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THE SOCIAL CAPITAL OF VENTURE CAPITALISTS AND ITS IMPACT ON THEIR INVESTMENTS IN START-UP FIRMS

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ABSTRACT

How does the social capital of venture capitalists (VCs) affect the valuation of start-ups? Based on the social capital literature, we hypothesize a positive effect of VCs’ social capital, derived from past syndication, on the amount of money they put into new ventures. Our results indicate that both structural aspects, such as the number of connections, and relational aspects, such as the diversity of network partners’ attributes, of VCs’ social networks matter. While generally exhibiting positive effects, our results highlight that the role and effect of VCs’ social capital are much more complex than previously thought.

INTRODUCTION

Venture capital investment plays a pivotal role in entrepreneurial processes. Aside from the capabilities and resources of the start-up and its founders (e.g., Burton, Sørensen, & Beckman, 2002; De Clercq, Fried, Lehtonen, & Sapienza, 2006), venture capital firms (VCs) arguably have the highest level of influence in shaping and developing start-up firms (Hsu, 2006). Simply put, VCs, often as a syndicate of several VCs rather than alone and with the goal of their own financial profit in mind (Lerner, 1994; Wright & Lockett, 2003), equip growth-oriented start-ups with essential resources to support them in their evolution and eventual success. In doing so, VCs impact on new ventures in two distinct ways: directly, by lending money (financial capital) and providing management skills (human capital) to the start-ups they fund, and indirectly, by giving them access to their network, thus taking on the role of information and resource brokers (social capital) (e.g., De Clercq, et al., 2006; Dimov & Shepherd, 2005; Pratch, 2005).

Generally, social capital is receiving ever more attention in entrepreneurship research (e.g., Aldrich & Zimmer, 1986; Hoang & Antoncic, 2003). For example, the social capital of starting entrepreneurs has been widely acknowledged as playing an important role in the evolution of firms and their eventual success (e.g., Bridler & Preisendörfer, 1998; Hallen, 2008). Indeed, past studies have shown the positive effect that entrepreneurs’ social networks have on access to information, reputation-building, and recognition of opportunities (e.g., Burton, et al., 2002; Hsu, 2004). Also, the variety in types of partners in a new venture’s alliance network has been shown to positively impact on its success (Baum, Calabrese, & Silverman, 2000). As these examples illustrate, studies on the role of social capital in entrepreneurship often focus on the social capital of the entrepreneurs themselves, and how this may help them to become successful.

On the contrary, the role of the social capital and social networks of the investing VCs takes a much less prominent position. Thus, the question of how exactly VCs’ social capital affects the value of new ventures still lacks systematic research (Fitza, Matusik, & Mosakowski, 2009). Specifically, the actual (monetary) effect of VCs’ social capital on the valuation of the start-up has so far not been the subject of any study. Consequently, the research question we pose in this study is: how does an investor’s social capital influence the amount of money they invest in a start-up?
Existing research suggests that VCs’ social capital might actually need to be “bought” or “paid for” by the new venture, reflected in entrepreneurs’ willingness to accept lower offers from well-networked VCs (Hsu, 2004). From the perspective of the start-up, this suggests the existence of a trade-off between the financial capital and social capital they can receive from their VCs.

Building on the literature on social capital (Burt, 2005; Coleman, 1988), we expand this view. Through the application of social network analysis on VCs’ syndication networks, we examine how VCs’ social capital affects the likelihood that they will invest in an entrepreneurial venture. In doing so, we follow Granovetter (1992) in distinguishing structural and relational aspects of social capital, i.e. paying attention to both the configuration of a VC’s syndication network and the diversity of its partners. Both aspects should, through distinct mechanisms, give a VC access to information that is helpful to them both in the pre- and post-investment phase (Bygrave, 1987; Tyebjee & Bruno, 1984). For the pre-investment phase, VCs with higher social capital may have better knowledge of the most promising firms currently looking for funding (see, e.g., Burt, 2005). Regarding the post-investment phase, Pratch (2005) and Hsu (2006) both show that VCs actively try to improve the chance of successful investment by using their social capital, which they derive from the social networks in which they are embedded through syndication. Privileged access to information highlighting such opportunities should consequently lead to the VC either evaluating future cash flows from the venture more positively, or attributing them with lower risk (see Tyebjee & Bruno, 1984 for how VCs valuate firms). Overall, compared to VCs that do not have access to these types of information, the focal VC should arrive at a higher valuation for that specific venture in the present, which will result in the focal VC’s willingness to invest a larger sum into the specific venture.

