Environment and Planning A 2008, volume 40, pages 2114 – 2131

doi:10.1068/a39353

Does venture capital investment really require spatial proximity? An empirical investigation

Michael Fritsch
Faculty of Economics and Business Administration, Friedrich-Schiller-University Jena, Carl-Zeiss-Strasse 3, 07743 Jena, Germany; also German Institute for Economic Research (DIW), Berlin, and Max Planck Institute of Economics, Jena; e-mail: m.fritsch@uni-jena.de

Dirk Schilder
Faculty of Economics and Business Administration, TU Bergakademie Freiberg, Lessingstrasse 45, 09596 Freiberg, Germany; e-mail: dirk.schilder@gmx.de
Received 8 November 2006; in revised form 18 February 2007; published online 4 August 2008

Abstract. We examine the role of spatial proximity for venture capital (VC) investments in Germany. The main database is a survey of seventy-five personal interviews with representatives of different types of financial institutions. The analysis shows that spatial proximity is much less important for VC investments than is often believed. The results indicate that telecommunication cannot be regarded as a means of overcoming the problems of geographical distance. We find that VC suppliers frequently syndicate investments in distant portfolio firms with partners who are more closely located. The age of the portfolio firm does not affect the importance of spatial proximity. On the whole, regional proximity is not a dominant factor in VC partnerships.

1 Introduction

It is largely undisputed that the spatial proximity of venture capital (VC) firms to the location of their investments should be important. The assumptions underlying this conjecture are that spatial proximity may in many cases constitute a precondition for the formation of a VC relationship and that it facilitates supervision of investments. This implies that innovative firms in regions without VC companies may experience a serious disadvantage due to an 'equity gap', that is, poor availability of capital. Such a capital shortage could severely hamper the emergence and the development of innovative new firms in a region. However, does this supposition that spatial proximity plays such a decisive role for VC investment decisions really hold?

Based on a study of VC suppliers in Germany, we cast serious doubt on the importance of spatial proximity in VC partnerships, especially in comparison with other types of financiers. We will show that geographical distance does matter, but that its role is largely overestimated in the literature. Furthermore, we find evidence that regional proximity is less important for VC companies than for other types of financiers which offer 'smart' capital such as 'business angels'. By 'smart' capital, we mean a financial relationship between a provider of finance and new businesses which is associated with pronounced reciprocal information flows between the investor and the financed company (for details, see Schäfer and Schilder, 2007). In addition to equity investments with hands-on support, which are the typical element of formal VC, smart capital also includes informal VC investments by private business angels and, in the German bank-based financial system, credit financing offered by banks (Schäfer and Schilder, 2007).

From a short review of the literature about the importance of spatial proximity for VC investment, we derive some hypotheses on possible factors which influence the role of proximity (section 2). We then investigate the spatial distribution of VC firms and their possible investment targets in Germany (section 3). In section 4 we provide an

overview of the characteristics of the different types of financial institutions offering smart capital in our sample of interviewed firms. We analyze different factors that might influence the role of spatial proximity for investments (section 5). We then discuss reasons for the relatively low importance of geographic proximity for VC investments that we find in Germany (section 6), and draw conclusions for policy as well as for further research (section 7).

2 Why should spatial proximity be important for VC investments?

The decision as to whether a VC company is willing to invest in a target company depends on several factors. According to the literature, the most important characteristics are the growth prospects of the targeted company and the risk of the investment (Fiet, 1995; Hall and Hofer, 1993; Sahlman, 1990). The geographic distance [(1)] between a VC company and a possible target firm can influence the financier's investment decision in two ways. First, it may affect the search for and identification of potential investment targets because of distance-related constraints in the spatial diffusion of information about these targets (Doran and Bannock, 2000; Green, 1991, page 23; Zook, 2002). Second, geographical distance may shape the amount of transaction costs that is expected to be necessary for monitoring and supervising the financed firm (Mason and Harrison, 2002a; Sorensen and Stuart, 2001). Since a distant investment which generates relatively high transaction costs will produce less return for the investor than a comparable investment in close spatial proximity, the expected costs of monitoring and supervising a portfolio firm may have an influence on the investment decision.

Identification and evaluation of a new investment opportunity may require kinds of knowledge that are tacit and are mainly transferred through personal contact within a local business community (Florida and Smith, 1993; Powell et al, 2002; Thompson, 1989). Contact with potential investments may emerge in several ways. In the case where the investor is approached by potential target companies, it is plausible to assume that the companies which are located close to the VC firm have a higher probability of taking the initiative to contact that investor than do companies in distant regions. The same applies to a VC company's search for possible investments. Upon screening the area for potential targets, the financier will have more and richer information available on local firms versus firms located further away. Furthermore, the investor can utilize its network with other financiers to find a target company which is particularly relevant for syndicated investments (Manigart et al, 2006). For this type of deal flow, however, a VC company's search for possible investments does not depend on the spatial distance to the targeted company but, rather, on the regional dimension of its network. In addition, spatial proximity may also be conducive to the making of a final investment decision which will, in most cases, require close on-site inspection of the project (Sorensen and Stuart, 2001).

Since monitoring and supervision of an investment require face-to-face contact, the related transactions costs can be expected to rise as the geographical distance between the VC investor and the portfolio firm increases (Gompers, 1995; Lerner, 1995; Mason and Harrison, 2002a; Sorensen and Stuart, 2001) because of longer travel times required for personal meetings and inspections on site. These costs and the resulting importance of regional proximity for an investment decision may well be shaped by certain characteristics of the VC company and of the portfolio firm. One of these characteristics is the development stage of the portfolio company. There are good

[(1)] Although proximity is more or less a subjective assessment which depends on several factors, such as the accessibility of locations or the regional dimension of personal networks, we measure it by geographical distance. The geographic distance is, particularly, a proxy for the respective travelling time.

reasons to assume that a young company in the early phases of its technical and organizational development is more likely to require a higher level of involvement by the VC firm than a company at a later stage (Gupta and Sapienza, 1992). The possible reasons for such a higher need for monitoring in the early stages of a firm's development are a lack of business and management skills in young innovative companies, which in many cases are run by engineers or natural scientists (Gupta and Sapienza, 1992), as well as a high degree of uncertainty about the technical and economic success of the project (Sapienza et al, 1996). Higher levels of monitoring and supervision of investments in earlier stages may cause higher costs than in the case of an investment at a later stage in a firm's development. Hence, spatial proximity can be expected to be more important for early-stage investments (Sorensen and Stuart, 2001). Moreover, because firms in the early stages of their development are of smaller size and have a lower degree of market presence, they may be more difficult to detect if located further away. Accordingly, a VC supplier with a focus on early-stage investments should have pronounced preferences for investments closely located to it (Elango et al, 1995).

