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Patterns in Spatial Proximity between Venture Capital Investors and Investees in Germany – An Empirical Analysis –

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PATTERNS IN SPATIAL PROXIMITY BETWEEN VENTURE CAPITAL INVESTORS AND INVESTEES IN GERMANY - AN EMPIRICAL ANALYSIS –

Abstract

The paper analyses patterns in spatial proximity between venture capital investors and investees. We use a dataset of 950 dyads of venture capitalists and German new ventures which have closed a financing round between January 2002 and March 2007. We are the first study to use minimum travel time via car or plane as realistic measure of spatial proximity. Our results indicate that different factors relating to characteristics of the new venture, the venture capitalist and the financing round help explain variations in spatial proximity. We find that spatial proximity is more likely for younger ventures, ventures in knowledge-intensive industries, smaller, less specialised, more experienced, semi-profit oriented, or lead-venture capital investors, as well as for very small or very large investment volumes. Furthermore, we find the effects to be more pronounced for lead-investors.

Keywords: Venture capital, new venture, spatial proximity, entrepreneurial finance

JEL Codes: G24, G31, M13

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- An Empirical Analysis –

1 Introduction

The role of venture capital for regional development is widely discussed in theory and practice (Florida/Kenney (1988); Mason/Harrison (2002); Achleitner et al. (2009)). As venture capital investors provide financing to young, high risk and high growth companies, venture capital plays a vital role in alleviating economic growth (Samila/Sorenson (2008)). Furthermore, venture capitalists are found to accelerate innovative output in their portfolio companies (Kortum/Lerner (2000)). In addition to this direct effect, the venture capital market also has a positive indirect effect on economic renewal through spill-over effects of the R&D activities in the ventures they nurture (Jaffe (1986); Audretsch/Feldman (1996)). In this context, the importance of spatial proximity between venture capitalists and their portfolio companies is a relevant topic as it can explain the importance of locally established venture capital firms for a region.

Informational asymmetries as well as transaction costs are expected to be less pronounced in deals with close spatial proximity between the venture capital investor and the new venture. In addition, local networks can help to initiate the first contact, conduct the due diligence, and can be helpful in post-investment support. Empirical evidence of Anglo-Saxon venture capital markets such as the UK, the US or Canada underlines these arguments and shows that venture capital investors prefer investments in close geographic distances (e.g. Mason (1992); Sorenson/Stuart (2001); Cumming/Johan (2006)). In contrast, based on a survey of German venture capitalists Fritsch/Schilder (2008) found that the interviewed venture capitalists did not see spatial proximity as an important investment decision factor. They offer two main explanations for their diverging results compared to other studies. First, the German market is characterized with less pronounced spatial clustering compared to the US or the UK (Martin et al. (2002)). In addition, Germany has a dense travel infrastructure through a tight network of flight connections, train connections and highways which makes it relatively easy to reach nearly all locations. Second, German venture capitalists may be forced to invest in a more dispersed geographic location in order to find attractive investment opportunities because there may be a relatively lower number of such opportunities in Germany compared to more mature venture capital markets. However, their findings are based on a small sample of German venture capitalists and the perception of venture capitalists on the importance of spatial proximity may differ from their actual investment behaviour.

We therefore set out to further investigate the particularities of the German market based on archival data analysis of a large sample. In analysing specific patterns in spatial proximity between venture capitalists and their investees in Germany, we want to yield further evidence on the relevance of spatial proximity in venture capital finance for a continental European country. Our paper sheds light on how the likelihood of spatial proximity in Germany relates to certain factors characterizing the new venture, the venture capitalist and the deal. Analysed factors include the development stage and industry of the new venture, as well as the size, experience, level of specialization, and type of the venture capitalist. Finally, round specific aspects such as the investment volume or consecutive investment rounds are analysed. In addition to these characteristics, we investigate differences between lead- and co-investors in regard to the found relationships. We are able to yield important new findings with our detailed analysis of the German market, particularly for markets in similar development stages and with a similar infrastructure as Germany.

Important implications can be drawn from our detailed analysis of patterns in spatial proximity in the venture capital market. Venture capitalists can review their investment strategies in terms of their geographic focus in the light of their specific business model. Entrepreneurial teams can gain important insights on where to focus their search for adequate venture capitalists depending on individual characteristics of their new venture. Public policy makers can get a view on the group of new ventures for which locally established venture capital investors seem to be particularly important. Hence, they can evaluate what type of new ventures profit the most from policies targeting to build up a vital local venture capital market.

We use a sample of 950 dyads of venture capitalists and German new ventures from January 2002 to March 2007 provided by Dow Jones VentureSource. For estimating spatial proximity between the venture capitalist and the new venture we use the minimum travel time which for longer distances includes travel by plane. We are the first study to introduce this flight option and, therefore, we are able to project spatial proximity more realistically compared to other studies. In addition, it allows us to also include foreign venture capitalists, e.g. from the US, in our analysis.

2 Theoretical background and hypotheses

The relationship between venture capital investors and investees is often investigated in the light of *principal agent theory* (e.g. Gompers (1995); Wright/Robbie (1998); Sapienza/De Clercq (2000); Kaplan/Strömberg (2001)) as multiple principal agent rela-

tionships emerge in a venture capital deal. First, the venture capitalist can be viewed as principal investing in a new venture in which the entrepreneurial team as agent has an information advantage pre- and post-investment e.g. in regard to the business model, the technology, the product or the service and regarding their own experience and capabilities. Second, the venture capitalist can also be viewed as agent as he is expected to offer non-financial support through value adding activities (Sapienza (1992); Hellmann/Puri (2002)). This support is valuable as the venture capitalist often has accumulated industry-specific knowledge through other investments which goes beyond the knowledge of the entrepreneurial team. The entrepreneurial team can not foresee the capabilities and intentions of the venture capitalist prior to closing the deal.

In combination with information asymmetries these principal agent relationships lead to incentive problems which can be defined as agency costs. In order to reduce these costs, Jensen/Meckling) (1976) describe monitoring and bonding as two general solutions which can also be applied to the venture capital context. The screening and intensive appraisal of a potential investment through due diligence which the venture capitalist undertakes pre-investment can be subsumed under monitoring in a broad sense. The entrepreneurial team can try to assess the venture capitalist pre-investment through evaluating his experience and reputation build up through prior deals.

In a narrow sense, monitoring refers to measures of control applied post-investment by the venture capitalist, e.g. through a seat on the board of directors, special control and voting rights or frequent reporting obligations of the venture (Gompers (1995); Kaplan/Strömberg (2001)). Bonding measures include self bonding contracts by the entrepreneurial team which align the interests of the venture capital investor and the investee (Kaplan/Strömberg (2003)). In addition, high reputation can serve as a signal for post-investment behaviour of the venture capitalist and the entrepreneurial team.

Spatial proximity between the venture capitalist and the venture is likely to affect the measures to mitigate agency costs as described above. Pre-investment, the screening and due diligence process is easier and less expensive for venture capitalists if they are located closer to the venture. Onsite meetings and personal contacts are less difficult to arrange. In addition, it is less complicated to acquire information through direct or indirect sources on the venture or the venture capitalist respectively if both of them are based in the same geographic region. Therefore, the reputation of potential partners is easier to assess if a personal regional network can be used. Post-investment, frequent visits to the venture are easier to undertake as less time is spend in transit. Therefore, spatial proximity facilitates monitoring in a narrow sense of the venture capitalist as the

direct involvement in the venture and control of the entrepreneurial team is easier to pursue (Sorenson/Stuart (2001)).