To understand the effect that VCs’ social capital has on the investments they make in start-ups, we follow Sorensen and Stuart’s (2001) approach in constructing the social network through VC syndication: a tie between a new venture and a VC exists when the VC invests in it. Thus, when multiple VCs syndicate their investment, they are also connected to each other through the shared investment object. Our social capital indicators focus on a VC’s structural and relational position in this network of prior syndication ties among venture capitalists. We then regress the lagged structural and relational attributes of investors on the amount of funds that they invest into a certain start-up. As a data source, we employ a novel dataset obtained from the information provider CrunchBase. Within this dataset of over 34,300 firms, 3,800 financial organizations, and 11,300 funding rounds, we focus on VC activity in the Internet sector, for which (almost) complete network data covering recent years is available. This allows us to derive longitudinal, valued, network-based structural and relational measures, while other work in this area often relies on cross-sectional, survey-based, positional measures (Hoang & Antoncic, 2003).

In doing so, we make three contributions to the literature on entrepreneurship and venture capital. First, we show that VCs’ social capital indeed has a positive impact on the amount of money they invest in start-ups. This willingness originates from the structural and relational attributes of the network. VCs that span structural holes in the syndication network particularly tend to invest larger sums in start-up companies. The number of network connections a VC has, in giving the VC access to more information, follows a similarly positive linear effect. Second, while, at first glance, diversity seems to have a more important influence on information arbitrage than similarity, post-regression analysis reveals a different effect. Regarding past partners’ industry specialization, both networks with very similar and very diverse partners have a positive impact on investment sum. This shows that, compared to hybrid forms, both types of network configurations create value in their own right by providing the VC with superior information. Finally, an exploratory analysis that includes the amount invested in start-ups in earlier funding

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rounds as a control variable allows us, to some degree, to disentangle the effects of social capital in the pre-investment phase vs. the post-investment phase. Structural network attributes are important sources of information arbitrage in both phases, whereas relational attributes only seem to matter for the pre-investment phase. Overall, our results reemphasize the importance of social capital for entrepreneurship research and entrepreneurs alike. In particular, we show that the role of social capital in the VC-venture relationship may be more complex than previously hypothesized.

THEORY AND HYPOTHESES

Venture capital investment plays a vital role in the evolution and eventual success of new ventures. Besides the capabilities and resources of the start-up and the characteristics of its founders (e.g., Burton, et al., 2002; Franke, Gruber, Harhoff, & Henkel, 2006) venture capital firms (VCs) arguably have the highest level of influence in shaping and developing start-up firms (Hsu, 2006). By investing in new ventures, often as a syndicate of several VCs rather than alone (Lerner, 1994; Wright & Lockett, 2003), VCs impact new ventures in several ways. Primarily and most obviously, VCs expecting a high rate of return at high risk lend financial capital to new firms so that these can compensate their often negative cash flows and fund their growth ambitions (De Clercq, et al., 2006). Moreover, VCs can assist start-ups by providing human capital in the form of management skills, experience, and expertise (Dimov & Shepherd, 2005). VCs can do so in several ways, for example by providing strategic advice and planning support, by taking a governance role on a board of directors, or – though somewhat less likely – by actively engaging in day-to-day operations (e.g., Lerner, 1995).

In addition, VCs have social capital that the start-ups will seek to access. This social capital is derived from the (social) network of professionals, experts, and other VCs, in which the VCs are embedded. In particular, VCs are strongly linked with each other through the joint investments they have made in the past (Bygrave, 1987; Sorenson & Stuart, 2001, 2008). Through the social networks arising from such past syndication, VCs receive from, and pass on to, each other strategic information about current investment opportunities as well as future innovation and technological trends, which helps them to reduce the uncertainty they face (Bygrave, 1987, 1988). Specifically, depending on the amount of social capital they have, VCs will have access to relative amounts of such information, which they will then exploit to the advantage of the firms in their portfolio (Hsu, 2006; Pratch, 2005). Thus, any effect of social capital that VCs receive from their embeddedness in social networks should result from their superior access to high-quality information, and their ability to use it to the benefit of the firms they (intend to) invest in. A strong social network of its VCs thus offers the start-up access to unique and valuable resources and future opportunities. Consequently, choosing the right VC matters. When evaluating an investment offer, start-ups should thus consider VCs’ social capital as an essential part of the added value they may bring to the table, in addition to the financial and human capital they offer (Sapienza, 1992). Past research even suggests that entrepreneurs may be willing to pay a price for access to high-social capital VCs. For example, Hsu (2004) shows a clear tendency for entrepreneurs to accept bids from high-social capital VCs, even if the respective investment offers are lower than those made by low-social capital VCs. In this sense, it seems as if entrepreneurs are facing a trade-off: they can expect to receive either financial capital or social capital, but probably not both simultaneously.

