Smart Capital for Start-ups – An Empirical Investigation of Relationship Financing in Germany

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Contents

1 Introduction and Research Focus ................................................................. 1
  1.1 Start-up Finance and Relational Investors .............................................. 1
  1.2 Scope and Structure .............................................................................. 5
  1.3 Data ....................................................................................................... 9
  1.4 Empirical Approach ........................................................................... 13

2 Smart Capital in German Start-ups — Suppliers and Determinants .......... 16
  2.1 Introduction .......................................................................................... 16
  2.2 Measurement and Determinants of Smart Capital ............................... 18
     2.2.1 Measuring ....................................................................................... 18
     2.2.2 The Institutional Background of Possible Relational Investors .......... 19
     2.2.3 Further Determinants of Smart Capital .......................................... 21
  2.3 Data ..................................................................................................... 23
  2.4 Empirical Issues ................................................................................... 25
     2.4.1 Descriptive Statistics .................................................................. 25
     2.4.2 Driving Forces of Smart Capital Provision ..................................... 30
  2.5 Concluding Remarks .......................................................................... 35

3 Does Smart Capital Investment Really Require Spatial Proximity? .......... 37
  3.1 Introduction .......................................................................................... 37
  3.2 Why should Spatial Proximity be Important for Investments? ............ 38
  3.3 Regional Distribution of Venture Capital Companies and Possible Target Firms ................................................................. 41
  3.4 Analyses ............................................................................................... 46
<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.4.1</td>
<td>Spatial Proximity of Investors and Investments</td>
<td>46</td>
</tr>
<tr>
<td>3.4.2</td>
<td>The Heterogeneity of the Market</td>
<td>48</td>
</tr>
<tr>
<td>3.4.3</td>
<td>What Influences the Distance between Investor and Investment?</td>
<td>54</td>
</tr>
<tr>
<td>3.5</td>
<td>Why is Regional Proximity Relatively Unimportant for German Venture Capital Investors?</td>
<td>56</td>
</tr>
<tr>
<td>3.6</td>
<td>Discussion</td>
<td>58</td>
</tr>
<tr>
<td>4</td>
<td>Is Venture Capital a Regional Business? – The Role of Syndication</td>
<td>60</td>
</tr>
<tr>
<td>4.1</td>
<td>Introduction</td>
<td>60</td>
</tr>
<tr>
<td>4.2</td>
<td>The Role of Spatial Influences for the Regional Supply of Venture Capital</td>
<td>61</td>
</tr>
<tr>
<td>4.3</td>
<td>The Database</td>
<td>62</td>
</tr>
<tr>
<td>4.4</td>
<td>What Influences the Distance between Venture Capital Firms and their Investments?</td>
<td>64</td>
</tr>
<tr>
<td>4.5</td>
<td>The Role of Syndication for the Regional Venture Capital Supply</td>
<td>66</td>
</tr>
<tr>
<td>4.6</td>
<td>Are there White Spots on the Map of Venture Capital Supply in Germany?</td>
<td>73</td>
</tr>
<tr>
<td>4.7</td>
<td>Concluding Remarks</td>
<td>77</td>
</tr>
<tr>
<td>5</td>
<td>Venture Capital Syndicate Networks</td>
<td>79</td>
</tr>
<tr>
<td>5.1</td>
<td>Introduction</td>
<td>79</td>
</tr>
<tr>
<td>5.2</td>
<td>Venture Capital Syndication</td>
<td>80</td>
</tr>
<tr>
<td>5.3</td>
<td>Syndicate Networks and the Characteristics of the Key Players</td>
<td>82</td>
</tr>
<tr>
<td>5.4</td>
<td>Analysis</td>
<td>85</td>
</tr>
<tr>
<td>5.4.1</td>
<td>Data</td>
<td>85</td>
</tr>
<tr>
<td>5.4.2</td>
<td>What do Venture Capital Syndicate Networks Look Like?</td>
<td>87</td>
</tr>
<tr>
<td>5.4.3</td>
<td>What Determines the Actor-level Degree Centrality of Venture Capital Firms in the Syndicate Network?</td>
<td>90</td>
</tr>
<tr>
<td>5.5</td>
<td>Conclusions</td>
<td>93</td>
</tr>
</tbody>
</table>
6  Public Venture Capital in Germany – Task Force or Forced Task? ..........95
6.1  Introduction.........................................................................................................................95
6.2  The Role of Public Venture Capital within the German Venture Capital Industry .................................................................96
6.3  The Rationale of Public Venture Capital Intervention ..........................................................100
6.4  The Differences between Public and Private Venture Capital Activities ...........102
6.5  Comparison of Private and Public Venture Capital Activity in Germany .......105
   6.5.1  Structure and Investment Behavior of Public and Private Venture Capital Firms ..............................105
   6.5.2  The Selection Process of Public and Private Venture Capital Companies ..............110
   6.5.3  The Monitoring and Advising by Public and Private Venture Capital Companies .................................................................113
6.6  Can Private Venture Capital Undertake the Tasks of the Public Venture Capital Activity? ..........................................................116
6.7  Concluding Remarks........................................................................................................118
7  Conclusion and Implications..........................................................................................119
7.1  The Market for Smart Capital in Germany is Heterogeneous and Various Types of Relational Investors Exist ........................................................................119
7.2  Venture Capital, as an Important Part of the Market for Smart Capital, is not a Regional Business .................................................................................122
7.3  Publicly Influenced Venture Capital Companies Generally do What Theory Expects of them ........................................................................126
References ................................................................................................................................129
Figures ..................................................................................................................................140
Tables ....................................................................................................................................141
1 Introduction and Research Focus

1.1 Start-up Finance and Relational Investors

Small companies and start-up firms are an important part of an economy’s growth and development prospects (EC, 2003; Audretsch et al., 2006; Mueller, 2006). However, many researchers hold that start-ups, especially small and innovative ones, are facing serious problems in regard to their capitalization because of market imperfections or failures on financial markets (Evans and Jovanovic, 1989; Blumberg and Letterie, 2005; Harding, 2002; Holtz-Eakin and Rosen, 1999). Therefore, the financing of new ventures and the supply of start-up or entrepreneurial finance is a major topic of interest to entrepreneurs, financial institutions, and public policymakers.

What is entrepreneurial finance? In accord with the umbrella term corporate finance, “entrepreneurial finance” comprises any form of capital or financial services provided to start-up companies (Denis, 2004). The expression start-up generally refers to the early stages of the technological and organizational development of a company. Therefore, throughout this thesis, the term “start-up” is not restricted to having to do with merely the age of a company. Start-ups are companies in a phase of development during which they do not generate great earnings and are still immature and developing in regard to product development and organizational structures.

Financial institutions offer widely varying products to start-ups, ranging from equity capital to credit financing (Denis, 2004), along with some products that combine characteristics of both, e.g., fixed interest payments and maturity of a credit and, at the same time, equity-like subordination in balance sheet terms. These equity-linked products are called mezzanine products, and one of the most prominent forms in Germany is the silent investment (Bascha and Walz, 2002). Equity and equity and
equity-linked products are provided by venture capital (VC) companies, either privately held or under governmental influence, or by high-net-worth private individuals, the so-called Business Angels. Few equity-linked investments and, especially, credits, in contrast, are almost exclusively supplied by banks. However, start-ups often lack collateral assets, a major component of loan financing. Furthermore, ventures are usually characterized by asymmetric information in favor of the entrepreneur. Credit financing offers only few possibilities to overcome these two problems and might in itself be a problematic alternative for new ventures (Evans and Jovanovic, 1989; Ueda, 2004).

Entrepreneurial finance is not only comprised of different financial products, but also involves various services, such as monitoring. Appropriate monitoring is important when financing a start up as a way to overcome the main problem of entrepreneurial finance: information asymmetries and moral hazard (for an overview, see Denis, 2004). Because there is little information and few data to use in evaluating a new company and because the entrepreneur may have a tendency to shirk since the money he or she is spending is not exactly his or her own, intensive monitoring by the financier is essential. Monitoring a start-up can involve something as simple as receiving and reading business reports or it can be much more hands-on and involve directly influencing business practices and strategy. For example, equity financing authorizes the financier to intervene rigorously in the business of the start-up based on the fact that the investor is actually one of the start-up’s owners (Hellmann, 1998). It is even possible that such intervention could lead to the entrepreneur being dismissed from his or her own company (Lerner, 1995; Hellmann and Puri, 2002). In contrast, monitoring transaction-based credit financing mostly involves keeping an eye on the pledged asset values, seeing as they serve as collateral for the loan (Manove et al., 2001).

The entrepreneurial financier often also includes consulting services as part of the financial package. In the early stages of their development, many companies lack adequate knowledge and experience in regard to many aspects of actually running a business (Gupta and Sapienza, 1992). For example, an entrepreneur who has developed a biotech product is likely to be an outstanding physician or scientist, but
might have very limited experience in running a company or marketing the product, leading to the possibility of limited success or even failure of the venture. There are two ways the entrepreneur could go about obtaining the expertise that will make business success more likely: he or she can either bring in another team member who has business acumen or hire an external consultant. However, as many start-ups face capital constraints (Evans and Jovanovic, 1989; Holtz-Eakin and Rosen, 1999), they often cannot afford an external consultant. Thus, financiers can find it in their own best interests to provide consultation services along with the entrepreneurial financing package — this saves the entrepreneur substantial costs and protects the financier’s investment. Of course, such services are not exactly free: the entrepreneur may have to give up some control over the start-up in exchange for this consultancy service.

![Diagram of entrepreneurial finance and smart capital]

*Figure 1.1: Entrepreneurial finance and smart capital*
The additional services provided by entrepreneurial finance to-start-ups are the foundation for the main topic of this thesis: relationship financing and smart capital (Figure 1.1). Relationship financing, which is the provision of smart capital, is a financial relationship between an investor and a financed company that is characterized by certain information flows (Boot, 2000). These flows of information arise out of the services provided by the financier that are in addition to capital. On one hand, monitoring the start-up provides information to the financier, for example, in the form of business reports. On the other hand, the consulting services are an information flow in the opposite direction — from the investor to the start-up.

This combination of financing and services is beneficial for both the financier and the financed company. The start-up receives external consulting that can evaluate and resolve deficits in the knowledge and skills needed for a successful venture (Hellmann and Puri, 2002). The financier benefits from the arrangement because appropriate and qualitative monitoring and consulting reduce the risk of failure for the venture (Sapienza et al., 1996) and thus increase the likelihood of the investment being a profitable one (Hellmann and Puri, 2002; Sapienza, 1992). Additionally, a flourishing start-up increases the financial company’s value, a benefit that is not simply lower default risk but monetary gain as well. Overall, relationship financing and smart capital for start-ups can be a profitable arrangement for all parties involved.

However, this picture is not all roses: the deep information flows of smart capital can entail large transaction costs (Kaplan and Strömberg, 2004; Sapienza et al., 1996). These costs will arise, for example, from monitoring and consulting that must be done at the start-up’s actual physical location so as to become cognizant of tacit knowledge that cannot be codified and communicated via figures or written words. In certain cases, entrepreneurial relationship financing will come up against spatial limitations (Mason and Harrison, 2002a). Very few investors can afford extensive and expensive traveling to perform services at the site of the investment. Furthermore, not all types of financial relationships will be profitable enough to justify such expense. Although profitable, a small-size equity investment might not be profitable enough to justify the expense of on-site financial services, especially if...
the distance between the financier and the start-up is great (Harding, 2002). Thus, smart capital in entrepreneurial finance may be subject to two restrictions. First, the regional scope of the financiers can be limited due to the high transaction cost of distant investments. Second, some ventures will be passed over by a financial institution because they do not fit into the institution’s expense-return profile. In such a case, which can be regarded as a market failure or imperfection, it might be necessary for public authorities to intervene.

1.2 Scope and Structure

The main objective of this thesis is to explore the market for and, especially, the supply of smart capital for start-ups in Germany, meaning that the components, determinants, and spatial influences of smart capital are analyzed. The research questions are: “Who provides smart capital for start-ups in Germany and what determines the provision?” “Is spatial proximity to investments important for relational investors or can it be substituted?” and “Are start-up financiers under governmental influence really helping overcome possible imperfections in the market for start-up financing?”

Germany has a bank-based financial system. In contrast to market-based systems, such as the one in the United States, equity is not the dominant source of capital for companies. Therefore, banks as providers of loans or credit dominate the corporate financing scene. However, other financial institutions, for example, VC companies, are also active in bank-based markets. Many types of financial institutions might act as relationship financiers. Therefore, the first part of the study — Sections 2 and 3 — is not limited to a specific type of financier, as are many previous investigations (see, e.g., Lerner, 1995; Sapienza, 1992; Mason and Harrison, 1996; Berger and Udell, 2002). The analysis compares different types of investors, including privately held VC companies, Business Angels, banks and their equity subsidiaries, and public equity suppliers. This type-spanning analysis should reveal the heterogeneity of possible relational investors and their differences with regard to the provision of smart capital. Furthermore, the attitude toward spatial proximity between financier and financed firm is explored, which is a crucial
research parameter because such attitudes might the regional supply of smart capital for entrepreneurs. The second part of the thesis (Sections 4, 5, and 6) deals with one specific and very important type of relational investor: VC companies. VC is a major part of the market for smart capital with regard to entrepreneurial finance because VC companies focus on start-ups and supply different forms of information flows (Gompers and Lerner, 2001). In these sections, the regional aspects of the German VC supply and investments are analyzed. Furthermore, public and private VC firms are compared to evaluate the public VC firms’ task performance in regard to possible imperfections in the market for smart capital.

Section 2, “Smart Capital in German Start-ups — Suppliers and Determinants”, deals with the question of which types of financial institutions actually are relationship financiers and, consequently, suppliers of smart capital. This is an important part of the thesis because it sets out which financial institution and which financial product is combined with which amount of services, representing the supply of smart capital. In the German financial system, the possible relational investors range from independent and corporate VC companies (Hellmann and Puri, 2002; Lerner, 1995) to other equity suppliers such as Business Angels (Brettel, 2003) or public authorities, which, in Germany, are very active in entrepreneurial finance (Sunley et al., 2005; Plagge, 2006). Banks in their role of so-called Hausbanks (Elsas and Krahnen, 1998, 2004) are also important players in the market for smart capital. The analysis reveals to what extent a bank-based system can incorporate relational investors and whether the supply of smart capital might be limited or enhanced due to few or many different types of relational investors. Furthermore, the determinants of becoming a relational financier are explored. These determinants include, for example, the combination of various financial products with different information flows or a focus on early-stage investments that might require a deeper exchange of information than that needed for financing older portfolio firms.

Section 3 — “Does Smart Capital Require Spatial Proximity?” — focuses on the second research question of the thesis. It examines the role of spatial proximity in VC investments as compared to other relational financiers. Spatial proximity between the relational investor and the start-up might be crucial for the provision of
smart capital because it allows for easy and inexpensive personal contact between the two parties (Lerner, 1995). Personal contact is important for the sharing of so-called implicit knowledge (Nonaka, 1994), for example, for on-site monitoring and consulting. Therefore, supplying smart capital might be restricted to businesses that are within a certain distance of the financier. However, spatial proximity might not be so important to some financier activities, such as joint investments with other financiers, so-called syndicates (Sorensen and Stuart, 2001; Doran and Bannock, 2000). If one syndicate member is located close to the investment, that member can be responsible for the services that need spatial proximity; the other investors need not be geographically close to the investment and still rest secure that their investment is being looked. Overall, the role of spatial proximity could be an important factor in regional provision of smart capital. Sections 2 and 3 reveal the importance of VC, especially in the regional context, and thus the following sections focus on VC as one very specific part of the market for smart capital.

Section 4, “Is Venture Capital a Regional Business? — The Role of Syndication,” investigates in detail whether the supply of VC in Germany is driven by spatial influences. This section is not merely an extension of the analysis undertaken in Section 3 regarding the importance of spatial proximity between investor and investment and the role of syndication in this context; it contains a more geographical exploration of spatial influences on VC investment and, especially, of the role of syndicated investments in this context. For example, information within the dataset used for this study on the location of financiers, co-investors, and the investments themselves enables a detailed empirical analysis of spatial distances. Furthermore, the question of whether the supply of VC in Germany is regionally restricted is examined. German VC suppliers are regionally clustered (Martin et al., 2002), and if spatial proximity is important for VC investors, regions that are home to no or only few VC companies would experience a severe undersupply of VC. This regional equity gap might be an explicit comparative disadvantage for start-ups in these regions.

The analysis undertaken in Section 4 highlights the importance of syndication to the VC supply. Therefore, a further analysis of VC syndication in a geographical
context follows in Section 5, “VC Syndicate Networks”. This section examines the relationships between German VC investors through an investigation of VC syndicate networks and spatial influences on the underlying cooperations. A syndicate network emerges from syndicate investments of VC companies (Bygrave, 1988). The greater the number of co-investors a VC firm has in different syndicates, the more central is its position within the overall network. Occupying a central position may give rise to certain advantages, such as, for example, finding and evaluating possible investments (Bygrave, 1987; Manigart et al., 2006) and overcoming spatial and geographical problems by way of suitably located syndication partners (Sorensen and Stuart, 2001). There are certain characteristics of a VC company that will determine its position within the syndicate network (Sorensen and Stuart, 2001). First, older VC companies might have a more experienced and interconnected management and, therefore, more contacts to different syndication partners than will younger VC investors. Second, the location of a VC firm within one of the German VC centers and a large spatial investment arena might spur syndication activity. Finally, the VC company’s background, i.e., whether under governmental influence or privately held, might have an impact on its number of co-investors and its network position. Discovering how VC company characteristics influence VC syndication activity is the first step in evaluating the public equity providers in Germany, a topic enlarged upon in Section 6.

Finally, Section 6 — “Public Venture Capital in Germany — Task Force or Forced Task?” — deals with a further important aspect of entrepreneurial smart capital provision: possible market failure or imperfection, a perhaps especially critical problem for VC (Harding, 2002; McGlue, 2002). Therefore, I look into the question of whether VC under governmental influence — so-called public VC companies — is performing its tasks properly. These tasks involve promoting entrepreneurial activity through direct capital aid and creating a suitable entrepreneurial environment. Furthermore, public authorities should try to accelerate the German VC market out of its current infant stage. This section of the thesis is of high relevance to policymakers. The analysis focuses on public VC firms’ selection process, investment behavior, and consulting services. It reveals to what extent these aspects are in accord with the goals of public VC, which should be at least somewhat
different from the goals of private VC firms. The theoretical rationale behind public VC supply is based on the existence of market failures (McGlue, 2002). For example, private investors may not be willing or able to invest in risky and generally small-scale start-ups (Harding, 2002), because the returns might not cover the costs. This is the situation public VC should be designed to remedy. In addition, the young and still immature private VC market could use a good role model, another function public VC could perform, demonstrating through example that investing in early-stage start-ups can be a profitable business (Leleux and Surlemont, 2003). The analysis undertaken in Section 6 of the thesis explores whether public VC firms deliver a different market segment than their private counterparts and whether they are acting in furtherance of their stated goal of promoting the local economy and building business and financial networks.

Sections 2 through 6 of the thesis are based on five research papers that were presented at refereed conferences, including the International Conference on Entrepreneurship Research (IECER, Regensburg, 2006), the International Schumpeter Society Conference (Nice, 2006), and the G-Forum Jahreskonferenz (Jena, 2005 and Berlin, 2006). The papers have been published as working papers of the TU Bergakademie Freiberg, the Deutsche Institut für Wirtschaftsforschung, and the Max Planck Institute of Economics. All five papers are either under submission or already accepted for publication in international refereed journals such as, for example, Environment and Planning A.

1.3 Data

The empirical analysis is based on two different datasets. An interview survey with different financial institutions in Germany is used for Sections 2, 3, and 6. For further analysis of spatial influences, with a focus on the VC market, a second dataset containing details about more than 300 German VC investments in the years 2004 and 2005 is employed in Sections 4 and 5. The survey data give detailed insight into the attitudes of different types of relational investors toward smart capital, into their investment behavior, and, especially, into the information flows between financier and start-up. The second dataset supplies detailed information on the level of
individual investments; for example, about the location of VC firms, their investments, and their syndication partners. In the following, some general information about both datasets is given. A detailed descriptive statistic can be found in the respective sections.

*Interview Survey Data*

The interview survey data consist of personal interviews with managers who were actively involved in corporate financing and specialized in start-up financing. The study participants were taken from the list of members of the German Private Equity and Venture Capital Association, the Business Angels Network Germany, and the Association of German Banks. The interviewed institutions were selected based on the regional distribution of different types of financiers in Germany. Out of initially more than 300 different types of financial institutions, 85 agreed to participate in the interview. The interviews were based on a largely standardized questionnaire and lasted between 50 and 90 minutes. One manager per firm was interviewed. All interviewees were actively involved in the financing, monitoring, and consulting process. The answers pertain only to the department in which the interviewee worked. The investors in the sample were located in diverse areas of Germany. Mirroring the overall market, these companies show a strong heterogeneity in regard to their industry and regional investment focus, their size, their age, and their institutional background. Therefore, the sampled firms can be regarded as representative of the respective types of financial institutions. The participating financiers were all very actively investing, whereby the accuracy of the data regarding financing behavior of relational investors is guaranteed. The sample covers different types of financiers that offer money to young companies. It contains 22 independent and corporate VC companies, 11 private Business Angels, 23 each of public savings and private commercial banks, 17 VC subsidiaries of banks, and 12 public providers of equity.

The survey questions pertained mainly to investment behavior and how investments are selected, as well as to monitoring and consulting activities. The
questionnaire was divided into five parts. The first part contained questions of a general nature, such as the age of the financier or the composition of its portfolio. In the second part, questions were asked about the financiers’ investments and their characteristics. The third part dealt with how investments were evaluated. In the fourth part, investors were asked what sorts of monitoring and consulting services they supplied. Finally, the questionnaire contained some space for open questions, for example, concerning the investor’s market expectations. All questions were validated by means of several pretests.

The survey of smart capital suppliers has two main advantages compared to other empirical studies based on micro-level investment data (see, e.g., Hellmann and Puri, 2002; Lerner, 1995; Petersen and Rajan, 1995; Sapienza et al., 1996). First, it provides detailed insights into the attitudes of relationship financiers and their investment behavior. Second, since the survey was not limited to only one type of financial institution, it is possible to analyze the heterogeneity of the market for relationship financing and smart capital by comparing different types of financiers. Thus, the data are restricted to the firm level and cannot be broken down to single investments. Prima facie, this may be regarded as a problem because every investment has its own specifics and, therefore, its own need for monitoring, consulting, or spatial proximity. For example, in some investments, the financier might act as a lead investors and undertake most of the monitoring and consulting, whereas in other cases he or she take the role of a more passive co-investor. In each case, certain factors, for example, spatial proximity, could vary in importance. Furthermore, the data do not allow distinguishing between different stages of an investment, which could also influence the level of the financier’s activity. However, assuming that decisions about investments and the type of services offered is made at the firm level, the interviews provide appropriate and detailed information about the strategies that are the center of interest for this study.

Micro-level Investment Data

The second dataset contains details about investments at the micro-level, focused on the German VC market. The data were provided by “VC facts,” a company that
collects information about VC investments in Germany. The data for the years 2004 and 2005 are used, which comprise information about 134 and 174 VC investments, respectively, which numbers are equal to nearly half the early-stage investments recorded by the German Private Equity and Venture Capital Association (2005). The financiers in the sample are mainly focused on technology-intensive industries and services, such as computer software, medical technologies, or biotech, industries that represent the majority of German VC investments (German Private Equity and Venture Capital Association, 2004, 2005). The sample appears representative of overall VC investment in Germany during the time period under investigation; there is no indication of any bias.