Transaction cost theory uses the total transaction costs which include all costs and disadvantages incurred by the contracting parties in order to realize a transaction as criteria to evaluate alternative institutional structures or transactions (Williamson (1981)). Accordingly, a venture capital investor is going to choose the investment opportunity with lowest transaction costs when deciding between opportunities with identical expected returns. In theory, the same argument holds true for entrepreneurial teams when deciding between venture capitalists with the same expected financial and non-financial support. Many of the transaction costs relevant in a venture capital deal are sensitive to the geographic dispersion of the involved parties. Search and information costs are expected to be lower if the venture capital investor and the new venture are located in the same area because they can use their regional network to identify and evaluate potential targets. Negotiation and decision costs occur in an iterative process prior to closing a venture capital deal whereas monitoring and enforcement costs become relevant post-investment (Sorenson/Stuart (2001)). All of these costs incur travel and information expenses which are less when the venture capitalist and the new venture are in close spatial proximity to each other. Information expenses are likely to be higher for more dispersed dyads of venture capitalists and new ventures because less experience with local markets, regional particularities or local service providers is likely to require additional information which leads to higher labour effort or the need for support from third parties. Hence, it can be assumed that transaction costs decrease with closer spatial proximity between the venture capitalist and the venture.

In addition, *social exchange theory* postulates that the likelihood and intensity of a relationship increases sharply if parties are located close to each other as the probability of a random encounter is higher and a reduced effort is necessary to get in contact with each other (Thibaut/Kelley (1959); Blau (1977)). Local personal relationships facilitate the transfer of information as well as tacit knowledge and build closely knit personal networks (McPherson et al. (2001)). Applied to the venture capital context, this implies that spatial proximity between the venture capital investor and investee not only facilitates opportunity recognition through denser local networks but also enhances value-adding activities post-investment as the transfer of information as well as tacit knowledge and the provision of local contacts is easier.

In the light of principal agent theory, transaction cost theory and social exchange theory described above, we hypothesize that the likelihood of spatial proximity between ven-

ture capital investors and investees will be systematically related to certain characteristics of the parties involved and the type of deal. These characteristics are shortly described below and summarized in testable hypotheses.

Development stage of the new venture

The development stage of the new venture is likely to impact the need for a thorough due diligence pre-investment and for monitoring and non-financial support by the venture capitalist post-investment. Less developed companies are usually characterised by technological, resource or management uncertainties and, therefore, problems arising from informational asymmetries can be expected to be stronger than in more mature companies. In addition to these uncertainties, entrepreneurial teams of less mature companies are likely to be less experienced and to be less complementary in their set of capabilities. Thus, it can be expected that they require more non-financial support by the venture capitalist compared to more mature companies (Gupta/Sapienza (1992), Powell et al. (2002)). Therefore, we expect that the likelihood for spatial proximity is higher for portfolio companies in earlier stages of development. We hypothesize:

H1a: Likelihood for spatial proximity is higher for younger portfolio companies.

H1b: Likelihood for spatial proximity is higher for seed investment rounds.

H1c: Likelihood for spatial proximity is lower for later stage investment rounds.

Industry of the new venture

The industry of the new venture is likely to be another indicator for the level of informational asymmetries and the required level of control and non-financial support (Gompers (1995); Cumming/Johan (2006)). The liquidation value of assets is positively related to the tangibility of assets since tangible assets are easier to sell and yield a price closer to their book value in case of default (Williamson (1988)). Hence, a greater fraction of intangible assets may be related to higher agency costs as the venture capitalist's potential loss increases in case of the venture's default or inefficient continuation. Furthermore, a high R&D intensity may lead to a relatively high amount of firm specific assets which are more difficult to sell in case of the venture's default compared to less specialised assets (Shleifer/Vishny (1992)). New ventures focussing on research and development may also require a higher level of non-financial support in order to focus and to successfully market their innovative products. Finally, entrepreneurs may be more prone to pursue personally beneficial investment strategies at the expense of their investors if the value of their venture largely depends on future growth options (Myers (1977)). High market to book ratios are often used as an indicator of high growth opportunities in an industry. Thus, a high R&D intensity in terms of a high ratio of R&D expenses to total assets as well as high market to book ratios may indicate higher risks

and, hence, a need for closer monitoring (Gompers (1995)) or for non-financial support. Since informational asymmetries, and thus agency costs, are easier to mitigate and support activities are easier to conduct in spatial proximity, we anticipate:

H2a: Likelihood for spatial proximity is higher for portfolio companies in industries with higher ratio of intangibles to total assets.

H2b: Likelihood for spatial proximity is higher for portfolio companies in industries with higher ratio of R&D expenses to total assets.

H2c: Likelihood for spatial proximity is higher for portfolio companies in industries with higher market to book ratios.

Size and experience of the venture capitalist

Larger venture capital investors are usually able and required to operate within a broader geographic scope. They are likely to have a more dispersed network of contacts and are more visible in the industry compared to smaller venture capitalists. Therefore, they are able to receive comparably more supra-regional deal flow which can imply higher geographical distance to their portfolio companies compared to smaller venture capitalists (Gupta/Sapienza (1992)). Furthermore, the larger fund size implies that they have to include a larger geographic radius in order to find a sufficient number of high potential new ventures. Thus, we posit:

H3: Likelihood for spatial proximity is higher for venture capitalists with lower amounts of assets under management.

In addition to size, the experience of a venture capitalist is also likely to influence the size and geographic dispersion of his network (Sorenson/Stuart (2001)). We use age as proxy for the experience of a venture capitalist. With increasing age, the venture capitalist can build on a growing network of contacts from prior investments. This includes contacts to other industry players as well as to other venture capitalists with which syndicated investments were realised. Furthermore, the reputation of more experienced venture capitalists is also likely to be higher. More experienced venture capitalists are therefore expected to receive more supra-regional deal flow and to be able to support their portfolio companies with a larger network of contacts post-investment compared to less experienced venture capitalists. On average, this could lead to more distant investments by more experienced investors (Powell et al. (2002)). However, in addition to the spatial structure of the venture capitalist's network and thus deal flow also the quantity and quality of deal flow has to be considered. As has been stated, more experienced venture capitalists are expected to have tighter and larger networks, a higher reputation, and thus are likely to receive more and potentially better deal flow compared to younger industry players. If more experienced venture capitalists have the choice, they might focus their efforts on more proximate investment opportunities, since those are easier to

assess and easier to manage in the future. In contrast, less experienced venture capitalists might be restricted by their deal flow, which forces them to also accept more distant investment opportunities in order to build up their network and reputation (Cumming/Dai (2007)).

Therefore, it is unclear whether the likelihood of spatial proximity is higher for more or less experienced venture capitalists. Thus, no hypothesis can be formulated. Nonetheless, the experience of the venture capitalist could turn out to be a relevant variable for the importance of spatial proximity in venture capital investing.

Specialization of the venture capitalist

The level of specialization of a venture capitalist is likely to be related to the geographic dispersion of portfolio companies. Local markets may not offer sufficient numbers of attractive investment targets in a certain industry or development stage. Therefore, venture capitalists with a high specialization on an industry or stage are likely to be forced to include a broader geographic region in their search for attractive investment targets. We thus anticipate:

H4a: Likelihood for spatial proximity is higher for venture capitalists with lower specialization in terms of industry.

H4b: Likelihood for spatial proximity is higher for venture capitalists with lower specialization in terms of investment stage.

Type of venture capitalist

Corporate venture capitalists are expected to focus their venture capital activities on industries related to the industry of their holding company. Therefore, they are likely to have a rather narrow industry focus. Furthermore, we assume that the management of the investment is conducted by one of the corporate venture capitalist's branches and not by any other branch of the holding company. Thus, in line with the arguments presented above on diversification, we expect the likelihood of spatial proximity to be lower for corporate venture capitalists.

