. Having experienced a persistent increase in competition, some will choose to focus their investments in more remote regions, where there is less competition, and where they may benefit from better access to local deal flow, and possible relatively lower prices for stakes in local firms (Doran and Bannock, 2000). In a third phase, venture capital firms tend to focus investments more on nearby firms. This is the result of an increase in specialization and division of labour between VCFs in the

market. In this phase, they are both specialized in terms of geography and with respect to the industries they focus on.

This reflects not only a structural process, where competition in the market imposes a division of labour, but it also reflects a learning process, since, in this period, many venture capital firms learned that a lot of resources are required to adequately monitor and guide portfolio firms. These competencies are built up over time, but as mentioned in section 2, only slowly. Moreover, it requires even more specific competences to assess business proposals before an investment and guide firms after it. One response to this challenge is specialization, since this increases learning and competencies in a narrow field[17].

Geographical specialization does not rule out simultaneous specialization in other dimensions, e.g. specific industries or stages of development. For example, proximity between the firm and the VCF could be expected to be negatively related to the degree of involvement, i.e. VCFs would tend to be more involved in local firms (Lerner, 1995; Powell et al., 2002)[18]. Similarly, several studies found that funds with a profile of investing in the early stage are more inclined to invest in local firms (Gupta and Sapienza, 1992; Mason and Harrison, 2000). De Clercq et al. (2001) find that, over time, VCFs in Finland in 1994 - 1997 persistently diversify their investments geographically, which is much the same pattern as in Denmark. According to the authors, one possible explanation is that, when faced with constraints on opportunities for industry specific investments, VCFs look for opportunities further away. Moreover, over time, VCFs can have developed the ability to deal with local entrepreneurs, and they may believe that these

[17] This may be supported by the fact that, from 1996, average distances between the old venture capital firms and their portfolio firms are persistently far below that of younger VCFs.

experiences are replicable in other geographical contexts. Powell et al. (2002) support this, as do Sorenson and Stuart (2001), who find that, as VCFs grow older, they are more inclined to invest in more distant firms. In addition to this explanation there may be an aspect of visibility and reputation. In a small market and small area like Denmark, investors throughout the country know most VCFs. Nevertheless, there may be an effect from having been in the market for a long time, since this may both increase firms' knowledge of the VCF as a potential investor and elicit more invitations from other investors to participate in syndicated investments[19].

Competencies in venture capital are not easily acquired, inasmuch as they rest on experience or hiring experienced venture capital managers from outside, something not easily done in an expanding market with a limited number of skilled venture capital managers. Therefore, the expansion of competencies in the venture capital market has a certain inertia. Mason and Harrison (2003) argue that experienced venture capital managers are unlikely to be attracted to regional venture capital funds (a point also made by Doran and Bannock, 2000), and that this makes it more likely that fund managers appointed to these funds have a background in financial engineering rather than classic, value-adding venture capital investment skills. Generally, the expansion of venture capital markets may be restricted by a lack of competencies, even if the financial capital is available. The regionalization of innovation and growth policies, with venture capital as one of the driving forces, must therefore take into consideration the availability of adequate competencies in the regions (Cooke, 2001).

[18] In a survey of venture capital firms in Germany and the UK, Martin et al. (2003) find that geographical proximity to investee firms was regarded as more important than proximity to other factors like financial service companies, investors, research institutions, other VCFs.

[19] The organisation of the fund could also have an effect. Funds, which only exist for a limited time, may tend to invest in more remote firms where capital gains in a near future are more likely. However, in Denmark, the majority of funds invest through evergreen funds, rather then fixed-end funds, which make this effect less important.

The results of the present study are not strictly comparable to previous studies, since these differ in method, data and the specific agenda. However, the findings from one study (McNaughton, 1989) resemble the approach taken in this paper. McNaughton finds, not surprisingly, that the concentration of venture capital sources in a market is inversely related to the size of the market. Furthermore, and particularly relevant in this context, he finds that the development of specialization follows a U-shaped curve, with market concentration on the horizontal axis and specialization on the vertical axis. Specialization is high when market concentration is either low or high, and low at intermediate levels of market concentration. If we convert market concentration to the opposite – the increasing number of Danish venture capital firms over time in the 1990s - the findings in the McNaughton study are similar to the ones found above.

5. Conclusions and implications

This paper has pointed out that, during a boom, the geographical specialization of venture capital firms may pursue a non-linear pattern involving several phases. First, a phase characterised by an open-minded search for opportunities, spatial diversification and the accumulation of experience from venture activities. Subsequently, competition and the need for the building up of competencies may result in concentration, the increased importance of specialized competencies in screening and monitoring, and, ultimately, geographical specialization (competence-building and specialization was argued to go hand in hand). This development was argued to be dependent not only on the strategic decisions and competence development of VCFs, but also on developments in the market.

This inverted V-shaped pattern of specialization may be better explained by resource-based theory, which suggests that venture capital firms specialize in order to be better equipped to assess and pursue opportunities, rather than traditional financial theory, which claims that increased volume and competition in the market should lead to diversification in order to spread risk.