For the purpose of this thesis, the focus was on gathering detailed information concerning the location of an investment, the number of investors involved and their locations, the overall amount of money invested, and the ages of the financier and the financed company. Based on the addresses of the VC firms and the investments, the average traveling distances and the shortest traveling time by car between an investor and a portfolio company was calculated using the Internet-based route planner map24.de. Out of the 308 VC investments in the sample, 199 are syndicated, i.e., there is more than one investor involved. Hence, 819 pairs of investors and the respective portfolio company can be identified, which is important for the analysis of VC syndication. Furthermore, the number of pairs of investors that are involved in an investments can be counted. If a portfolio company has two investors, it has one pair of co-investors. Within a syndicate of three investors, there are six pairs of co-investors, but only three different pairs. The data contain 2,107 pairs of co-investors involved in syndicates. Out of these pairs of investors the syndicate networks emerge. Due to several missing values, most of the analysis is based on considerably fewer than 2,107 observations, however. The missing information mainly concerns the age of some VC companies and the addresses of informal VC investors and foreign investors, which were not included in the studies.
In addition to the survey and the micro-level investment data, further data are used for analysis of the geographical and spatial market characteristics and, especially, for the data collection in the run-up of the interview survey. First, the members of the German Private Equity and Venture Capital Association (Bundesverband Deutscher Kapitalbeteiligungsgesellschaften; BVK) and their investments are taken from the BVK’s annual statistics and webpage (German Private Equity and Venture Capital Association, 2003–2005). Second, information about financiers other than VC companies was collected from several webpages and from online publications of the German Business Angels Network (BAND), the German Savings Banks Association (DSGV), and the Federal Financial Supervisory Authority. Finally, data on R&D intensive manufacturing start-ups at the level of German districts (Kreise) from the years 1990-2003 are from the Mannheim Foundation Panels of the Centre for European Economic Research (ZEW) in Mannheim. I am greatly indebted to the ZEW for making these data available.

1.4 Empirical Approach

To answer the research questions posed by this thesis, several methodological and empirical approaches are used. In Section 2, which explores the different types of relational investors in Germany and the determinants of the supply of smart capital, the concept of knowledge building (Nonaka, 1994; Polanyi, 1965) is employed to evaluate the different dimensions of information flow between financier and financed company. Implicit and explicit forms of information sharing are used to overcome the problems of measuring the provision of smart capital. In a second step, the possible determinants of the “smartness” of capital, which are derived from a literature review, are highlighted using Ordered-Logit-models. The dependent variables of the models indicate the information flows within relationship financing and, therefore, the “smartness” of capital; for example, through the intensity of the consulting services provided by the financiers.

The answer to the question of how important spatial proximity is to the provision of smart capital is derived by three methods. First, in Section 3, a geographical analysis of the German VC market, as a major part of smart capital in
Germany, should reveal spatial and geographical influences on this market. An investigation of possible determinants of the importance of spatial proximity in relationship financing follows, covering issues such as the opportunity for financiers to overcome the problems of distant investments via syndication. These determinants are selected from earlier research studies that deal with similar problems. Since the range of values of the dependent variables is restricted a Tobit-regression is employed that allows a comparison of the spatial investment behavior of VC companies with other types of relationship investors. Second, in Section 4, the micro-level investment data regarding German VC investments is employed to provide a more detailed look at the importance of spatial proximity to smart capital. Logit models are used to show whether the probability of syndication is affected by spatial influences, for example by the distance between VC company and investment or the possibility of finding a syndication partner being located close to the portfolio firm. The dependent variable is the syndication-dummy, which assumes the value one if an investment is syndicated and the value zero if not. Based on the geographical results from Section 3, the finding of this analysis indicates the extent of the regional equity gap for start-ups in Germany. Third, the micro-level investment data are used for a network analysis (Section 5). This reveals the degree of interconnectedness of the supply side of the German VC market, by way of syndication, and sets forth the determinants of that interconnectedness, for example, the spatial investment behavior of investors. Some aspects from network analysis are used to explain the findings, such as graphical interpretations and the concept of degree-centrality to indicate the interconnectedness of the VC firms. Because of the distribution of the dependent variable and the error term a negative-binomial regression is employed to show which characteristics of investments and investors have an influence on the syndicate network behavior of financiers.

The third research question is mainly explored in Section 6, though the results from the network analysis (Section 5) also give some indication of the network position and syndication behavior of publicly influenced VC firms. Section 6 is mostly concerned with the extent to which VC companies under public influence perform their tasks of promoting start-ups and creating a stand-alone VC market and conducive entrepreneurial environment. These tasks are derived from the theory of
possible imperfections in the market for entrepreneurial finance. The empirical approach compares the investment behavior of publicly influenced and privately held VC firms, namely, the deal flow and the evaluation and supervision of portfolio firms. Both types of financiers are compared along the entire spectrum of VC investment, from the search for possible investments, through the monitoring and consulting process, and right up to the termination, by whatever means, of an investment, using a Wilcoxon-Mann-Whitney test.

Finally, the results from the empirical estimations in the Sections 2 to 6 are summarized (Section 7). Following, the answers to the research questions are used to draw implications for entrepreneurs and financial institutions as well as for policy makers in regard to entrepreneurial finance and the provision of smart capital in Germany.
2 Smart Capital in German Start-ups — Suppliers and Determinants

2.1 Introduction

The provision of smart capital by so-called relational investors is commonly considered to be pivotal for the growth prospects of risky and developing start-ups. Relational investors, such as venture capital (VC) companies, are expected to combine the provision of corporate finance with consulting services and to promote the professionalism of the firms in their portfolio (Hellmann and Puri, 2002). The term smart capital for this kind of financial service derives from the fact that in order to be successful, it is necessary to have considerable expertise with regard to the portfolio firm, the technology employed and the market environment. Ideally, the financiers participate actively in the information flows both within the firm and between the firm and its business environment. Indeed, several studies find evidence that VC companies do in fact invest in obtaining proprietary information about their clients’ businesses and spend substantial time and effort in assistance, advising, and monitoring their portfolio firms (Kaplan and Strömberg, 2004; Macmillan et al., 1988; Sapienza, 1992; Sapienza et al., 1996). Nevertheless, the term smart capital still remains somewhat of a black box. What is still unclear is the kind of smart capital actually provided, and whether “smartness” means the same when different relational investors other than just VC companies are considered.

The research focus on VC companies as relational investors might be justified in the market-based US financial system. However, the situation may be different in a bank-based system like that in Germany. The German financial system is characterized by two major features: the well-known Hausbank principle and the importance of public intermediaries in corporate financing. The Hausbank principle reflects a close relationship between the bank and its client firm. Hausbanks are involved in the businesses they finance and they monitor them closely (Elsas and
Krahnen, 1998, 2004). Thus many German commercial banks can also be seen as relational investors. Moreover, despite the fact that public financing is often said to be passive (Hellmann and Puri, 2002), several references in the literature indicate that German public equity suppliers, in particular public VC companies, are different because they try to establish a close relationship with their target firms (Hood, 2000, Schilder, 2006). Therefore, the public equity suppliers in Germany could be also an important part of the market for smart capital.

In this section the provision of smart capital not only by VC companies but also by other possible relational investors in Germany investigated. Smart capital is defined as a two way flow of information where information flows from the company to the financier and consultation and support flow in the opposite direction. The financier has some right to control and information for ensuring the flow of data, mainly reports, about the development in management, technology, and product marketing of the firm it finances. In return the investor has to carry out certain responsibilities, predominantly those of an advisory or consulting nature.

The main focus of this section is twofold. First, the “smart capital” black box is opened and the characteristics that turn financiers into relational investors are exposed. Second, various types of financiers who differ with respect to their provision of smart capital are compared. In particular, it is analyzed how both the intensity of the reciprocal information flows and the intensity of the control and consulting services differ among distinct types of relational investors.

The interview survey data (see Section 1.3) is used to explore the provision of smart capital for start-up companies within the bank based system in Germany. The rest of this section is organized as follows. In Section 2.2, a concept for measuring smart capital is introduced and hypotheses about the determinants of the supply of smart capital are derived from a literature review. Section 2.3 describes the dataset and Section 2.4 presents the empirical analyses and the results. Finally, in Section 2.5 some conclusions are drawn.
2.2 Measurement and Determinants of Smart Capital

2.2.1 Measuring

Smart capital can be defined as a reciprocal information process. To capture this notion the concept of knowledge building is employed in the following. Nonaka (1994) defines this process as, “… knowledge is created and organized on the very flow of information.” Therefore, the bases of knowledge creation are information flows. Knowledge can analytically be divided into two types (Polanyi, 1966). The first type is the so-called explicit knowledge. Explicit knowledge and the underlying information flows can be codified and documented in the form of reports. These features make information sharing among individuals fairly easy. In corporate financing, the exchange of explicit knowledge can be done by business assessments or balance-sheet statements. Thus, the flow of explicit knowledge or information is measured by the frequency of the codified information exchange, e.g., in the form of reports.

The second form, tacit knowledge, is more complex. Tacit knowledge cannot be easily translated into numbers or even into words and is strongly linked with the individual itself. Typical examples are practical expertise or knowledge that a person gains by personally experiencing a specific situation. Tacit knowledge usually cannot be codified because of its implicit character (Nonaka, 1994). It is often impossible to communicate and share tacit knowledge via documentation, in particular, since it is frequently associated with what von Hippel (1994) calls sticky information. The exchange of sticky information is difficult and costly. Personal interaction is necessary for acquiring tacit knowledge (Nonaka, 1994). Thus, the frequency of personal contacts and the amount and different forms of consulting services delivered by the investor are used as proxies for the extent to which tacit knowledge is exchanged between the two parties.

Based on the distinction between explicit and tacit knowledge, the different components of smart capital can be identified. First, the exchange of explicit knowledge appears in different forms of business reports such as business
assessments, reports on collateral or the technological development of a product. The second component contains flows of implicit knowledge. These comprise the frequency of contacts between the financier and the financed company – face-to-face and via telecommunication – and the different forms of consulting and influence offered or mandated by the investor. It can be assumed that the more distinct topics this consulting entails, the broader the flows of implicit knowledge are. The combination of both flows of implicit and explicit knowledge results in smart capital. If the financier offers investments linked to the two ways of knowledge exchange he is considered a relational investor.

### 2.2.2 The Institutional Background of Possible Relational Investors

Different financial institutions with different business and investment strategies might deliver smart capital up to various levels. The literature allows no doubt that VC firms offer smart capital. Several surveys that summarize the research findings on VC clearly state that VC companies are highly involved in the business of the financed companies (Macmillan et al., 1988; Hellmann and Puri, 2002; Lerner, 1995), have intensive contacts with their portfolio firms (Sapienza, 1992), and are well informed with regard to the financed companies’ businesses through constant monitoring (Gompers, 1995). The VC subsidiaries of industrial companies, so-called corporate VC firms, are believed to initiate an even more intensive flow of information than their independent counterparts (Bottazzi et al., 2004) due to a higher ratio of strategic investments (Block and MacMillan, 1993) and due to better technical skills (Chesbrough, 2000). In line with these findings, it is expected that VC companies deliver a wide range of services in connection with their equity investments, which can be equated with a provision of smart capital.

The formal VC investors are supplemented by an informal market segment: the Business Angels. These are private individuals who are, similar to the formal VC companies, considered to be deeply involved in the businesses they finance (Mason and Harrison, 1996; Osnabrugge, 1998; Brettel, 2003). Furthermore, they often have hedonistic and altruistic motives when investing in a start-up company (Mason and Harrison, 1994; Paul et al., 2003). Private benefits such as "happiness" caused by the
development of a new company should improve the cooperation and result in heavy flows of information between “Angel” and firm (Sullivan and Miller, 1996). Because of this one can not expect to find a great difference in the provision of smart capital between informal VC suppliers, i.e., Angel investors or Business Angels, and formal VC firms.

Several aspects of the German financial system suggest that there is another group of relational investors in addition to formal and informal VC investors: the commercial banks and the savings banks. German banks have a long history in relationship banking and in playing an active role in corporate control (Gerschenkron, 1962; Cable, 1985). Relationship-based financing is often considered to be one of the core businesses of most German banking institutions (Schäfer, 2002). German universal banks have never been legally restricted in either their contracting behavior or their ability to exert corporate control. As so-called Hausbanks, banks as credit suppliers are prepared to be deeply involved with their firms’ businesses (Elsas and Krahnen, 1998, 2004). A Hausbank relationship is characterized by constant interaction, a reciprocal flow of information (Elsas and Krahnen, 2004, 208f.), and even direct influence by the creditor on the financed companies (Elsas, 2004). This behavior is not just based on transactional information, but it is also based on a strong relationship between the participating parties. Therefore, it is compatible with what Boot (2000) called relationship financing. Thus, the banks might also provide smart capital for start-ups, especially as the Hausbank relationship is common for financing small-sized and medium-sized companies (Edwards and Fischer, 1994, 143; Lehman and Neuberger, 2001).

During the 1990s, German banks have started to set subsidiary VC organizations in order to expand their equity financing. The bank-related VC companies have similar investment criteria and employ monitoring and consulting strategies analogous to those of their individual counterparts (Bottazzi et al., 2004). However, their integration into the institutional background of banks and their dependency on their mother company might influence their aims and therefore their investment strategy (Tykvova, 2004; Osnabrugge and Robinson, 2001). Banks often use VC subsidiaries for establishing a financial relationship with the customers and
possibly for providing loans to the customers later on (Hellman et al., 2004). The independent VC companies’ predominant aim which is helping the portfolio firm grow quickly and selling their shares with a profit might not be an important feature of banks’ VC subsidiaries. This difference might reduce the incentives of the banks’ subsidiaries to offer a wide range of consulting services and to exert direct influence on their portfolio companies. Therefore, the information flows within bank dependent VC investments might be lower than those of other relational investors such as independent VC companies or Angel investors.

Apart from the important role of banks, the German financial system has a second special feature: the public VC providers. Public VC firms have a considerable market presence in the entrepreneurial finance sector (see for example Sunley et al., 2005; Fritsch and Schilder, 2006; Schilder, 2006). Their lower return requirements (Bascha and Walz, 2002) combined with their strong ambitions to contribute to local economic development (see e.g., Sunley et al., 2005; Tykvova, 2004) may allow, and even force, these entities to establish a more intensive relationship and closer contact to the portfolio firms than their private counterparts can afford. Therefore, their provision of smart capital might be characterized by intensive flows of information by means of large numbers of consulting services.

2.2.3 Further Determinants of Smart Capital

The literature reflects the assumption that financiers with different institutional background and different business strategies offer different levels of smart capital. In addition to the type of financiers, some further factors might influence the level of smart capital: the financial product that is predominantly used, the developmental stage that the financed companies are in, and the expected time horizon or duration of the investment.

Equity financing turns the external investor into one of the owners of the enterprise. This owner position is associated with a large numbers of monitoring rights - often even enhanced by additional rights (Sahlman, 1990) - that spur the deep information flows between firm and investor. Furthermore, the financier participates
directly in the earnings of the company and, if the investor sells his shares, he can also benefit from the growth of the venture. Therefore, it is in his interest to ensure that the financed develops rapidly. This often requires consulting services and, sometimes, directly exerted influence on the business practice of the portfolio company, for example by a CEO turnover when the start-up is in trouble (Lerner, 1995). Thus, equity financing is an incentive for strong flows of information in both directions.

Mezzanine products and, in particular, silent investments, might be combined with less monitoring, advising and, especially, direct influence. In balance-sheet terms both financial products are located between the two poles of equity and debt. They usually do not include voting rights. Furthermore, the financiers participate less in the profits than they would with direct ownership (Bascha and Walz, 2002). With regard to credit financing, some caveats should be mentioned which may constrain the information flows. First, due to the collateral, some of the investor’s risk exposure comes from the fluctuations of the value of the pledged assets. Thus, relational credit financiers may focus less on both the consulting activities and a regular exchange of information regarding the project’s development. Their main focus is on the pledged assets rather than on uncollateralized equity as in the case of the equity financiers (Manove et al., 2001). Second, compared to investment managers in VC companies, the loan officers may have built up their expertise predominantly on financial issues but lack technological knowledge (Ueda, 2002). This might hinder their ability to explore the non-transactional information about the start-up, such as entrepreneurial or technological abilities within the company. Given these caveats, the credit financiers may place more weight on information about the collateral’s value and financial reports than equity financiers do. Therefore, the supply of monitoring and consulting combined with credit financing might be lower than that of equity financing.

The age of the firm might also influence the provision of smart capital. Young companies often need to be monitored and advised more intensively than companies in later stages of their technical and organizational development (Gupta and Sapienza, 1992; Sapienza et al., 1996; Sorensen Stuart, 2001). A young company in
the early phase of its growth is likely to require more involvement by the relational investor than a company at a later stage of development (Gupta and Sapienza, 1992). Possible reasons are a lack of business and management skills in young innovative companies which are often run by engineers or natural scientists (Gupta and Sapienza, 1992) and a high degree of uncertainty about the technical and economic success of the project (Sapienza et al., 1996). Financiers that focus on early stage investments might, therefore, have to offer deeper flows of information in order to increase the chances of success of the portfolio firm and, therefore, of their investment. Accordingly, early stage investors are expected to provide more smart capital services than later stage financiers.

The effect of the investment horizon on the provision of smart capital has not been evaluated as much as the development stage of the portfolio firm. Gompers (1995) suggests that the duration of the investment is negatively related to the financier’s degree of involvement in the firm’s affairs. The longer the expected investment horizon is, the less likely it is that the financier will be actively involved in the business. There are basically two reasons for this negative relationship. Firstly, long-term investors often target stable and relatively safe firms and stay away from high-risk-high-return companies. These firms seem to be able to organize most of their growth themselves. Secondly, short-term financing may create additional transaction costs from renewing of the financing contract and the additional information collection required (Fama, 1985; Gompers, 1995). By contrast, gathering information about the portfolio company will be of little importance for long-term investments. This leads to the assumption that the longer the time horizon of the investment, the less intense are the information flows.

2.3 Data

The in depth empirical analysis is based on the interview survey introduced in Chapter 1.3. For this analysis, the survey data was grouped into two sets of variables that open the black box “Smart Capital” and capture the different directions of the information flow. The deeper and more diverse these flows of information are, the higher is the level of smart capital. The frequency of reports (weekly, monthly,
quarterly, or yearly) and their contents was used as an indicator of the flow of information from the firm to the financier. The flow of information in the opposite direction is measured by the importance, frequency, and diversity of the financier’s consulting activity and its direct influence on the businesses financed.

In addition to quantifiable information such as the share of early stage investments within a portfolio, the data contain two types of ordinal variables. The first type (Type A) varies within the ranges: never (1), seldom (2), frequently (3), very frequently (4). For example, if asked, “How often do you actively consult your portfolio firm?” the respondent had the choice between the four alternatives. The second type (Type B) results from questions that aim at receiving a personal assessment of the financier’s investment activity such as, “How important do you consider your advice for the success of your portfolio firm?” In this case, the respondent had to decide between the following five alternatives: not important (1), of minor importance (2), among other things important (3), very important (4), dominant (5).

Furthermore, two variables concerning the frequency of interaction between the two parties are included. These variables can be used as a proxy for the flow of information in both directions. It was asked for the frequency of contacts per month, either personal or via telecommunication means. Both variables are interval variables not ordinal ones. A short description of the main variables we use in the analysis is provided:

CONSULTING (CS) is the frequency of the financier’s consulting (Type A).

INFLUENCE (INF) shows the importance of influence by the financier (Type A).

EARLY-STAGE (EARL) is a variable that gives the percentage of early stage investment in the portfolio considered.

EXPECTED INVESTMENT-PERIOD (INVPER) is the average estimated investment period per investment in months.
Finally, we use Type A variables to indicate how important a specific financial product is for the financier:

CRED is credit financing.

MIHO25 is the minority holding up to 25 percent of the stakes.

MIHO50 is the minority holding between 25 percent and 50 percent of the stakes.

SILENT is the silent investment.

MEZZ is the mezzanine product.

\section*{2.4 Empirical Issues}

\subsection*{2.4.1 Descriptive Statistics}

The financiers in the sample cover a wide range of potential suppliers of smart capital and differ strongly in their structure. However, there is partial homogeneity with respect to the financial products offered, and this might be important for the provision of smart capital. Apart from commercial and savings banks which almost exclusively use loan financing, all other intermediaries in the survey offer equity or at least equity linked products (Table 2.1). The average importance of the financial products used is a Type A variable and ranges from one, which means that the investor does not use this product at all, to four, which means that this product is most frequently used. For example, the value 3.83 in line one indicates that banks concentrate almost completely on loans, whereas the figures around one show that the other types of financiers hardly ever use them. VC companies and Angel investors prefer to acquire minority stakes in the portfolio firms. Silent equity investments occur more frequently with the banks’ VC subsidiaries and public equity suppliers.
Table 2.1: Importance of financial products (mean values)

<table>
<thead>
<tr>
<th>Financial product</th>
<th>VCs</th>
<th>Business Angels</th>
<th>Banks</th>
<th>Bank-VCs</th>
<th>Public-VCs</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRED</td>
<td>1.04</td>
<td>1.27</td>
<td>3.83</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>MIHO25</td>
<td>3.14</td>
<td>3.64</td>
<td>1.04</td>
<td>3.41</td>
<td>3.24</td>
</tr>
<tr>
<td>MIHO50</td>
<td>3.00</td>
<td>2.27</td>
<td>1.09</td>
<td>2.23</td>
<td>2.33</td>
</tr>
<tr>
<td>SILENT</td>
<td>1.04</td>
<td>1.00</td>
<td>1.43</td>
<td>2.43</td>
<td>3.47</td>
</tr>
<tr>
<td>MEZZ</td>
<td>1.00</td>
<td>1.00</td>
<td>1.52</td>
<td>1.43</td>
<td>1.47</td>
</tr>
</tbody>
</table>

A strong heterogenic structure from the sample can be seen with regard to the composition of the managed portfolios, i.e. the share of early stage investments and the average investment period (Table 2.2). On average, the banks, the private Angel investors, and the public VC companies tend to have the longest investment horizon with more than 70 months; however, the average share of early stage investments in the portfolios of these financiers differs explicitly and ranges from around 22 percent in the portfolios of public equity suppliers to more than 90 percent of early stage investments for Business Angels. By contrast, the VC firms follow a rather short-term strategy with respect to the investment horizon (55 months) and invest, on average, more than two thirds of their money in early stages.

Table 2.2: Average share of early stage investments and average investment period per portfolio (in percentage)

<table>
<thead>
<tr>
<th>Financier</th>
<th>Share of early stage investments (in percentage of the portfolio)</th>
<th>Average investment period (in months)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Standard deviation</td>
</tr>
<tr>
<td>VCs</td>
<td>70.91</td>
<td>29.93</td>
</tr>
<tr>
<td>Business Angels</td>
<td>92.73</td>
<td>24.12</td>
</tr>
<tr>
<td>Banks</td>
<td>41.75</td>
<td>42.39</td>
</tr>
<tr>
<td>Bank-VCs</td>
<td>44.06</td>
<td>30.49</td>
</tr>
<tr>
<td>Public-VCs</td>
<td>21.92</td>
<td>29.02</td>
</tr>
</tbody>
</table>
Table 2.3 shows the average values of these variables that indicate the information flows for the five types of financial intermediaries and, therefore, help to open the black box “smart capital”. In parallel with earlier research, the analysis supplies evidence that VC companies offer a high-level of smart capital. The first row reveals that VC firms use both forms of knowledge transfer – the explicit and implicit forms – very intensely. In addition, they are more deeply involved in the businesses of the companies than the other types of financiers. VC firms do not only consult frequently (lines 1 to 10) and exert direct influence (line 18) but they are also well informed about what is going on in the portfolio companies (lines 12 to 15). Furthermore, they report, on average, a high frequency of contacts with their portfolio firms (lines 16 and 17). These results indicate that the VC companies offer a high level of smart capital with deep and diverse flows of explicit and implicit information.

Private Angel investors largely behave in line with formal VC suppliers but fall behind in some aspects for some kinds of consulting (lines 8 to 10) and reporting (lines 14 and 15). This deviation can be grounded in their relatively strong specialization and their restricted resources. Furthermore, they might have a very close informal relationship with their portfolio companies, which is indicated by the highest frequency of personal contacts per month. This relationship might make intensive reporting by the portfolio company unnecessary and lead to an underestimation of the different consulting activities within the survey. Nevertheless, the statistics seems to support the hypothesis that informal VC investors offer smart capital to an extent rather similar to that of formal VC companies.