Semi-profit oriented venture capitalists include venture capital entities from savings banks, state-funded venture capitalists and other venture capitalists that do not follow an investment strategy focussed solely on financial return (see also Achleitner et al. (2009)). Instead, these venture capitalists have in common that they also pursue the objective to facilitate regional development through their investments. These types of investors should be located closer to their portfolio companies compared to other venture capitalists since their investment activities are constrained to certain regions (Gupta/Sapienza (1992); Fritsch/Schilder (2008)). Thus, we hypothesize:

H5a: Likelihood for spatial proximity is lower for corporate venture capitalists.

H5b: Likelihood for spatial proximity is higher for semi-profit oriented venture capitalists.

Investment volume per venture capitalist

The investment volume of a venture capital deal can influence the likelihood of spatial proximity between actors in two opposing directions. On the one hand, the expected profit can increase with the size of the investment as transaction costs do not increase in the same proportion as the deal size. Consequently, investors might be less reluctant to overcome large geographical distances the higher the investment volume (Martin et al. (2005); Fritsch/Schilder (2006)). On the other hand, the possibility of venture capital funds to diversify their portfolio declines with increasing investment sums per deal. This could lead to higher motivation of the venture capitalist for more frequent interaction and support for each single investment in case of a low level of diversification and i.e. high investment volumes. It could then be of advantage to be located closer to the investment the higher the investment volume.

Hence, the overall relationship between the likelihood of spatial proximity and the investment volume is not clear. However, the relative effect of the transaction costs on the expected profits decrease with an increasing investment volume while the costs of not being able to appropriately diversify the portfolio increase. Therefore we anticipate:

> *H6: Likelihood for spatial proximity decreases with larger investment volumes up to a certain threshold and increases thereafter.*

Consecutive investment round

As explained above, informational asymmetries and transaction costs are expected to be lower for deals with closer distance between the venture capitalist and the venture. In addition, the support through the provision of local contacts is easier. Therefore, it can be hypothesized that financing rounds which include venture capital investors and investees located closer to each other incur less problems compared to financing rounds with regionally dispersed actors. In addition, venture capitalists could be more willing to finance consecutive financing rounds of ventures close to them as they have build up a closer relationship and as value-adding activities in future rounds are easier. Underlining these arguments, Sapienza/Gupta) (1994) find first empirical evidence that geographic distance and the venture's performance are negatively correlated. The likelihood of receiving future financing rounds is then expected to be higher for deals with closer spatial proximity between the venture capital investor and the investee. We thus posit:

> *H7: Likelihood for spatial proximity is higher for consecutive investment rounds by the same investor.*

Lead-investor vs. co-investor

Lead-investors usually have a key role in a syndicated venture capital deal. They are likely to be more involved in trying to mitigate informational asymmetries by supporting and monitoring the venture more closely compared to co-investors. Empirical evidence shows that they have more face to face meetings with the management of their portfolio companies compared to co-investors (Wright/Lockett (2003)). Furthermore, first empirical indications exist that syndication is used as a measure to overcome challenges of regionally dispersed investments (Fritsch/Schilder (2006)). Therefore, it is expected that for lead-investors spatial proximity to the venture is more important than for co-investors. Thus, we anticipate:

H8: Likelihood for spatial proximity is higher for lead-investors.

H9: Some of the effects of the elaborated hypotheses differ between lead- and co-investors.

3 Empirical evidence

3.1 Sample description and methodology

Our analysis is based on a sample of 950 dyads of venture capitalists and portfolio companies. The dyads include 364 German new ventures that received 504 venture capital financing rounds from 187 different venture capital investors between January 2002 and March 2007. The data was gathered from the Dow Jones VentureSource database.

The collected data included the location of all branches of both parties, the portfolio companies' age and industry, the venture capitalists' size as assets under management, age of the venture capitalist, and role as co- or lead-investor, as well as the type, total amount raised, and number of investors in the financing round. In total, VentureSource reports 756 financing rounds of German ventures in the respective time frame, which leads to 1,402 dyads of venture capitalists and portfolio companies. Unfortunately, 452 dyads had to be excluded due to missing values for certain variables. In most of these cases either the amount raised in the financing round, the assets under management or the age of the venture capital investor were not provided by VentureSource.

Dependent variable: Spatial proximity

In order to analyze spatial proximity between the venture capitalist and the new venture this paper is the first that includes a flight option and investigates the minimum travel time for each dyad. Various measures of spatial proximity like spherical distance, car distance, or car travel time are proposed in the literature (Lerner (1995); Sorenson/Stuart (2001); Fritsch/Schilder (2006)). These measures have the common weakness of providing very large values for longer distances, especially for intercontinental relationships. The long distance does not represent the actual travel time in case a

good flight connection exists. In order to represent spatial proximity more realistically, one has to estimate the shortest travel time which can be achieved with different means of transport including car or air plane. By including a flight option we provide the first study that adequately accounts for long distances between the venture capitalist and the new venture. We are therefore able to include international and especially intercontinental relationships in our analysis. We used Google Maps to collect average travel times by car between the two parties' ZIP codes. In case a venture capitalist runs several offices, we assumed that the office located the closest to the new venture is in charge of the deal. If the car travel time was greater than three hours, a flight option was investigated. Then the travel time was assumed to be the sum of the car travel time from the investor to the closest airport, a check-in time of 60 minutes, the average flight time to the airport closest to the venture, a check-out time of 30 minutes and the car travel time from the airport to the venture. The appropriate airport was assigned to each venture capitalist and portfolio company as follows: First, Germany was divided into 97 areas according to the first two digits of the five digit ZIP code. Second, each of the areas was assigned to one of the 13 largest German airports. If there was no flight connection between two airports or if a foreign venture capitalists was involved, the optimal flight connection was investigated manually. Finally, the smaller value of car or flight option was used as minimum travel time. In 31,5% of the dyads the flight option was finally used.

Independent variables

Development stage of the new venture. The age of the new venture at each financing round was provided by VentureSource. Seed, first, second and later stage rounds were included in the analysis according to the VentureSource round class definition.

Industry of the new venture. We use an approach similar to Gompers) (1995) to construct generic industry variables for each new venture because individual accounting data of portfolio companies was not available. Annual industry averages for each GICS code (Global Industry Classification Standard) were calculated by using all German companies listed in the Thomson ONE Banker database. The eight digit GICS code was used to form a group. If there were fewer than four companies in a group, the six digit GICS group was used instead. In case there were still not enough companies in one group, the level was further reduced until at least four companies were in the group. Following this procedure, annual industry variables for the asset tangibility (intangibles to total assets), research intensity (R&D expenses to total assets), and growth opportunities (market to book ratio) were calculated. In addition, each new venture in our sample

was assigned to an eight digit GICS code according to its VentureSource industry code. Finally, the data were matched by date and industry to each financing round.

Size and experience of the venture capitalist. Assets under management were used as proxy for the size of a venture capitalists. For experience, we used age of the venture capital firm as proxy. Both of these variables were provided in the VentureSource database.

Specialization of the venture capitalist. To characterize the portfolio strategy of each venture capitalist, we calculate Herfindahl-Hirschman Indices (HHI) to measure the specialization across different industries and financing stages (Lossen (2007)). To calculate the HHI the fraction of investment rounds per industry and stage was determined for each venture capitalist over the whole sample time period. The respective fractions were then squared and summed up. In consequence, a HHI of 1 indicates a very high specialization (i.e. a venture capitalist investing in only one industry or stage) and a HHI close to 0 indicates a very high diversification. We calculated the HHI only for those venture capitalists which participated in at least 3 financing rounds throughout the sample period. As categorization of industries, the VentureSource industry segment, which entails 16 categories, was used. The VentureSource round class, which comprises seed stage, first stage, second stage, and later stage, was used to categorize financing stages.