There are several implications of these findings, and for different groups. For *funds-of-funds*, the institutions back-funding VCFs, it is important to recognize that VCFs are very heterogeneous. The strategy of the VCF must be taken into consideration, because the spread of the portfolio will affect the potential risk and return profile of the fund, and with it the decision of the back-funder on whether to invest in a few or many funds. The resource base of the venture firm must match its investment focus/specialization.

Venture capital firms may face a choice between specialization strategies. This is important, since it implies quite different paths for internal competence building. The choice is either to build up competencies with respect to industry specificities, i.e. development stages of the firms, or to develop competencies necessary for assessing and nursing the portfolio firms in the regional context in which the firm is embedded. In principle, it is possible to pursue several strategies simultaneously, inasmuch as they are not mutually exclusive. However, the costs associated with developing competencies in all these areas are substantial, and involves trade-offs[20]. The competencies needed to invest in a specific type of firms are costly to build-up. These costs may be associated with initial penetration of the regional investment market, including building up networks and reputation, trial and error processes related to region-specific

[20] Similarly, Kannianen and Keuschnigg (2003) find that there is a trade-off between how much advice venture capital firms can give and the number of firms in the portfolio.

investments, attracting managers and other staff, and operational costs. Running a venture capital firm requires a certain minimum of fixed costs, and involve not only initial costs, but also continuous investments to maintain networks, pay staff, update information on regional development, etc. Even in a small country such as Denmark, there are big differences between regions and local specificities[21]. Consequently, even if there are some scale effects from diversifying into new regions, these may only partly compensate for the costs involved. This relates very closely to the above-mentioned dilemma between specialization and diversification. The regional evolution of demand may determine the extent to which regional specialization is a sound strategy (Martin et al., 2002).

For *regional government,* the findings imply that it may not be advisable to impose too strict criteria on venture capital funds regarding which investments are eligible for subsidies or the support instrument concerned [22]. Over time, the venture capital fund may need to diversify investments geographically according to market developments and the potential for exploiting learning effects from, for example, greater industry specialization. In addition to stimulating the supply side of the venture capital market, governments increasingly recognise that the demand side also needs stimulating. This includes raising awareness among SMEs about appropriate sources of finance. Such awareness raising is generally most efficient at the regional level. The amplitude of business cycles and the peripheral character of a region may be reduced by the

[21] In Harding's (2002) study of the Danish venture capital market, she notes that, as regards the regional gaps in venture finance 'Investment managers of any fund have to be regionally based since they have the knowledge of the regional market. This is particularly important in a country like Denmark where the regional cultures are keenly protected' (p.18).

[22] In Denmark, the Growth Fund co-finances direct investments and back-funding venture funds. In addition, they operate a guarantee scheme for losses in venture funds. The choice of which funds to finance and the criteria for coverage under the guarantee scheme was previously affected by the strategy of the fund regarding the industry and geographical specialization. Thus, legislation required a minimum of €8 million as the capital base for approving a fund. However, funds with a capital base of €3 million also qualified for a guarantee if they were either geographically specialized or focused on seed/early-stage investments. The general opinion is now that larger funds have better chance of good performance, which may fall back on the possibilities for establishing regional funds.

active participation of regional government bodies supporting the financing of new opportunities. However, this is only likely to be successful if the required competencies exist in the market[23]. While blindly throwing money into the venture capital industry in the hope of generating a return at some point is often seen recommended, it is rarely a successful strategy. In particular, in a period such as the one studied in this paper, with a rapid expansion of the market and demand, there may be trade-offs between the expansion of the quantitative and regional scope of the venture capital market and the advice and monitoring it is possible to provide. Furthermore, it is precisely the skills of experienced venture capitalists that may be important in preventing a cyclical development, since one of the characteristics of a competent venture capitalist is to spot opportunities even in a declining market. Thus, geographical specialization may both be part of the strategy of individual venture capital firms and part of the strategy of regional government to stimulate development through regionally focused venture capital. However, it follows implicitly from the above emphasis on a gradual competence-building process through specialization that this is a long-term process, which requires patience on behalf of regional government. Thus, according to Doran and Bannock (2000), experience from the US suggests that, for a sustainable venture capital industry to be built, publicly sponsored venture capital programmes may have to operate with a 25-year planning horizon.

Increasingly there has also been a debate on the design of government initiatives to stimulate regional venture capital, specifically whether they are targeting the right financing gap (Harding, 2000), and whether regional funds established are generally too small (Murray, 1998). There has even been concern as to whether it is at all possible to address regional equity gaps using general policy instruments, since the size and character of the equity gap may vary not

[23] Mason and Harrison support this argument: ”Efforts by governments to promote classic venture capital in countries that lack this form of finance may be constrained by the industry’s human resource base.” (1999, p.20).

only between regions and industries, but also over time. The picture gets even more complicated considering that demand may likewise vary a lot across regions. A 'one-size fits all' approach is likely to be inadequate (Tödtling and Trippl, 2005). This calls for some degree of flexibility in policy instruments. The specific design of the individual policy instruments may result in some of this flexibility. Thus, Heger et al. (2005) observe that, while the centralised German regulation of government support for regional financing perhaps makes possible a close monitoring of the development in national funds, it may also limit the degree of flexibility and reduce the regional level of agency involvement and local knowledge. In contrast, the Regional Venture Capital Funds programme in the UK allows autonomy of investments to the regional actors. In order to be effective, regional venture capital policy needs precisely to incorporate locally embedded knowledge, as explained above (Heger et al., 2005).