A further factor that is supposed to influence the importance of the distance between the VC supplier and the portfolio firm is the size of the VC company. The larger the VC firm is, the more likely it is that investments will be made in more distant locations (Gupta and Sapienza, 1992; Powell et al, 2002). The main reason why VC suppliers with larger funds may have more investments at distant locations is that they have greater and, perhaps, also better resources for monitoring and consulting. The more time and capital the investor is able to spend on an investment, the more likely it is that he or she can afford the resources for adequate supervision of distant investments. Therefore, the amount of resources available for monitoring and supervision—as indicated, for example, by the number of portfolio firms per investment manager—may also have a considerable influence on the importance of spatial proximity of VC investments.

'Syndication' means that an investment involves several investors which permits the sharing of the amount of resources to be spent as well as of the risk and the work involved (Brander et al, 2002; Doran and Bannock, 2000; Gompers and Lerner, 2001; Lerner, 1994; Lockett and Wright, 2001). Syndication of investment can constitute a particularly important strategy of VC suppliers to reduce disadvantages of spatial distance to a portfolio company (Fritsch and Schilder, 2006; Sorensen and Stuart, 2001). In a syndicated investment, the so-called 'lead investor' undertakes the main tasks of monitoring and consulting with the venture whereas the coinvestors are involved with the management to a considerably lesser degree (Gupta and Sapienza, 1992). For these coinvestors, spatial proximity is not as important as it is for the lead investor because of their lesser need for direct face-to-face contact with the portfolio company (McNaughton and Green, 1989; Wright and Lockett, 2003). Therefore, joining a syndicate as a coinvestor may be a means of overcoming possible problems related to geographical distance from the portfolio firm.

Another possible way of reducing the importance of spatial proximity for VC investments could be to substitute face-to-face contact with telecommunication. This could lower the costs of monitoring and consulting considerably. However, since face-to-face contact during the monitoring and consulting process is a necessary way of sharing personal and tacit knowledge (Nonaka, 1994; von Hippel, 1994) replacement by means of telecommunication may not really be possible (Powell et al, 2002; Sapienza et al, 1996). For VC companies that are mainly focused on innovative industries especially, tacit knowledge is an important part of their business (Powell et al, 2002). However, if a portfolio firm is not located within a certain geographical distance, personal contacts will probably require much higher transaction costs and,

therefore, be less frequent than they would be if the investments were closer to the site of the investor.

In addition, whether a VC company is state owned or not may affect the importance of spatial proximity for its investments. If VC firms are in public ownership or are publicly funded they may face governmental restrictions with regard to the location of their investments (Doran and Bannock, 2000; Gupta and Sapienza, 1992). Quite frequently, publicly owned VC suppliers are required to provide capital in a specific region and are, therefore, not allowed to make investments outside the particular region or abroad (Doran and Bannock, 2000; Schilder, 2006). Consequently, the public ownership of VC companies may shape the regional focus of their investments and, hence, the importance of spatial distance to portfolio companies.

3 Regional distribution of VC companies and possible target firms

The spatial distribution of VC suppliers and of the companies that might be possible investment targets can provide a first indication of the role of spatial proximity for VC partnerships. The closer the investors are located to their potential targets, the more likely it is that the proximity is important for investment decisions. For the VC market in the USA, several studies have found a high degree of spatial clustering of suppliers and investments in the east and in the west of the country (Florida et al, 1991; Leinbach and Amrhein, 1987; Powell et al, 2002; Sorensen and Stuart, 2001). The UK VC market is also highly clustered in the London region (Martin, 1989; Martin et al, 2005; Mason and Harrison, 1999; 2002a). For the 'emerging' VC markets in continental Europe, such as France and Germany, Martin et al (2002) also found a considerable degree of spatial concentration that was, however, not as pronounced as in the case of the USA or the UK.

Data from the German Private Equity and Venture Capital Association (Bundesverband Deutscher Kapitalbeteiligungsgesellschaften—BVK) confirm this result of a relatively low degree of spatial concentration of the German VC market. The suppliers of this market are clustered in five regions (as at January 2006); Munich takes the lead, with about 30 of the more than 170 regular members of the BVK; and Frankfurt am Main is in second place with 27 VC suppliers (figure 1). However, Berlin, Hamburg, and the Rhine–Ruhr area (Düsseldorf, Cologne, and Bonn) have around 20 VC suppliers each and several VC firms can also be found in smaller places. The white parts of the circles in figure 1 indicate VC companies which could be identified as being predominantly under public influence, either through direct public ownership or because they utilize publicly funded programs. Such public VC companies obviously play a considerable role in the German market (Sunley et al, 2005). The relatively dispersed spatial distribution of the predominantly public VC suppliers is probably a result of a political influence on their choice of location.

At the district level, the regional distribution of potential VC investments as indicated by the number of R&D-intensive manufacturing start-ups[2] in Germany deviates quite considerably from the distribution of the VC suppliers (figure 1). The figures pertain to the average number of start-ups per year in the 1990–2003 period.[3] Obviously, there are potential investments all over Germany whereas the suppliers tend to be concentrated in a few larger cities. For example, the area between Düsseldorf and Hannover and the southwestern part of the country show a number of districts with more than ten R&D-intensive start-ups per year, but there are relatively few

[2] For a detailed classification of R&D-intensive start-ups, see Grupp and Legler (2000).

[3] Data on innovative start-ups at the level of German districts (Kreise) is based on the Mannheim Foundation Panels of the Centre for European Economic Research (ZEW) in Mannheim. We are greatly indebted to the ZEW for making these data available.