Type of venture capitalist. We determined the type of venture capitalist by analyzing his shareholder structure. Most of the venture capitalists report their shareholder structure to the Bundesverband Deutscher Kapitalbeteiligungsgesellschaften (BVK) which publishes them on their website (www.bvkap.de). In case a venture capitalist was not included, a web search was conducted or the venture capitalist was contacted directly. Each venture capitalist was categorized in one of the following groups: independent venture capitalist (i.e. independent venture capitalists, subsidiaries of financial corporations, and others), corporate venture capitalists (i.e. subsidiaries of non-financial corporations), semi-profit venture capitalists (i.e. Mittelständische Beteiligungsgesellschaften (MBG), subsidiaries of savings or cooperative banks, state banks, promotional banks, and other institutions linked to the German government (see also Achleitner et al. (2009)).

Investment volume per venture capitalist. To test the impact of the investment volume on the likelihood of spatial proximity we assume that each venture capitalist contributes equally to the total amount raised in a financing round. Thus, the investment volume per

venture capitalist is determined by dividing the total amount raised as given in VentureSource by the number of participating investors in a financing round.

Consecutive investment round. A discrete variable indicating the count number of the follow on financing round of an investor was generated.

Lead-investor vs. co-investor. We created a dummy variable for lead investors based on the data given in VentureSource.

Control variables

To control for further effects influencing spatial proximity between venture capitalists and portfolio companies, we also collected several control variables. To account for structural differences in the historical and present economic development as well as development of the German venture capital industry, a dummy variable was collected which entails whether a new venture is *located in the former German Democratic Republic* (GDR). Venture capitalists might also perceive investment opportunities differently depending on whether the venture is located in an urban or rural area. Therefore, data on the *annual population density* of each German district was collected from the GENESIS database of the federal statistical office and included as a dummy variable. Further control variables for economic development included *total German venture capital fundraising* in the previous calendar year and *total German venture capital investments* in the calendar year of the respective financing round, as well as the discrete *return of the MSCI Germany Small Cap Index* over the last twelve months before the respective financing round. These variables were collected from Thomson SDC – VentureXpert and Datastream. Finally, the venture capitalist's total number of offices as provided by VentureSource was included to control for proximity between both parties which is simply induced by multiple offices.

Methodology

As can be seen in *Figure 1*, the minimum travel time as dependent variable is not normally distributed. First, the minimum travel time is restricted to positive values. Second, the distribution exhibits multiple maxima. This is due to the inclusion of the flight option, which leads to many observations with a minimum travel time between three and four and a half hours. In consequence, OLS and even Tobit models are not appropriate to analyze the observed spatial proximity (Wooldridge (2008)). However, the minimum travel time can sensibly be divided in ordinal categories, which are easy to interpret. Thus, we use ordered logit regressions to test our hypotheses.

Each dyad was assigned to a certain category depending on its minimum travel time. The used categories are depicted in *Figure 1***Error! Reference source not found.**. The

first category contains all dyads with a minimum travel time from zero to half an hour, which represents a very short distance and means that the venture is a taxi ride away. The second category (greater than half an hour to one and a half hours) represent relatively short car distances, while the third category (greater than one and a half hours to three hours) already contains quite substantial car distances. The forth category (greater than three to four hours) mainly contains national and European flight connections as well as longer car distances. Finally, the fifth category (greater than four hours) contains flight connections and very long car distances.

Table 1 shows descriptive statistics of relevant variables. Some variables do either have a very large skewness or contain some outliers. Whenever it makes economic sense, these variables were included with their logarithmic value in our final models. In consequence, the problem of skewness and outliers is alleviated and the impact of these variables is modelled with a decreasing impact of their absolute variations.

3.2 Empirical results

An analysis of the correlation matrix, which is shown in *Table 2*, offers first insights into bivariate relationships. As many of the variables are dichotomous or categorical *Table 2* depicts Kendall's tau. The correlations of different measures for spatial proximity with characteristics of the venture capitalist, the venture, and the respective financing round are fairly small in most cases but reveal several significant bivariate relationships.

Table 3 shows the results of the ordered logit regressions. The dependent, ordinal variable contains five categories which were built based on the minimum travel time as described above. A higher category number indicates a larger minimum travel time between the venture capitalist and the new venture. Model OL 1 includes all variables in their original linear form. However, for many variables it makes economic sense to include their logarithm as the relative variation of the respective variable is pivotal. In consequence, Model OL 2 includes the logarithm of certain variables if appropriate. Model OL 3 replaces the strictly monotonic increasing effect of the investment volume by a non-linear effect which allows minima or maxima. Thus a linear and a quadratic effect are included jointly. As can be seen in *Table 3*, Model OL 3 provides a better fit to the data as indicated by a higher Nagelkerke's R^2 of 27.00% and a smaller Akaike Information Criterion (AIC). Thus, the following discussion of results will be mainly based on Model OL 3. Model OL 4 tests the impact of the venture capitalist's speciali-

zation on the likelihood of spatial proximity. This test was conducted separately as it reduces the available sample size to 859.

In addition, we tested whether there are structural differences between lead- and co-investors other than the general intercept. Therefore, we ran regressions on different subsamples. The results are shown in the Model OL 5. Model OL 5 (Lead-Inv.) includes only those dyads in which the respective venture capitalist served as lead-investor and Model OL 5 (Co-Inv.) includes the remaining dyads.

Development stage of the new venture

The results show that on average younger portfolio companies exhibit more spatial proximity to their investors and thus support Hypothesis 1a. Hypothesis 1b, seed rounds are usually financed by proximate investors, is not supported as the coefficient is not significant. The correlation matrix in *Table 2* reveals, that the seed round dummy is negatively correlated to the investment volume per venture capitalist and the portfolio companies' age. The coefficients of these variables are significant, which indicates that these variables overlay the effect of the seed round dummy on the minimum travel time. Overall, Model OL 3 depicts a negative point estimate for the later stage dummy which even becomes significant in Model OL 4. These results suggest that later stage rounds are financed by venture capitalists with shorter minimum travel times. This is surprising and contradicts hypothesis 1c. A closer look at the separate models for lead- and co-investors reveals, that this effect is mainly driven by co-investors, which are closer to their investments in later stage rounds. Lead investors on average tend to exhibit less spatial proximity to their later stage investments, even though this effect is not significant. We currently do not have an explanation for this effect and further research is required.

Industry of the new venture

Regarding the portfolio companies' industry, the results indicate that the observed spatial proximity between venture capitalist and portfolio companies with low asset tangibility is higher compared to others. This supports hypothesis 2a. The effects of the venture's research intensity (H2b: R&D expenses to total assets) and future growth perspectives (H2c: market to book value) are not significant, but the point estimates of the coefficients indicate the hypothesized direction.

Size and experience of the venture capitalist

All analyzed models clearly show, that larger venture capitalists in terms of assets under management have a larger investment radius, since they are under pressure to invest their assets. Thus, hypothesis 3 is supported. The effect itself seems to be diminishing

the larger the venture capital investor is because the significance level of the logarithm of assets under management exhibits a higher significance level compared to the linear effect.

The empirical analysis further reveals that older and thus more experienced venture capitalists on average invest in more proximate ventures. In consequence, the effect that more experienced venture capitalists are able to choose more proximate investment opportunities among a higher quantity and quality of deal flow outweighs the effect of a geographically more dispersed network. This is a very interesting result as it could be an indication that more experienced venture capitalists are aware of the advantages of spatial proximity and choose ventures in short travel distances.

Specialization of the venture capitalist

Model OL 4 indicates that the average minimum travel time increases the higher the specialization of venture capitalists is in regard to industry and stage. These results support hypotheses 4a and 4b and show that investors are willing or forced to give up the advantages of spatial proximity in order to follow their specialization strategies.