In this paper, we strive to expand this view. Fundamentally, a strong social network does not only hold opportunities for the start-up. VCs themselves may also directly benefit from the prospects of their own network when investing in a start-up. In a nutshell, their social capital may allow VCs to benefit from having superior access to high-quality information and thus increase
their chances of identifying the most promising investment opportunities in the pre-investment phase, as well as foreseeing opportunities to add value to the venture after the investment has been made (see Tyebjee & Bruno, 1984 for how VCs valuate firms). Looking at the potential for pre-investment information arbitrage, VCs are competing against each other to identify and invest in the most promising new ventures (Bygrave, 1987). High social capital should give a VC an advantage in spotting suitable candidates for investment (see Burt, 2005; Granovetter, 1985; Uzzi, 1997) and also increase the likelihood that their bid is accepted (Hsu, 2004). Subsequently, during the post-investment phase, VCs can leverage their investment through value-adding involvement in their ventures “as related to perceiving and responding to opportunities and threats to increase the chances of success of the portfolio companies.” (Dimov & Shepherd, 2005, p. 5) High social capital should again increase the likelihood that a VC will become aware of such opportunities and threats (see Burt, 2005; Coleman, 1988). For example, a VC with high social capital may be aware of specific customer groups or complementary ideas in developmental stage that may useful to the start-up they consider investing in (Bygrave, 1988). For such a VC, consequently, the value of future cash flow they may receive from the start-up should increase, and the associated risk decrease, leading to a higher valuation of the potential investment object in the present, and, consequently, a higher investment sum in the focal start-up (Tyebjee & Bruno, 1984). From the perspective of the start-up, this means that the total funds it can raise in one funding round should increase with the social capital of the investors that participate in it.

There are two sources of social capital that VCs can derive from their network, which, in distinct ways, will provide them with access to valuable information from their environment as we have described above. These are the structural as well as relational aspects of the network in which a VC is embedded. Structural aspects describe the configuration of the network, such as the position of a firm in a network (Burt, 2005), and the number and intensity of connections it has with others (Uzzi, 1997). Relational aspects on the other hand focus on who you are connected with (Granovetter, 1992). In the following, we will derive hypotheses for why and how structural and relational aspects of a VC’s social network should have an effect on the investment sum a start-up receives. In doing so, we build on Fleming et al. (2007, pp. 444-445) who note that “[m]ost research on the influence of brokerage has focused on purely structural explanations. […] Little research in the controversy has started from the premise that individuals have biographies and experiences and attributes that they bring to their brokered or cohesive collaborations.” We thus follow more recent studies that pay increasing attention also to the relational characteristics of networks (e.g., Moran, 2005; Reagans & McEvily, 2003).

**Structural Aspects and Investment Sum**

Due to the syndicative nature of the VC industry, most VCs make their investments in new start-ups jointly with other VCs (Lerner, 1994; Wright & Lockett, 2003). On the one hand, this may bring at least “another pair of eyes” to a deal, thus decreasing the likelihood of failed investments. At the same time, other VCs may contribute to the partnership distinct competencies that will increase the likelihood of venture success (for a discussion of these partly competing explanations, see, e.g., Brander, Amit, & Antweiler, 2002). On top of this, joint investments create ties between organizations through which information can be exchanged in the future, which may well be independent of the investment that created the tie (Bygrave, 1987, 1988). Finally, multiple ties between two organizations may result from multiple joint investments in different start-ups, which will allow for an increased amount and quality of information flowing between them.