By contrast, the results show that banks, as loan suppliers, are less interested in the details concerning the businesses of their portfolio companies. As indicated in the lines 1 to 11, this attitude leads to a less intensive and rather specific consulting activity mainly focused on business related topics, such as financing (line 8). Moreover, the portfolio firms report overall less frequently (line 12) but inform quite often about collateral (line 14). The interaction between banks and firms is rather scarce (lines 16 and 17). Such behavior corresponds with the assumption that the
flow of explicit and implicit information between banks and their portfolio firms is less developed than that of the VC investors and the Angel investors.

Table 2.3: Importance of main variables (mean values)

<table>
<thead>
<tr>
<th>Line</th>
<th>VCs</th>
<th>Business Angels</th>
<th>Banks</th>
<th>Bank-VCs</th>
<th>Public-VCs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Frequency of consulting</td>
<td>3.91</td>
<td>3.91</td>
<td>3.22</td>
<td>3.59</td>
</tr>
<tr>
<td>2</td>
<td>Frequency of consulting in... accounting</td>
<td>2.36</td>
<td>2.00</td>
<td>2.48</td>
<td>2.47</td>
</tr>
<tr>
<td>3</td>
<td>Frequency of consulting in... controlling</td>
<td>2.50</td>
<td>1.82</td>
<td>2.39</td>
<td>2.65</td>
</tr>
<tr>
<td>4</td>
<td>Frequency of consulting in... marketing</td>
<td>2.59</td>
<td>2.18</td>
<td>2.00</td>
<td>2.24</td>
</tr>
<tr>
<td>5</td>
<td>Frequency of consulting in... technical problems</td>
<td>2.36</td>
<td>1.55</td>
<td>1.09</td>
<td>1.41</td>
</tr>
<tr>
<td>6</td>
<td>Frequency of consulting in... strategic problems</td>
<td>2.59</td>
<td>3.18</td>
<td>2.61</td>
<td>3.35</td>
</tr>
<tr>
<td>7</td>
<td>Frequency of consulting in... network advantages</td>
<td>3.00</td>
<td>3.27</td>
<td>2.44</td>
<td>2.71</td>
</tr>
<tr>
<td>8</td>
<td>Frequency of consulting in... financing</td>
<td>3.50</td>
<td>2.00</td>
<td>3.74</td>
<td>3.23</td>
</tr>
<tr>
<td>9</td>
<td>Frequency of consulting in... patent protection</td>
<td>2.59</td>
<td>1.36</td>
<td>1.26</td>
<td>1.71</td>
</tr>
<tr>
<td>10</td>
<td>Frequency of consulting in... juridical problems</td>
<td>2.27</td>
<td>1.18</td>
<td>1.30</td>
<td>1.41</td>
</tr>
<tr>
<td>11</td>
<td>Importance of consulting for success of portfolio firm</td>
<td>4.23</td>
<td>4.46</td>
<td>3.74</td>
<td>3.88</td>
</tr>
<tr>
<td>12</td>
<td>Frequency of reports</td>
<td>3.00</td>
<td>2.73</td>
<td>2.17</td>
<td>2.88</td>
</tr>
<tr>
<td>13</td>
<td>Frequency of reports about... business assessments</td>
<td>3.96</td>
<td>4.00</td>
<td>3.91</td>
<td>3.88</td>
</tr>
<tr>
<td>14</td>
<td>Frequency of reports about... collateral</td>
<td>1.23</td>
<td>1.00</td>
<td>2.74</td>
<td>1.41</td>
</tr>
<tr>
<td>15</td>
<td>Frequency of reports about... technological development</td>
<td>3.27</td>
<td>2.18</td>
<td>2.17</td>
<td>2.53</td>
</tr>
<tr>
<td>16</td>
<td>Number of face-to-face contacts (per month)</td>
<td>1.35</td>
<td>1.64</td>
<td>0.43</td>
<td>0.92</td>
</tr>
<tr>
<td>17</td>
<td>Number of contacts via tele-communication (per month)</td>
<td>8.05</td>
<td>3.73</td>
<td>1.71</td>
<td>3.75</td>
</tr>
<tr>
<td>18</td>
<td>Degree of influence exerted by the financier</td>
<td>3.32</td>
<td>2.55</td>
<td>2.13</td>
<td>2.65</td>
</tr>
</tbody>
</table>

The results for the VC-subsidiaries of banks are, in some respect, similar to those of their mother companies. On average, they have less frequent interactions with their portfolio firms (lines 16 and 17) than Angel investors and the group of independent and corporate VC companies. Overall, consulting activities (lines 1 to
are of minor importance for bank-dependent VC firms; although they offer financial products similar to those of independent VC companies (see Table 2.1). Their consulting activity is mainly focused on financing issues, strategic problems, and business related topics such as strategic problems (lines 2, 3, 6, and 8). These findings indicate that the information flows are smaller in the case of bank-dependent VC firms than in the case of other formal and informal VC investors, i.e., a provision of smart capital with limitations.

The public equity suppliers have a fairly similar pattern to that of the bank subsidiaries. On the one hand, they indicate with a quite high frequency of consulting in some areas (see e.g., lines 1 through 3, 6 and 8) rather strong involvement in the businesses of the portfolio firms. Again, the consulting activity is focused on the same business related topics. On the other hand, they barely reach the overall average of contacts per month (lines 16 and 17). These findings do not correspond with the hypothesis that public VC investors spend more effort and time on the flow of information to their portfolio firms than any kind of private VC company. They suggest rather that the public equity suppliers offer only a reduced choice of smart capital services.

Line 11 shows an interesting finding about how German start-up financiers judge the importance of their consulting for the success and growth of the portfolio firm. Despite considerable differences in the amount of consulting services offered to the companies, all types of financiers regard consulting as an important driver for the portfolio firm’s success. Although financiers are more or less convinced of the necessity of their consulting activity, there seems to be a certain imbalance between the assumed need of start-ups and the services offered.

Overall, the descriptive statistics of the different components of smart capital show that all financiers provide some sort of smart capital, but that there are considerable differences in the intensity of information flows. Furthermore, one can see that the world of smart capital is not black and white, or even good and evil. There is no clear dichotomy between relational investors and non-relational investors, as, for example, is sometimes expected for banks and non-banks or credit and equity financiers. This segmentation hypothesis was evaluated by using a
dichotomous discriminant analysis. Neither the comparison of banks versus non-banks nor credit versus equity financiers show a well defined dichotomy. Therefore, the first result from this study is that the issue of being a relational investor is not a question of offering smart capital or not, it is more a question of the level of information flows that determine the provision of smart capital.

### 2.4.2 Driving Forces of Smart Capital Provision

To estimate in how far the financial product predominantly used, the share of early stage investment (EARL) and the investment horizon (INVPER) influence the level of smart capital, an ordered logistic estimation is employed. As the dependent variable the frequency and importance of consulting (CS) and the directly exerted influence by the financier (IFL) are used, because those indicate the intensity of information flows from the financier to the company. The average investment period and the financial product preferred are missing in some observations. Even though the missing values are almost equally distributed over the different groups, one has to be cautious when interpreting the results. I abstain from calculating the marginal effect due to the missing value problem in some specifications and to the ordinal character of the used variables. Only on the direction of the coefficients but not on their magnitude is commented.

The results of estimations clearly show that the share of early stage investments within a portfolio affects the consulting activity and, therefore, the investors’ level of smart capital (Tables 2.4 and 2.5). The more early-stage investments the financiers have in their portfolio, the more intensive is their consulting (Table 2.4). The influence exerted by the financier on the activity of the portfolio firm, which is the strongest form of information flow, is also much more developed for those financiers that focus on early stage investments (Table 2.5). This finding is in line with the expectations from the literature (see Section 2.2). The opposite correlation can be seen for the average investment period. The longer the investment horizon, the less are consulting services and influence provided by the financier. This result is consistent with Gompers (1995).
Table 2.4: The influence of financial products on the provision of consulting services
(ordered logistic regression)

<table>
<thead>
<tr>
<th></th>
<th>CS(I)</th>
<th>CS(II)</th>
<th>CS(III)</th>
<th>CS(IV)</th>
<th>CS(V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EARL</td>
<td>0.027**</td>
<td>0.024**</td>
<td>0.028**</td>
<td>0.030**</td>
<td>0.027**</td>
</tr>
<tr>
<td></td>
<td>(2.83)</td>
<td>(2.62)</td>
<td>(2.86)</td>
<td>(3.23)</td>
<td>(2.83)</td>
</tr>
<tr>
<td>INVPER</td>
<td>-0.027*</td>
<td>-0.026*</td>
<td>-0.035**</td>
<td>-0.040**</td>
<td>-0.033**</td>
</tr>
<tr>
<td></td>
<td>(2.13)</td>
<td>(1.98)</td>
<td>(2.63)</td>
<td>(2.85)</td>
<td>(2.62)</td>
</tr>
<tr>
<td>CRED</td>
<td>-0.676**</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>(2.60)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>MIHO25</td>
<td>-</td>
<td>0.590*</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>(2.20)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>MIHO50</td>
<td>-</td>
<td>-</td>
<td>-0.117</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>(0.37)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>SLEEP</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.415</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>(1.49)</td>
<td>-</td>
</tr>
<tr>
<td>MEZZ</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.108</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>(0.25)</td>
</tr>
<tr>
<td>Pseudo R- squared</td>
<td>0.285</td>
<td>0.265</td>
<td>0.219</td>
<td>0.240</td>
<td>0.218</td>
</tr>
</tbody>
</table>

Number of observations: 64; * significant at a 5% level; ** significant at a 1% level, z-value in parentheses

To capture the isolated effect of different financial products, the regressions were run using the ordinal variables for the importance of each product as independent variable. Credits (Models CS (I) and IFL (I)) have a statistically significant influence on the level of smart capital. The focus on loan financing leads to less consulting and influence being exerted by the investor. Whereas the other financial products do not show strong statistically significant impact on the consulting service, except for of a weak influence by minority holdings up to 25 percent (Model CS(II)). Minority holdings positively affect the occurrence of the influence (Models IFL (II) and IFL(III)). They enable the financier to exert influence at different levels from simple business decisions up to the composition of the management. Credits, mezzanine products, and silent investment do not allow such a high level of influence, or do so only if these are constituted in additional agreements. Although, the financial products are connected with different rights and
different incentives for consulting a portfolio company, they only partly affect the flows of information between financier and firm.

Table 2.5: The influence of financial products on the influence by financiers (ordered logistic regression)

<table>
<thead>
<tr>
<th></th>
<th>IFL (I)</th>
<th>IFL (II)</th>
<th>IFL (III)</th>
<th>IFL (IV)</th>
<th>IFL (V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EARL</td>
<td>0.020**</td>
<td>0.017*</td>
<td>0.014</td>
<td>0.016*</td>
<td>0.016*</td>
</tr>
<tr>
<td></td>
<td>(2.72)</td>
<td>(2.35)</td>
<td>(1.78)</td>
<td>(2.16)</td>
<td>(2.14)</td>
</tr>
<tr>
<td>INVPER</td>
<td>-0.022*</td>
<td>-0.019</td>
<td>-0.020</td>
<td>-0.021*</td>
<td>-0.027**</td>
</tr>
<tr>
<td></td>
<td>(2.10)</td>
<td>(1.90)</td>
<td>(1.89)</td>
<td>(2.08)</td>
<td>(2.60)</td>
</tr>
<tr>
<td>CRED</td>
<td>-0.651**</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>(2.74)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MIHO25</td>
<td>-</td>
<td>0.425*</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.01)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MIHO50</td>
<td>-</td>
<td>-</td>
<td>0.908**</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(3.38)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SLEEP</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-0.354</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(1.46)</td>
<td></td>
</tr>
<tr>
<td>MEZZ</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-0.673</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(1.47)</td>
</tr>
<tr>
<td>Pseudo R-squared</td>
<td>0.177</td>
<td>0.148</td>
<td>0.209</td>
<td>0.135</td>
<td>0.135</td>
</tr>
</tbody>
</table>

Number of observations: 63; * significant at a 5% level; ** significant at a 1% level, z-value in parentheses

A further reason for the varying levels of smart capital might be the institutional background of the financiers as it influences their business practice and their will and ability to provide services that support the firm. Therefore, the regressions were re-run substituting the variables for the distinct financial products by dummy variables for the different types of financiers (Tables 2.6 and 2.7). The variables take the value one, if the investor belongs to a certain type of financiers and zero, if not. The results indicate that the institutional background and the corresponding business strategy have an effect on the provision of smart capital similar to that of the financial products used predominantly. Banks show a statistically negative impact on the intensity of consulting service (Model CS (VI)) and on the influence exerted on the financed companies (Model IFL (VI)).
correlation is in line with the results for credit, which is mostly used by banks (Table 2.1). The VC companies exert influence on the portfolio companies more often than other investors do. This might be due to their equity investments and, especially, their business strategy. However, being one of the other financiers who offer equity or equity linked products does not affect the level of consulting services provided by the investors (Models CS (VII) to CS (X)). In line with the results about the influence of diverse financial products on the provision of smart capital (Tables 2.4 and 2.5), the share of early stage investments within a portfolio has a statistically positive impact on the consulting activities of the financiers and on the influence exerted. The average investment period negatively affects the level of both independent variables reflecting the flows of information (Models CS(VI)-CS(X) and IFL(VI)-IFL(X)).

Table 2.6: The influence of institutional backgrounds on the provision of consulting services (ordered logistic regression)

<table>
<thead>
<tr>
<th></th>
<th>CS (VI)</th>
<th>CS (VII)</th>
<th>CS (VIII)</th>
<th>CS (IX)</th>
<th>CS (X)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EARL</td>
<td>0.025** (2.70)</td>
<td>0.024** (2.68)</td>
<td>0.024** (2.57)</td>
<td>0.026** (2.98)</td>
<td>0.029** (3.08)</td>
</tr>
<tr>
<td>INVPER</td>
<td>-0.027* (2.15)</td>
<td>-0.029* (2.28)</td>
<td>-0.034** (2.74)</td>
<td>-0.034** (2.66)</td>
<td>-0.036** (2.77)</td>
</tr>
<tr>
<td>Banks</td>
<td>-2.016** (2.65)</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>VC companies</td>
<td>–</td>
<td>1.199 (1.38)</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Business Angels</td>
<td>–</td>
<td>–</td>
<td>1.009 (0.52)</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Bank dependent VC companies</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>0.078 (0.11)</td>
<td>–</td>
</tr>
<tr>
<td>Public VC companies</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>0.780 (0.93)</td>
</tr>
<tr>
<td>Pseudo R-squared</td>
<td>0.287</td>
<td>0.2381</td>
<td>0.222</td>
<td>0.217</td>
<td>0.226</td>
</tr>
</tbody>
</table>

Number of observations: 64; * significant at a 5% level; ** significant at a 1% level, z-value in parentheses
Table 2.7: The influence of institutional backgrounds on the influence by financiers (ordered logistic regression)

<table>
<thead>
<tr>
<th></th>
<th>IFL (VI)</th>
<th>IFL (VII)</th>
<th>IFL (VIII)</th>
<th>IFL (IX)</th>
<th>IFL (X)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EARL</td>
<td>0.019*</td>
<td>0.016*</td>
<td>0.024**</td>
<td>0.020**</td>
<td>0.019*</td>
</tr>
<tr>
<td></td>
<td>(2.55)</td>
<td>(2.15)</td>
<td>(2.94)</td>
<td>(2.74)</td>
<td>(2.54)</td>
</tr>
<tr>
<td>INVPER</td>
<td>-0.022*</td>
<td>-0.017</td>
<td>-0.023*</td>
<td>-0.024*</td>
<td>-0.024*</td>
</tr>
<tr>
<td></td>
<td>(2.11)</td>
<td>(1.66)</td>
<td>(2.30)</td>
<td>(2.41)</td>
<td>(2.35)</td>
</tr>
<tr>
<td>Banks</td>
<td>-2.022**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2.83)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VC companies</td>
<td></td>
<td>2.647**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3.57)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business Angels</td>
<td></td>
<td></td>
<td>-0.927</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(1.09)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bank dependent</td>
<td></td>
<td></td>
<td></td>
<td>0.083</td>
<td>-0.598</td>
</tr>
<tr>
<td>VC companies</td>
<td></td>
<td></td>
<td></td>
<td>(0.14)</td>
<td></td>
</tr>
<tr>
<td>Public VC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.598</td>
</tr>
<tr>
<td>companies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.81)</td>
</tr>
<tr>
<td>Pseudo R-squared</td>
<td>0.182</td>
<td>0.234</td>
<td>0.128</td>
<td>0.120</td>
<td>0.124</td>
</tr>
</tbody>
</table>

Number of observations: 63; * significant at a 5% level; ** significant at a 1% level, z-value in parentheses

The information flow in the opposite direction, i.e. from the company to the financier, can be measured by the frequency of reports given to the investors. This frequency does not vary significantly between the groups of different financiers and, especially, within the groups. Therefore, a statistically significant analysis is somewhat meaningless. However, the frequency of reports does show a significant correlation with the frequency of consulting and the influence indicator. The Spearman-Kendall’s rank correlation coefficient between the frequency of reports and of consulting is 0.34 and between reporting and exerting influence it is 0.56, both statistically significant on the one-percent level. This finding implies that an intense flow of information from the financier to the firm in form of consulting and influence is highly linked to a deep flow in the opposite direction. The same applies to the number of contacts – personal and via telecommunication - between investor and
target firm. The exchange of implicit knowledge is connected strongly with consulting and influence exerted by the financier. Thus those two components are the best indicators for the level of smart capital the different types of financiers provide.

To check for the robustness of the estimations I experimented with other possible determinants, such as the ratio of portfolio firms per investment manager or the size of the intermediary measured by the number of investment managers. Since there are no significant impacts of these variables, these specifications are not reported.

2.5 Concluding Remarks

In this section, a special part of the German market for start-up finance is explored: the market for smart capital. The analysis is based on a theoretical concept for measuring the “smartness” of capital that enables us to open the black box “smart capital”. The results reveal a certain heterogeneity regarding the provision of smart capital by different types of financiers. The results show that all financiers deliver smart capital. However, the extent and the manner of doing this differ. The banks, as credit financiers, seem to offer rather low levels of smart capital whereas Business Angels and the independent and corporate VC companies prefer a deep and diverse exchange of information with their portfolio companies. The banks’ VC subsidiaries and the public VC companies lie between these extremes.

With regard to the determinants of smart capital, it is indicated that the share of early stage investments in a portfolio and the investment horizon both affect the level of smart capital. The influence of the financial product is statistically significant for loan financing and minority holdings. However, the financial instrument predominantly used does not seem to affect the provision of smart capital. This result supply evidence that the separation of the market observed is also driven by the institutional background of the investors, not only by the financial instrument used. This assumption is confirmed when we control for the different types of financiers. The fact of being a bank influences the “smartness” of the capital negatively, whereas being an independent or corporate VC company has a slightly positive
influence. This might reflect different business strategies, although the varying institutional backgrounds of public VC firms, bank-dependent VC companies or Business Angels does not affect the provision of smart capital.

Although the analysis lacks detailed data on the actual amount invested in start-ups by the different types of financiers, from the survey results can be conclude that the commitment to the provision of smart capital is still strong among Germany’s financiers, especially in start-up financing. Moreover, the surviving companies of the still immature VC industry in Germany are struggling to overcome the slump in investment activity and fund raising, and they are trying to build a strong reputation as unique providers of a specific form of smart capital.
3 Does Smart Capital Investment Really Require Spatial Proximity?

3.1 Introduction

It is largely undisputed that the spatial proximity of relational investors and, especially, venture capital (VC) firms to the location of their investments should be important. The assumption underlying this conjecture is 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 locations of VC companies may experience a serious disadvantage due to an “equity gap,” i.e., 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 the VC investment decisions really hold?

Based on an inquiry of VC suppliers in Germany, serious doubt on the importance of spatial proximity in VC partnerships can be cast, especially in comparison to other types of financiers. It will be shown that geographical distance does matter, but that its role is largely overestimated in the literature. Furthermore, the analysis supplies evidence that regional proximity is less important for VC companies in comparison to other types of financiers that offer smart capital such as Business Angels.

Starting with a short review of the literature about the importance of spatial proximity for VC investment, some hypotheses on possible factors which influence the role of proximity are set up (Section 3.2). Then the spatial distribution of VC firms and their possible investment targets in Germany is investigated (Section 3.3). Section 3.4 provides an overview on the characteristics of the different types of financial institutions offering smart capital in the sample of interviewed firms. Different factors that might influence the role of spatial proximity for investments...
are analyzed in Section 3.5. Finally, reasons for the relatively low importance of geographic proximity for VC investments that is found in Germany are discussed (Section 3.6) and some conclusions are drawn (Section 3.7).

### 3.2 Why should Spatial Proximity be Important for Investments?

The decision 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 (Sahlman, 1990; Hall and Hofer, 1993; Fiet, 1995). The geographic distance 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 and identification of potential investment targets due to distant-related constraints in the spatial diffusion of information about these targets (Green, 1991, 23; Doran and Bannock, 2000; 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, 1988; Powell et al., 2002; Thompson, 1989). Contact to 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 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 networks 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 networks. Finally, spatial proximity may also be conducive for making 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 requires 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 (Mason and Harrison, 2002a; Lerner, 1995; Sorensen and Stuart, 2001) because of longer travel times 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 company. There are good reasons to assume that a young company in the early phase of its technical and organizational development is likely to require a higher level of involvement by the VC firm in comparison to a company at a later stage (Gupta and Sapienza, 1992). The possible reasons for such a higher need of 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 high uncertainty of 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. Hence, spatial proximity can be expected to be more important for early stage investments (Sorensen and Stuart, 2001). Moreover, because firms in the early stage 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 are 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 can afford the resources for adequately supervising distant investments. Therefore, the amount of available resources 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 the risk and the work involved (Lerner, 1994; Brander et al., 2002; Lockett and Wright, 2001; Gompers and Lerner, 2001; Doran and Bannock, 2000). Syndication of investment can particularly constitute an important strategy of VC suppliers to reduce disadvantages of spatial distance to a portfolio company (Sorensen and Stuart, 2001; Fritsch and Schilder, 2006). In a syndicated investment, the so-called lead-investor undertakes the main task of monitoring and consulting of the venture whereas the co-investors are involved with the management to a considerably lesser degree (Gupta and Sapienza, 1992). For these co-investors, spatial proximity is not as important as for the lead-investor because of the lesser need of direct face-to-face contact with the portfolio company (Wright and Lockett, 2003; McNaughton and Green, 1989). Therefore, joining a syndicate as a co-investor may be a means of overcoming possible problems related to geographical distance to the portfolio firm.

Another possible way to reduce the importance of spatial proximity for VC investments could be to substitute face-to-face contact by telecommunication. This could lower the costs of monitoring and consulting considerably. However, since face-to-face contacts during the monitoring and consulting process is a necessary way of sharing personal and tacit knowledge (von Hippel, 1994; Nonaka, 1994) replacement by means of telecommunication may hardly be possible (Sapienza et al., 1996; Powell et al., 2002). Especially for VC companies that are mainly focused on
innovative industries, the 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.

Finally, the fact whether a VC company is state owned or not may also 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 even 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.

3.3 Regional Distribution of Venture Capital Companies and Possible Target Firms

The spatial distribution of VC suppliers and of the companies that might be possible investments 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 found a high degree of spatial clustering of suppliers and investments on the east and on the west of the country (Powell et al., 2002; Florida et al., 1991; Leinbach and Amrhein, 1987). The UK VC market is also highly clustered in the London region (Mason and Harrison, 1999, 2002a; Martin, 1989; Martin et al., 2005). 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.
Figure 3.1: The spatial distribution of VC firms and R&D intensive start-ups in Germany
Data from the German Private Equity and Venture Capital Association (Bundesverband Deutscher Kapitalbeteiligungs gesellschaften; 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; Munich takes the lead with about 30 of the more than 170 regular members of the BVK in January 2006 and Frankfurt a.M. is in second place with 27 VC suppliers (Figure 3.1). However, Berlin, Hamburg, and the Rhine-Ruhr area (Düsseldorf, Cologne, and Bonn) have around 20 VC suppliers each and several of the VC firms can also be found in smaller places. The black parts of the circles in Figure 3.1 indicate VC companies which could be identified clearly 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.