Type of venture capitalist

Hypothesis 5a, corporate venture capitalist are willing to invest in more distant ventures due to their primarily strategic interests, is supported by Model OL 3. Moreover, this result is robust to the inclusion of the specialisation variables in Model OL 4.

The results also support hypothesis 5b, which states that semi-profit oriented venture capitalists invest in more proximate ventures. As has been stated above, these venture capitalists are mainly influenced by public policy or other restrictions, which leads to a limitation of their target area on specific regions.

Investment volume per venture capitalist

Models OL 2 and 3 provide insights into the impact of the investment volume on the likelihood of spatial proximity. As can be seen in Model OL 2 a strictly monotonic increasing effect of the logarithm of the investment volume can not be proved. In unreported regressions we also tested a pure linear effect of the investment volume which is also not significant. Thus, a non-linear effect which allows minima or maxima was included in Model OL 3. As can be seen in *Table 3* a linear and a quadratic effect are jointly included and both effects are significantly different from zero. Hence, with increasing investment volume the positive linear effect is more and more offset by the negative quadratic effect. This results in an inverted u-shaped relationship and supports hypothesis 6. The likelihood of a distant investment increases up to an investment volume of about 3.5 m€ and decreases thereafter. This is an intriguing result as it implies

that for small investments transaction costs outweigh the desire to monitor investments more intensively. In contrast, for large investments the need for more close monitoring outweighs the relatively lower transaction costs.

Consecutive investment round

Consecutive investment rounds by the same venture capitalist are on average closer to the investor in terms of minimum travel time which supports hypothesis 7. This result indicates that the spatial proximity between both parties is regarded as important in order to continue the relationship. The observed closer proximity of consecutive investment rounds may have two rationales. Either the involved parties decide not to continue distant relationships more often because closer relationships have more advantages. Or portfolio companies decide to move their venture closer to typical locations of venture capital investors after initial investment rounds because proximity is regarded as success factor. As the second rationale seems to be less realistic, the effect may prove the importance of spatial proximity for venture capital investment decisions.

Lead-investor vs. co-investor

Hypothesis 8, lead-investors are expected on average to be located more proximate to the new ventures compared to co-investors, is also supported by the data (Model OL 3). Furthermore, a comparison of the results of the different subsamples of Model OL 5 and Model OL 4 indicates that there are also structural differences between lead- and co-investors. A Chi^2 difference test whether the models on the divided subsamples provide a better fit compared to Model OL 4 is significant at a 10% level. Thus, hypothesis 9 is supported. In most cases the difference in the coefficient's point estimates for lead- and co-investors are in line with our hypotheses. Thus, the coefficients for the venture's age and later stage dummy, the venture capitalist's age and corporate venture capitalist dummy, as well as for the investment volume and the consecutive financing round indicate a stronger impact for lead-investors compared to co-investors. In contrast, the venture capital investor's size has a greater impact on the average minimum travel time for co-investors compared to lead-investors. This implies that co-investors are less reluctant to increase their investment radius in order to find a sufficient number of investment opportunities compared to lead-investors. Furthermore, specialized venture capital investors seem to prefer the role of a co-investor if they are investing in more distant ventures as the coefficients for specialization are more pronounced for co-investors. Only the coefficients for the venture's seed round dummy and industry variables as well as for the semi-profit oriented venture capitalist dummy show mixed results. *Table 4* summarizes the tested hypotheses and the empirical results.

3.3 Robustness checks

Various robustness checks were conducted to verify the empirical results presented above. In unreported regressions, multiple alternative category definitions for the dependent variable minimum travel time were tested. Furthermore, alternative model definitions including smaller sub-models were tested. The main results remained unchanged which supports the reported results. In addition, unreported regressions suggest that the consideration of a flight option leads to clearer results compared to alternative measures of spatial proximity like car travel time or car distance.

For all presented models we also tested OLS regressions with ln(1 + minimum travel time) as dependent variable. The results are presented in *Table 5* in the appendix. Most results remain unchanged with minor differences in the significance of the coefficients. Only the coefficient of the seed round dummy changed its sign, but was not significant. Moreover, all models were tested for multicollinearity. The variables of our core Models OL 1 – 4 revealed only low multicollinearity for most variables. Only the linear and quadratic term of the investment volume have moderate to high variance inflation factors (VIFs) of 6.85 and 6.11 respectively. The VIFs of the other variables are always equal or below 3.53. However, the VIFs of the different subsamples of Model OL 5 indicate fairly high multicollinearity for both terms of the investment volume. Thus, the coefficients of these variables have to be interpreted with caution in Model OL 5. The VIFs of the other variables are equal or below 3.68 in both subsamples of Model OL 5 (Wooldridge (2008)).

Finally, in unreported regressions also Tobit models and multinomial logit regressions were tested and suggested that our results are robust. All unreported regressions are available upon request.

4 Conclusion

The aim of our paper is to extend the understanding of patterns in spatial proximity in venture capital finance in Germany and comparable continental European countries. We investigate how the likelihood of spatial proximity relates to different characteristics of the new venture, the venture capitalist and the financing round. We use a dataset of 950 dyads of venture capitalists and German new ventures which closed a financing round between January 2002 and March 2007.

We use ordinal logit regressions to depict patterns in the geographic dispersion of these dyads. It is the first study to use the minimum travel time including travel by car and/or

plane to estimate spatial proximity as dependent variable realistically and to be able to include intercontinental deals. As independent variables, we use characteristics of the new venture, the venture capitalist, and the respective financing round. Investigated venture characteristics include factors relating to the development stage (age, seed, early or later stage) and the industry (generic industry ratios such as intangibles to total assets, R&D expenses to total assets, market to book ratios). In regard to the venture capitalist its size (assets under management), experience (age), level of specialization (in terms of industry, stage), and type (independent venture capitalist, corporate venture capitalists, semi-profit oriented venture capitalists) were analyzed. Finally, variables relating to other specifics of the financing round (investment volume, consecutive investment rounds) were scrutinized. In addition, we investigated differences between lead- and co-investors in regard to the found relationships.

Key findings are that younger ventures as well as ventures in knowledge-intensive industries are likely to be located closer to their venture capitalist. This is in line with principal agent theory as these characteristics are an indicator for the level of informational asymmetries. In line with Kaserer et al.) (2007) and EFI (2009), this fact also suggests that a local investor base is crucial to spur innovation within regions. This has important implications for policy makers of countries such as Germany which have clusters of venture capitalists in certain regions. It could possibly help to improve regional development in deprived areas if a local venture capital market is established through institutional settings.

Later stage deals were not found to be geographically further dispersed which contradicts principal agent theory based arguments. Further research is required to understand this phenomenon. In addition, we find that larger venture capitalists are forced to increase their investment radius in order to find a sufficient number of high potential ventures and seem to have a larger network from which to benefit as they are found to realize more geographically dispersed deals.

Older and thus more experienced venture capitalists exhibit shorter distances to their portfolio companies in our sample. This implies that they are able to benefit from their higher quantity and quality of deal flow and are able to choose more proximate deals compared to their younger counterparts. Venture capitalists with a high degree of specialization in terms of industry or stage were found to realize deals with less spatial proximity. Thus, also corporate venture capitalists on average invest in more distant new ventures. As expected, semi-profit oriented venture capitalists in our sample were focussed on local new ventures in their investment strategy.

In regard to the investment volume, an inverted u-shaped relationship exists. Up to an investment volume of about 3.5 m€ investors are willing to increase their investment radius as the relative importance of transaction costs declines. However, for investment volumes larger than about 3.5 m€ the desire to monitor larger investments more intensively outweighs the advantage of a reduced relative impact of transaction costs. Finally, lead investors were found to be located closer to their portfolio companies in general and we found that the findings described above are even more pronounced for lead-investors than for co-investors.