The number and strength of ties that a VC has with their peers is thus an essential source of information they may use to leverage portfolio investments. The structural network attribute that
captures this, is the number of connections the VC has (also accounting for the fact that a connection with the same partner may occur repeatedly). Ceteris paribus, the more information the VC has available to use, filter, or recombine, the higher the likelihood that they can extract value from this information (Uzzi, 1997). In our setting, the more connections an investor holds, the more they are aware of new high-quality investment prospects, as well as opportunities that can be used to leverage (also more widely-known) investment prospects if they were to become part of its portfolio. As argued previously, both factors should positively impact a VC’s valuation of the investment object they are considering, relative to investors with fewer network connections, which will result in the start-up ultimately receiving higher investment funds. However, it might be naïve to assume that anyone could establish and maintain an unlimited number of connections to other parties. On the contrary, keeping healthy network ties to another party requires actors to bear significant cost and effort, while the additional information a new connection can add will decrease (Uzzi, 1997). Considering that management attention and information processing capability is limited (Ocasio, 1997) we expect that, after a certain threshold, the marginal value that an additional network connection can add for the firm will decrease, and might even turn negative. Consequently, we formulate two hypotheses that:

**H1a [degree - linear]: The number of connections investors have in the syndication network prior to their investment in the start-up will positively affect investment sum.**

**H1b [degree - curvilinear]: With an increasing number of connections investors have in the syndication network prior to their investment in the start-up, the positive effect of an additional connection on the investment sum will decrease.**

In addition to the sheer volume of incoming information, the quality and uniqueness of incoming information should fundamentally impact a VC’s ability to engage in information arbitrage. Burt’s work (e.g., 1992, 2005) shows how a structurally advantageous network position may give actors in a network privileged access to such information. Specifically, Burt argues that firms or individuals that span structural holes in networks can acquire unique rents through information arbitrage. The spanning of structural holes happens when an individual or firm is the sole link between two otherwise disconnected individuals or groups. The argument is that, in such a case, all information that has to travel from one group to the other must travel through the person or firm in the middle, the so-called broker (Burt, 2005). Since the broker is the only person who has access to both the disconnected knowledge (or: resource) pools, he or she is in a position to act strategically to derive personal benefits through information arbitrage. For example, the broker may selectively pass on or hold back information from one group according to the broker’s best interest, or charge a fee for doing so. Alternatively, the broker may bring together information from the disconnected groups and combine them into a superior, more valuable configuration. The latter is crucial in innovation problems, which are often successfully solved by individuals at the interface between different fields (e.g., Poetz & Schreier, 2009).

The benefits brokers can achieve from information arbitrage have been confirmed in a wide variety of settings. For example, Fleming et al. (2007) find that brokerage is positively associated with creativity, particularly when the brokering individual bridges people with diverse backgrounds. In the case of investors, a VC that is able to span structural holes should have access to unique and valuable information related to both the pre- and post-investment phase. The more structural holes a VC spans, the higher the likelihood that the focal VC is the only one to know about prospective investments and/or future opportunities to leverage. As a consequence, this VC should arrive at a higher valuation for the investment object than any other potential investor, which will ultimately increase the amount of cash this venture will receive in a funding round. Thus, we specify as our second hypotheses:
**H2 [structural holes]: The more an investor spans structural holes in the syndication network prior to their investment in the start-up, the larger the investment sum will be.**

**Relational Aspects and Investment Sum**

In addition to the structural aspects of VCs’ syndication networks, their relational attributes should matter. Relational attributes refer to the characteristics that network partners have, and how these compare with each other, as well as to the focal organization. Relational attributes thus capture the fact that it is important and relevant to the organization with which it is connected implying that diversity or similarity of connections will affect social capital (Reagans & McEvily, 2003). In this study, we focus our analysis of the relational attributes of the VCs’ past syndication partners on two particular elements, namely the type of investor a VC syndicates with (other VC, CVC, business angel) and the structure of the investment portfolio of the syndication partners.