The regional distribution, considering a district level, of potential VC investments as indicated by the number of R&D intensive manufacturing start-ups (for details see Grupp and Legler, 2000) in Germany deviates quite considerably from the distribution of the VC suppliers (Figure 3.1). The figures pertain to the average number of start-ups per year in the 1990-2003 period. Obviously, there are potential investments all over Germany while the suppliers tend to be concentrated in a few larger cities. For example, the area between Düsseldorf and Hannover as well as the southwestern part of the country show an explicit number of districts with more than ten R&D intensive start-ups per year, but there are relatively few 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 for a minor role of regional proximity between VC firms and portfolio companies for the emergence of a VC relationship.
In order to assess the spatial concentration of the German VC industry, Gini coefficients for the regional distribution of the VC companies and other types of financial institutions are calculated as well as for some measures of innovative activity\(^1\) (Table 3.1). 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 as compared to the VC companies. The Gini coefficients clearly show a much stronger spatial concentration of public and private VC companies compared to the distribution of commercial and savings banks. The difference is even more pronounced when comparing the value of the Gini coefficients for the number of VC companies per district with the value of the public savings banks, which have at least one employee who is specialized in the financing

\(^1\) See e.g., Fritsch and Slavtchev (2005, 2007) for a more detailed analysis.

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**Table 3.1: Spatial concentration of financial institutions and innovative activity on a district level**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Donaldson-Weymark relative S-Gini inequality measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of private VC companies</td>
<td>0.97</td>
</tr>
<tr>
<td>Number of public VC companies</td>
<td>0.96</td>
</tr>
<tr>
<td>Number of banks (all types)</td>
<td>0.45</td>
</tr>
<tr>
<td>Number of savings banks with specialist for start-up financing</td>
<td>0.39</td>
</tr>
<tr>
<td>Number of R&amp;D intensive manufacturing start-ups (mean over the years 1990-2003)</td>
<td>0.45</td>
</tr>
<tr>
<td>Number of technology intensive service start-ups (mean over the years 1990-2003)</td>
<td>0.52</td>
</tr>
<tr>
<td>Number of knowledge intensive service start-ups (mean over the years 1990-2003)</td>
<td>0.60</td>
</tr>
<tr>
<td>Number of patents (mean over the years 1995-2000)</td>
<td>0.42</td>
</tr>
</tbody>
</table>
and supervision of innovative start-ups. These results provide evidence that the spatial clustering of VC firms in Germany is much more pronounced than the geographical concentration of the overall finance industry and innovative activity. If spatial proximity should be important for the emergence and the maintenance of a VC partnership, this higher 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.

Table 3.2: Rank correlation coefficients for the relationship between the number of VC companies, banks, and potential investments (district level)

<table>
<thead>
<tr>
<th>Variable:</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Number of start-ups (mean over the years 1990-2003)</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of R&amp;D intensive start-ups (mean over the years 1990-2003)</td>
<td>0.89**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of technology intensive start-ups (mean over the years 1990-2003)</td>
<td>0.91**</td>
<td>0.87**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of knowledge intensive start-ups (mean over the years 1990-2003)</td>
<td>0.89**</td>
<td>0.82**</td>
<td>0.94**</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of banks (all types)</td>
<td>0.40**</td>
<td>0.50**</td>
<td>0.51**</td>
<td>0.49**</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Number of public VC companies</td>
<td>0.27**</td>
<td>0.25**</td>
<td>0.28**</td>
<td>0.29**</td>
<td>0.19**</td>
<td>1.00</td>
</tr>
<tr>
<td>Number of private VC companies</td>
<td>0.35**</td>
<td>0.32**</td>
<td>0.39**</td>
<td>0.39**</td>
<td>0.26**</td>
<td>0.32**</td>
</tr>
</tbody>
</table>

Spearman and Kendall’s rank correlation coefficients; ** statistically significant at the 1%-level.

The regional distribution of VC suppliers may be shaped by two factors (Mason and Harrison, 1999, 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 next to other financial institutions in order to benefit from all kinds of agglomeration advantages such as close contact to a variety of co-investors (Martin et al., 2005).
The Gini coefficients (Table 3.1) indicate clear differences in the spatial concentration between VC companies, potential investment targets, and the overall banking sector. Rank-correlation coefficients have been calculated (Table 3.2) 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 to both the distribution of investment targets and financial institutions. According to these coefficients, the correspondence of the number of VC companies per district and the number of banks is fairly 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 one percent level, point to an effect of these factors on the spatial distribution of VC firms. However, the correlation coefficients between private VC firms and possible investments are not much higher than the coefficient for co-location with public VC-providers and with banks. Therefore, the results still do not allow stating 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.

3.4 Analyses

3.4.1 Spatial Proximity of Investors and Investments

The empirical in-depth analysis of the role of spatial proximity for VC in Germany is based on the interview survey introduced in Section 1.3. Due to some missing values, especially in regard to the distance between financier and portfolio company, the analysis is refers to less than 85 observations. In the interviews it was asked for 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. The 100 kilometer frontier was chosen because it can be regarded as an approximation for a 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 the sample (Figure 3.2).

![Bar chart showing investment distribution by type of provider and distance](chart.png)

**Figure 3.2: Average share of investments within a certain distance (in percentage)**

Banks, bank-dependent VC firms, public VC companies, and Business Angels all have more than 75 percent of their investment within a distance of 100 km. In contrast, the independent VC investors in the sample have less than 30 percent 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 astonishing because the analysis of Section 2 shows that banks offer less consulting than VC companies; hence, spatial proximity should be of relatively low importance. The high share of investments by banks in close proximity is obviously a result of their tight net of regional branches (see Section 3.3). This regionally dispersed network makes investments in distant geographical locations unnecessary because a bank’s office is typically located within a certain spatial proximity of possible investments, e.g. within the same district. The high share of investments in close spatial proximity, which is found for Business Angels, may be
caused by their limited amount of resources available or by their regionally limited network for information about possible investments. The public venture capital companies are often restricted in their regional focus by administrative constraints or political demands (Schilder, 2006).

3.4.2 The Heterogeneity of the Market

Despite the pronounced heterogeneity of the financiers in the sample, most of them focus on nearly the same financial product: equity investments for innovative young firms (see Section 2.4). This is an important issue because 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 due to lower participation in a portfolio company’s return and 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 the survey offer mainly equity or related products.

The results reveal considerable differences between the types of financiers with regard to the share of early stage investments in their portfolio (see Figure 3.3). Investments in companies which are in the early development stages may require relatively intensive consulting and, therefore, spatial proximity. The early stage investments in the interview survey 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 developing phases. While this share of early stage investment amounts to more than 90 percent for the Business Angels in the sample and to about 70 percent for the VC companies, it is much lower for banks and bank-dependent VCs (less than 50 percent). The lowest share of start-up investment, less than 30 percent, 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 3.4). 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. Financiers with a large number of portfolio companies per manager may be expected to consider spatial proximity as being more important than firms with few investments per manager (Section 3.2). 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 100 investments, is found for the banks which supply credit financing. The fewer management resources per portfolio firm in banks may lead to higher importance of regional proximity for the location of the investment.

Figure 3.3: Average share of early stage investments within a portfolio (in percentage)
Figure 3.4: Average number of portfolio companies per investment manager

The different types of financiers show distinct syndication behavior. On average, the VC companies and the Business Angels syndicate 77 percent and 70 percent 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 is found for the banks which have one or more co-investor 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, the interviewees were asked 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 distance, 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 particularly close to those investments that are far away. Therefore, the share of syndication partners located within a great geographical distance should be the higher the larger the share of investments in distant portfolio firms is.

![Figure 3.5: Average share of syndication partners within a certain distance (in percentage)](image)

Figure 3.5: Average share of syndication partners within a certain distance (in percentage)

It is found, indeed, that the regional distribution of syndication partners for the different types of VC providers (Figure 3.5) is quite similar to the regional distribution of their investments as given in Figure 3.2. The independent VC companies have on average more investments and more syndication partners in distant locations than 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 network. The closer the network is, the easier the identification of potential investments is. 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, the financiers were asked for the relevance of different ways of contacting possible portfolio companies (Figure 3.6). The weights for the importance of a certain mode of contact range from one (“never”) to four (“always”; for details see Section 2.3). The responses show that all types of investors rely heavily on their networks of relationships in identifying 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, i.e., their own investors, seems to be an important channel of information about potential target firms. The Business Angels also use their personal network indicated by the strong weight 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 that might particularly require spatial proximity seems to be of relatively minor importance, except for public VC companies.
Information about the frequency of contacts, personal and via telecommunication, between the investor and their portfolio companies per month was raised for a representative investment of the firm. On average, the financiers met their portfolio companies once a month (Figure 3.7). The highest number of meetings (1.64 personal contacts per month) is 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. While the VC firms contact their portfolio companies via phone or internet about eight 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 heavily use telecommunication, such as the VC companies, also have a considerable amount 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 one percent level, indicates that both forms of communication are rather complementary versus substituting one another.
3.4.3 What Influences the Distance between Investor and Investment?

For further investigation of the influence of different factors that might affect the importance of regional proximity for VC investment decisions, an econometric model is employed. The dependent variable is the share of investments in a portfolio that are located more than 100 kilometer 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. The 100 kilometer distance is chosen 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 kilometer away or abroad as well as the number of contacts via telecommunication per month. Furthermore, it was controlled for the different types of financiers by using dummy variables with the value one if the financier belongs to the specific type of investor and zero if not. Since the range of values of the dependent variables is restricted, the Tobit-regression is employed as the estimation technique.

The results show 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 3.3). Obviously, investors are willing to take good investment opportunities in start-ups even if they are located far away. 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.
Specific effects on the importance of spatial proximity for investments, according to the type of financier, can only be found for the private VC firms (Table 3.3). 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 insignificance of the public VC dummy variable might be due to the definition of the dependent variable. Obviously, a circumference of 100
kilometer is too small to properly represent the political and legal restrictions that
limit the investments of these financiers regionally. The banks in the sample have a
rather tight regional network of branches which makes investments in a distance of
more than 100 kilometer obsolete, resulting in the insignificance of the bank dummy
variable.

3.5 Why is Regional Proximity Relatively Unimportant for German Venture
Capital Investors?

Although a pronounced clustering of VC companies and investments is found in
Germany (Section 3.3), the survey indicates that regional proximity between the VC
firm and the portfolio company does in no way play a dominant role for investment
decisions. However, misinterpretations by the investment managers due to
unconscious discriminatory behavior can not 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 the interview partners agreed that
spatial proximity is an advantage for VC investments, mainly due to fewer
difficulties of monitoring and advising. None of the interview partners neglected the
importance of monitoring and supervision on-site of the portfolio companies, though,
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 region, none of the interviewed VC managers would
reject a promising investment opportunity that is 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 there are convenient possibilities 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 the survey stated that they do not want to travel longer 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 staying 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 a 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 there were some available. Obviously, the main restriction for the German VC companies is the availability of promising investment targets, not time and effort of monitoring and consulting. One of the VC managers that were interviewed answered the question whether regional proximity is important for VC investments in Germany by stating: “It is not time to pick and chose in the regional sense as long as you want to earn money.” This indicates that the main bottleneck for occurrences of a VC investment in Germany is not the absence of VC suppliers but the limited number of promising projects. This finding is rather astonishing because the 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 lacking 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, one should be aware of possible interdependencies between demand and supply; i.e., that easy access to VC in a region may stimulate respective demand (Mason and Harrison, 1992). Therefore, the limitation of demand for VC could be affected by restrictions in the supply.


3.6 Discussion

In this section the role of geographical proximity for VC investments was examined. The results show 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 that is located close to a possible investment, the investments can be further away. However in such a case, spatial proximity is, at least, import in regard to the location of a suitable syndication partner. The role of geographical proximity for VC investments is also influenced by the amount of 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, the analysis does not indicate 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. The results also do not reveal any statistically significant impact of telecommunication on the role of regional proximity that might work as a substitute for face-to-face-contacts.

It appears quite likely that these results are influenced by several special characteristics of the immature and still changing German VC market as compared to countries like the US or the UK. Germany has a relatively balanced spatial structure of VC companies, compared to other countries, that leads to good accessibility of 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, one has to be cautious in generalizing the findings to other markets than Germany.

The results indicate that the absence of VC firms in a region is not likely to be a bottleneck for innovative entrepreneurs in Germany. It cannot be confirmed 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 bottleneck is the presence of promising investment opportunities. However, additional analyses are necessary to explore spatial and geographical influences on VC markets and, especially, the regional supply of equity for start-ups. Therefore, in the following section micro-level investment data is used to explore these questions in detail.
4 Is Venture Capital a Regional Business? – The Role of Syndication

4.1 Introduction

As already mentioned in Section 3, it is often assumed that regional disparities in the supply of equity capital exist that lead to an ‘equity gap’ in certain regions. This hypothesis is based on two assumptions. First, suppliers of VC are clustered in just a few locations. Second, spatial proximity between a VC investor and its portfolio firms is needed for the emergence and successful maintenance of a VC partnership. As a consequence, the undersupply of sufficient equity for start-ups may occur in those regions where no or only few VC companies are located. It is the combination of regional clustering of VC firms and a need of spatial proximity for VC investment that may cause an equity gap, thus working as an impediment for entrepreneurial activity in certain regions.

In this section, the importance of spatial proximity for the emergence of VC investments and, especially, the role of syndication for overcoming problems of geographical distance is analyzed. Syndication means that “… two or more venture capital firms come together to take an equity stake in an investment” (Wright and Lockett, 2003, 2074). The results will help to judge if there are regional equity gaps for innovative start-ups in Germany. The remainder of the section is organized as follows. Based on a short review of the relevant literature (Section 4.2), the data (Section 4.3) is introduced and possible reasons for a regional lack of VC are discussed (Section 4.4). The results of the empirical analyses on the importance of spatial proximity for a syndication of VC investments are presented in Section 4.5. Section 4.6 provides an overview of the regional distribution of VC suppliers and VC investments in Germany. Finally, the results are summarized (Section 4.7).
4.2 The Role of Spatial Influences for the Regional Supply of Venture Capital

The role of regional proximity for the supply of equity for young and innovative start-ups has been intensely discussed in the literature. It was found that the locations of VC companies are highly clustered in space in most countries (see also Section 3.3). For the VC market in the USA, several studies show a high degree of spatial clustering of suppliers on the East and West Coast of the country (Sorensen and Stuart, 2001; Powell et al., 2002; Florida et al., 1991; Leinbach and Amrhein, 1987). The VC market in the UK, which is the largest in Europe, is also highly clustered around London and the southern part of the country (Mason and Harrison, 1999, 2002a; Martin, 1989; Martin et al., 2005). For VC markets in continental Europe, such as France and Germany, Martin et al., (2002) found a considerable degree of spatial clustering of suppliers although this concentration was not as pronounced as in the case of the USA or the UK.

Several studies investigated the role of spatial distance between VC supplier and investment, which might determine the regional supply of VC (see Section 3, for an overview). If proximity between the investor and the financed firm is important, the geographical scope of the activities of VC firms will be limited. Hence, clustering of VC firms in just a few locations may result in regional disparities with regard to the availability of VC. The main reason why regional proximity should be important for VC firms is that they do not only provide financing but also frequently perform activities such as consulting and monitoring of the financed firm. These activities can be rather time consuming and may, particularly, require direct personal interaction (Gompers, 1995; Lerner, 1995; Sapienza and Gupta, 1994; Petersen and Rajan, 2002). The costs of the interactions are higher when the location of an investment is further away (Mason and Harrison, 2002a; Sorensen and Stuart, 2001). Therefore, spatial proximity between investor and investment may be needed to ensure

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sufficient management support and control for making VC investments profitable. In an attempt to assess the geographical field of activity for informal VC investors (private individuals), Masons and Harrison (2002b) identified a circumference within a two-hour travel time as the spatial limit. Zook (2002) arrives at a distance of a one-hour trip for formal VC companies in the Silicon Valley. In contrast to these studies, Fritsch and Schilder (2007) presented evidence that regional proximity is not an important factor for VC investments in Germany.

4.3 The Database

The analysis is based on a data set containing details about German VC investments at the micro-level (see Section 1.3). Due to some missing values, most of the analysis in this section is based on 569 and 420 such pairs. The missing information mainly concerns the addresses of informal VC investors and of foreign investors. Therefore, it is not possible to calculate detailed distances between the financiers and their investments. Consequently, these investors are not included in the analysis.

Table 4.1: Descriptive statistics of VC firms and investments

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Median</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of portfolio company (years)</td>
<td>4.84</td>
<td>4.00</td>
<td>0</td>
<td>36.00</td>
<td>3.84</td>
</tr>
<tr>
<td>Number of employees in portfolio company</td>
<td>36.73</td>
<td>26.00</td>
<td>2.00</td>
<td>481.00</td>
<td>34.67</td>
</tr>
<tr>
<td>Overall amount of capital invested (million €)</td>
<td>8.21</td>
<td>5.00</td>
<td>0.15</td>
<td>35.00</td>
<td>8.65</td>
</tr>
<tr>
<td>Number of investors per investment</td>
<td>4.17</td>
<td>3.00</td>
<td>1.00</td>
<td>12.00</td>
<td>2.59</td>
</tr>
<tr>
<td>Geographical distance to VC company (km)</td>
<td>247.20</td>
<td>169.63</td>
<td>0</td>
<td>828.61</td>
<td>236.31</td>
</tr>
</tbody>
</table>
Table 4.1 shows descriptive statistics for the main characteristics of the sample. All figures refer to the point in time when the investment is made. On average, the financed companies were almost five years old and had 37 employees. The average amount invested per financed company and per investment amounts to slightly more than eight million Euros. Almost two thirds of the investments are syndicated. On average, the number of investors for the syndicated investments is about 4.2. There is a clear focus of investment in certain industries. More than 36 percent of the investments are in the biotechnology industry followed by investments in software related businesses (14 percent). Around six percent of the financed start-ups are active in the communication business as well as in medical technologies.

Table 4.2: Distance and travel time between VC company and portfolio firm

Number of investments within a certain distance:

<table>
<thead>
<tr>
<th>Distance</th>
<th>&lt;100km</th>
<th>100-200km</th>
<th>200-300km</th>
<th>300-400km</th>
<th>400-500km</th>
<th>500-600km</th>
<th>600-700km</th>
<th>&gt;700km</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of investments:</td>
<td>231</td>
<td>68</td>
<td>61</td>
<td>42</td>
<td>50</td>
<td>66</td>
<td>30</td>
<td>21</td>
</tr>
<tr>
<td>Percentage:</td>
<td>40.60</td>
<td>11.95</td>
<td>10.72</td>
<td>7.38</td>
<td>8.79</td>
<td>11.60</td>
<td>5.27</td>
<td>3.69</td>
</tr>
</tbody>
</table>

Number of investment within a certain travel time:

<table>
<thead>
<tr>
<th>Travel Time</th>
<th>&lt;1h</th>
<th>1-2hs</th>
<th>2-3hs</th>
<th>3-4hs</th>
<th>4-5hs</th>
<th>5-6hs</th>
<th>6-7hs</th>
<th>&gt;7hs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of investments:</td>
<td>193</td>
<td>89</td>
<td>65</td>
<td>39</td>
<td>57</td>
<td>60</td>
<td>43</td>
<td>23</td>
</tr>
<tr>
<td>Percentage:</td>
<td>33.92</td>
<td>15.64</td>
<td>11.42</td>
<td>6.85</td>
<td>10.02</td>
<td>10.54</td>
<td>7.56</td>
<td>4.04</td>
</tr>
</tbody>
</table>

Number of observations: 569

Since the main interest in this section is the analysis of the role of spatial proximity between VC investors and portfolio firms, it is closely looked at the distance between the two parties of a VC partnership. Table 4.2 shows the distribution of the spatial distance between the VC companies and their portfolio firms in kilometers as well as in terms of travel time. It is found that only 40 percent of the investments are located within a distance of 100 kilometers and slightly more than 50 percent are within 200 kilometers. This means that almost half of the VC
investments are located more than 200 kilometers away. In most of these cases, this is more than a two-hour trip by car: what was assessed by Mason and Harrison (2002b) as the regional restriction for a VC investment. The average distance between a specific VC company and its investment is 247 kilometers. Looking at the shortest travel time between VC companies and portfolio firms, it can be seen that only one third of the investments are within a circumference of a one-hour trip, which was the critical distance according to Zook (2002). The two-hour-rule covers less than 50 percent of the investments. The average travel time between the VC investor and the financed firm is approximately two hours and 40 minutes.

The distribution of geographical distance and travel time between VC investors and their investments indicate that regional proximity is not as important for VC investments in Germany as is widely believed. Furthermore, it shows that regions that are located far away from the centers of the VC suppliers might not face a regional disadvantage in attaining equity for young and innovative companies.

4.4 What Influences the Distance between Venture Capital Firms and their Investments?

There are two characteristics of an investment which might influence the distance between a VC company and its portfolio firm: the age of the portfolio firm and the amount of capital that is invested. A young company which is in the early stage of its technical and organizational development and that does not generate considerable turnover or profit is likely to require more involvement by the VC firm than a company at a later stage (Gupta and Sapienza, 1992). This hypothesis is based on the assumption that a lack of business and management skills may, particularly, be a problem in young innovative companies, which are often run by engineers or natural scientists (Gupta and Sapienza, 1992). Furthermore, young and innovative companies are faced with high uncertainty with regard to the technical and the economic success of their project (Sapienza et al., 1996). Therefore, the monitoring and supervising activities by the VC supplier may be more time-consuming and may cause considerably higher transaction costs for the investments during earlier development stages of the portfolio firm versus in the case of an investment at a later
stage. For these reasons, spatial proximity between the VC company and the portfolio firm is expected to be more important for early stage investments (Sorensen and Stuart, 2001).

The size of the investment may influence the necessity of consulting and monitoring and, therefore, the importance of regional proximity in two converse ways. First, the larger the investment is, the higher the expected profit is (Martin et al., 2005). Hence, VC companies will be willing to put more effort forth to ensure the success of a project for a large investment as compared to a smaller one. Moreover in the case of a large investment, the investor can more easily afford the higher transaction costs for monitoring and advising of a portfolio firm that is located far away. Therefore, regional proximity between VC suppliers and financed firms may be less important for larger investments. Second, larger investments reduce the ability of a VC company to spread the risk over several different investments (Robinson, 1987; Robbie et al., 1997). Due to relatively high losses of a large investment that has failed, VC investors might want to undertake greater efforts to minimize such a risk of failure. This might raise the importance of spatial proximity because monitoring and advising is easier for investments located nearby. Due to these contradicting effects, the direction of the relationship between the size of an investment and the importance of spatial proximity is a priori unclear.

Table 4.3: Correlation coefficients of main variables regarding spatial proximity

<table>
<thead>
<tr>
<th>Age of portfolio company (years)</th>
<th>Amount of capital invested (million €)</th>
<th>Geographical distance to investment (km)</th>
<th>Travel time to investment (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.00</td>
<td>0.04</td>
<td>-0.03</td>
<td>-0.02</td>
</tr>
<tr>
<td>Overall amount of capital invested (million €)</td>
<td>1.00</td>
<td>0.17**</td>
<td>0.16**</td>
</tr>
<tr>
<td>Geographical distance to investment (km)</td>
<td></td>
<td>1.00</td>
<td>0.99**</td>
</tr>
<tr>
<td>Travel time to investment (hours)</td>
<td></td>
<td></td>
<td>1.00</td>
</tr>
</tbody>
</table>

** Statistically significant at the 1%-level; * Statistically significant at the 5%-level; Number of observations: 569
The correlation coefficients between the age of the financed firms at the time of the investment and the geographical distance between the VC company and the portfolio firm are not statistically significant (Table 4.3). The same holds for the correlation between the age of the investment and the travel time. This can partly be explained by the composition of the sample. About 93.5 percent of the portfolio firms in this study were not older than ten years and more than 76 percent were not older than six years at the time when the investment was made. Therefore, the financed firms in this sample can be regarded as being rather young. Since nearly all of the investments are in an early stage of their development, they may have similar needs of monitoring, consulting, and, as a consequence, spatial proximity. The amount of an investment is positively correlated with the distance between the investor and the investment (Table 4.3). The larger the investment is, the greater the distance to the VC firm is.