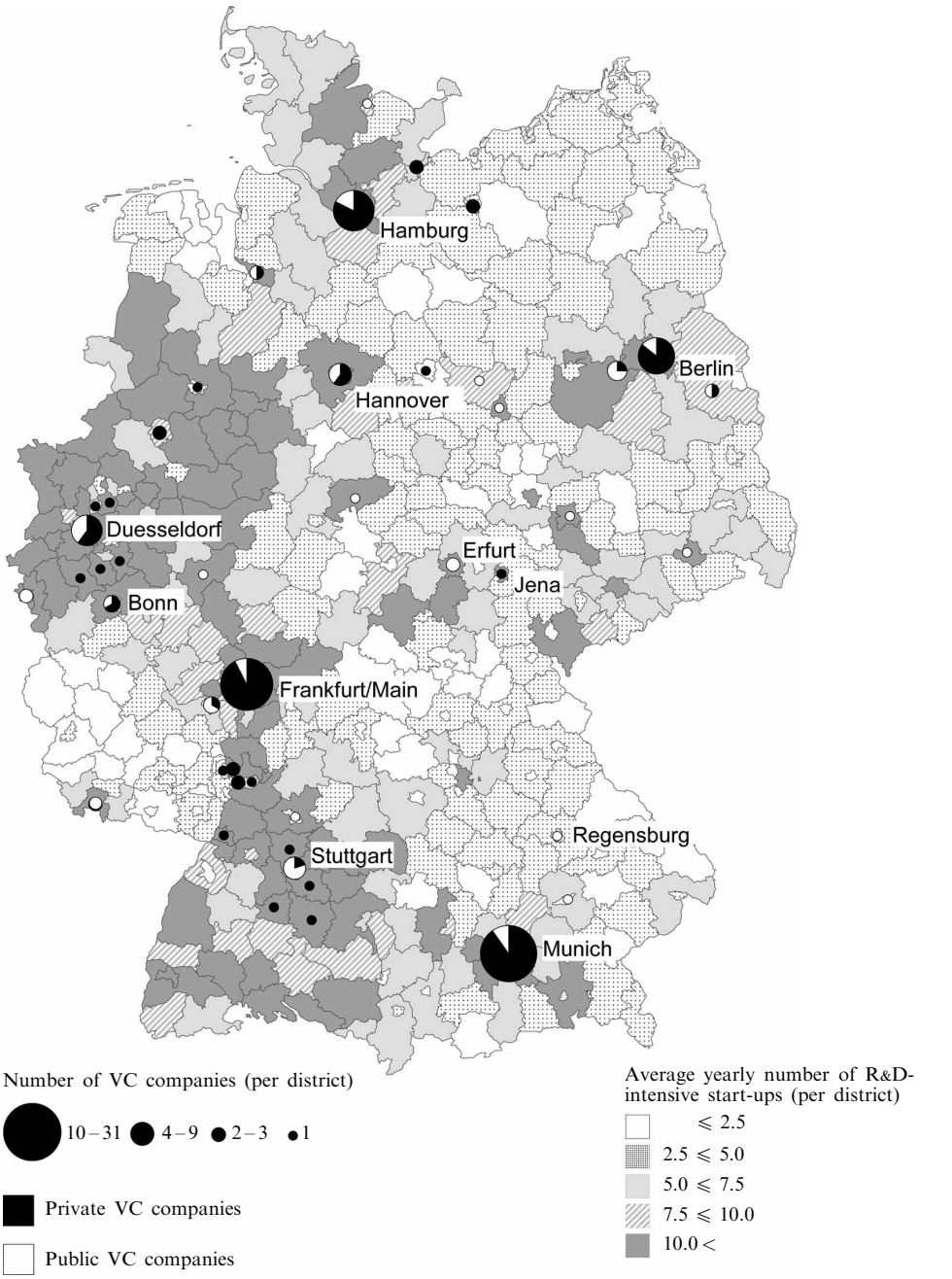

Figure 1. The spatial distribution of venture capital (VC) firms and R&D-intensive start-ups in Germany.

VC companies located in these districts. The data indicate that the location of VC companies is not closely tied to the regional distribution of possible investments. This can be regarded as an indication of a minor role of regional proximity between VC firms and portfolio companies in the emergence of a VC relationship.

In order to assess the spatial concentration of the German VC industry, we calculated Gini coefficients for the regional distribution of the VC companies and other

Table 1. Spatial concentration of financial institutions and innovative activity at the district level.

	Donaldson – Weymark relative *S*-Gini inequality measures
Number of private venture capital companies	0.97
Number of public venture capital companies	0.96
Number of banks (all types)	0.45
Number of savings banks with specialist for start-up financing	0.39
Number of R&D-intensive manufacturing start-ups (mean over the years 1990 – 2003)	0.45
Number of technology-intensive service start-ups (mean over the years 1990 – 2003)	0.52
Number of knowledge-intensive service start-ups (mean over the years 1990 – 2003)	0.60
Number of patents (mean over the years 1995 – 2000)	0.42

types of financial institutions as well as for some measures of innovative activity[4] (table 1). These measures of innovative activity, such as the number of innovative start-ups or the number of patents per district, point to locations of VC investment opportunities. The indicators for innovative activity also show a much lower degree of spatial concentration than the VC companies. The Gini coefficients clearly show a much stronger spatial concentration of public and private VC companies than of the distributions of commercial and savings banks. The difference is even more pronounced when the value of the Gini coefficients for the number of VC companies per district is compared with the value of the public savings banks, which have at least one employee who is specialized in the financing and supervision of innovative start-ups. These results provide evidence that the spatial clustering of VC firms in Germany is much more pronounced than are the geographical concentrations of the overall finance industry and of innovative activity. If spatial proximity should be important for the emergence and the maintenance of a VC partnership, the concentration of VC firms could be regarded as an indication that an equity gap may exist in some regions. However, it could also indicate that regional proximity is not important for VC investments.

The regional distribution of VC suppliers may be shaped by two factors (Mason and Harrison, 1999, pages 173 – 176). First, if VC companies want to be close to their portfolio companies their locational choice may be strongly shaped by the distribution of potential investments. Second, VC companies may prefer locations near to other financial institutions in order to benefit from all kinds of agglomeration advantages—such as close contact to a variety of coinvestors (Martin et al, 2005). The Gini coefficients (table 1) indicate clear differences in the spatial concentration between VC companies, potential investment targets, and the overall banking sector. Rank-correlation coefficients were calculated (table 2) in order to assess to what extent the spatial distribution of the VC companies corresponds to that of their investment targets or of other financial institutions. The results show that the regional distribution of public and private VC companies is linked both to the distribution of investment targets and to that of financial institutions. According to these coefficients, the correspondence of the number of VC companies per district and the number of banks is less pronounced than the relationship between the location of VC companies and innovative start-ups. At first sight, the values of these coefficients, all statistically significant at the 1% level, point to an effect of these factors on the spatial distribution of VC firms.

[4] See, for example, Fritsch and Slavtchev (2005; 2007) for a more detailed analysis.

Table 2. Spearman and Kendall rank-correlation coefficients for the relationship between the number of venture capital (VC) companies, banks, and potential investments within German districts.

	Variable					
	1	2	3	4	5	6
1 Number of start-ups (mean over the years 1990 – 2003)	1.00					
2 Number of R&D-intensive start-ups (mean over the years 1990 – 2003)	0.89**	1.00				
3 Number of technology-intensive start-ups (mean over the years 1990 – 2003)	0.91**	0.87**	1.00			
4 Number of knowledge-intensive start-ups (mean over the years 1990 – 2003)	0.89**	0.82**	0.94**	1.00		
5 Number of banks (all types)	0.40**	0.50**	0.51**	0.49**	1.00	
6 Number of public venture capital companies	0.27**	0.25**	0.28**	0.29**	0.19**	1.00
7 Number of private venture capital companies	0.35**	0.32**	0.39**	0.39**	0.26**	0.32**

** Statistically significant at the 1% level.

However, the correlation coefficients between private VC firms and possible investments are not much higher than the coefficient for colocation with public VC-providers and with banks. Therefore, we still cannot state that the necessity of spatial proximity to investments is the main reason for the spatial clustering of VC companies, because the correlation coefficients may also suggest that a location close to other financiers might also be important.

4 Empirical approach

Our empirical in-depth analysis of the role of spatial proximity for VC in Germany is based on an interview survey that was carried out between September 2004 and September 2005. The survey consisted of seventy-five personal interviews with managers who specialize in corporate start-up financing. All interviews were based on a largely standardized questionnaire. Questions pertained mainly to investment behavior and to monitoring and supervision of portfolio companies. There was special focus on the role of spatial proximity in the management of an investment. We interviewed one manager per firm. The interviews lasted between 50 and 90 minutes. All interviewees were actively involved in the financing, monitoring, and supervising process. All answers pertain only to the department in which the interviewee worked.