Interestingly, past literature is split on whether similarity or diversity of partners in the social network is a more potent source of information arbitrage. Diversity will give a VC access to more exclusive and varied information (Granovetter, 1985), going beyond the advantages associated with the mere spanning of structural holes (Fleming, et al., 2007). Generally, the social networks literature would argue that with increasing diversity in the relational attributes of an actor’s network, the higher the likelihood that this actor has access to rich, unique, and varying information (Reagans & McEvily, 2003). Furthermore, information from beyond the domain of the focal actor, provided that it fits the actor’s needs, is likely to have a higher impact on performance-related outcomes. As Poetz and Schreier (2009) show, problem solutions that are based on analogies from more cognitively distant fields are likely to be more innovative than those based on local knowledge. In our case, access to more diverse information should thus enable VCs access to more unique opportunities, in particular in their identification during the post-investment phase. Being linked to different types of investors such as CVCs or business angels through past deals will give a VC a higher chance of receiving a certain unique piece of information, for example about an upcoming technology, than VCs without this type of relation. Similarly, being linked to investors that have diverse investment portfolio structures might give the focal VC that unique information in the form of new markets for start-ups they have invested in. To ensure that they have a continuous inflow of non-redundant information, Bygrave (1988) thus recommends that VCs “should have as many links as possible to other organizations and individuals besides venture capitalists” (p. 138, formatting added).

On the other hand, much of the existing venture capital literature and its wider theoretical foundations strongly argue in favor of specialization. At the core of the argument is the idea that being embedded in a network of similarly specialized VCs will increase the focal VC’s ability to extract valuable information from the network and efficiently and effectively process it (Bygrave, 1987). For fast moving areas in particular, specialization will be the only way to keep up with technological progress and guarantee the ability to process incoming information relating both to the pre- and post-investment phase (Bygrave, 1987; De Clercq & Dimov, 2004). Repeated engagement with the same type of partner and in similar industries should lead to VCs being able to build specific routines and capabilities for doing so. Similarly, a smaller cognitive distance between the VC and its network partners will increase the VC’s effectiveness in processing information sent out by the partners (Gulati, 1995; Nooteboom, 2000; Uzzi, 1997). This will make it easier for the focal VC to use this information to learn about new investment prospects and opportunities to leverage them, which could lie in collaborating with a similar firm in the portfolio of one of the partners. Thus, specialization, both regarding the type of partner a VC chooses as well as the structure of their investment portfolios as compared to each other and the VC firm,
might enable the VC to extract more reliable and higher quality information from its social network. The effects of this are shown by Dimov & De Clercq (2006), who find that VCs following a specialization strategy actually see a lower default rate in their portfolio.

Summarizing, extant theory on social networks and venture capital makes competing claims concerning the effects of similarity/diversity on VCs’ ability to benefit from information that is flowing through their social network. Thus, we can derive competing hypotheses for the effect of similarity/diversity on the ability to draw valuable information from the network. That is, we arrive at two competing logics for how relational attributes of the network improve the firms’ ability to profit from information in its social network. Yet, following the arguments we presented for the effect of network structure on investment sum, we can say that, whichever explanation holds true, VCs having superior information due to the relational aspects of their social network will again be in a preferential position when making an investment decision. They will have better knowledge about both upcoming investment prospects and how to potentially leverage them. Similar to H1 and H2, and taking into account that two competing logics for the effects of relational network attributes exist, we thus state:

H3a [investor diversity]: The more diverse investors’ networks are in terms of the type of syndication partners prior to investment, the larger the investment sum will be.
H3b [investor similarity]: The more similar investors’ networks are in terms of the type of syndication partners prior to the investment, the larger the investment sum will be.
H4a [investment diversity]: The more diverse investors’ networks are in terms of the fields of investment of past syndication partners, the larger the investment sum will be.
H4b [investment diversity]: The more similar investors’ networks are in terms of the fields of investment of past syndication partners, the larger the investment sum will be.

Finally, we also note that our hypotheses, in fact, might not be competing, but indicative of a non-linear effect. For example, one might imagine that both very similar and very diverse partnership networks might help VCs in generating social capital. Yet again, we are not aware of corresponding theory that would allow us to make a clear prediction. Rather, we will control for any potential non-linear effects in exploratory fashion when analyzing our data.