4.5 The Role of Syndication for the Regional Venture Capital Supply

One possibility for VC companies to overcome the problems of great geographical distance to an investment is syndication (Sorensen and Stuart, 2001). Fritsch and Schilder (2007) find strong evidence that syndication can, at least partly, be used as a substitute for regional proximity. If one of the syndication partners is located close to the investment, it can do most of the monitoring and consulting involved. The other co-investors can then behave more or less passively (Gupta and Sapienza, 1992; Wright and Lockett, 2003). If this assumption is correct, syndicated investments can be located in greater geographical distances from the VC companies in comparison to investments which are only undertaken by a single investor. This hypothesis can even be extended further when one assumes that the probability for syndication of an investment will increase with the geographical distance between the financiers and the portfolio firm. One may, therefore, expect that investors, which are located far away from an investment, will search for syndication partners close to the portfolio firm to perform most of the monitoring and consulting activities. Consequently, if syndication is used as a substitute for regional proximity, one of the investors should be located close to the investment. As a result, the geographical distance between at least one of the VC companies that form a syndicate and the financed firm should be
relatively small. If syndication is, indeed, used as a means to create greater geographical proximity, one may well expect the minimal distance between one of the syndicated firms and the investment to be smaller than in case of a non-syndicated investment with only a single VC investor.

**Table 4.4: Correlation coefficients of variables regarding syndication and the distance between VC company and portfolio firm**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Number of investors</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Age of portfolio company (years)</td>
<td>0.02</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Overall amount of capital invested (million €)</td>
<td>0.68**</td>
<td>0.05</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>4 Distance to specific investment (km)</td>
<td>0.15**</td>
<td>-0.03</td>
<td>0.17**</td>
<td>1.00</td>
</tr>
<tr>
<td>5 Minimal distance to investment (km) (a)</td>
<td>-0.16**</td>
<td>-0.08*</td>
<td>-0.04</td>
<td>0.57**</td>
</tr>
<tr>
<td>Distance to investment ./ minimal distance to investment (a)</td>
<td>0.31**</td>
<td>0.04</td>
<td>0.21**</td>
<td>0.09**</td>
</tr>
</tbody>
</table>

\(a\) Syndicated investments only; ** Statistically significant at the 1%-level; * Statistically significant at the 5%-level; Number of observations: 563

Correlation coefficients show a statistically significant positive relationship between geographical distance to a portfolio company and the number of investors that are engaged in the investment (Table 4.4). This indicates that the VC companies tend to particularly syndicate those investments that are located far away. This interpretation is supported by the negative correlation between the number of investors involved and the minimum distance between one of the investors and the portfolio firm. The higher the number of investors is, the greater the spatial proximity of one of the investors to investment is. On average, the minimal distance between the syndication partner, which is located closest to the investment and the portfolio firm, is 108 kilometers for syndicated investments. Investments with a single investor show an average distance of 185 kilometers. There is a pronounced positive
correlation between the minimal distance within a syndicated investment and the distance between an individual VC company and the portfolio firm. This seems to indicate that the further away the investment is located, the greater the distance of the closest investor to the portfolio firm is. However, this positive correlation is a statistical artifact that has no meaningful interpretation.

The difference between the geographical distance of a VC firm to an investment and the distance of the syndication partner that is located closest to the portfolio firm indicates the two distance-related benefits of syndication in one variable. The larger this difference is, thus, the more advantageous the syndication is if the partner located close by does the monitoring and consulting. If a VC firm is located closest to an investment as part of a syndicate, it has no distance related incentive for syndication. This is confirmed by the significantly positive correlation of this variable with the number of investors (Table 4.4). The negative correlation of the difference to the minimal distance within a syndicate and the minimal distance indicates that the search for a syndication partner which is located close to the investment is more important for those investors which are located farther away. The further away a VC firm is located from an investment, the larger the distance to the syndication partner that is located closest to the investment is.

The results of an independent samples t-test that compares the means of different variables of syndicated and non-syndicated investments (Table 4.5) are in line with this interpretation. It is found that syndicated investments are, on average, significantly larger in terms of the overall amount of capital invested. Furthermore, the average distance of a VC company to a syndicated investment is greater than that of a single investment, whereas the minimal distance of one of the firms that form a syndicate is smaller than in the case of a single investor. The results indicate that the VC companies which are located far away from the portfolio firm tend to syndicate their investments with at least one of the syndication partners being located relatively close to the target firm. As a consequence, the minimal distance of a syndicated investment to a target firm is significantly smaller than of the projects with a single investor. However, there are no significant differences with regard to the age of the
financed companies. This may be due to the structure of the sample that contains mainly early stage investments.

Table 4.5: Independent samples t-test for comparing investments with a single investor and syndicated investments

<table>
<thead>
<tr>
<th></th>
<th>Single investor</th>
<th>Mean</th>
<th>t for H0: mean(0) != mean(1)</th>
<th>Syndicated investments</th>
<th>Number of observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of portfolio company (years)</td>
<td>Single investor</td>
<td>4.23</td>
<td>-1.74</td>
<td>Sydicated investments</td>
<td>105</td>
</tr>
<tr>
<td></td>
<td>Syndicated investments</td>
<td>4.93</td>
<td></td>
<td></td>
<td>705</td>
</tr>
<tr>
<td>Overall amount of capital invested (million €)</td>
<td>Single investor</td>
<td>2.67</td>
<td>-5.02**</td>
<td>Sydicated investments</td>
<td>54</td>
</tr>
<tr>
<td></td>
<td>Syndicated investments</td>
<td>8.74</td>
<td></td>
<td></td>
<td>561</td>
</tr>
<tr>
<td>Distance to a specific investment (km)</td>
<td>Single investor</td>
<td>185.91</td>
<td>2.44*</td>
<td>Sydicated investments</td>
<td>76</td>
</tr>
<tr>
<td></td>
<td>Syndicated investments</td>
<td>256.77</td>
<td></td>
<td></td>
<td>487</td>
</tr>
<tr>
<td>Minimal distance to investment (km)</td>
<td>Single investor</td>
<td>185.91</td>
<td>3.48**</td>
<td>Sydicated investments</td>
<td>76</td>
</tr>
<tr>
<td></td>
<td>Syndicated investments</td>
<td>108.03</td>
<td></td>
<td></td>
<td>487</td>
</tr>
</tbody>
</table>

** Statistically significant at the 1%-level; * Statistically significant at the 5%-level

The interpretations of the correlation analysis and the t-tests are confirmed by the multivariate negative binomial and logistic regressions (Table 4.6 and 4.7). The two models in Table 4.6 show the results of the logit estimations regarding the influence of the distance between a VC company and the portfolio firm on the probability of syndication. The dependent variable is the syndication-dummy, which assumes the value one if an investment is syndicated and the value zero if not. Some missing values of both variables lead to a decrease of the sample size which comprises 420 observations in this analysis. According to the estimates, the age of the portfolio company has no statistically significant effect on the syndication of an investment, whereas the probability of syndication rises with the amount of capital that is invested. The latter result can be explained by a higher need for risk sharing within larger investments. Moreover, a single VC company may not have the amount of capital available that is required for a larger investment. The results for model I in
Table 4.6 indicate that the distance between a VC company and a portfolio firm has no significant effect on the decision for syndication. However, when substituting the distance variable by the minimal distance between one of the syndication partners and the investment (model II), this minimal distance has a significantly negative influence on the probability of syndication. This indicates that the probability of syndication increases with the spatial proximity of one of the investors to the investment. Unfortunately, the distance and the minimal distance cannot be included into the same model because close correlation between these variables would lead to pronounced multicollinearity. Furthermore, the variable that shows the difference between the distance of an investor to the investment and the minimal distance of one of the VC syndication partners to the portfolio firm can not be added to the model, because it would predict the outcome perfectly.

Table 4.6: The effect of spatial proximity on the probability of syndication (logit estimation)

<table>
<thead>
<tr>
<th></th>
<th>Probability of syndication</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
</tr>
<tr>
<td>Age of portfolio company (years)</td>
<td>-0.024 (0.58)</td>
</tr>
<tr>
<td>Overall amount of capital invested (million €)</td>
<td>0.445** (4.31)</td>
</tr>
<tr>
<td>Geographical distance to investment (km)</td>
<td>0.001 (1.23)</td>
</tr>
<tr>
<td>Minimal distance to investment (km)</td>
<td>–</td>
</tr>
<tr>
<td>Distance to investment ./ minimal distance to investment</td>
<td>–</td>
</tr>
<tr>
<td>Constant</td>
<td>0.718 (1.83)</td>
</tr>
<tr>
<td>Pseudo R-squared</td>
<td>0.182</td>
</tr>
</tbody>
</table>

Asymptotic t-values in parentheses; ** Statistically significant at the 1%-level; * Statistically significant at the 5%-level; Number of observations: 420

The data are not able to contain information about which of the partners of a syndicate takes the role of a lead-investor. The importance of regional proximity and
the use of syndication for overcoming the problem of distantly located investments might be different for an actively involved lead-investor and for passive co-investors. Furthermore, it is not possible to distinguish between the investor who initialized the investment and the following VC companies. The sample only includes two years and out of the 308 investments, only 22 are follow up investments. The estimation models containing only these investments that are definitely not follow-up investments show results that do not differ from the results presented in Table 4.6.

The evidence from these empirical results has some further limitations. Syndication might not solely be used to overcome the problems of distantly located investments. Several other reasons for VC companies to search for a syndication partner exist. For example, the sharing of risk or resources and the possibility to ease the access to investments in the future might motivate the VC company to syndicate an investment (Lockett and Wright, 1999; Manigart et al., 2006). Regarding the regional aspect, it might also be possible that the investors which are located close to an investment search for VC companies that are located far away. For example, public VC firms try to attract additional capital from outside their resident region with the help of syndication (Schilder, 2006). In this case, syndication is not used to overcome the problems of distant located VC investments.

Similar results are achieved when the number of co-investors, which are syndicated in an investment, is taken as the dependent variable (Table 4.7). The negative binomial regression was applied here as estimation method because of the integer character of this variable. Like the probability of syndication, the number of co-investors rises with the overall size of the investment and is not significantly affected by the age of the portfolio company. Furthermore, the size of the syndicate is not significantly statistically affected by geographical distance between an investor and the location of the respective investment (model I). However, the minimal distance between one of the investors and the financed company has a statistically significant impact on the number of co-investors (model II).

The argument may be expanded by assuming that the geographical distance between a VC company and a portfolio firm might, particularly, have an impact on the decision to syndicate an investment if syndication provides the opportunity of
having a syndication partner involved which is located much closer to the investment. The geographic distance to an investment minus the minimal distance of one syndication partner can be regarded as an indicator for this kind of advantage of syndication. Including this variable in the analysis, the two other distance-related variables have to be omitted due to the threat of multicollinearity. The significantly positive coefficient for the distance to the investment minus the minimal distance of a syndication partner (model III in Table 4.7) confirms this hypothesis. According to the estimation results, the number of co-investor increases with the spread between the distance of a VC company to the portfolio firm and the minimal distance in a syndicated investment.

Table 4.7: The effect of spatial proximity on the number of syndication partners (negative binomial regression)

<table>
<thead>
<tr>
<th></th>
<th>I</th>
<th>II</th>
<th>III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of portfolio company (years)</td>
<td>0.0018</td>
<td>-0.0005</td>
<td>0.0013</td>
</tr>
<tr>
<td>Overall amount of capital invested (million €)</td>
<td>0.0438**</td>
<td>0.0442**</td>
<td>0.0414**</td>
</tr>
<tr>
<td>Geographical distance to investment (km)</td>
<td>0.0001</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Minimal distance to investment (km)</td>
<td>–</td>
<td>-0.0007**</td>
<td>–</td>
</tr>
<tr>
<td>Distance to investment ./ minimal distance to investment</td>
<td>–</td>
<td>–</td>
<td>0.0006**</td>
</tr>
<tr>
<td>Constant</td>
<td>0.8372**</td>
<td>0.9309**</td>
<td>0.7766**</td>
</tr>
<tr>
<td>Pseudo R-squared</td>
<td>0.086</td>
<td>0.095</td>
<td>0.094</td>
</tr>
</tbody>
</table>

Asymptotic t-values in parentheses; ** Statistically significant at the 1%-level; * Statistically significant at the 5%-level; Number of observations: 420

The results of this analysis show that syndication is used to overcome the problems involved with geographical distance between a VC investor and the investment. The probability of syndication does not rise because of large geographical distance of the VC company to the portfolio firm. Location has only an
impact on syndication if one of the syndication partners is located relatively close to the investment. This indicates that the supply of VC in a region can be multiplied with the help of syndicated investments even if there are only a few VC companies present in that region. Thus, capital for young and innovative companies is available in a region without large VC clusters. However in a syndicated investment, one of the investors should be closely located to the portfolio company. Therefore, one may suspect that there is an equity gap in regions with no VC supplier. Though, given the average minimum distance of 108 kilometers for the closest VC-investor within syndicated investments and 186 kilometers for investments with a single investor, the occurrence of such an equity gap in Germany may appear to be quite unlikely. One factor that determines the danger of a regional equity gap is the distribution of VC firms in space. This will be examined in the next section.

4.6 Are there White Spots on the Map of Venture Capital Supply in Germany?

Figure 4.1 shows the regional distribution of the members of the German Private Equity and Venture Capital Association. The black spots indicate the number of VC companies. The larger the spot signifies the greater number of VC companies located in a certain district. The flags represent the regional distribution of the members of the German Business Angels Network Association. Although, these networks only represent a small fraction of the informal VC investors, they, nevertheless, indicate the regional distribution of a market segment that has significant effects. The circles mark a circumference of 150 kilometers around the main German VC centers. However, this circumference is even smaller than the average distance of 247 kilometers between a VC company and its portfolio firms in the data set; it indicates the average minimum distance within an investment. The 150 kilometers circumference lies between the average minimum distance of VC companies and their portfolio firms for syndicated investments and the average distance to non-syndicated investments (see Section 4.5).
Figure 4.1: The regional distribution of VC companies and Business Angels Networks in Germany
Figure 4.2: The regional distribution of VC investments in Germany
According to Figure 4.1, most parts of the country lie within these circles. Mainly, a small area in the center of Germany seems to experience a gap or a white spot on the map. However, even in these regions some “stand-alone” VC firms exist (for example in Jena, Erfurt, and in Dresden) which may at least be used as an anchor for syndicated investments. As argued above (Section 4.5), even large amounts of VC may be made available in such regions by syndication of an investment.

The assumption of good availability of VC in most German regions is confirmed by the spatial distribution of VC investments as contained in the data set (Figure 4.2). The dark spots represent the total number of VC investments in a district in the years 2004 and 2005. The larger a spot is indicates that more investments have been made in the region. Although, the distribution of VC investments corresponds to the distribution of VC firms (Figure 4.1), there are some differences. Figure 4.2 indicates that those regions, which seem to be disadvantaged by the location of VC companies, are at least not completely ignored by VC investment. This is particularly true for some parts of Eastern Germany, such as the areas around Jena and Dresden. In contrast, almost no VC investments are made in the region in the center of Germany between Düsseldorf, Frankfurt, Erfurt, and Hannover, which are in close proximity to a large number of VC companies.

Altogether, there is no strong indication for a severe regional undersupply of VC, which might hamper the entrepreneurial and innovative activity in a region. In fact, VC is available all over the country and regional disparities in VC investment are obviously caused by determinants other than the lacking presence of VC suppliers. However, one has to keep in mind that the analysis solely comprises companies that received VC, thus there is a certain bias in the data. It is not possible to make any statement if those companies that did not receive VC have been rejected because of their geographical distance towards possible investors. In interviews conducted with managers of German VC companies, the interview partners strongly denied that geographic distance of a promising project would inhibit investment (see Section 3). On the contrary, the managers unanimously claimed that location of an investment within Germany is more or less unimportant.
4.7 Concluding Remarks

The role of spatial influences on the regional dimension of VC supply in Germany is investigated in this section. In line with the findings from Section 3 the results show that regional proximity between a VC company and a portfolio firm is not important for German VC investments. Based on a data set that contains more than 300 VC investments made in Germany between 2004 and 2005, the results provide evidence that the regional supply of VC is not mainly determined by location. The average distance between investor and investment is about 250 kilometers, and nearly 50 percent of the investments are made in locations which are more than 200 kilometers away from the financier. Expressed in terms of average travel time by car, less than 50 percent of the investments are made within a two-hour trip.

It can be shown that the syndication of VC investments is used to overcome the problems attached to investments that are located farther away. The greater the geographical distance between investor and investment and, at the same time, the more closely a syndication partner is located to the portfolio firm, the more likely the syndication of an investment is. The same results are found for the number of co-investors, participating in a syndicated investment. Furthermore, the probability of syndication rises with the amount of capital invested. The age of the portfolio firm does not have an effect on the probability of syndication.

The findings of this section clearly show that there is no severe regional equity gap for young and innovative start-ups in Germany for at least three reasons. First, regional proximity seems not to be an important factor for VC investments in Germany. Second, syndication may help to overcome the problems of an investment in a distant location. Third, within a range of 150 kilometers around the core VC centers in Germany almost every region is covered. The regions that are not within this circumference have at least some isolated VC companies which may act as a syndication partner for other investors located in more distant places. Moreover, the region with nearly no VC investment in the center of Germany is well accessible for a large number of VC firms. Altogether, the analysis gives indication that the regional supply of VC does not work as an important major obstacle for
entrepreneurial activity in Germany. Furthermore, the importance of VC syndication can be seen, especially in regard to spatial influences on investments. Therefore, the next section contains a network analysis to reveal the syndication behavior of German VC firms in detail.
5 Venture Capital Syndicate Networks

5.1 Introduction

Research examining both the networks of VC companies built through syndicated venture capital (VC) investments as well as geographical and spatial influences on the VC markets is somewhat insufficient. Most of the studies either focus on the geographical aspects (Powell et al., 2002; Martin et al., 2002; Fritsch and Schilder, 2007) or on the syndication of VC investments (Manigart et al., 2006; Lerner, 1994; Lockett and Wright, 2001). Only a few studies combine both lines of research, including the study by Sorensen and Stuart (2001) and the work of Bygrave (1987, 1988). However, research is mainly limited to the US VC market which shows certain particularities such as large spatial distances. Furthermore, the characteristics of the key players within the networks are not completely explored, e.g., the role of public authorities within VC syndicate networks. Therefore, additional research on VC syndicate networks and the geographical and spatial influences seems to be necessary.

Accordingly, this section focuses on the interconnectedness of VC companies within syndicate networks. Syndication means that “… two or more venture capital firms come together to take an equity stake in an investment” (Wright and Lockett, 2003, 2074). The more network ties a VC firm has in form of syndication partners, the higher its degree centrality of the network is and the larger its own syndicate network is. However, past research (see for example Sorensen and Stuart, 2001 and Bygrave, 1987, 1988) does not entirely explain to what extend different characteristics of VC companies and, especially, spatial and geographical aspects influence the network position of a VC company – in other words to what extent the VC firms are connected with other investors. The logical question raised in this context is: “What determines the number of ties to syndication partners of a VC company within a syndicate network?”  The analysis of this study examines the
characteristics of the VC firms that influence their degree centrality within the network, which is measured by the number of different syndication partners each VC firm has. To answer this question, a dataset based on more than 300 VC investments made in Germany in the years 2004 and 2005 is used. The results of the analyses show which individual characteristics of VC investors, including their age, their geographical location or their spatial investment behavior lead to a central position within a syndicate network, i.e., a large individual network of a VC firm. The findings also indicate the role of different types of VC firms in the German VC market, e.g., by a comparison of privately held VC firms and VC companies that are under governmental influence.

The remaining sections are structured as follows. The following section (Section 5.2) contains the rationale of VC syndication. Thereafter, important assumptions regarding the influential factors of the position of VC firms within a syndicate network are hypothesized, which are based on a review of the literature (Section 5.3). The data are then described in Section 5.4 and the syndicate network relationships in Germany are shown. Then, the empirical analysis follows (Section 5.5) based on the hypothesis of different determinants affecting the network position of VC companies. Section 5.6 concludes.

5.2 Venture Capital Syndication

The VC business is not a lonesome activity of individual investors working separately; it is often the case that VC investments are syndicated (Lerner, 1994). As already mentioned in Sections 3 and 4, syndication means that more than one VC investor is involved in the investment (Wright and Lockett, 2003). Even though all participating VC firms are taking a stake in the investment, their function within the syndicate may differ. The role of the financiers ranges between active lead investors (they do not only invest but also offer further services such as consulting) and the more or less passive co-investors (they merely give money and abstain from providing additional services). Every VC company is incorporated in different syndicates with various syndication partners. A so-called syndicate network develops from this cooperation (Bygrave, 1988; Sorensen and Stuart, 2001). The more
syndication partners in different syndicates a VC company has, the larger the specific syndication network of the individual VC firm is.

The syndication of VC investments has various reasons. Each phase of a VC investment has its own characteristics, i.e., the search for possible target companies, the act of investing itself, the monitoring and consulting of the portfolio firm during the investment and the exit of the investment (Gompers and Lerner, 2001). Hence, different reasons or rationales for syndication emerge from the phases of a VC investment (Sorensen and Stuart, 2001). In the pre-investment stage, syndication, or more precisely the possible syndication of investments, might help to find and to evaluate target companies (Manigart et al., 2006; Lockett and Wright, 2001). If one VC company identifies a possible investment, it might ask other VC companies to syndicate. For these VC firms, the invitation to syndicate eases the search for investments, i.e. the so-called deal flow.

Within the next phase of an investment, known as the investment decision, syndication might be helpful or even necessary. Firstly, one investor might not be able or willing to raise enough capital for the investment individually (DeClerq and Dimov, 2004, Brander et al., 2002); the VC company needs help from other investors. Secondly, it is an advantage to share the investment even though the investor is able to manage the investment alone. Possible reasons are risk reduction through portfolio diversification for the individual VC company and a combined evaluation of the investment (Lockett and Wright, 1999, 2001; Cumming, 2006). Additionally, due diligence done by different VC companies might be more valuable than that of a single investor (Lerner, 1994).

Once the investment is made, syndication is also advantageous for the participating investors (Brander et al., 2002). These benefits apply to the additional services that VC companies provide to their portfolio firms, such as monitoring, advising and consulting. Through syndication, the costs of these activities can be shared, whereby the resources of the individual investor are saved. Furthermore, the syndication partners can combine their resources (DeClerq and Dimov, 2004). This is especially important if one syndication partner is located close to the investment and
other investors are further away from the portfolio firm (Fritsch and Schilder, 2006, 2007; Sorensen and Stuart, 2001). In this case, the VC company that is located closest to the investment can do most of the monitoring and advising activities on site. The distantly located syndication partners benefit from this proximity, e.g., through reduced costs of monitoring and traveling (Fritsch and Schilder, 2007).

Even if the VC investment comes to an end syndication might be helpful for the VC companies. One possible example is the exit through a trade sale, which is the sale of the venture’s shares to an industrial company. This is one of the most important ways of exiting a VC investment in Germany (German Private Equity and Venture Capital Association, 2006). Trade sales might be easier if more than one investor is involved. The different financiers have contact to different possible buyers for the stakes of an investment. Therefore, the search for a trade sale partner is eased. After an exit, the fact that an investment has been syndicated can still be valuable. The participating investors might remember their syndication partners when they search for future co-investors, especially, if the syndicate was successful (Manigart et al., 2006; Sorensen and Stuart, 2001). Again, this allows an easier deal flow for the VC company.