The firms in the sample were located in diverse areas of Germany. The sample included different types of financiers which offer money for innovative young companies. It contained twenty-two independent and corporate VC companies, eleven business angels, nineteen banks, fourteen VC subsidiaries of banks, and nine public providers of equity. The participants in the study were taken from list of members of the German Private Equity and Venture Capital Association, the Business Angels Network Germany, and the Association of German Banks. From these databases we selected 300 possible interview partners, accounting for the regional distribution of the different types of financiers. Like the overall population of firms in this market, these companies show a pronounced heterogeneity in regard to the industry focus of their investment, their size,

their age, and their institutional background. The firms from the sample can be regarded as being representative of the respective type of financial institution; at least, we are not aware of any bias in the sample.

In contrast to the data used in section 3, this sample of smart-capital suppliers has two main advantages. First, it provides detailed insights into the investment behavior of German VC suppliers. Second, since the survey was not limited solely to financial institutions which are completely specialized in VC, it allows us to analyze the heterogeneity of the market for relationship financing and to compare different types of financiers. The data are limited to the firm level and cannot be broken down into single investments. Prima facie, this may be considered a problem because every investment has its own specifics and may, therefore, have its own need for spatial proximity. For example, in some investments, the financier might act as a lead investor, undertaking most of the monitoring and consulting, whereas in other cases he or she may behave as a largely passive coinvestor. In these two cases, spatial proximity could play different roles. Furthermore, our data do not permit the distinction between the different stages of a VC investment. This could also influence the level of activity on the part of the involved VC companies and, therefore, the role of spatial proximity. However, assuming that the decision about the way of accounting for geographical distance to potential investments is made at the firm level, the interviews provide appropriate and detailed information about the respective strategies which are our main point of interest here.

5 Analyses

5.1 Spatial proximity of investors and investments

In the interviews we asked about the average share of investments in four spatial categories: in the same region (district); not in the same region (district, but within a distance of 100 km); more than 100 km away but within Germany; and investments abroad. We chose the 100 km boundary because it can be regarded as an approximation for the one-hour trip that Zook (2002) evaluated to be crucial for the Silicon Valley VC investments. The results reveal great differences between the types of providers of smart capital in our sample (figure 2).

Banks, bank-dependent VC firms, public VC companies, and business angels all have more than 75% of their investment within a distance of 100 km. In contrast, the independent VC investors in our sample have less than 30% located within such a short distance but have spread their investments all over Germany and abroad. The high concentration of banks having investments in close proximity is rather surprising because Schäfer and Schilder (2007) show that banks offer less consulting than VC companies; hence, spatial proximity should be of relatively low importance to banks. The high share of investments by banks in close proximity is obviously a result of their tight net of regional branches (see section 3). This regionally dispersed network makes investments in distant geographical locations unnecessary because a bank's office is typically located within a certain spatial proximity to possible investments, for example, within the same district. The high share of investments in close spatial proximity which we find for business angels may be caused by the limited amount of resources available to them, or by their regionally limited network for information about possible investments. The public VC companies are often restricted in their regional focus by administrative constraints or political demands (Schilder, 2006).

5.2 The heterogeneity of the market

Despite the pronounced heterogeneity of the financiers in the sample, most of them focus on virtually the same financial product: equity investments for innovative young firms (for details see Schäfer and Schilder, 2007). This is an important issue because

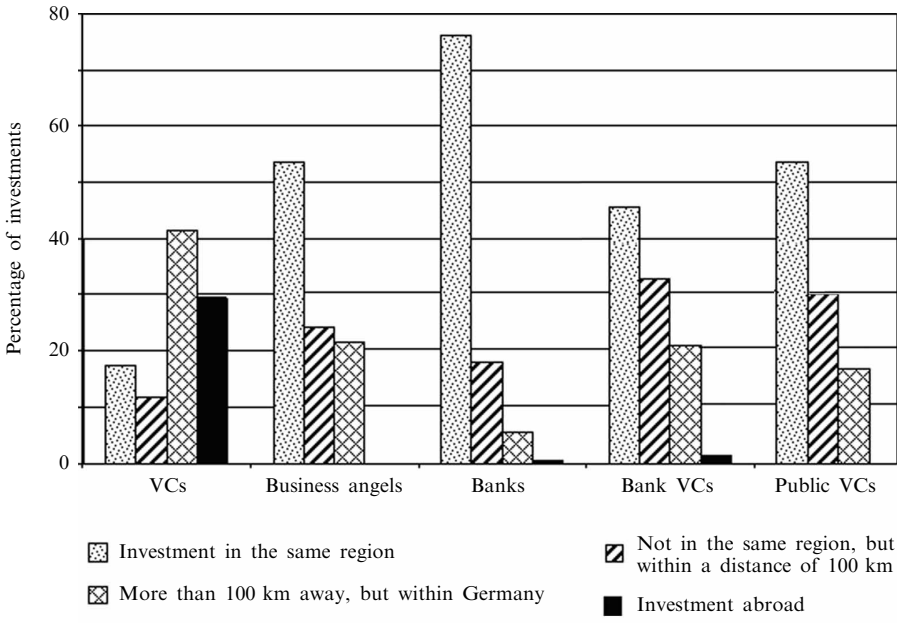

Figure 2. Average percentage share of investments of venture capital (VC) and other institutions within a certain distance.

different financial products may require different degrees of spatial proximity. Silent partnerships, mezzanine products, and credits, for example, may require considerably less monitoring, consulting, and spatial proximity than direct equity investments because of their lower participation in a portfolio company's return and, hence, less of a voice in the matter (Bascha and Walz, 2002). With the exception of banks, which almost exclusively use credit financing, all other intermediaries in our survey offer mainly equity or related products.

We find considerable differences between the types of financiers with regard to the share of early-stage investments in their portfolio (figure 3). Investments in companies which are in the early development stages may require relatively intensive consulting and, therefore, spatial proximity. The early-stage investments in our study refer to companies that are usually younger than five years; companies older than five years and younger than ten years were classified as being an early-stage investment if they were in their first phases of development. Whereas this share of early-stage investment amounts to more than 90% for the business angels in our sample, and to about 70% for the VC companies, it is much lower for banks and bank-dependent VCs (about 50%). The lowest share of start-up investment, less than 30%, is found for VC providers in public ownership. These figures suggest that regional proximity may be of relatively low importance for this group of financiers.