**DATA AND METHOD**

**The CrunchBase Data Set**

As a data source, we make use of a novel dataset obtained from the web site CrunchBase (Block & Sandner, 2009). CrunchBase can be best viewed as a “repository” of start-up companies, individuals, and investors having a focus on US high-tech sectors (in particular IT and Internet). It offers almost complete coverage of start-ups and investors in the Internet sector, including the relationships between them. As of 15 February 2010, CrunchBase included information on 34,302 firms, 3,843 financial organizations, and 11,375 funding rounds. As we seek to analyze the social capital of VCs, we first remove those 7,926 companies that did not receive any funding. Because of our focus on US high-tech sectors, we then exclude those companies not related to the IT and Internet sector. We compute our network metrics and conduct our regression analysis on reduced samples, including only US-based start-ups in Internet and IT and the financial organizations that have invested in those start-ups. As a robustness check, we also conducted an analysis identical to the one above, but where we did not drop the observations originating from other industries. Results remain largely identical, with all variables of interest keeping their sign and only minor changes in coefficient sizes and levels of significance. The CrunchBase dataset is a formidable dataset to employ social network analysis as it covers almost complete relationships between start-ups and VCs. This is contrasted by other research relying on survey data which leads to
methodological difficulties as networks can only partly be observed. The relationships between
start-ups and VCs – materializing through investments (i.e., funding rounds) is thus the point of
departure for calculating the network metrics on the VC syndication network. The value of links in
the syndication network among investors – i.e. the syndication network – is given by the number
of times they have jointly invested in the same startup firm. Using a five-year moving window
procedure, the investment volume of a funding round in which a VC participates in year $t$ is
regressed on metrics of the VC’s position in the syndication network covering the five years
preceding that investment. The network grows substantially over the complete observation period,

**Variables**

*Funds raised.* Our dependent variable is the amount of funds raised by the focal start-up in a
particular funding round. Since the variable is highly skewed in nature, we apply the logarithm of
this variable in our regression model. Although we are not able to observe the valuation of the
company in a funding round, this variable proxies the value of the firm at the time when the
investors jointly conducing a funding round equip the start-up with VC money. The measure
reflects realized, rather than intended investments (see also Dimov & De Clercq, 2006).

*Valued degree.* To test the first hypothesis, we measure the number of connections VCs have
in the syndication network. In network terminology, we measure the valued degree (Wasserman &
Faust, 1994). This is a centrality measure that indicates the number of direct co-investment
relationships, where (vs. the unvalued degree) multiple co-investment relations with the same
partner are also counted as such. To cater to potential multicollinearity issues, we divide this
number by the number of investments a VC has made in the same 5-year moving window.

*Network constraint.* In order to measure the effect of structural holes on investment sum, we
use Burt’s constraint measure (1992, p. 55). Network constraint is an index that measures the
extent to which a person’s contacts are redundant. More precisely, the lack of structural holes in a
VC’s network of direct relations – also referred to as network redundancy – is measured by the
extent to which relations are directly or indirectly concentrated in a single contact. For each node
in a focal VC’s network, we calculate which proportion of the focal VC’s direct connections
directly or indirectly have a network path through that node. The constraint measure is the sum of
squared proportions for all nodes in the VC’s network of direct syndication links. The richer the
network of a VC’s network of direct syndication partners is in structural holes, the lower
constraint, and the more opportunities for information arbitrage should exist.

*E-I index.* To measure similarity in past investment partners, we used the E-I index
(Wasserman & Faust, 1994). The E-I (external-internal) index measures the extent to which an
investor’s direct connections are within or outside the group to which the investor itself belongs.
Investors in the syndication network can be categorized as business angels, corporate venture
capitalists, or other venture capitalists. For each investor, the E-I index is calculated as the number
of ties external to their group minus the number of ties that are internal to their group divided by
the total number of ties. The E-I index is bound between -1 and 1, where +1 indicates a full
external orientation of an investor towards syndication partners of a different type than itself, and
-1 a full internal orientation of an investor towards syndication partners of the same type.

*Network specialization index.* Diversity in a VC’s network can also derive from the sub-sectors
within the Internet field in which its syndication partners have invested. On the basis of their
investment history over the five years preceding the focal investment, we calculated the extent to
which a VC’s syndication partners have invested in similar versus diverse subsectors. That is, for
each investor we defined a vector specifying the shares of its investments over 11 subfields. Taking the cross-product of vectors for each pair of investors (Bonacich, 1972), results in a measure of specialization in terms of their investment focus. To relate this measure only to those investors to which the focal investor is connected, we calculated the weighted sum of this specialization index, where the weight is the value of the connection (the number of times two investors co-invested in a firm in a moving 5-year period). A value of 1 represents the situation where a VC’s syndication partners exclusively invested in the same subfields as the focal VC (a specialized network) and 0 a situation in which a VC’s syndication partners entirely invested in different subfields as the focal VC (a diverse network).