An important limitation of our study is the problem of causality. Spatial proximity is not a pure endogenous variable but is likely to impact the investment decision. Venture capitalists and/or new ventures are likely to base their decision to close a deal also on the geographical distance between them. This effect then determines the composition of our sample of venture capital financing rounds and causes the relationships that we explored in our study. In consequence, our results can not be interpreted as causal relationships but have to be interpreted as correlations. Future studies could tackle this problem by modelling spatial proximity in conjecture with other decisive factors as a variable impacting the likelihood that a venture capital financing round will take place to shed further light on this issue.

Overall, our results indicate that the patterns in spatial proximity in venture capital finance are shaped by a broad combination of characteristics of the new venture, the venture capitalist and the financing round. In finding patterns in the geographic dispersion of German venture capital deals, we are able to show that the relevance of spatial proximity seems to differ systematically for certain types of new ventures, venture capitalists and deals. This gives an important indication that spatial proximity is in fact an investment decision factor contradicting the findings of Fritsch/Schilder (2008). Our study leads to important implications for entrepreneurial teams, venture capitalists and policy makers alike as the results give indications for what type of venture capital deals spatial proximity seems to be particularly relevant and, hence, a vital, locally established venture capital market appears to be more important.

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6 Appendix

Figure 1: Distribution of minimum travel time

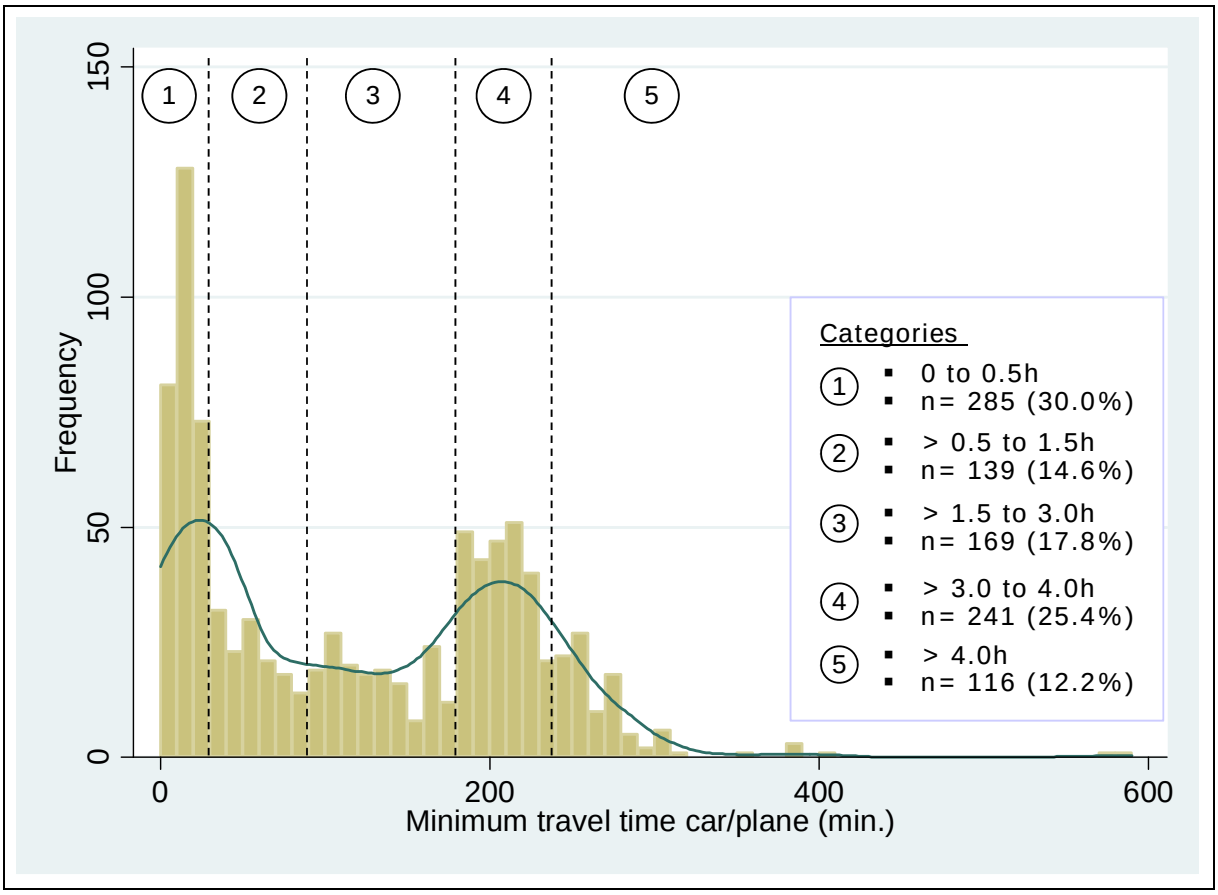

Table 1: Descriptive statistics

This table reports descriptive statistics for the variables used in our multivariate tests. The sample consists of 950 dyads of venture capitalists and German portfolio companies which have closed a financing round between January 2002 and March 2007.

Variable	n	Mean	Median	S.D.	Min	Max
Proximity / Distance						
Ordinal min. travel time (5 cat.)	950	2.75	3.00	1.42	1.00	5.00
Min. travel time (min.)	950	132.93	114.50	133.74	0.00	1,166.00
Car travel time (min.)	930	163.16	109.00	169.86	0.00	997.00
Car Distance (km)	950	438.92	194.00	1,142.86	0.00	9,672.00
Venture						
Age (years)	950	4.54	4.00	3.46	0.01	23.56
Dummy seed stage round	950	0.03	0.00	0.17	0.00	1.00
Dummy early stage round	950	0.58	1.00	0.49	0.00	1.00
Dummy later stage round	950	0.39	0.00	0.49	0.00	1.00
Intangibles to total assets	950	0.17	0.15	0.06	0.00	0.34
R&D exp. to total assets	950	0.13	0.11	0.09	0.00	0.33
Market to book	950	2.80	2.05	3.86	-16.32	25.87
Venture capitalist						
Assets under management (m€)	950	1,280.35	124.90	3,680.39	2.00	38,766.54
Age (years)	950	11.11	6.28	13.68	0.10	61.65
HHI industry	859	0.43	0.33	0.23	0.19	1.00
HHI stage	859	0.42	0.39	0.13	0.26	1.00
Dummy independent VC	950	0.75	1.00	0.43	0.00	1.00
Dummy corporate VC	950	0.06	0.00	0.23	0.00	1.00
Dummy semi-profit VC	950	0.19	0.00	0.39	0.00	1.00
Dummy lead-investor	950	0.35	0.00	0.48	0.00	1.00
Round						
Investment volume per VC (m€)	950	1.68	1.23	1.42	0.01	11.00
No. of consecutive round	950	0.86	1.00	1.07	0.00	7.00

Table 2: Correlation matrix

This table presents the correlation coefficients based on Kendall's tau between the variables used for our multivariate tests. The sample consists of 950 dyads of venture capitalists and German portfolio companies which have closed a financing round between January 2002 and March 2007.