5.3 Syndicate Networks and the Characteristics of the Key Players

The reasoning for syndication gives evidence for the role of syndicate networks. A syndicate network is composed of a number of VC companies that have a relationship to each other through their joint investments (Bygrave, 1988; Sorensen and Stuart, 2001). Based on this definition one is able to depict the syndicate network by simply starting with one specific VC company. Its syndicate network partners are all investors that have involvement in any of the VC company’s investment syndicates. As each individual network partner of the VC company is also interconnected with other investors through syndicates, an overall VC syndicate network exists for the whole or nearly the whole market, e.g., within one country. Past research on VC syndicate networks and spatial determinants focused on the reasons of syndication and syndicate networks (Bygrave, 1987, 1988) or on the impact of syndicate networks on the spatial investment behavior of VC firms.
(Sorensen and Stuart, 2001). However, these studies show two main limitations. First, they are restricted to the US VC market which is said to be rather unique in regard to its development (Martin et al., 2002), its investment activity (Sapienza et al., 1996) or its geographical structure (Martin et al., 2002). Second, they do not entirely explore which determinants turn VC investors into active network players, such as the role of governmental influence on VC syndication behavior.

The role of different actors within a syndicate network is important for VC companies. According to network analysis theory, the more ties a financier has to other VC firms through syndication, which corresponds to its individual co-investment network, the more central its position within the network is (Wassermann and Faust, 1994, 178), and the more it can benefit from the network (Bygrave, 1988). First, a large network of co-investors eases the search for further investments because the co-investors might invite the VC company to participate in deals of which they have not heard (Bygrave, 1987; Manigart et al., 2006). Second, a group of co-investors helps to find a syndication partner for various kinds of future investments. A suitable co-investor might enable the VC company to expand the provided services for the portfolio company (Brander et al., 2002), to ensure sufficient capital availability for large investments (Lerner, 1994) and to overcome the problems attached to investments that are located far away from the VC company (Fritsch and Schilder, 2006, 2007). For these reasons, it is important to understand what determines a well interconnected network position of VC firms.

One important characteristic of a VC company with regard to its position within the syndicate network is the VC firm’s age (Sorensen and Stuart, 2001). First, the older the VC company is, the more experienced its management is said to be (Gompers, 1996). Experienced investment managers might possess many different contacts, both personal links as well as through work experience. Due to these contacts, the co-investment and syndication of VC deals can emerge (Sorensen and Stuart, 2001). Second, older VC companies have a longer history of past VC syndicates than young VC firms. These co-investments might be able to help find syndication partners or be invited to syndicate themselves. The trust established during a past syndication is an important advantage for future deals (Wright and
Lockett, 2003). If the earlier joint investment was successful, this cohesion might be even stronger. Finally, a good and sustainable track record strengthens the reputation of the VC firm and encourages other VC companies to participate with the successful VC company in the same syndicate (Lockett and Wright, 1999). A young VC firm does not have this track record and its management might be less experienced than older VC firms (Sorensen and Stuart, 2002). Therefore, it can be assumed that older VC firms have a central position within the syndicate network and show a variety of co-investment ties in comparison to the younger VC investors do.

The second possible determinant of the VC firm’s network position is a spatial argument. The larger the individual network of the VC company is, i.e., the higher its degree centrality within the overall network is, the more likely the investor will have investments that are located further away from its own location (Sorensen and Stuart, 2001). There are two main reasons for this assumption. Firstly, with increasing spatial distance it will become more difficult to find and to evaluate suitable investment opportunities (Manigart et al., 2006; Lockett and Wright, 2001). Making use of a large syndicate network can ease the search and evaluation of target companies. Secondly, syndication might be used to overcome the problems of investments that are located further away from the investor such as long traveling distances for the monitoring and consulting of the portfolio firm (Fritsch and Schilder, 2006). If one syndication partner is located close to the investment, it can undertake the services that need to be done on site of the financed venture; these include certain monitoring and consulting activities. Under such circumstances the other syndication partners can be located farther away and do not have to be at the investment very often. Therefore, multiple relationships to different syndication partners might help to find, evaluate, and manage distantly located investments. In other words, a large spatial investment behavior of VC firms requires and entails many network ties to other VC investors.

As a third determinant, the geographical dispersion of the VC suppliers might influence the interconnectedness of syndicate networks. For instance, although the German VC market is less spatially clustered than the US market (Powell et al., 2002; Florida et al., 1991), it has several VC centers including Munich,
Frankfurt/Main, Düsseldorf, Hamburg, Berlin and the Rhine-Ruhr area (see Section 3; Fritsch and Schilder, 2007). VC companies that are located in these core centers might have a more central position within the overall VC syndicate network (Sorensen and Stuart, 2001). The spatial proximity to many other VC firms might spur their personal contacts within the VC community which, in turn, might lead to possible contacts to syndication partners. In return, the VC companies that are located in a peripheral region might have a disadvantage with regard to their contacts to other investors and, therefore, their syndicate network. Thus, being located in one of the German VC centers might lead to a higher level of interconnectedness of a VC company within a syndicate network than that of investors in peripheral regions.

Finally, the background of the VC company, in this context, that means whether they are public – an investor is under governmental influence – or privately held, might have an impact on its number of co-investors and its personal syndicate network. Many public VC companies are restricted in regard to their investments to a certain region (Doran and Bannock, 2000; Sunley et al., 2005). Their main goal is to ensure a sufficient supply of capital for entrepreneurship and innovative activity in one specific area (Schilder, 2006; McGlue, 2002). Therefore, they have to work as a magnet attracting capital from outside their resident region and multiplying their own supply of capital through syndication. Furthermore, the private syndication partners can strongly benefit from the public VC companies’ access to local networks (Sunley et al., 2005), which might be advantageous for their deal flow and for the evaluation of the target company. Therefore, a public VC investor as syndication partner should be an interesting co-investor for private VC suppliers. For that reason, public VC firms might have more co-investments than their private counterparts, which is equal to a more central position within the overall syndicate network.

5.4 Analysis

5.4.1 Data

The analysis is based the micro-level investment data introduced in Section 1.3. Table 5.1 shows descriptive statistics for the main variables of the sample. All
figures refer to the point in time when the investment was made. On average, the financed companies were almost five years old whereas the VC companies already existed for more than ten years. The average amount invested per financed company and per investment amounts to slightly more than eight million Euros. On average, the number of investors for the syndicated investments is about 4.2. The average number of syndication ties per VC company is 9.65. However, this number does not show the network of the individual VC company in detail. If a VC company has two syndicates with the same syndication partner, the syndicates are counted as two ties. Such a tie between the two is stronger than that of a single syndicate (Bygrave, 1987). The network of different syndication partners of a single VC company is smaller than the total number of syndication ties. On average, the syndicate network of an individual VC company contains about eight different syndication partners. This relatively small difference between the overall number of ties of a VC company and the number of different co-investors of the financier might be due to the short period of time within the analysis. Serial investments, which are based on experiences of past syndicates, are not very likely within such a short period of time.

*Table 5.1: Descriptive statistics*

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Median</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of portfolio company (in years)</td>
<td>4.84</td>
<td>4.00</td>
<td>0.00</td>
<td>36.00</td>
<td>3.84</td>
</tr>
<tr>
<td>Age of VC company (in years)</td>
<td>10.43</td>
<td>7.00</td>
<td>0.00</td>
<td>57.94</td>
<td>10.12</td>
</tr>
<tr>
<td>Overall amount of capital invested (in million €)</td>
<td>8.21</td>
<td>5.00</td>
<td>0.15</td>
<td>35.00</td>
<td>8.65</td>
</tr>
<tr>
<td>Average distance to investment (per portfolio in kilometers)</td>
<td>271.81</td>
<td>228.74</td>
<td>0.00</td>
<td>868.61</td>
<td>225.50</td>
</tr>
<tr>
<td>Number of investors per investment</td>
<td>4.17</td>
<td>3.00</td>
<td>1.00</td>
<td>12.00</td>
<td>2.59</td>
</tr>
<tr>
<td>Number of syndication ties (per VC company)</td>
<td>9.65</td>
<td>5.00</td>
<td>0.00</td>
<td>92.00</td>
<td>13.14</td>
</tr>
<tr>
<td>Number of different syndication partners (per VC company)</td>
<td>8.08</td>
<td>5.00</td>
<td>0.00</td>
<td>65.00</td>
<td>9.94</td>
</tr>
</tbody>
</table>
5.4.2 What do Venture Capital Syndicate Networks Look Like?

The syndicate network’s size of the individual VC company, which indicates the network position of the investor, can either be described by its overall number of ties to co-investors, which show the frequency of network contacts or by its number of different co-investors, that provides an idea about the breadth of the network (see Section 5.4.1; Bygrave, 1987). In the following analysis, the syndicate networks are limited to the number of different co-investors of each VC company for two reasons. First, the correlation coefficient of both variables is approximately 0.98 and highly statistically significant. Therefore, the empirical results do not differ considerably and both variables seem to act as good proxies for each other. Second, some advantages of VC syndicate networks come from large networks – e.g., through the sharing of information (Bygrave, 1988) – and depend on the number of different syndication partners. The strength of the ties between two VC investors might not be as important for these network benefits. If a VC company has ten syndicates with only the same co-investor, it still has the smallest possible network containing only one financier. It’s interconnection within the overall syndicate network is rather limited. Therefore, the number of different co-investors is a more appropriate indicator for the network of a VC company (Bygrave, 1987).

The overall syndicate network is composed of the individual networks of the single VC companies, the so-called ego-networks (Wassermann and Faust, 1994, 42). Through joint investments, the VC companies are interconnected and, therefore, their networks are also connected. However, some VC firms that either do not have syndicated investments or whose networks are isolated from other networks are not part of the main component of a VC syndicate network. Figure 5.1 depicts the main component for the German VC market. It is the largest interconnected syndicate network and contains more than two-thirds of all VC firms in the sample used. The rest of the VC firms are either not part of any syndicate or are interconnected in networks that do not have more than three participants. The network graph only shows German VC investors and their ties to other German VC companies. Although, the ties to foreign investors are excluded, whereby a supra-national or global network could be illustrated, the overall German syndicate network is
indicated. Furthermore, more than 50 percent of the German VC investments are made solely with German syndication partners (German Private Equity and Venture Capital Association, 2006). Therefore, the exclusive German syndicate network is an important characteristic of the market with regard to domestic VC investment activity.

Figure 5.1: Main component of the German VC syndicate network
Each node of the network represents one VC firm (Figure 5.1). The size of the node stands for the age of the investor; the older the VC company is, the larger the circle is. The different shadings indicate whether the VC company is public or private; black circles indicate VC firms that are under governmental influence and gray circles indicate privately held investors. The ties between the financiers represent the cooperation within one or more syndicates and are shown by the black lines. The thicker the line is, the more joint syndicates these two VC companies have. This equals a stronger network tie between the two investors. The ties and the position of the nodes do not show any geographical or spatial characteristics of the syndicate relationships. Furthermore, the data does not enable to the two other dimension of social relationships in addition to the strength of the tie: the content and the direction of the relationship. The more lines that emerge from a VC firm, the more network ties with different financiers it has. Many ties coming out of a node mean that this VC company has a central position within the overall network because the number of ties is the simplest measure of an actor-level degree centrality (Wassermann and Faust, 1994, 178).

Overall, the network indicates that the VC market is very well interconnected. However, it also shows that some VC firms are more or less key network players that have many different ties and keep the large network together (Figure 5.1). These mostly tend to be older firms such as the VC subsidiary of Siemens, 3i in Frankfurt and Munich or Techno Venture Management. Most of these key players are privately held and only few VC suppliers, which are mainly influenced by public authorities, are also highly interconnected in the network. Among these are for example the VC subsidiary of the Merchant and Development Bank Berlin (IBB) and the IBG Beteiligungsgesellschaft Sachsen-Anhalt mbH.

The main component of the VC syndicate network shows a strong interconnection of the German VC market. Many of the investors have syndication ties with other VC firms and, in most cases, with more than one co-investor.

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3 The network graphic does not show any geographical or spatial characteristics of the syndicate network.
Furthermore, there are some key players within the network that ensure such a large main component. They seem to be rather old and privately held. However, the visual interpretation of Figure 5.1 still leads to an important question: Which determinants turn VC companies into key players of the network? In other words, one still has to search for characteristics that enable a single VC firm to develop many different syndication ties. Furthermore, the graphical interpretation of the syndicate network does not show any regional or spatial influences that might be important determinants.

5.4.3 What Determines the Actor-level Degree Centrality of Venture Capital Firms in the Syndicate Network?

The possible determinants of the size of the VC companies’ syndicate networks measured by the number of different syndication partners per VC firm are explored in the following in-depth analysis. A negative binomial regression is employed because the distribution of the dependent variable is strongly skewed to the right. The dependent variable is the number of different syndication partners each VC investor has as indicator for degree centrality of the VC firms. The independent variables depict the determinants of the interconnectedness or degree centrality of the VC companies (see Section 5). First, the age of the VC company is used because older VC firms might have larger networks than young VC companies. Second, a dummy variable, which shows whether the VC firm is privately held or under governmental influence (public dummy), is used to demonstrate the possible differences between both types of financiers. Third, two variables are added to the model to explore the influence of geographical and spatial aspects on VC syndicate networks – a dummy variable comparing the investors that are located within the German VC centers and those that are not and a variable that shows the average distance between a VC company and its portfolio firms. The analysis is based on network information about 128 German VC firms and their syndication ties, which are part of the previously introduced dataset. Private individuals and foreign VC companies are excluded from the analysis. Furthermore, the data lacks information on the age of several of the investors. Therefore, they are not included in the estimations.
The results clearly show that the age of the VC company has a statistically significant and positive impact on its number of different co-investors (Table 5.2, Model I). However, by adding the variable age², which is the square of the age of the VC firm, it can be seen that this influence becomes smaller over time and, finally, is negative (Model II). This means that the benefits of being older in regard to the network degree centrality of a VC firm, e.g., through the experience and the track record of the investor, are only important at a certain age. Very young companies cannot benefit from these advantages. Very old VC firms also do not have an advantage of being older. One reason for this dichotomous influence of the age might be that the older VC firms begin to rest on their laurels.

The institutional background of the VC company, i.e., whether the VC suppliers are privately held or under governmental influence, does not affect the degree centrality within VC syndicate network. The estimations do not show any
statistically significant difference between both types of VC companies. Therefore, public VC companies seem to be equally interconnected and established within the German VC network, which might be rather astonishing in regard to the visual analysis of the VC syndicate network (Figure 5.1). However, they do not make more extensive use of syndication than their privately held counterparts to enlarge, for example, the VC supply for their resident region. Unfortunately, the data do not provide information about the current overall number of portfolio companies per investor, the amount of capital a VC firm has under management or the number of investment managers per financier. Therefore, it is not possible to control for differences in regard to the size of the VC companies, which might also influence the network activity of the investors (Bygrave, 1987). However, the age of the VC company can be regarded as a proxy for the size of the investor, because size and age of VC firms are often highly correlated (Sorensen and Stuart, 2001).

The geographical and spatial influences on the number of network ties of a single VC company are less pronounced than previously assumed. First, the location of a VC company in one of the German VC centers does not have a statistical significantly effect on its syndicate network. Both VC firms in the centers or in peripheral regions seem to have a similar degree centrality in the syndicate network (Model III). This might be due to the composition of the data, which show a relatively high share of VC companies in peripheral regions. Second, the spatial investment behavior, which is measured by the average distance between a VC company and its portfolio firms, has no statistically significant influence on the number of ties of a VC company (Model IV). Contrary to the findings from a US study conducted by Sorensen and Stuart (2001) the network position of a VC investor and its spatial investment behavior are not related in Germany. This might derive from a distinct insignificance of spatial aspects for the German VC market (Fritsch and Schilder, 2007).

Furthermore, other variables such as the spatial dimension of the syndicate network, indicated by the average distance between the investor and its syndication partners or the geographical location of the investments, do not have a statistically significant influence on the network position of the VC company. These results are
not reported in the estimation tables. Overall, the estimations on geographical and spatial influences of the VC investors’ network position show that these determinants are less important than for the large and geographical more dispersed US VC market (Sorensen and Stuart, 2001).

5.5 Conclusions

VC companies are interconnected through a network of joint investments, the so-called syndicates. In this section, the VC syndicate network structure in Germany is explored, and, possible determinants of the role of certain VC companies within the network are analyzed. This study shows to what extent certain characteristics of the investors influence their individual or ego-network of syndication partners, which equals their level of interconnectedness or degree centrality within the overall network. The empirical analysis is based on a unique dataset containing information on more than 300 VC investments made in German during the years 2004 and 2005.

The analyses reveal that the German VC market is closely interconnected. The main component of the network shows that more than two-thirds of the VC firms within the used data are connected through syndicates. Furthermore, the visual and descriptive analyses provide evidence that some VC firms have considerably more relationships to syndication partners than others do. Therefore, a regression analysis is employed to explore the influence of several possible determinants of the network position of VC firms. The number of different co-investors per VC company, which is an indicator for the degree centrality of the network position of VC firms, mainly depends on the VC companies’ age. Older VC investors seem to profit from advantages through more experience or a longer track record of investments than their younger counterparts. However, this effect diminishes over time and even turns into a negative influence.

Furthermore, the results provide evidence that the German VC syndicate network is not influenced by geographical or spatial aspects. Neither the location of the VC companies – this means a location either in one of the German VC centers or in a peripheral region – nor their spatial investment behavior affects their number of
different syndication partners. Other characteristics of the VC firm, including but not limited to the fact whether they are under governmental influence or not, do not show a statistically significant influence on the network position of the investor. This shows that the public VC companies in Germany seem to be as well interconnected as their privately held counterpart, which indicates their task to promote local entrepreneurship and to create functioning financial networks.
6 Public Venture Capital in Germany – Task Force or Forced Task?

6.1 Introduction

Section 5 supplies first indication that public VC activity, i.e., any VC activity that is under some kind of governmental influence, is an evident part of the German VC market (See also Sunley et al., 2005; Plagge, 2006; Almus and Prantl, 2002). However, we do not know much about whether public VC companies are doing what is expected of them. In the literature, the public intervention on the VC market is mainly justified by possible market failures that may prevent private VC companies from investing in start-ups. For example, these market imperfections arise from problems attached to small-scale investments (McGlue, 2002; Harding, 2002). In an attempt to overcome these barriers, the public authorities try to promote the local economy with a supply of capital for young companies. Furthermore, they attempt to establish financial and business networks which might not currently exist due to these market failures. This justification of public activity on a VC market leads to several tasks for public VC firms that might be quite different than the activities of their mainly profit-oriented private counterparts.

Until now, the question whether public VC intervention is performing these tasks or if it is merely an end in itself has not been completely answered. With this study, I make several contributions to endorse the previous research. The main research questions of this section are: “Where are the differences between publicly influenced and private VC firms in Germany?” “To what extent do the deal flow, the evaluation of investments and the investment behavior itself reflect the task of public VC companies?” and “Can private financiers undertake the tasks of public VC providers?” The analysis is based on a unique data set of personal interviews conducted at various VC companies in Germany. The survey has two advantages in comparison to past studies that are mostly based on individual investment data. First,
the personal face-to-face interviews provide detailed insight into the attitude, the aims and the behavior of VC investment managers. Second, the survey was conducted during the end of the downturn phase in the market and is, therefore, the first study that deals with data from extremely difficult market conditions.

Overall, the data of this study allow a direct comparison of the investment activities of public and private VC companies. Thereby, the task performance of public VC firms can be indicated. Furthermore, the ability and the willingness of private VC companies to overtake the investments, which are currently held by their public counterparts, can be examined. However, the data restrict the analysis to focus on direct public VC intervention both through VC firms with mainly governmental funding and influence. Other means of public activity regarding the VC market such as public guarantees, grants for private investors and completely passive co-investments are not considered. Although, this excludes a large portion of the publicly influenced VC market in Germany such as most activities by the Kreditanstalt für Wiederaufbau, the analysis allows the concentration on VC investments with active hands-on support.

The remainder of the section is structured as follows. Section 6.2 shortly deals with the role of public and private VC companies in Germany. The successive section proposes several hypotheses in regard to the tasks of public VC firms based on a review of the relevant literature (Sections 6.3 and 6.4). In Section 6.5, the database is introduced with a focus on the differences and the similarities of the two analyzed groups. The main part of this section contains the empirical results of the comparison of the two groups of VC providers. In Section 6.6, the question whether private VC might be able to undertake the current tasks of public VC companies is discussed. Finally, Section 6.7 provides a conclusion.

6.2 The Role of Public Venture Capital within the German Venture Capital Industry

The relevance of the question whether public VC is performing its task is deeply rooted in the role of public intervention on the German VC market. The importance of direct public VC activity in Germany is mainly unquestioned (see e.g., Sunley et
al., 2005 or Plagge, 2006). The regional distribution of public VC companies in Germany can indicate their actual impact on the German VC industry. Several studies show that the distribution within the different VC markets all over the world is highly unequal in many countries, for example the US market (Sorensen and Stuart, 2001; Powell et al., 2002; Florida et al., 1991) or the UK market (Mason and Harrison, 1999, 2002; Martin, 1989; Martin et al., 2005). For the VC markets in continental Europe, such as France and Germany, Martin et al., (2002) also found a considerable degree of regional concentration; although, this concentration was less pronounced.

The regional distribution of the members of the German Private Equity and Venture Capital Association (Bundesverband Deutscher Kapitalbeteiligungs-gesellschaften; BVK) from January 2006 is rather unequal (Figure 6.1). The gray circles demonstrate that the private sector of the German VC market is clustered in five regions: Munich, Frankfurt, Berlin, Hamburg, and the Rhine-Ruhr area. The black sections indicate VC companies which could be identified as having an underlying predominantly public influence. These VC companies can be divided into three types: the subsidiaries of public savings banks and state banks, the Mittelständische Beteiligungsgesellschaften (MBG), and other VC companies with mainly public funding or influence by public authorities. The MBGs are a specific form of public VC in Germany. They were founded in the 1970s by all of the federal states, with the exception of Bremen, and they have been established in cooperation with the local banks and the representatives of the industry. Their investments are restricted to the specific state. Overall, the BVK data clearly show that the public VC companies contribute largely to the relatively low regional VC clustering in Germany.
Figure 6.1: The spatial distribution of public and private VC firms in Germany
Figure 6.2: The spatial distribution of investments by the German Mittelständische Beteiligungsgesellschaften
The regional distribution of public VC companies and their investments (Figures 6.1 and 6.2) shows that the public VC companies play an important role on the German VC market. They are not only represented in the large VC centers, such as Munich or Hamburg, but can also be found in a diverse number of smaller cities all over the country, for example Regensburg in the southeast or Dresden in the eastern part of Germany. Although the regional proximity between the VC company and the portfolio firm is not an irrevocable necessity for VC investment (Fritsch and Schilder, 2006, 2007), this might indicate that they perform their duty to be active, whereas private VC companies are absent. Furthermore, the public VC companies have an active investment behavior; i.e. they do not merely exist but are actively providing VC. Particularly, they are important in the segment of small investments, whereas many private VC companies might refuse to invest.

6.3 The Rationale of Public Venture Capital Intervention

The justification of public intervention within the VC market is mainly tripartite. First, it is argued from a static perspective that the public VC activity should help to overcome market failures that may lead to an equity gap for young and innovative companies (McGlue, 2002). Second, assuming a dynamic perspective it is argued that a young and developing private VC market may just need a stimulus to motivate it (Leleux and Surlemont, 2003). The third type of argument is based on spillover and social effects, spanning the first two arguments. It says that public authorities should try to create an adequate environment to additionally stimulate a prospering entrepreneurial and innovative activity (McGlue, 2002). All three motivations imply that the public VC activity should be more or less complementary to the private VC supply. Otherwise, there would be an effect of public crowding out and, thus, hinder the private VC investments.