Controls. To not confound the effects of the VC’s social network with other effects, we include a number of control variables. Based on a careful review of extant literature (e.g., De Clercq & Dimov, 2004; Dimov & Shepherd, 2005), we include variables related to the characteristics of the start-ups, the investors and the respective funding rounds. To account for business cycle effects in the provision of VC, we include year dummies. Table 1 provides an overview of all variables.

RESULTS

Table 1 shows descriptive statistics and correlations of the variables in our regression models. Not surprisingly, the social network measures are correlated with each other. For example, the higher the investor’s degree, the more likely this financial organization is able to span structural holes. Yet, given the large number of observations in our data set (N=5,120), we regard the issue of multicollinearity to be only of minor concern. Some descriptive statistics are noteworthy: about 98% of investors are VCs; only a small portion of investors are strategic investor such as industrial firms (2%) or business angels (0.3%). The mean syndicate size is 3.2 and the mean number of total investments of each investor is 22. About 25% of all prior investments of any investor were in the same industry category. This may seem low but can be explained by the fine-grained industry categories which we use. The mean amount of dollars raised per funding round is 15 million. However, this number is highly skewed; to account for this in the regressions, we use the natural logarithm of the raised amount.

As explained above, our unit of analysis is the individual VC participating in a funding round. We argue that the amount raised in a funding round depends on VCs’ social capital as derived from the social network created through past syndication. Table 2 shows different regression specifications with the amount of funds raised in the focal funding round as the dependent variable. Model I includes a linear term of the investors’ degree of connection to other investors (H1a), Model II includes both a linear and a squared term of this variable (H1b). Model III includes the absolute values of the network specialization index and the E-I index. Most of our hypotheses relating to the VCs social capital are supported. Burt’s constraint measure (H2) shows a negative effect on the amount of funds raised (ß= -0.17, p<0.01). That is, the more the VC investors are spanning structural holes in the syndication network prior, the larger is the amount of funds raised in the particular funding round. H1a is also supported. The higher the investor’s degree of connection to other investors, the higher is the start-up’s amount of funds raised in the respective funding round (ß=0.13, p<0.01). H1b is not supported: the squared term of the investor’s degree of connection to other investors is insignificant (ß=0.03, p>0.1). Our results further support a network specialization effect. The more diverse the syndication network of the VC in terms of the industries in which the investor’s prior syndication partners invested, the higher is the amount of funds raised by the start-up in the current round (H4a, ß=0.48, p<0.05). Contrary to that, no effect could be found with regard to the diversity of the syndication network in terms of the type of investors. However, when we control for the possibility of a non-linear
effect, we find that it may indeed be present. Specifically, when we transform the network specialization index to a format where 0 indicates a perfectly hybrid strategy between similarity and diversity, and 1 may stand both for a perfectly similar and a perfectly diverse network, we see that the coefficient carries a positive sign and remains significant. This indeed indicates that both similar and diverse networks may have positive effects on the investment made by the VC when compared to hybrid approaches.

In additional analyses (not reported here), we further include a control variable capturing the funds invested in the focal start-up in a preceding investment round. In reflecting the result of a past evaluation of the firm, we use this measure to reflect the quality of the new venture and thus use it as a baseline proxy for the inherent and publicly known value of new venture, that is, the value of the idea, founding team, resources, etc. that the venture has available at start-up, representing all information available in the pre-investment phase. As a consequence, when we include this variable in the regression, our social network measures should mainly capture the effect of social capital in the post-investment phase, that is, how the firm can use its social network to leverage the value of the focal startup. As expected, the variable for preceding founding round is highly significant. Of our network measures, only the effect of structural holes (H2) remains, all other network measures turn insignificant.

DISCUSSION, IMPLICATIONS, AND CONCLUSION

In this paper, we looked at the effects of VCs’ social capital, coming from the relational and structural attributes of the syndication networks, on investments made into start-up firms. Regarding the structural elements, we find that brokerage has a significant effect which is significant in all specifications. Also, the variable capturing the number of connections has a linear positive effect on investments made. The fact that it is not curvilinear might be due to censoring issues in our data (i.e., we do not observe any VC that has done too much syndication), rather than eradicating the possibility of decreasing returns of additional connections. The relational elements, too, showed an effect. While diversity in terms of type of partner did not matter, we found that portfolio specialization indeed mattered. In fact, exploratory analysis showed that both similarity and diversity had positive effects on investment sum. Both effects, however, disappear when controlling for past investments made into the same venture.