	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Ordinal min. travel time (5 cat.)	1.000												
2 Min. travel time (min.)	0.885 *	1.000											
3 Car travel time (min.)	0.852 *	0.923 *	1.000										
4 Car Distance (km)	0.852 *	0.901 *	0.969 *	1.000									
5 Venture age (years)	0.027	0.032	0.022	0.024	1.000								
6 Dummy seed stage round	-0.066 *	-0.074 *	-0.072 *	-0.075 *	-0.211 *	1.000							
7 Dummy early stage round	0.013	0.016	0.016	0.014	-0.348 *	-0.213 *	1.000						
8 Dummy later stage round	0.011	0.010	0.010	0.013	0.428 *	-0.144 *	-0.937 *	1.000					
9 Intangibles to total assets	-0.070 *	-0.068 *	-0.068 *	-0.066 *	0.022	0.062 *	-0.065 *	0.044	1.000				
10 R&D exp. to total assets	-0.025	-0.033	-0.070 *	-0.047 *	0.093 *	-0.042	-0.111 *	0.127 *	0.085 *	1.000			
11 Market to book	-0.005	-0.011	-0.010	-0.012	0.124 *	0.032	-0.080 *	0.070 *	0.368 *	-0.038	1.000		
12 VC Assets under management (m€)	0.101 *	0.108 *	0.082 *	0.093 *	0.024	-0.088 *	-0.070 *	0.103 *	-0.024	0.025	0.003	1.000	
13 VC age (years)	-0.034	-0.026	-0.040	-0.033	0.126 *	-0.092 *	-0.076 *	0.110 *	0.022	0.048 *	0.117 *	0.361 *	1.000
14 HHI industry	0.095 *	0.069 *	0.043	0.057 *	0.012	0.054	-0.067 *	0.048	0.026	0.176 *	0.070 *	-0.105 *	-0.109 *
15 HHI stage	0.097 *	0.091 *	0.076 *	0.087 *	0.115 *	-0.092 *	-0.141 *	0.177 *	-0.029	0.006	-0.002	0.132 *	0.056 *
16 Dummy independent VC	0.167 *	0.148 *	0.143 *	0.155 *	0.018	-0.064 *	-0.045	0.068 *	-0.012	-0.003	-0.018	0.054 *	0.126 *
17 Dummy corporate VC	0.097 *	0.086 *	0.092 *	0.081 *	-0.036	-0.018	-0.007	0.014	0.048	-0.052	0.012	0.004	-0.124 *
18 Dummy semi-profit VC	-0.240 *	-0.212 *	-0.210 *	-0.218 *	0.001	0.081 *	0.053	-0.083 *	-0.015	0.033	0.012	-0.061 *	-0.065 *
19 Dummy lead-investor	-0.011	-0.002	0.010	-0.002	-0.045	0.082 *	0.114 *	-0.145 *	0.018	-0.090 *	0.010	-0.038	-0.022
20 Investment volume per VC (m€)	0.146 *	0.137 *	0.118 *	0.127 *	0.044 *	-0.179 *	0.005	0.059 *	-0.080 *	0.039	0.021	0.249 *	0.123 *
21 No. of consecutive round	-0.051	-0.050 *	-0.054 *	-0.038	0.279 *	-0.163 *	-0.284 *	0.346 *	0.006	0.075 *	0.078 *	-0.075 *	0.099 *
22 Dummy East German venture	-0.012	0.003	0.033	0.026	0.146 *	-0.078 *	-0.008	0.036	-0.019	0.030	0.053 *	-0.037	-0.008
23 Dummy urban venture location	-0.063 *	-0.067 *	-0.025	-0.029	0.071 *	-0.058	-0.156 *	0.178 *	0.151 *	-0.080 *	0.115 *	0.033	0.033
24 VC's no. of offices	-0.067 *	-0.048 *	-0.060 *	-0.060 *	-0.026	-0.077 *	-0.041	0.069 *	0.045	-0.003	-0.004	0.452 *	0.343 *
25 Germany VC fundraising (t-1)	-0.011	-0.014	-0.016	-0.013	-0.179 *	0.081 *	0.045	-0.075 *	0.094 *	0.014	-0.181 *	-0.083 *	-0.151 *
26 Return of MSCI SC Germany (ltm)	0.026	0.030	0.027	0.026	0.117 *	-0.035	-0.085 *	0.099 *	0.003	0.020	0.197 *	0.073 *	0.153 *
27 Germany VC investments	-0.014	-0.004	-0.011	-0.009	-0.104 *	0.003	0.071 *	-0.073 *	0.063 *	-0.027	-0.210 *	-0.045	-0.094 *

	14	15	16	17	18	19	20	21	22	23	24	25	26	27
14 HHI industry	1.000													
15 HHI stage	0.079 *	1.000												
16 Dummy independent VC	0.091 *	0.120 *	1.000											
17 Dummy corporate VC	0.094 *	0.031	-0.425 *	1.000										
18 Dummy semi-profit VC	-0.146 *	-0.144 *	-0.849 *	-0.118 *	1.000									
19 Dummy lead-investor	0.002	-0.002	0.154 *	-0.073 *	-0.126 *	1.000								
20 Investment volume per VC (m€)	0.013	0.086 *	0.178 *	-0.020	-0.184 *	-0.002	1.000							
21 No. of consecutive round	0.058 *	0.002	0.002	-0.017	0.007	-0.149 *	-0.089 *	1.000						
22 Dummy East German venture	-0.059 *	-0.006	-0.238 *	-0.005	0.264 *	-0.024	-0.015	0.058	1.000					
23 Dummy urban venture location	-0.050	0.133 *	0.067 *	0.050	-0.103 *	-0.023	0.020	0.047	0.186 *	1.000				
24 VC's no. of offices	-0.193 *	0.052 *	0.102 *	0.078 *	-0.157 *	-0.009	0.140 *	-0.101 *	-0.110 *	0.042	1.000			
25 Germany VC fundraising (t-1)	0.012	-0.042	0.039	-0.007	-0.039	0.047	-0.029	-0.127 *	-0.068 *	-0.049	-0.042	1.000		
26 Return of MSCI SC Germany (ltm)	-0.014	0.013	0.002	-0.035	0.018	0.013	0.007	0.123 *	0.024	0.038	0.038	-0.499 *	1.000	
27 Germany VC investments	-0.019	-0.077 *	0.017	-0.013	-0.011	0.003	-0.066 *	-0.091 *	-0.024	-0.075 *	-0.018	0.384 *	-0.227 *	1.000

* $p < 0.05$

Table 3: Ordered logit regressions

This table presents the results of ordered logit regressions with ordinal categories of the minimum travel time as dependant variable. The sample consists of 950 dyads of venture capitalists and German portfolio companies which have closed a financing round between January 2002 and March 2007. Smaller sample sizes in some models are due to missing values. HHI: Herfindahl-Hirschman Index; *, **, ***: significant at the 10%, 5%, and 1% level, respectively.