The mean number of professional investment managers in a firm ranges from one for the business angels to 10.5 within the public VC firms. The average number of portfolio companies is between 3.6 investments for business angels and 417 VC investments in the average portfolio of a bank. This difference becomes even more pronounced with regard to the average number of firms that one investment manager has to monitor and advise (figure 4). The ratio of portfolio companies per investment manager is important because the more companies a manager has to maintain, the less time he can spend on each of these companies individually. Institutions with a large number of portfolio companies per manager may be expected to consider spatial proximity more

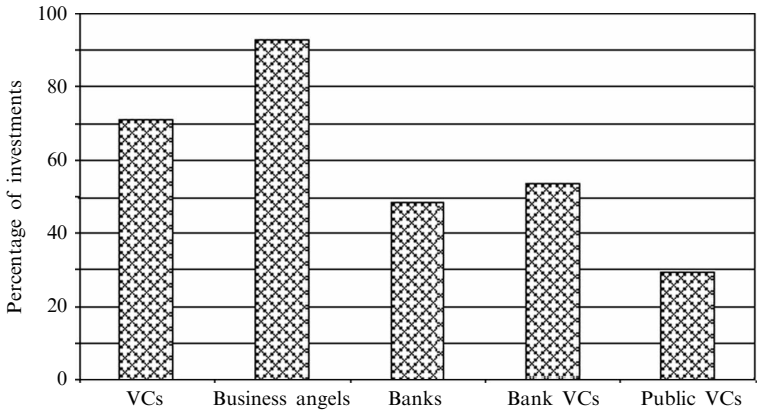

Figure 3. Average percentage share of early-stage investments of venture capital (VC) and other institutions within a portfolio.

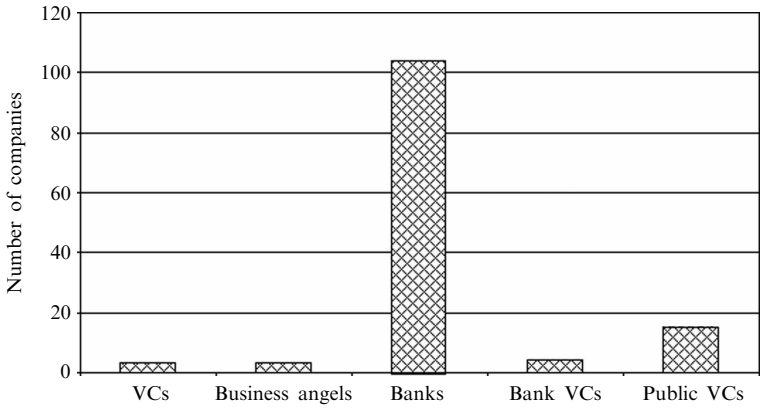

Figure 4. Average number of portfolio companies per investment manager in venture capital (VC) and other institutions.

important than firms with few investments per manager (section 2). For the VC companies, the bank-dependent VC firms, and the business angels, the average number of companies per manager is about four. The number of companies per manager is considerably higher for the public VC companies (more than fifteen investments per manager). The largest number of portfolio companies per manager, on average 104 investments, was found for the banks which supply credit financing. The fewer management resources per portfolio firm in banks may lead to a higher importance of regional proximity for the location of the investment.

The different types of financiers show distinct syndication behaviors. On average, the VC companies and the business angels syndicate 77% and 70% of their investments, respectively. The public VC firms and the banks' subsidiaries syndicate less than two thirds of their projects. The lowest rate of syndication was found for the banks which have one or more coinvestor(s) for about one third of their investments. The average total number of syndication partners over the whole portfolio varies even more. The VC companies cooperate on average with 14.5 syndication partners, whereas the business angels and the banks on average only syndicate with approximately five financiers. The banks' VC subsidiaries and the public VC companies lie in between these values, with a mean of about ten syndication partners over the whole portfolio.

In order to find out whether the spatial focus of VC investments corresponds to the syndication strategy, we asked the interviewees for the locations of their syndication partners. The response categories were the same as for the location of investments (in the same region/district; not in the same region/district, but within 100 km; more than 100 km away, but within Germany; abroad). If syndication of investments works as a strategy to overcome disadvantages of geographical distance, the syndication partners should be located close to the investment—and in particular close to those investments that are far away. Therefore, the share of syndication partners located within a great geographical distance should be higher, the larger the share of investments in distant portfolio firms is.

Indeed, we found that the regional distribution of syndication partners for the different types of VC providers (figure 5) is quite similar to the regional distribution of their investments as given in figure 2. The independent VC companies have, on average, more investments and more syndication partners in distant locations than do the other types of smart-capital providers, which tend to have a higher share of investments and syndication partners located nearby. Although the data indicate a positive relationship between investments in distant locations and cooperation with syndication partners which are also located far away, there may be a number of other reasons for syndication—such as the sharing of financial volumes or risk (Manigart et al, 2006).

The syndication behavior of the different types of financiers is an important aspect of their financial and social networks: the tighter the network is, the easier the identification of potential investments. Firms with a regionally dispersed network should be more able to detect investment targets in distant locations than firms which are more or less entirely focused on their region. To explore this issue, we asked the financiers about the relevance of different ways of contacting possible portfolio companies (figure 6). The weights for the importance of a certain mode of contact range from one ("never") to four ("always"). The responses show that all types of investors rely heavily on their

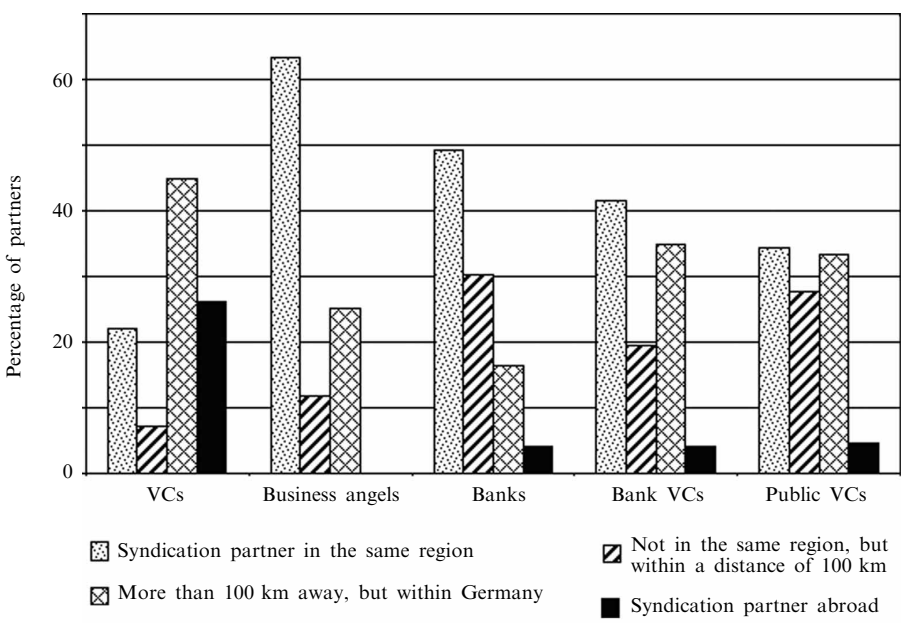

Figure 5. Average percentage share of syndication partners within a certain distance among venture capital (VC) and other institutions.