The reasoning for public VC activity to overcome a market failure in the form of an equity gap is mainly grounded in the specific assumption that the private sector is not able to deliver enough capital for young and innovative companies on its own. Information failures such as information asymmetries between the VC company and the entrepreneur or a moral hazard problem (Harding, 2002) might lead to an
insufficient supply of capital. Further market imperfections, for example a lack of suitable exit possibilities for VC investments, can enhance this effect. An equity gap for young and innovative companies may also emerge in regard to certain investment sizes (Harding, 2002; Martin et al., 2005). The costs of searching, monitoring, and supervising investments do not significantly vary between small and large investments. Thus, the overall returns of large investments are higher (Harding, 2002). Therefore, the expected return-cost-ratio of small investments is lower than those of larger ones. Consequently, small- and medium-sized companies might be facing restrictions in the supply of risk capital (Martin et al., 2005).

The second argument for public VC intervention – that the VC market needs a stimulus – is based on a more dynamic perspective. It assumes that the VC market needs some sort of precursor, signaling that the provision of equity for entrepreneurs can be a risky but profitable business (McGlue, 2002). The larger the VC network becomes, the more positive network and spillover effects it might have (Sorensen and Stuart, 2001). Thereby, the public VC activity should help the industry to boost itself out of a stage of infancy (Leleux and Surlemont, 2003). For example, Hood (2000) found evidence that the Scottish public VC program SDF was followed by the formation of new private VC funds. The logical conclusion of this seeding argument is that private VC can be used to close a possible equity gap by multiplying the initial public intervention. Consequently, according to the seeding hypothesis, the VC intervention by public authorities has to be time-limited. As soon as the private VC market is able to stand on its own feet, public VC must be reduced and finally discontinued. Furthermore, the public VC activity must not crowd out private investments as indicated, for example, in a study by Cumming and MacIntosh (2006) on the Canadian VC market.

The first two arguments are more or less spanned by the third justification of public VC activity. The creation of an adequate environment for entrepreneurial growth is heavily linked with a sufficient supply of capital (Friedman, 1995; Harding, 2000; Zook, 2002). This can only be ensured with the creation of a strong financial network and the support of public VC companies to overcome possible market failures. However, the final goal of public authorities is not only the
promotion of entrepreneurship but also the emergence of innovation, economic growth, and employment through start-ups (McGlue, 2000; Hood, 2000; Harding, 2002; Leleux and Surlemont, 2003; Almus and Prantl, 2002). These “private returns” might even be multiplied by further “social returns,” for example through spillovers by positive externalities of innovations (Boadway and Tremblay, 2005; Lerner, 1999). For this purpose, VC is regarded as a catalyst for entrepreneurial and innovative activity (Florida and Kenney, 1988; Kortum and Lerner, 2000). However, some studies find evidence that innovative activity does not always follow the capital but vice versa, which debilitates the assumption of public VC as a catalyst for entrepreneurship (Florida and Smith, 1993; Martin et al., 2005; Fritsch and Schilder, 2007).

6.4 The Differences between Public and Private Venture Capital Activities

Before some specific tasks for public VC firms are deviated out of the justifications of public VC intervention (Chapter 3), the reader should be aware that direct public VC intervention in Germany is a regional business. The respective companies mainly act on behalf of regional governments, such as on a state- or a district-level, and utilize their money. Therefore, the public VC companies have a clear regional restriction and focus. Furthermore, they are deeply incorporated in the local businesses and social networks. In the following, I shortly show some tasks for public VC companies, on the basis of the justification of public VC intervention, that severely differ from the goals of private VC firms. Hereon, three distinctive features between the activity of public and private VC firms are hypothesized. These tasks and the differences in their behavior mainly reflect the regional focusing of the public VC companies.

Public VC companies should assist the VC market to get up and running by the creation of a strong regional financial network. Furthermore, they have to establish strong regional networks, and they must attract VC companies to invest in their region in order to ensure a sufficient equity supply. Finally, they have to promote the regional entrepreneurial and innovative activity. Hence, the public VC providers seem to have other goals than the private VC companies do. Their objectives are
more focused on the development of regional business communities, e.g., to promote start-ups and to help the VC market to grow. In addition, the monetary return on investment, which is the main purpose of private VC investments, seems to be less important. This leads to lower return requirements for public VC companies (Bascha and Walz, 2002). Therefore, I expect several distinctive features between private and public VC companies such as differences in their syndication behavior, their selection process, and their monitoring and advising services.

First, the development of a functioning VC market with a specific size means that the public VC companies either have to attract other financiers to invest in their region (McGlue, 2002) or they must signal local financiers that VC investments are a profitable business (Hood, 2002; Lerner, 2002). This can be done by helping private VC firms to overcome the information asymmetries between the VC company and entrepreneur (Lerner, 1999). This capability is grounded in the good regional market knowledge of public VC firms evolving from their strong regional commitment (Sunley et al., 2005). Furthermore, public VC companies have a high quality of expertise through large networks of experts to which private VC firms cannot revert (Lerner, 2002). To the contrary, the amounts invested by public VC companies can have a large leverage effect through the syndication of investments with financiers from other regions. Syndication means that within a single investment several investors are involved. Thereby, the investors share the volume of investment as well as the risk and the work involved (Brander et al., 2002; Lockett and Wright, 2001; Gompers and Lerner, 2001; Doran and Bannock, 2000). The syndication partners can strongly benefit from the public VC companies’ access to local networks, as the syndication partners’ networks is one of the main reasons for co-investing (Fritsch and Schilder, 2007). Therefore, I expect a twofold syndication behavior of public VC firms. Initially, they syndicate with local investors to strengthen the regional financial networks. Furthermore, they might have many investments syndicated with financiers that are not located in their region to attract capital from other regions and to enlarge the local VC supply (Mason and Harrison, 1991).

Second, the public VC companies’ duties to promote the local entrepreneurial and innovative activity might influence their selection process. This is particularly
important in the cases where private investors refuse to invest. In addition to a possible superior selection process due to good regional market knowledge (Sunley et al., 2005), the public VC companies’ due diligence has to be focused on certain items. First, the outcome of an investment might not solely be measured by the return of the investment as it is expected for private VC companies (Hood, 2000). Although, Leleux and Surlemont (2003) could not find a significant relationship between public VC activity and high employment industries, the potential effects on the regional economic development might also be an important output for public VC companies. Second, their highly developed access to regional networks (Sunley et al., 2005) enables public VC companies to discover the regional need of promotion for entrepreneurs. This influences their major ways of deal flow. Their close relationship to local incubators or the chambers of industry and commerce can grant access to possible investments. The different objectives lead to the assumption that public VC companies use different ways of deal flow and have a deviating selection process in comparison to their private counterparts.

Third, there are several factors that can influence the monitoring and advising activities of public VC companies. Therefore, they might show obvious differences in comparison to the private VC investors. The public VC companies’ lower return requirements (Bascha and Walz, 2002) in combination with strong ambitions to contribute to the local economic development (Sunley et al., 2005; Tykvova, 2004) allows or even forces them to establish a more intensive and costly contact to the portfolio firms than the private VC firms would do. Furthermore, as they should focus on investments that do not get private VC, they might have more problematic cases in their portfolio. These investments require more attention and involvement from the financier (Doran and Bannock, 2000). This activities are time consuming and costly. Thus, the private VC firms which are mainly return maximizing cannot afford such intensive relationships. In contrast, many public VC firms do not solely have the duty to promote start-ups but all kinds of businesses. Therefore, the public VC companies may focus more on later stage investments and prefer mezzanine financing and silent investments than their private counterparts (Tykvova, 2004; Bascha and Walz, 2002; Bottazzi et al., 2004). The later stage investments usually require less involvement by the financier than early stage investments (Sapienza et
al., 1996). This arises from the lack of management or technical knowledge in the early stages of the companies’ development which the financier has to provide (Gupta and Sapienza, 1992).

The monitoring and advising activities by public VC companies might also depend on the predominantly used financial products. They prefer products that usually do not have voting rights such as silent partnerships (Tykvova, 2004). Thereby, they participate less in the financed firms’ profits than, for example, with direct ownership (Bascha and Walz, 2002). This leads to fewer consulting activities by the financiers because they have fewer incentives to generate a fast growth of the financed firm (Schäfer and Schilder, 2006). Furthermore, the fact that many public investment managers are civil servants and government employees might also influence their consulting activities. Due to their different educational backgrounds (Bottazzi et al., 2004) and their incentive structure – they have other payment systems than private funds managers – their consulting activities might suffer (Leleux and Surlemont, 2003). On the whole, the assumptions about public VC investments, in regard to monitoring and advising, are twofold. The amount of involvement might be larger than that of the private VC firms because of lower return requirements and a duty to promote the local economy. Contrarily, their predominantly used financial products and the different incentives and educational background of their employees might hinder monitoring and consulting.

6.5 Comparison of Private and Public Venture Capital Activity in Germany

6.5.1 Structure and Investment Behavior of Public and Private Venture Capital Firms

For purpose of this section, the different types of financiers from the interview survey (Section 1.3) are re-grouped into merely two groups: public and private VC companies. The first group consists of 23 observations containing subsidiaries of public savings banks, merchant and development banks and MBGs. The second group has 28 observations including independent and corporate VC companies as well as subsidiaries of private banks. Although, this is group composition considerably differs from that used in the Sections 2 and 3, it enables an analysis of
the overall German VC market. For example, the VC subsidiaries of public savings banks are part of the public VC sector. Therefore, they are not longer treated as banks’ subsidiaries but as public VC companies. A further differentiation of the VC firms’ institutional background, for example whether they are subsidiaries of industrial corporations or banks is not possible due to too small groups sizes. Because of mere focus on VC activity in this section, the other providers of smart capital, for example banks and Business Angels that are part of the underlying survey data are excluded.

The data set of the interviewed VC companies shows a strong heterogeneity between public and private VC firms. This heterogeneity is important as the different objectives of both groups consequently lead to different investment behaviors, e.g., through the offered products and services. The first difference can be found for the predominantly used financial products. The importance of diverse products for public and private VC suppliers ranges in categories from one, i.e., the investor does not supply this product at all, to four, which means that this is the most frequently used product (Figure 6.3).

The private VC firms are clearly focused on direct equity investments, mainly as minority holdings with up to 25 percent or between 25 and 50 percent of the portfolio companies’ shares. In contrast, the public VC companies prefer minority holdings up to 25 percent and, considerably, silent investments. The latter product is located between equity and debt in balance-sheet terms. Other mezzanine products, credits and majority holdings, seem to be less appealing to both groups. These findings are in line with former research (Tykvova, 2004; Bascha and Walz, 2002). The financial products represent the different aims of both groups. Direct investments are combined with many rights of influence and a participation in the portfolio companies’ return, because they turn the investor into a co-owner of the venture. Thereby, the goal of private VC companies to generate profit can be achieved. In contrast, the public VC companies predominantly use a product that usually has no voting rights and mainly fixed interest rates. This reflects their aim to supply capital for their investments and not to exert an extreme influence on the portfolio firms or to generate as much profit as possible.
Public and private VC companies show further heterogeneity in their share of early stage investments within their portfolios (Figure 6.4). On average, the private VC firms hold more than 60 percent of the number of investments in companies that are in early stages of their development. The public VC suppliers have only a mean of 34 percent of their portfolio companies in early stages. This strengthens the assumption that public VC firms do not only focus on early stage investments as most of them have a duty and tendency to promote companies in all stages of their development and not only start-ups. However, this seems to be astonishing as the lack of private capital and, therefore, the market failure is said to be very pronounced for early stage investments (Martin et al., 2005).

The resources to which the two groups can revert are another distinctive issue between public and private VC companies (Figure 6.4). The resources are measured by the average number of investments each investment manager has to monitor and advise. 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. Within the private VC companies, each manager is responsible for an average of 3.5 investments, whereas the mean of the portfolio companies per manager for the public VC firms is 9.7. The investment managers of
public VC firms have a clear time restriction for their monitoring and consulting tasks. These results indicate that the public VC companies might have less monitoring and consulting activities. The lower resources and the associated time and knowledge restriction enable less consulting and monitoring because these services are costly and time consuming. Furthermore, the more later-stage investments need less involvement by the financier, as they can manage most of their business on their own (Gupta and Sapienza, 1992; Sapienza et al., 1996).

Figure 6.4: Share of early stage investments and ratio of portfolio companies per investment manager (public and private VC firms)

The public VC companies distinguish themselves from the private VC firms in regard to the spatial dimension of their investment behavior (Figure 6.5). Public VC companies are often restricted by law or by their articles to regional investment activities. This restriction ranges from a district, which counts for many public savings banks’ VC subsidiaries, up to a federal state, which is the investment area of the MBGs. Unsurprisingly, the public VC companies in the survey have 81.6 percent of their investments at the same site or within 100 kilometers and only 0.5 percent abroad. Contrarily, the private VC firms invest more than 68 percent of the investments over 100 kilometers away from their location and only 18 percent at the same site. The results reflect the regional limitations of public VC companies and
prove that they perform the duties to promote the regional economic activity which is combined with a strong regional commitment.

![Figure 6.5: Average share of investments within a certain distance (public and private VC firms)](image)

Another aspect that covers a regional topic is the public VC firms’ syndication behavior and especially the distance to the syndication partner (Figure 6.6). On the one hand, public VC companies might syndicate with investors that are far away and, therefore, try to attract investors from outside of their resident region. This enables a further flow of capital for the economy which eases the search for liquidity for the local companies. On the other hand, they might try to build a strong regional financial network by syndicating with local investors. Although, the data do not allow distinguishing between the initiator of the syndicate and the invited VC companies or active and passive syndicate members, the results support the second assumption. The public VC companies only have 35.6 percent of their syndication partners within a distance of more than 100 kilometers. However, almost 40 percent of their syndication partners are located at the same site. The private VC companies have, on the contrary, almost 70 percent of their syndication partners in more than
100 kilometers distance, thereof 21 percent abroad which is parallel to the spatial
distribution of their investments (Figure 6.5).

![Figure 6.6: Average share of syndication partners within a certain distance (public
and private VC firms)](image)

On the whole, the public VC companies show explicit differences in
comparison to their private counterparts. Initially, this supports the hypothesis that
public VC companies perform their tasks because they seem to follow different
objectives. Especially the duty to promote the local economy is reflected by some of
these differences. However, only a detailed analysis of their investment behavior can
show whether they really concentrate on what they should do.

6.5.2 The Selection Process of Public and Private Venture Capital Companies

The first description of the heterogeneity within the data set indicates that public and
private VC companies are very different. A detailed analysis of their selection
process and their monitoring and consulting activities might reflect whether public
and private VC companies follow their different objectives. Therefore, a Wilcoxon-
Mann-Whitney test is employed to compare both groups. This test allows the
comparison of two sub-samples by assigning a rank to the individual observation. The Wilcoxon-Mann-Whitney test is the non-parametric version of the independent samples t-test. Therefore, the test is able to reveal the relation of two groups even if the assumption of a normal distribution is violated or if the variances between the sub-samples are explicitly different. A positive value indicates that the sum of the ranks for the public VC companies group must be larger than the sum of the ranks for the private VC firms. For example, the positive value in the third row and the last line of Table 6.1 shows that the public VC investors regard possible exits of their investments to be less important than their private counterparts.

Table 6.1 depicts the average importance and the rank sum comparison of certain variables regarding the selection of new investments by the VC companies. Both public and private VC firms organize their selection process in teams, expressed by the total number of people who are involved in the selection process of a single project. However, the difference is not statistically significant. Furthermore, there are obvious differences within the distinct means of contacting potential targets for investments for public and private VC firms. The possible answers to the question on this deal flow lie in a category between one, i.e., this way is never used, and four, i.e., this form of approaching new investment possibilities is always used (see Section 2.3). Most of the contacts for both public and private VC companies result from active marketing, syndication partners, or direct address by target firms. Though, the public VC companies more often make use of intermediaries such as the chambers of industry and commerce and start-up centers versus the private VC firms. The difference is statistically significant on the one percent and the five percent level, respectively. This indicates that they are more deeply involved in the local business networks than their private counterparts. Regarding their task to promote the regional business development, the deep involvement within the local networks is necessary to detect possible market failures. The deal flow via syndication partners is more developed for the private VC firms, proved by a statistically significant difference on the five percent level. This shows that the public VC companies have to be more active in searching for a partner for a syndicated investment rather than being in the passive position of the addressed co-investor.
Table 6.1: Selection process of public and private VC companies (mean values and results of Wilcoxon-Mann-Whitney test)

<table>
<thead>
<tr>
<th></th>
<th>Public VC (mean values)</th>
<th>Private VC (mean values)</th>
<th>Wilcoxon-Mann-Whitney test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of people involved in selection process (within a single investment opportunity)</td>
<td>3.65</td>
<td>4.44</td>
<td>0.42 (0.68)</td>
</tr>
<tr>
<td>Contact to possible investment target by:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Active marketing by VC firm</td>
<td>2.78</td>
<td>2.57</td>
<td>-1.39 (0.17)</td>
</tr>
<tr>
<td>Address by syndication partner</td>
<td>2.44</td>
<td>2.82</td>
<td>2.53* (0.01)</td>
</tr>
<tr>
<td>Direct address by target firm</td>
<td>2.87</td>
<td>2.96</td>
<td>1.24 (0.22)</td>
</tr>
<tr>
<td>Address by accountants or auditors</td>
<td>2.26</td>
<td>2.04</td>
<td>-1.02 (0.31)</td>
</tr>
<tr>
<td>Address by Chambers of Industry and Commerce</td>
<td>1.87</td>
<td>1.21</td>
<td>-3.65** (0.00)</td>
</tr>
<tr>
<td>Communication to start-up centers</td>
<td>1.70</td>
<td>1.36</td>
<td>-2.11* (0.04)</td>
</tr>
<tr>
<td>Main factors influencing the investment decision:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expected risk/return-ratio of the investment</td>
<td>2.61</td>
<td>3.64</td>
<td>3.19** (0.00)</td>
</tr>
<tr>
<td>Short-term horizon of the investment</td>
<td>1.87</td>
<td>2.39</td>
<td>2.04* (0.04)</td>
</tr>
<tr>
<td>Long-term horizon of the investments</td>
<td>3.04</td>
<td>2.07</td>
<td>-3.16** (0.00)</td>
</tr>
<tr>
<td>Previous composition of the portfolio</td>
<td>2.87</td>
<td>3.57</td>
<td>2.26* (0.02)</td>
</tr>
<tr>
<td>Promising strategic orientation of the investment</td>
<td>4.30</td>
<td>4.21</td>
<td>0.10 (0.92)</td>
</tr>
<tr>
<td>Well-skilled management of the target firm</td>
<td>4.61</td>
<td>4.25</td>
<td>-0.90 (0.37)</td>
</tr>
<tr>
<td>Exit possibilities for the investment</td>
<td>2.78</td>
<td>4.22</td>
<td>4.16** (0.00)</td>
</tr>
<tr>
<td>Number of observations</td>
<td>23</td>
<td>28</td>
<td></td>
</tr>
</tbody>
</table>

** significant at 1%-level; * significant at 5%-level; a significant at 10%-level; Prob > |z| in parentheses
The investment decision of public and private VC companies is determined by several issues (Table 6.1, third part). The possible categories for these type B (see Section 2.3) variables are: not important (1), of minor importance (2), among other things important (3), very important (4), and dominant (5). For these variables, even stronger differences between the two groups can be found than in the case of the deal flow. The public VC companies are less concerned about the expected risk-return-ratio and prefer long-term investments. Furthermore, the possible ways of exiting the investment are less important for them. All three differences are highly statistically significant. These results might be due to their focus on silent investments, which is a rather prominent instrument for the promotion of start-ups. This product mainly matures between seven and ten years, which can be regarded as long-term, and has largely fixed interest payments that limit the risk-return-ratio. Furthermore, the financier does not have to worry about exiting an investment. Finally, the composition of the VC company’s portfolio is less important for public financiers than for private investors. This can be grounded in a stronger industry specialization of the latter and the duty to promote all kinds of industries of the initial type. Many public VC firms cannot reject investing in a software start-up just because they already have two software investments in their portfolio. However, some important factors are equal for public and private VC firms and do not show significant differences. Both groups mainly look for a promising strategic orientation of the investment and well-skilled management. The selection process of public and private VC investors shows further evidence that the public VC companies are driven by their considerably different aims; especially through a strong commitment that they have in the local business community.

6.5.3 The Monitoring and Advising by Public and Private Venture Capital Companies

The second important issue that indicates the task fulfillment by public VC companies is their monitoring and consulting activities. The different topics of consulting by public and private VC companies (Table 6.2) are a key aspect as these services determine the character and the quality of the offered VC investment. The variables differ within the range: never (1), seldom (2), frequently (3), and very
frequently (4). The average number of contacts between the investors and the financed companies per month – personal contacts as well as contacts via telecommunication - provide evidence for the exchange of knowledge between the investor and the portfolio company (Table 6.2). With an average of 0.9 face-to-face contacts and 2.5 contacts via telecommunication per month, the public VC companies have a particularly less intensive interaction with their portfolio firms in comparison to their private counterparts. This indicates a lower amount of deep flows of information in comparison to the private VC firms. Thereby, the hypothesis of less consulting by public VC firms is supported.

Table 6.2: Consulting activities of public and private VC companies (mean values and results of Wilcoxon-Mann-Whitney test)

<table>
<thead>
<tr>
<th></th>
<th>Public VC (mean values)</th>
<th>Private VC (mean values)</th>
<th>Wilcoxon-Mann-Whitney test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of face-to-face contacts (per month)</td>
<td>0.90</td>
<td>1.26</td>
<td>1.70a (0.09)</td>
</tr>
<tr>
<td>Number of telecommunication contacts (per month)</td>
<td>2.50</td>
<td>7.39</td>
<td>3.45** (0.01)</td>
</tr>
<tr>
<td>Frequency of consulting in:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>accounting</td>
<td>2.57</td>
<td>2.32</td>
<td>-1.10 (0.27)</td>
</tr>
<tr>
<td>controlling</td>
<td>2.70</td>
<td>2.46</td>
<td>-1.28 (0.20)</td>
</tr>
<tr>
<td>marketing</td>
<td>2.00</td>
<td>2.50</td>
<td>2.39 (0.02)</td>
</tr>
<tr>
<td>technical problems</td>
<td>1.35</td>
<td>2.18</td>
<td>3.53** (0.00)</td>
</tr>
<tr>
<td>strategic problems</td>
<td>3.13</td>
<td>3.61</td>
<td>2.73** (0.01)</td>
</tr>
<tr>
<td>network advantages</td>
<td>2.65</td>
<td>2.89</td>
<td>1.50 (0.14)</td>
</tr>
<tr>
<td>financing</td>
<td>3.30</td>
<td>3.50</td>
<td>1.12 (0.26)</td>
</tr>
<tr>
<td>patent protection</td>
<td>1.35</td>
<td>2.54</td>
<td>4.21** (0.00)</td>
</tr>
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<td>juridical problems</td>
<td>1.39</td>
<td>2.14</td>
<td>3.28** (0.00)</td>
</tr>
<tr>
<td>Number of observations</td>
<td>23</td>
<td>28</td>
<td></td>
</tr>
</tbody>
</table>

** significant at 1%-level; * significant at 5%-level; a significant at 10%-level; Prob > |z| in parentheses
Furthermore, the public VC investors seem to offer a smaller spectrum of consulting (Table 6.2). On the one hand, they consult in business related topics such as accounting, controlling, marketing, or financing. However, they do not differ significantly statistically from the private VC providers. On the other hand, they offer a limited amount of consulting in technical problems or patent protection. This difference is statistically highly significant. One reason for this might be a stronger specialization of the private VC firms in certain industries. Public VC investors mainly invest in several different industries, either because of a limited pool of target firms or because of their duty to promote different industries. Another reason can be the different background of the employees. For example, private VC firms usually have more scientists within their workforce (Bottazzi et al., 2004). Therefore, the evidence from Sunley et al., (2005) who state that public VC investors offer less hands-on support, is supported. This indicates that public VC companies deliver a market segment which demands less consulting. However, if they only distinguish from their private counterparts by fewer services, their contribution to the promotion of the local economy is questionable.