					OL 5	
Variable	**OL 1**	**OL 2**	**OL 3**	**OL 4**	**Lead-Inv.**	**Co-Inv.**
Dep. var.: Ordinal min. travel time						
Venture						
Age (years)	0.0353 *					
ln(age)		0.2627 ***	0.2607 ***	0.2465 ***	0.3191 **	0.1878 *
Dummy seed stage round	-0.4090	0.2233	0.2545	0.1512	0.1262	0.0771
Dummy later stage round	0.0655	-0.1398	-0.1494	-0.3793 **	0.2730	-0.7065 ***
Intangibles to total assets	-3.1590 **	-3.5425 **	-3.4984 **	-3.6229 **	-3.8615 *	-3.1445 **
R&D exp. to total assets	0.1350	-0.2055	-0.3040	-1.2257	-0.7363	-1.4166
Market to book	-0.0180	-0.0147	-0.0143	-0.0123	-0.0428	-0.0023
Venture capitalist						
Assets under management (m€)	0.0001 **					
ln(assets under management)		0.4326 ***	0.4302 ***	0.4370 ***	0.3854 ***	0.4596 ***
Age (years)	0.0117					
ln(age)		-0.2505 **	-0.2478 **	-0.2274 **	-0.3847 **	-0.1464
HHI industry				0.5417 *	-0.2685	0.8855 **
HHI stage				2.0487 ***	1.1893	2.3304 ***
Dummy corporate VC	0.7302 **	0.5412 **	0.5429 **	0.5743 *	1.1225	0.3887
Dummy semi-profit VC	-1.4982 ***	-1.7235 ***	-1.7088 ***	-1.4837 ***	-1.5158 ***	-1.5428 ***
Dummy lead-investor	-0.3055 **	-0.2781 **	-0.2580 *	-0.1768		
Round						
Investment volume per VC (m€)	0.1198 **		0.2278 **	0.1754	0.2511	0.0794
(Investment volume per VC)²			-0.0325 **	-0.0256	-0.0328	-0.0111
ln(investment volume per VC)		0.0716				
No. of consecutive round	-0.2666 ***	-0.2438 ***	-0.2339 ***	-0.2080 **	-0.2877 **	-0.1358
Control						
Dummy East German venture	0.2880 **	0.2960 **	0.3046 **	0.3426 **	0.7950 **	0.1667
Dummy urban venture location	-0.5029 ***	-0.5728 ***	-0.5773 ***	-0.5326 ***	-0.5225 **	-0.4547 **
VC's no. of offices	-0.0968 ***	-0.1006 ***	-0.1004 ***	-0.0930 ***	-0.0839 ***	-0.0976 ***
Germany VC fundraising (t-1)	0.0000	0.0000	0.0001	0.0000	0.0000	0.0001
Return of MSCI SC Germany (ltm)	0.3028	0.3787	0.4043	0.3973	0.3113	0.3998
Germany VC investments	0.0001	0.0001	0.0001	0.0000	0.0008	-0.0003
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
cut1	-1.8602 ***	-0.6496	-0.4348	0.5745	0.8032	0.3943
cut2	-1.1206 **	0.1315	0.3472	1.3944 **	1.6009 *	1.2560 *
cut3	-0.2528	1.0485 **	1.2658 **	2.3254 ***	2.4146 **	2.2983 **
cut4	1.3865 ***	2.7771 ***	3.0005 ***	4.3276 ***	4.5457 ***	4.3036 ***
N	950	950	950	859	310	549
LR Chi²	200.6620 ***	280.0360 ***	283.4980 ***	265.4520 ***	111.1250 ***	183.7820 ***
Nagelkerke's R²	0.1990	0.2670	0.2700	0.2790	0.3160	0.2980
McFadden's R²	0.0679	0.0948	0.096	0.1011	0.118	0.1094
AIC	2804.5020	2725.1280	2723.6660	2417.8710	886.2840	1552.3150
Max. VIF	7.89	3.53	6.72	6.85	8.57	13.26

Table 4: Summary of hypotheses and investigated effects

Hypothesis / investigated effects	**Hypothetized impact on minimum travel time**	**Empirical result**
Venture		
Venture development stage		
H1a: Age	+	supported
H1b: Seed round	-	n.s.
H1c: Later stage round	+	significant in opposite direction
Industry		
H2a: Intangibles to total assets	-	supported
H2b: R&D expenses to total assets	-	n.s.
H2c: Market to book ratios	-	n.s.
Venture capitalist		
Size and experience		
H3: Assets under management	+	supported
Effect of age	open	significant negative effect
Specialization		
H4a: Industry	+	supported
H4b: Stage	+	supported
Type		
H5a: Corporate VC	+	supported
H5b: Semi-profit oriented VC	-	supported
Round		
H6: Investment volume per VC	inverted u-shaped effect	supported
H7: Consecutive round	-	supported
H8: Lead-investor	-	supported
H9: Lead- vs. co-investor	different effects for lead- and co-investors	supported

n.s. = not significant

Table 5: Ordinary least squares regressions

This table presents the results of ordinary least squares regressions with the minimum travel time (in natural logarithm) as dependant variable. The sample consists of 950 dyads of venture capitalists and German portfolio companies which have closed a financing round between January 2002 and March 2007. Smaller sample sizes in some models are due to missing values. HHI: Herfindahl-Hirschman Index; *, **, ***: significant at the 10%, 5%, and 1% level, respectively.

					OLS 5	
Variable	**OLS 1**	**OLS 2**	**OLS 3**	**OLS 4**	**Lead-Inv.**	**Co-Inv.**
Dep. var.: ln(1 + min. travel time)						
Venture						
Age (years)	0.0320 **					
ln(age)		0.2171 ***	0.2149 ***	0.1969 ***	0.2536 ***	0.1361 *
Dummy seed stage round	-0.8603 ***	-0.2861	-0.2883	-0.3199	-0.4089	-0.2384
Dummy later stage round	0.0626	-0.0939	-0.0949	-0.2049 *	0.0805	-0.3222 **
Intangibles to total assets	-2.3382 **	-2.3197 **	-2.3186 **	-2.5425 **	-2.4715 *	-2.4200 **
R&D exp. to total assets	-0.9173 *	-1.1508 **	-1.1761 **	-1.4718 **	-1.2372	-1.4706 **
Market to book	-0.0189	-0.0172	-0.0168	-0.0104	-0.0140	-0.0121
Venture capitalist						
Assets under management (m€)	0.0000 *					
ln(assets under management)		0.2967 ***	0.2987 ***	0.2962 ***	0.2132 ***	0.3280 ***
Age (years)	0.0072					
ln(age)		-0.1794 **	-0.1790 **	-0.1966 **	-0.2470 **	-0.1699 **
HHI industry				-0.1630	-0.5384	-0.0181
HHI stage				1.2032 ***	0.8861	1.3441 **
Dummy corporate VC	0.4665 **	0.2715	0.2652	0.2754	-0.0993	0.3798
Dummy semi-profit VC	-0.8056 ***	-0.8870 ***	-0.8881 ***	-0.7842 ***	-0.9443 ***	-0.7199 ***
Dummy lead-investor	-0.1558 *	-0.1352	-0.1285	-0.0762		
Round						
Investment volume per VC (m€)	0.0632 *		0.0443	0.0146	0.0906	-0.0047
(Investment volume per VC)²			-0.0082	-0.0053	-0.0113	-0.0035
ln(investment volume per VC)		0.0129				
No. of consecutive round	-0.1981 ***	-0.1755 ***	-0.1732 ***	-0.1413 **	-0.1578 **	-0.1162 *
Control						
Dummy East German venture	0.2147 **	0.2322 **	0.2361 **	0.2353 **	0.5674 ***	0.1074
Dummy urban venture location	-0.3794 ***	-0.4171 ***	-0.4175 ***	-0.3881 ***	-0.4376 **	-0.3000 **
VC's no. of offices	-0.0578 ***	-0.0629 ***	-0.0631 ***	-0.0580 ***	-0.0543 ***	-0.0574 ***
Germany VC fundraising (t-1)	0.0001	0.0001	0.0001	0.0001	0.0000	0.0000
Return of MSCI SC Germany (ltm)	0.2051	0.2382	0.2387	0.1719	0.2590	0.1431
Germany VC investments	0.0001	0.0001	0.0001	0.0001	0.0002	0.0000
Constant	4.8132 ***	3.8820 ***	3.8425 ***	3.4535 ***	3.7320 ***	3.3184 ***
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	950	950	950	859	310	549
F-value	8.2153 ***	13.4530 ***	12.8855 ***	11.0435 ***	6.1917 ***	6.5630 ***
R^2	0.1632	0.2420	0.2425	0.2489	0.3427	0.2311
adj. R^2	0.1433	0.2240	0.2236	0.2264	0.2874	0.1959
Max. VIF	7.89	3.53	6.72	6.85	8.57	13.26