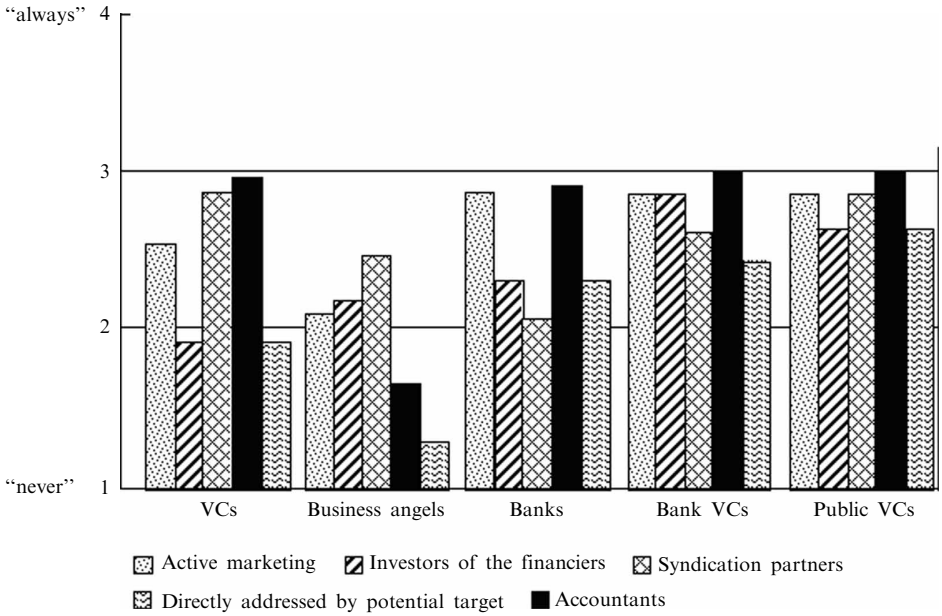

Figure 6. Ways of contacting possible investment targets among venture capital (VC) and other institutions.

networks of relationships to identify possible investment targets. The VC companies detect possible investments relatively often through their syndication partners and through third parties such as accountants. Furthermore, the relation to the financiers' capital providers, that is, their own investors, seems to be an important channel of information about potential target firms. The business angels also use their personal networks — indicated by the strong weight which they attach to the investors' relations. The banks, in contrast, access new investments relatively often by means of active marketing. Contact initiated by the potential portfolio companies, which might particularly require spatial proximity, seems to be of relatively minor importance except to public VC companies.

Information about the frequency of contacts, face-to-face and via telecommunication, between the investors and their portfolio companies per month was raised for a representative investment of the firm. On average, the financiers meet their portfolio companies once a month (figure 7). The highest number of meetings (1.64 personal contacts per month) was found for the business angels and the lowest number (0.43 meetings) for banks. With regard to the average number of contacts via telecommunication, the variance between the types of financiers is much more pronounced. Whereas the VC firms contact their portfolio companies via phone or Internet about 8 times a month, the banks have an average of 1.5 contacts per month. The number of telecommunication contacts of the other types of financiers is between 2.3 and 4.2 contacts per month. Remarkably, those financiers who use telecommunication heavily, such as the VC companies, also have a considerable number of face-to-face contacts. A Spearman rank correlation coefficient of the number of face-to-face contacts and the number of telecommunication contacts of 0.72, statistically significant at the 1% level, indicates that both forms of communication are complementary rather than substituting one another.

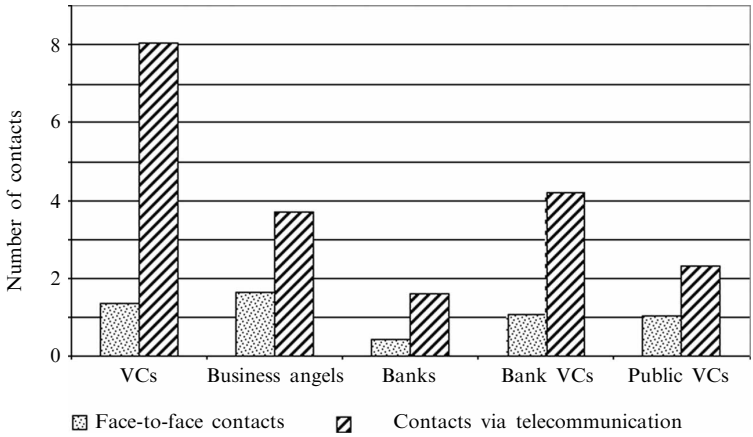

Figure 7. Average number of face-to-face contacts and contacts via telecommunication per month for venture capital (VC) and other institutions.

5.3 What influences the distance between investor and investment?

For further investigation of the influence of different factors which might affect the importance of regional proximity for VC investment decisions, we employed an econometric model. The dependent variable was the share of investments in a portfolio that are located more than 100 km away or abroad. The actual VC investments are a reflection of past investment decisions, and indicate the financiers' attitude towards regional proximity for future investment decisions.[5] We choose the 100 km distance because it can be regarded as an indicator for the one hour travel time that might be a critical threshold for the location of VC investments (Zook, 2002). The potential determinants of the share of distant investments included as independent variables are the share of early-stage investments within a portfolio, the number of portfolio firms per investment manager, the share of syndication partners located more than 100 km away or abroad, as well as the number of contacts via telecommunication per month. Furthermore, we controlled for the different types of financiers by using dummy variables with the value 1 if the financier belongs to the specific type of investor and 0 if not. Since the range of values of the dependent variables is restricted, we applied the Tobit regression estimation technique.

We found that neither a focus on early-stage investments, which might require spatial proximity, nor the usage of telecommunication, which is often assumed to lessen the importance of regional proximity, have a significant impact on the share of geographically distant investments (table 3). Obviously, investors are willing to take good investment opportunities in start-ups even if they are located far way. Furthermore, telecommunication does not seem to be an appropriate way to overcome the problems of distant investments. The statistically significant impact of the share of syndication partners that are located far away indicates that involvement of a partner located close to the portfolio firm can be regarded as a way to overcome problems of geographical distance. The time that is available for managing an investment, as indicated by the number of portfolio firms per manager, also has a significant effect: the more time a manager can spend on each investment, the more likely he is to engage in distant investments.

[5] However, since a financier may have based his or her investment decision on incorrect estimates of the necessity for direct personal contact these figures may not reflect the role of spatial distance for this decision entirely accurately.

Table 3. The determinants of the distance between investor and investment (65 observations).

	Share of investments more than 100 km away but within Germany or abroad[a]					
	I	II	III	IV	V	VI
Share of early-stage investments	−0.1335 (0.88)	−0.1562 (1.24)	−0.1239 (0.75)	−0.1454 (0.97)	−0.1532 (1.03)	−0.2025 (1.29)
Portfolio firms per manager	−0.1837*[a] (2.03)	−0.1177 (1.59)	−0.1835* (2.03)	−0.0964 (0.86)	−0.2075* (2.30)	−0.2058* (2.28)
Share of syndication partners >100 km/ abroad	1.0985** (5.17)	0.7358** (4.34)	1.0928** (5.56)	1.0444** (5.43)	1.0716** (5.73)	1.0813** (5.77)
Contacts via telecommunication	−0.1086 (0.10)	−1.2538 (1.33)	−0.1337 (0.12)	−0.1481 (0.14)	−0.1661 (0.16)	−0.2852 (0.27)
VC dummy[b]		46.8066** (4.37)				
Business angel dummy			−2.2147 (0.14)			
Bank dummy				−24.1347 (1.24)		
Bank VC dummy					−18.6062 (1.57)	
Public VC dummy						−20.2398 (1.39)
Constant	−13.1653 (1.05)	−4.5542 (0.44)	−13.0072 (1.04)	−8.0918 (0.63)	−5.7103 (0.44)	−3.7639 (0.27)
Pseudo R^2	0.0904	0.1262	0.0904	0.0937	0.0956	0.0945

** Statistically significant at the 1% level; * statistically significant at the 5% level.
[a] *t*-statistics are given in parentheses.
[b] VC—venture capital.