Overall, the results show that there are clear differences between public and private VC companies. Firstly, the public VC firms rely on their role within local business networks to generate their deal flow. Secondly, their selection process is mainly determined by their focus on different financial products and, therefore, by their objectives. Thirdly, they offer less diversified consulting than their private counterparts. Particularly, the latter results indicate that the public VC firms’ contribution to the promotion of the local economy might be limited, because many of their portfolio firms might be problematic ventures and, therefore, in the need of much advice. Furthermore, the results furnish evidence that both groups of VC investors are not deeply involved in competition as they act on different market segments. The public VC firms seem to be offering less “real” VC, which is equity investment combined with a heavy flow of information, and rather they offer a more scaled-down version.
6.6 Can Private Venture Capital Undertake the Tasks of the Public Venture Capital Activity?

The analyses offer evidence that the public VC companies follow different objectives than their private counterparts. These goals are determined by their different tasks, mainly caused by their duty to promote the local economy. However, the results do not clearly show whether or not the private VC companies might also be able to offer the light version of VC that the public VC firms currently use. If so, there would be no need for public VC activity, at least in its present design. In the following, I present some findings derived from the statements of the interview partners in the survey. Since the results come from many different interviews, I refrain from reporting the detailed quotes. I attempt, however, to find evidence whether private VC firms are able and willing to acquire the task of public VC companies and whether the latter really act as a task force for these cases which are neglected by private VC investors.

Firstly, the size of the deal is an important factor in regard to this question. Private VC companies typically prefer larger deals. The transaction costs between small and large deals do not differ very much. At the same time, the returns from large investments are higher. Therefore, the ratio of return to effort is much better for big deals (Harding, 2002). Furthermore, large deals minimize the costs of searching for the investments. If you would like to invest, for example, ten million Euros you either can search for 100 investments each requiring 100,000 Euros or you can invest in ten investments each with one million Euros. The latter possibility has fewer costs for searching. Accordingly, it requires less monitoring by the VC company. As already mentioned (Section 6.3), this leads to a market failure and, therefore, to an undersupply of equity within the segment of small investments in which the private VC investors are not willing to be active.

Secondly, the original VC business is characterized by an extremely high risk. This can only be compensated with a very high profit opportunity, which is only possible within certain industries (Sahlman, 1990; Bygrave, 1992). The public VC companies in Germany do not solely focus on the original VC and, therefore, they do
not need the high yield investment opportunities. This leads to a wider investment focus regarding the industries. The diversified offerings are strengthened by the public task to promote the economy, as this is not compatible with an industry focus. Furthermore, the private VC companies have to justify their investments to their own investors. Anyone who invests in a VC fund is searching for investments with high risk combined with high return opportunities. Several interview partners stated that VC companies which do not invest in high-yield investments fail at their jobs. Therefore, in their opinion, many private VC companies are not willing to take on the tasks of their public counterparts although they might in theory be able to do so.

Thirdly, some interviewees annotated that the private VC companies are facing a certain reputation with which public VC firms usually are not confronted. The entrepreneurs often have extreme reservations towards direct investments. They are hesitant to give away a piece of their start-up, whereby they might lose control. This leads to a different position of public investors as they do not have such a negative reputation and offer much more silent versus direct investments. Furthermore, the entrepreneurs’ attitudes towards direct investments bring another participant into the game of start-up financing: financiers such as banks. These financiers increasingly offer mezzanine products and other similar financial products comparable to the public VC companies. Moreover, some interviewees said that private investors, so-called Business Angels, might be able to offer the trimmed-down version of VC as it requires fewer resources. This becomes even more important regarding the size of the investment because the Business Angels prefer smaller investments, whereby many VC companies refuse to invest in such companies.

These findings indicate that the private VC companies in Germany are not able or willing to undertake the public VC activity. One of the interview partners summarized this in the following words, “You can never turn a public official into a real Venture Capitalist – and vice versa.” However, other financiers such as banks or Business Angel investors might be able to undertake the tasks of the public VC companies.
6.7 Concluding Remarks

This section analyzes the VC activity of public authorities in Germany. The results indicate that the public VC companies in Germany are performing their tasks and are not just forcing a task. The public VC firms in the survey seem to serve a market segment that differs considerably from that of the private VC companies, whereby the threat of crowding out of private activity is reduced. Firstly, they offer fewer direct investments and prefer silent investments which are complimentary to their task to promote the economy and, particularly, entrepreneurship. Secondly, their selection process of new investments clearly reflects their tasks and differs from their private opponents. However, the analyses also offer evidence that public VC is more or less a scaled-down version of the original VC since it is comprised of less hands-on support. Thus, the question arises whether private VC firms are able to acquire the tasks of their public counterparts. I am able to find two answers to this question in various statements from the interviewees. On the one hand, the private VC companies do not want to invest in these companies in which the public authorities are invested because they, typically, do not fit into their risk-return requirements. On the other hand, the private VC firms are not able to overtake the public VC companies’ work because they are confronted with a stronger reservation by the entrepreneurs than the public VC investors.

Overall, the analysis shows that the public VC companies in Germany are mainly doing what is expected of them. They help to ensure the supply of equity for their local economy. Furthermore, they help to establish strong financial and business networks which might enable the creation of a growing VC market and an entrepreneurial environment. However, the analysis shows that the public VC companies do not deliver VC in its original meaning. They more or less offer “VC light” with less hands-on support and different financial products. Thus, the question arises whether other financiers such as banks and Business Angels might be able and willing to overtake the task of the public authorities. The actual system of public VC in Germany should be reconsidered. Out of this query, it becomes evident that further research must be conducted to evaluate the necessity and, especially, the success of public intervention in the German VC market.
7 Conclusion and Implications

The empirical analyses of this thesis provided several answers to the research questions, which were: “Who provides smart capital for start-ups in Germany?” “Is spatial proximity important for the provision of smart capital?” and “Are start-up financiers under governmental influence really helping overcome possible imperfections in the market for start-up financing, especially on the VC market?” In the following sections, the results are summarized into three main findings. From these results, implications for entrepreneurs, financial institutions, and policymakers are drawn.

7.1 The Market for Smart Capital in Germany is Heterogeneous and Various Types of Relational Investors Exist

Results

The market for smart capital in Germany is a very heterogeneous composition of different types of relational investors that provide smart capital (Section 2). However, the “level of smartness” of the capital supplied by the diverse types of investors differs with their institutional background and their business goals and strategies. The independent and corporate VC firms and informal VC investors in the guise of Business Angels tend to combine investment in their portfolio companies with various and deep flows of informational exchange. They provide consulting to their portfolio firms on a wide range of topics and sometimes even exert direct influence on the financed businesses. The data revealed that this type of relational investor has the most frequent personal contacts — face-to-face or via telecommunication — which are a necessary condition for an exchange of implicit and tacit knowledge. In contrast, public equity providers deliver a smaller range of services, for example, in regard to the covered topics of consulting. The lowest level of capital “smartness” can be found for banks acting as loan suppliers. Their information flows are mainly focused on business and management concerns and
they do not exert a significant influence on the businesses of their portfolio companies. However, all types of financiers engage in some form of information flow with the financed firms and thus all types of financiers can be regarded as relational investors, although the level of “smartness” of the capital varies between the different types.

The institutional background and business strategies of the relational investors are not the only reasons for the different levels of smart capital provided. Further determinants of the intensity of information flow between the financier and the investment as revealed by the study include, first, the age and development stage of the financed company; the younger the firm, the more intensive the information flow. Young start-ups are likely to need more intense consulting and advising services due to the entrepreneur’s possible lack of managerial or business experience. Second, in general, the expected duration of an investment has no influence on the provision of smart capital, although long-term investments might require less consulting. Finally, the financial product used has an influence on the information flow. The acquisition of a minority stake increases the exchange of information, whereas the provision of credit does not necessitate a very intense information flow. This finding is indicative of the different rights of involvement inherent in different financial products. However, other financial products, such as mezzanine products or silent investments, do not have a statistically significant impact on the provision of smart capital.

Implications

For financiers, these results indicate that their role within the financial system is not fixed in regard to the provision of relationship financing. Being a relational investor is not dependent on the institutional background of the financial institution: all kinds of financiers are able to deliver some kind of smart capital. However, financiers are certainly aware of the differences between the types of service they offer and those of other financiers, that is, the amount of service offered is a deliberate decision, and thus the competition between financiers may actually not be as great as it is often believed to be. Cooperation between various types of relational investors in the form
of syndication could be either helped or hindered by this unequal provision of smart capital. Overall, financiers must seriously consider the extent to which they wish to be relational investors, taking into account the various costs, risks, and benefits. Furthermore, they should be aware of the heterogeneity of the market in regard to possible competitors and cooperation partners.

For entrepreneurs, the plurality of suppliers of relational financing means that there is a variety of financiers to choose from, at least theoretically. Almost any need can be met in this market. For example, if the entrepreneur wants an investor that will provide a wide range of services — from technical consulting to advising about business practices — he or she should choose a Business Angel or a privately held VC company. If the entrepreneur prefers a more hands-off sort of financial investor, he or she should try a bank or public equity supplier. In any case, the entrepreneur needs to take careful stock of the requirements and needs of the start-up and choose a financier accordingly.

The many different types of relational investors also has implications for public authorities. Policymakers who understand the positive impact of entrepreneurial activity on economic development and are aware of how important entrepreneurial relational financing is should take this knowledge and awareness into consideration when formulating policy. Many public interventions or actions focus solely on the VC market, for example, the recently launched ERP-Startfonds in Germany, which is a combination of passive public co-investments and active privately held VC companies. However, simply providing VC will not be enough to ensure an environment conducive to entrepreneurial activity. The other segments of the market for smart capital, such as Business Angels or banks, should not be neglected, as sometimes they can provide the most appropriate supply of financing. The results of this study reveal that only a type-spanning policy can guarantee an appropriate supply of smart capital for start-ups across a wide range of entrepreneurial activity.
7.2 Venture Capital, as an Important Part of the Market for Smart Capital, is not a Regional Business

Results

VC investments are often said to be subject to regional or spatial restrictions. When the relationship between a VC company and a portfolio firm requires frequent contact, either face-to-face and/or via telecommunication, it could be that close proximity would make providing financing easier and less expensive. If spatial proximity is indeed very important to a successful investment relationship, then one would expect to find regional disparity in the supply of VC, as well as a geographical clustering of VC companies. However, the empirical results of this thesis show that the role of regional proximity for German VC companies is far less pronounced than often indicated in the literature, especially in comparison to other relational investors (Sections 3 and 4).

First, the interview survey data used in Section 3 provide evidence that VC companies do not focus their investments within a certain spatial circumference, whereas banks and private Business Angels prefer investments within a range of 100 kilometers. These results are supported by the analysis of more than 300 German VC investments made in the years 2004 and 2005 (Section 4). The average distance between the VC firm and its portfolio company is about 250 kilometers, and nearly 50 percent of the investments are made in locations that are more than 200 kilometers away from the investor. Expressed in terms of average travel time by car, less than 50 percent of the investments made are within a two-hour car trip. This is a much wider circumference for VC investments than found by other studies that evaluated the U.S. and U.K. markets (Zook, 2002; Mason and Harrison, 2002b). One possible reason for the unimportance of spatial proximity to German VC investment might have to do with the country’s excellent transportation infrastructure.

Second, empirical results based on both sets of data indicate that VC firms use syndication, that is joint investment with other financiers, to overcome the problems inherent in distant investments. This practice makes it possible for investors to find, evaluate, and handle investments that are located far away (Sections 3 and 4) because
if the financier can find a syndication partner located near the promising but distant investment, distance becomes of less concern. The investor located nearest to the portfolio firm can perform the services that need to be done onsite, thus dispensing with the need for the farther-away investor to incur travel and time expenses. The closer a possible syndication partner is located to the site of investment, the greater the chance that a syndication will emerge, especially if one of the other syndication partners is located far away (Section 4). Therefore, syndication is important for VC investments in regard to spatial influences.

Third, the role of spatial proximity for VC investments is influenced by the amount of management resources the VC firm has available (Section 3). The more time an investment manager can spend on each investment, the more likely it is that the financier will be willing to make distant investments. There is no statistically significant impact of the share of early-stage investments in a portfolio, which is surprising as this phase of investment is believed to require relatively intensive involvement by the financier and, therefore, closer spatial proximity. Similar results are found for telecommunication, which is commonly held to work as a substitute for face-to-face-contact. The analysis suggests that telecommunication is mainly a complement to and not a substitute for personal face-to-face interaction.

Finally, analysis of the investment data revealed that German VC firms are closely linked via syndicate networks (Section 5). Syndicate networks emerge when VC investments involve more than one investor. As each investor has many different syndicates with different co-investors (its individual or personal network), the suppliers of VC are also generally interconnected. The larger the VC company’s individual network, giving it a more central position within the overall network, the more it can benefit. The advantages mainly come from better access to new investments and more easily finding suitable syndication partners, for example, in regard to geographical location. More than two-thirds of the VC investors in the data are part of the main network component, which is the largest interconnected part of the overall market of VC suppliers. The results indicate that the network position of a VC company, measured by the number of different co-investors, is influenced by the age of the VC company. However, the benefits of being older, namely, experience
and track record, diminish over time and even become more of a hindrance than a help. Furthermore, the analysis did not reveal any geographical or spatial influences on the number of syndication partners a VC company has within its individual network. For example, the fact that a VC company is not located in one of the German VC centers does not impair its contact with other financiers in regard to syndication. This final result is a further evidence for the unimportance of spatial proximity and regional influences in the German VC market: VC companies in peripheral regions use syndication to multiply their own capital provision for start-ups in their home region.

Overall, the results clearly reveal that there are two reasons for there being no obvious regional equity gap for start-ups in Germany. First, regional proximity appears to be unimportant for German VC investments, especially because syndication is employed to overcome the problems of distant investment. Second, the German VC market is geographically more widely dispersed than, for example, the U.S. or U.K. markets, having seven core centers. Almost every region in Germany is easily reachable by VC suppliers within a circumference of about 150 kilometers of these core centers, which is in most cases a distance easily covered in two hours or less by car.

**Implications**

Financiers should not overemphasize the role of spatial proximity in making investment decisions. This finding is especially pronounced for the VC companies in this study in comparison to other types of relational investor. Of course, financiers need to take their particular resources and/or their position within a regional network into account, as well when making investment decisions. However, they should realize that self-imposed geographical restrictions will limit the possibilities for investments. Additionally, syndication can further reduce the importance of spatial proximity between financier and financed company if the financier is able to find a syndication partner located close to the investment. To this end, investors should make every effort to join the VC network in Germany so as to gain additional access to suitable syndication partners and investments.
The results in regard to the regional and spatial influences are also important for entrepreneurs. Being located in a region with only few relational financiers does not necessarily mean that a start-up will face a strong competitive disadvantage due to a regional undersupply of equity. Investors do not have to be located close to the venture; in most cases, one financier being nearby is sufficient. Therefore, the entrepreneur can look nationwide for possible investors. However, this could be costly and time consuming. Overall, though, the regional aspect of financing a start-up is less important than many entrepreneurs might think.

Finally, these results have important implications for policymakers. Public activity and relational financing can be one way of complementing existing regional policies. Locating public financiers in regions containing no or only few private suppliers could attract capital from outside this region. Syndication with nonlocal private financiers can enhance the local supply of entrepreneurial capital available. This possibility is supported by the finding that a location outside of one of the German VC centers is not a disadvantage in regard to the position of VC investors within syndicate network. Therefore, public activity, especially on the VC market, can be used as a part of regional policy but only if it overcomes spatial influences. Furthermore, the relatively clear unimportance of spatial proximity between VC companies and start-ups provides one additional area where public authorities can have a beneficial influence: they can encourage entrepreneurs and privately held financiers to enlarge their spatial and geographical horizons in regard to financial relationships. For example, a supra-regional or nationwide search for suitable financiers could be a difficult, expensive, and time-consuming challenge, especially for smaller start-ups. Therefore, a publicly supported nationwide database of financiers or monetary aid would be a tremendous boon. Setting up and maintaining such a database, although not without some problems, would be vastly cheaper than setting up costly public financial institutions and could have just as good, if not better, results in the realm of entrepreneur financing.
7.3 Publicly Influenced Venture Capital Companies Generally do what Theory Expects of them

Results

VC firms under governmental influence, the so-called public VC companies, seem to serve a market segment that is considerably different than that served by privately held VC companies. First, the interview survey (Section 6) reveals that public VC firms’ deal flow and evaluation of new investments reflects their business goals, such as, for example, overcoming failures in the market of entrepreneurial finance. Second, they offer fewer equity investments and prefer silent investments, financial products that are suitable to their task of promoting the economy and, particularly, entrepreneurship. Furthermore, they participate in the local business community and are strongly interconnected within the German VC market (Section 5). Being privately held or under governmental influence has no effect on the syndicate network behavior of VC firms. Through this interconnection with the German VC market, public VC suppliers help establish strong financial networks, which may spur the growth of the VC market and, along the way, ensure a suitable supply of capital for start-ups. This finding is extremely important because many public VC firms are located in peripheral regions instead of in the financial centers; indeed, in some cases, they are located outside the 150-kilometer circumference around the seven core VC centers mentioned above. Therefore, their strong syndication behavior helps attract capital for start-ups from outside their resident region and multiplies their own capital supply.

However, the analyses also indicate that public VC is a scaled-down version of VC in its original sense since it is comprised of considerably less hands-on support in the form of consulting. The question arises whether public VC is even necessary. Could privately held VC firms supply the entire market demand? From interviewee responses, I gleaned two different answers to this question. On the one hand, private VC companies do not want to invest in the companies public authorities are invested in because these investments, typically, do not fit into their risk-return requirements. For example, many start-up investments are small scale and, therefore, do not
generate enough profit to cover the attendant risk. On the other hand, private VC firms are not able to take on public VC investment because, simply put, the entrepreneurs prefer to receive financing from public equity suppliers. For example, many entrepreneurs have strong reservations about obtaining financing from private VC firms because of these firms’ focus on financing through equity stakes, which is profitable enough to cover the risk for the investor. The threat of losing control or even being dismissed by the financier is considerably lower for the entrepreneur if he or she chooses a silent investment offered by a public VC firm. Therefore, the results indicate that public VC might be helping to overcome market imperfections and that it is not explicitly crowding out private activity.

Implications

The findings concerning the investment activity of publicly influenced VC companies are relevant for privately held financial institutions. Public VC activity plays a significant role in Germany, both in regard to the number of VC firms and the number of investments made. The regional dispersion of public VC firms, in combination with their strong syndication behavior, can assist private financiers to find a co-investor in those areas where no or only few private investors are located. In addition to this spatial aspect, private financiers can benefit from syndication with their public counterparts because of public entities’ good regional market knowledge and their involvement within local business and financial networks.

Entrepreneurs should also take an interest in the role public VC suppliers play. Especially in German VC markets, public financiers are an important group of relational investors and they are located in many areas where no or only few privately held investors are seated. Furthermore, they focus on financial products different from those offered by their private counterparts, such as silent investments. These products are not usually accompanied by the loss of control that is involved in certain private investment arrangements, and may be more comfortable for an entrepreneur who is not ready for outside interference and/or advice. However, interference and advice might be exactly what some entrepreneurs need, especially
those not well-versed in business. Thus, entrepreneurs need to know that receipt of publicly-influenced financing will be not be accompanied by much else than the money itself, that is, there will be little offered in the way of advice or consultation.

For policymakers, the results should make clear that public intervention on VC market is not an end in itself. The investment behavior of public VC firms differs considerably from that of their privately held counterparts and reflects their goals of promoting entrepreneurship and building local business and financial networks. Therefore, public intervention in the market for smart capital is not without value. However, public authorities must be careful not to crowd out private activity in the market. Merely spending money on start-ups without taking the private supply of finance into account will lead to a dissipation of public money and will not automatically or even necessarily encourage entrepreneurship. Entrepreneurship is not solely dependent on the supply of capital. Money is only one, admittedly important, piece in the game. Public authorities may be able to level the playing field, so to speak, in ways other than actually, or only, financing start-ups, perhaps by providing information in the form of a nationwide database about types of and access to finance, or possibly subsidizing certain forms of infrastructure. Furthermore, making the public aware of how essential to success are knowledge and information diffusion and networking skills could create a rich and fertile environment in which entrepreneurs, and the companies who finance them, flourish and grow.
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Figures

Figure 1.1: Entrepreneurial finance and smart capital .............................................. 3
Figure 3.1: The spatial distribution of VC firms and R&D intensive start-ups
   in Germany ........................................................................................................ 42
Figure 3.2: Average share of investments within a certain distance
   (in percentage) ................................................................................................. 47
Figure 3.3: Average share of early stage investments within a portfolio
   (in percentage) ................................................................................................. 49
Figure 3.4: Average number of portfolio companies per investment manager .... 50
Figure 3.5: Average share of syndication partners within a certain distance
   (in percentage) ................................................................................................. 51
Figure 3.6: Ways of contacting possible investment targets .................................. 52
Figure 3.7: Average number of personal contacts and contacts via
   telecommunication per month ......................................................................... 53
Figure 4.1: The regional distribution of VC companies and Business Angels
   Networks in Germany ..................................................................................... 74
Figure 4.2: The regional distribution of VC investments in Germany ................. 75
Figure 5.1: Main component of the German VC syndicate network .................. 88
Figure 6.1: The spatial distribution of public and private VC firms in Germany .... 98
Figure 6.2: The spatial distribution of investments by the German
   Mittelständische Beteiligungsgesellschaften ............................................. 99
Figure 6.3: Importance of financial products (public and private VC firms) ....... 107
Figure 6.4: Share of early stage investments and ratio of portfolio companies
   per investment manager (public and private VC firms) ............................ 108
Figure 6.5: Average share of investments within a certain distance
   (public and private VC firms) ......................................................................... 109
Figure 6.6: Average share of syndication partners within a certain distance
   (public and private VC firms) ......................................................................... 110
Tables

Table 2.1: Importance of financial products (mean values) ......................................... 26
Table 2.2: Average share of early stage investments and average investment period per portfolio (in percentage) .......................................................................................... 26
Table 2.3: Importance of main variables (mean values) ................................................. 28
Table 2.4: The influence of financial products on the provision of consulting services (ordered logistic regression) ................................................................................. 31
Table 2.5: The influence of financial products on the influence by financiers (ordered logistic regression) ........................................................................................................... 32
Table 2.6: The influence of institutional backgrounds on the provision of consulting services (ordered logistic regression) .......................................................... 33
Table 2.7: The influence of institutional backgrounds on the influence by financiers (ordered logistic regression) ................................................................. 34
Table 3.1: Spatial concentration of financial institutions and innovative activity on a district level .................................................................................................................. 44
Table 3.2: Rank correlation coefficients for the relationship between the number of VC companies, banks, and potential investments (district level) .......... 45
Table 3.3: The determinants of the distance between investor and investment ......... 55
Table 4.1: Descriptive statistics of VC firms and investments ........................................ 62
Table 4.2: Distance and travel time between VC company and portfolio firm ......... 63
Table 4.3: Correlation coefficients of main variables regarding spatial proximity. 65
Table 4.4: Correlation coefficients of variables regarding syndication and the distance between VC company and portfolio firm ................................................. 67
Table 4.5: Independent samples t-test for comparing investments with a single investor and syndicated investments ................................................................. 69
Table 4.6: The effect of spatial proximity on the probability of syndication
(logit estimation) .......................................................................................... 70

Table 4.7: The effect of spatial proximity on the number of syndication partners
(negative binomial regression) ........................................................................ 72

Table 5.1: Descriptive statistics ............................................................................. 86

Table 5.2: Determinants of the number of syndication ties per VC company
(negative binomial regression) ........................................................................... 91

Table 6.1: Selection process of public and private VC companies
(mean values and results of Wilcoxon-Mann-Whitney test) .................... 112

Table 6.2: Consulting activities of public and private VC companies
(mean values and results of Wilcoxon-Mann-Whitney test) ....................... 114