There are, of course, some limitations to the argument in this paper. The political inducements to regionalise finance were partly left out of the empirical analysis, because we were interested in behavioural changes. We have also only briefly discussed possible interaction with other specialization strategies, which was an important part of the study by Gupta and Sapienza (1992) and de Clerq et al. (2001). In other words, that the development in geographical specialization may be explained by a development in industry specialization. In a small market like Denmark, such specialization might be expected to mirror that of geographical specialization. In other words, focusing on a narrow segment of industries would require venture capital firms to diversify geographically in order to have enough investment opportunities. It is unclear which of these forces is the main driving force. However, it is clear from the above that the learning that results from following one of these strategies will be different to that resulting from following another strategy. In an era where the regional level is increasing in importance,

this is a significant result in itself, but it also highlights the types of knowledge that may be more important in the future.

6. References

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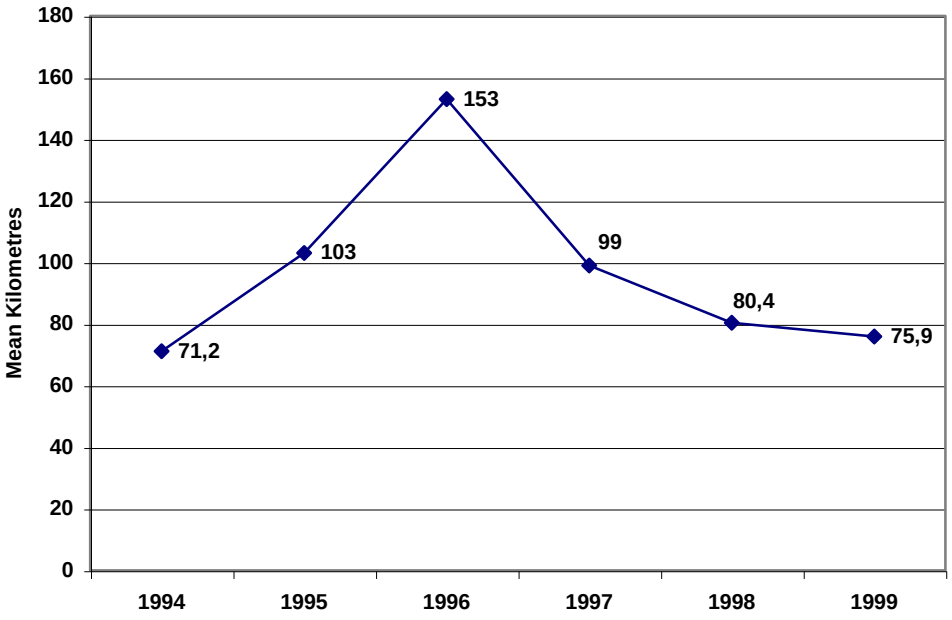
Figure 1: Average distance in kilometres between venture capital firms and their Danish portfolio firms, 1994-99



Year	1994	1995	1996	1997	1998	1999
COVARIANCE	1,101561	1,183062	0,76176	1,154106	1,385164	1,268076

Figure 2: Yearly investments as a pct. of GDP.

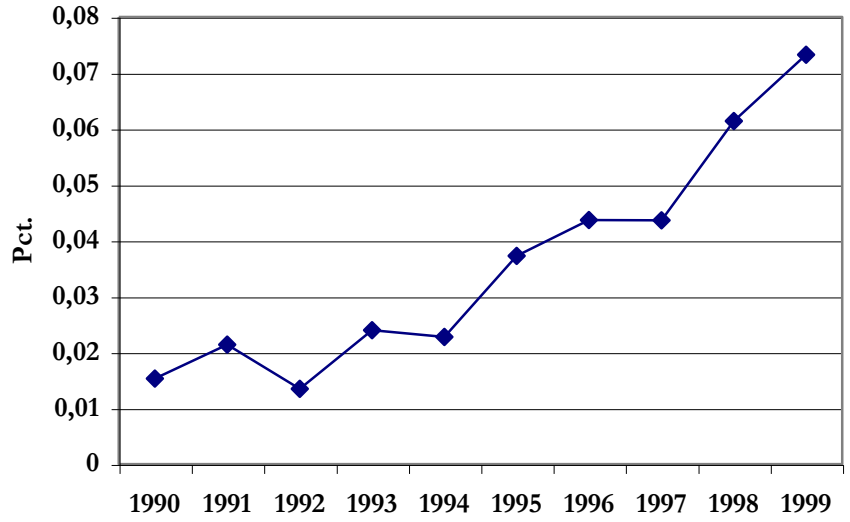


Figure 3: Number of venture capital firms in Denmark 1993-2000