Specific effects on the importance of spatial proximity for investments, according to the type of financier, could only be found for the private VC firms (table 3). The positive coefficient for the respective dummy variable indicates that spatial proximity to portfolio companies seems to be of relatively low importance for these types of financiers. The lack of significance of the public VC dummy variable might be due to the definition of the dependent variable. Obviously, a circumference of 100 km is too small to properly represent the political and legal restrictions that limit the investments of these financiers regionally. The banks in our sample have a rather tight regional network of branches, which makes investments at a distance of more than 100 km obsolete—resulting in the insignificance of the bank dummy variable.

6 Why is regional proximity relatively unimportant for German VC investors?

Although we found pronounced clustering of VC companies and investments in Germany (section 3), our survey indicates that regional proximity between the VC firm and the portfolio company in no way plays a dominant role for investment decisions. However, misinterpretations by the investment managers due to unconscious discriminatory behavior cannot be ruled out because even the management itself might not have detailed insight into its own decision-making process (Zacharakis and Meyer, 1998). All of our interview partners agreed that spatial proximity is an advantage for VC investments, mainly because of the reduced difficulties of monitoring and advising. None of the interview partners neglected the importance of monitoring and supervision on-site of the portfolio companies, although most of them stated that spatial proximity

is not a dominant factor in this respect. Furthermore, most of the interviewees declared that the geographical distance is not a problem with regard to the deal flow because they can revert to large and regionally dispersed networks. With the exception of public VC companies, whose investments are mostly restricted to their own region, none of the interviewed VC managers would reject a promising investment opportunity not located at the same site—at least as a member of a syndicate. The reasons for this are diverse.

First, the spatial structure of Germany is rather balanced and accessibility of almost any location within Germany is relatively easy. Spatial distances are much smaller than in the US and a dense infrastructure for traveling exists almost everywhere in Germany. Nearly all locations in Germany can be reached within a day, and in most cases it is possible to return home on the same day. As in the study of the informal VC market in the UK by Mason and Harrison (2002b), many investment managers interviewed in our survey stated that they do not want to travel more than two hours to visit a company and that many locations in Europe can be reached by a two-hour plane trip. This is double the time Zook (2002) found in his Silicon Valley study. Furthermore, for the monitoring and consulting of companies that are located far away, some managers prefer to stay several days on-site in project teams—which results in a decrease of the relative importance of the travel times.

Second, the majority of the interview partners stated that the limited pool of promising investment opportunities was a main reason for searching outside the region. They would invest in promising new companies located nearby if they were available. Obviously, the main restriction for the German VC companies is the availability of promising investment targets—not time and effort required for monitoring and consulting. One of the VC managers we interviewed answered the question about whether regional proximity is important for VC investments in Germany by stating: "It is not time to pick and choose in the regional sense as long as you want to earn money." This indicates that the main bottleneck for VC investment in Germany is not the absence of VC suppliers but the limited number of promising projects. This finding is rather surprising because our survey was conducted at a time when the downturn of the VC market after the year 2000 had reached its bottom. In such a market phase, an undersupply of VC could be expected (Green, 2004). As a consequence of the lack of appropriate investment opportunities, in 2005 only €21.5 billion out of the €54.2 billion under management by the members of the German Private Equity and Venture Capital Association had been invested (German Private Equity and Venture Capital Association, 2006). In spite of these indications of a demand-side problem that leads to the unimportance of spatial proximity for VC investments, we should be aware of possible interdependencies between demand and supply; that is, that easy access to VC in a region may stimulate demand (Mason and Harrison, 1992). Therefore, the limitation of demand for VC could be affected by restrictions in the supply.

7 Conclusion and implications

In this paper we have examined the role of geographical proximity for VC investments. The main part of the empirical analysis was based on a survey of seventy-five face-to-face interviews with different types of financiers in Germany. This not only enabled us to gain insight into the investment behavior of VC companies and their attitude towards the importance of spatial proximity to portfolio companies, but also enabled us to compare the results of the importance of regional proximity for different types of financiers offering smart capital.

We found that the role of spatial proximity for German VC companies is far less pronounced than indicated in the literature. The VC companies do not focus their investments within a certain distance. Furthermore, they seem to use syndication to overcome the problems attached to distant investments. If the investor can find a syndication partner located close to a possible investment, the investments can be further away. However, in such a case, spatial proximity is important in regard to the location of a suitable syndication partner at least. The role of geographical proximity for VC investments is also influenced by the management resources the VC firm has available. The more time an investment manager can spend on each single investment, the more likely the firm is willing to make distant investments. Surprisingly, we did not find an influence of the share of early-stage investments in a portfolio that might require intensive involvement by the financier and, therefore, more spatial proximity. Neither did we find a statistically significant impact of telecommunication on the role of regional proximity, which might work as a substitute for face-to-face-contact.

It appears quite likely that these results are influenced by several special characteristics of the immature and still changing German VC market compared with countries like the US or the UK. Germany has a relatively balanced spatial structure of VC companies, compared with other countries, which leads to good accessibility for most locations in the country. Moreover, the interviewed managers stated that there are not enough promising investment opportunities on site; thus, distant investments are necessary. Last but not least, the well-developed travel infrastructure in Germany makes traveling relatively easy. These factors may have contributed to the striking unimportance of geographical distance for German VC providers. Therefore, we have to be cautious in generalizing our findings to markets other than Germany.

A main conclusion of our analysis is that the absence of VC firms in a region is not likely to be a hindrance to innovative entrepreneurs in Germany. We cannot confirm that there are equity gaps in certain regions that represent a severe problem for innovative start-ups. At least from the perspective of the VC managers, the main hindrance is the low numbers of promising investment opportunities. We can, however, not completely preclude the existence of informational bottlenecks which prevent a match between entrepreneurs and VC suppliers.

Our results generate some important questions for further research. First, the role of syndication as a possible substitute for regional proximity in the VC industry should be investigated further. Second, additional research is desirable to find out whether a regional equity gap or an information problem exists—especially from the viewpoint of entrepreneurs who search for VC.

Acknowledgements. We gratefully acknowledge financial support by the German Research Foundation (FR 979/8-1). Comments of two anonymous referees helped considerably to improve the presentation.

References

Bascha A, Walz U, 2002, "Financing practices in the German venture capital industry: an empirical assessment", WP 2002/08, Center for Financial Studies, Frankfurt am Main

Brander J A, Amit R, Antweiler W, 2002, "Venture-capital syndication: improved venture selection vs. the value-added hypothesis" *Journal of Economics and Management Strategy* **11** 423 – 452

Doran A, Bannock G, 2000, "Publicly sponsored regional venture capital: what can the UK learn from the US experience?" *Venture Capital* **2** 255 – 285

Elango B, Fried H V, Hisrich R D, Polonchek A, 1995, "How do venture capitalist firms differ" *Journal of Business Venturing* **10** 159 – 179

Fiet J O, 1995, "Risk avoidance strategies in venture capital markets" *Journal of Management Studies* **32** 551 – 574

Florida R L, Smith D F, 1993, "Venture capital formation, investment, and regional industrialization" *Annals of the Association of American Geographers* **83** 434 – 451

Florida R L, Smith D F, Sechoka E, 1991, "Regional patterns of venture capital investment", in *Venture Capital: International Comparisons* Ed. M Green (Routledge, London) pp 102 – 133

Fritsch M, Schilder D, 2006, "Is venture capital a regional business? The role of syndication", DP 2506, Max Planck Institute for Research into Economic Systems—Group Entrepreneurship, Growth and Public Policy, Jena

Fritsch M, Slavtchev V, 2005, "The role of regional knowledge sources for innovation—an empirical assessment", WP 15/2005, Faculty of Economics and Business Administration, TU Bergakademie Freiberg

Fritsch M, Slavtchev V, 2007, "Universities and innovation in space" *Industry and Innovation* **14** 201 – 218

German Private Equity and Venture Capital Association, 2006, "Statistics", Bundesverband Deutscher Kapitalbeteiligungsgesellschaften, http://www.bvk-ev.de

Gompers P A, 1995, "Optimal investment, monitoring, and the staging of venture capital" *The Journal of Finance* **6** 1461 – 1489

Gompers P A, Lerner J, 2001, "The venture capital revolution" *Journal of Economic Perspectives* **15** 145 – 168

Green M B, 1991, "Preferences for US venture capital investments 1970 – 1988", in *Venture Capital: International Comparisons* Ed. M Green (Routledge, London) pp 18 – 58

Green M B, 2004, "Venture capital in the United States 1995 – 2002" *The Industrial Geographer* **2** 2 – 30

Grupp H, Legler H, 2000, "Hochtechnologie 2000", Fraunhofer Institute for Systems and Innovation Research, Karlsruhe

Gupta A K, Sapienza H J, 1992, "Determinants of venture capital firms' preferences regarding the industry diversity and geographic scope of their investments" *Journal of Business Venturing* **7** 347 – 362

Hall J, Hofer C W, 1993, "Venture capitalists' decision criteria in new venture evaluation" *Journal of Business Venturing* **8** 25 – 42

Leinbach T R, Amrhein C, 1987, "A geography of the venture capital industry in the US" *The Professional Geographer* **39** 146 – 158

Lerner J, 1994, "The syndication of venture capital investments" *Financial Management* **23** 16 – 27

Lerner J, 1995, "Venture capitalists and the oversight of private firms" *Journal of Finance* **50** 301 – 318

Lockett A, Wright M, 2001, "The syndication of venture capital investments" *Omega* **29** 175 – 190

McNaughton R B, Green M, 1989, "Spatial patterns of Canadian venture investment" *Regional Studies* **23** 9 – 18

Manigart S, Lockett A, Meuleman M, Wright M, Landström H, Bruining H, Desbrières P, Hommel U, 2006, "Venture capitalists' decision to syndicate" *Entrepreneurship Theory and Practice* **30** 131 – 153

Martin R, 1989, "The growth and geographical anatomy of venture capitalism in the United Kingdom" *Regional Studies* **23** 389 – 403

Martin R, Sunley P, Turner D, 2002, "Taking risks in regions: the geographical anatomy of Europe's emerging venture capital market" *Journal of Economic Geography* **2** 121 – 150

Martin R, Berndt C, Klagge B, Sunley P, 2005, "Spatial proximity effects and regional equity gaps in the venture capital market: evidence from Germany and the United Kingdom" *Environment and Planning A* **37** 1207 – 1231

Mason C M, Harrison R T, 1992, "The supply of equity finance in the UK: a strategy for closing the equity gap" *Entrepreneurship and Regional Development* **4** 357 – 380

Mason C M, Harrison R T, 1999, "Financing entrepreneurship: venture capital and regional development", in *Money and the Space Economy* Ed. R Martin (John Wiley, Chichester, Sussex) pp 157 – 183

Mason C M, Harrison R T, 2002a, "The geography of venture capital investments in the UK" *Transactions of the Institute of British Geographers, New Series* **27** 427 – 451

Mason C M, Harrison R T, 2002b, "Barriers to investment in the informal venture capital sector" *Entrepreneurship and Regional Development* **14** 271 – 287

Nonaka I, 1994, "A dynamic theory of organizational knowledge creation" *Organization Science* **5** 14 – 37

Powell W W, Koput K W, Bowie J I, Smith-Doerrs L, 2002, "The spatial clustering of science and capital: accounting for biotech firm – venture capital relationships" *Regional Studies* **36** 291 – 305

Sahlman W A, 1990, "The structure and governance of venture-capital organizations" *Journal of Financial Economics* **27** 473 – 521
Sapienza H J, Manigart S, Vermeir W, 1996, "Venture capitalist governance and value added in four countries" *Journal of Business Venturing* **11** 439 – 469
Schäfer D, Schilder D, 2007, "Smart capital in German start-ups—an empirical analysis", Jena Economic Research Papers 2007-15, Friedrich Schiller University, http://zs.thulb.uni-jena.de/servlets/MCRFileNodeServlet/jportal_derivate_00024262/wp_2007_015.pdf
Schilder D, 2006, "Public venture capital in Germany—task force or forcing a task?", WP 12/2006, Faculty of Economics and Business Administration, TU Bergakademie Freiberg
Sorensen O, Stuart T E, 2001, "Syndication networks and the spatial distribution of venture capital investments" *American Journal of Sociology* **106** 1546 – 1588
Sunley P, Klagge B, Berndt C, Martin R, 2005, "Venture capital programmes in the UK and Germany: in what sense regional policy?" *Regional Studies* **39** 255 – 273
Thompson C, 1989, "The geography of venture capital" *Progress in Human Geography* **13** 62 – 98
Wright M, Lockett A, 2003, "The structure and management of alliances: syndication in the venture capital industry" *Journal of Management Studies* **40** 2073 – 2102
von Hippel E, 1994, "'Sticky information' and the locus of problem solving: implications for innovation" *Management Science* **40** 429 – 439
Zacharakis A L, Meyer D G, 1998, "A lack of insight: do venture capitalists really understand their own decision process?" *Journal of Business Venturing* **13** 57 – 76
Zook M, 2002, "Grounded capital: venture financing and the geography of the Internet industry, 1994 – 2000" *Journal of Economic Geography* **2** 151 – 177