With this study, we make three contributions to the literature on entrepreneurship and venture capital. First, regarding the effects of network structure on investments, we highlight the effects of brokerage and degree, representing opportunities for information arbitrage and the sheer volume of incoming information. We find that the sheer amount of information that VCs have at their disposal, thanks to the structural attributes of their network, will increase the amount of money they put into start-ups. Moreover, the spanning of structural holes gives VCs access to unique information and allows them to engage in information arbitrage. We thus show that brokerage, as for many other fields, matters for venture capital. Even more, the spanning of structural holes is the only network indicator that still matters in the post-investment phase. Here, too, it will allow VCs to achieve abnormal returns and lower risk through information arbitrage (Burt, 2005), thus positively affecting its willingness to spend money on a startup. Second, we shed light on the role of structural network attributes, and in particular the relative advantage of having either similar or diverse networks. Regarding the structure of network partners’ investment portfolio, there is an indication that diverse networks are preferential to similar ones. This would be in accordance with the literature on social capital and embeddedness (e.g., Granovetter, 1985), which argues that diverse networks facilitate access to richer information than similar networks. However, on closer inspection, we see that both similarity and diversity have positive effects on the information
available to a VC and the investments they are willing to make. Thus, we suggest that VCs may be successful by building networks both alike to focused boutiques as well as broad generalists. Start-ups, as a consequence, need not have a preference for either, as long as the VC either has a clear specialization or diversity strategy. However, we are aware that we cannot draw any conclusions on the circumstances under which one of the two strategies would be preferable, and thus leave this question open for future research. Third, we show that, overall, the role and nature of VCs’ social capital might be much more complex than previously stated in the respective literatures. This is true on several accounts. First, we highlight that VCs’ high social capital may in fact lead them to make higher rather than lower investments in start-ups (cf. Hsu, 2004). Second, our results indicate that both similarity and diversity in the social network may lead to higher investments, whereas hybrid strategies do not (cf. Uzzi, 1997). Finally, we have given an indication that sources of social capital will have varying effects over the course of the investment process, in showing that only the spanning of structural holes matters in all phases. However, we need to emphasize that further research into all factors is needed to truly understand the effect of VCs’ social capital on the investment decisions they make in practice. In particular, we think that our work raises a call for more qualitative work to investigate this issue, as our understanding of the processes inside VC organizations, including is currently limited at best.

Our results have practical relevance both for VCs and entrepreneurs. For VCs, they further indicate the importance of social capital, which they will need to build and maintain through suitable strategies. Specifically, we point out that both a strong diversification as well strong specialization strategies seem to have merits, whereas hybrid forms could be of lower value. Regarding the start-up, we find that they need not be shy about approaching high-social capital VCs. Indeed, if there is a chance their social capital is beneficial to a specific deal, there is no reason why this should result in the start-up receiving a discount on their inherent valuation. In fact, the opposite may hold.

Some limitations of our study need to be mentioned. First, we do not observe exact ownership percentages by VC in a funding round. However, since we control both for the size of the syndicate as well as many other characteristics, we do not expect this effect to have a large impact on our results. Similarly, our data is biased towards North American IT and Internet firms. Yet, as said earlier, a robustness check including all reliable investment information we had (worldwide and across many different industries) gave us almost identical results, with all results reported qualitatively unchanged. Nevertheless, future research that can link the CrunchBase dataset to other sources that may cater to its disadvantages (e.g., VentureExpert) will help to ensure the validity of our findings. Limitations aside, our study has shed new light on the role of VCs’ social capital for the entrepreneurship and venture capital literatures, showing that its effects are likely to be more complex than previously hypothesized. While answering some questions on this issue, we have simultaneously created many new ones, which we hope will encourage further research on this topic. Before this background, we think that our study can provide a valuable building block to help improve our still limited understanding of the role and effects of VCs’ social capital.

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NOTES

1. Joern H. Block (Erasmus University, The Netherlands), has been removed from the author list because of the “Rule of Three” of the Babson College Entrepreneurship Research Conference.
2. Since VCs are the largest category of investors in our dataset, and, more generally, likely to be the most important and impactful source of funding for new ventures (De Clercq, et al., 2006), we will use this term interchangeably with the more general term “investor.”

REFERENCES


Table 1: Descriptive Statistics

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<tr>
<td>Raised amount</td>
<td>14.69</td>
<td>80.78</td>
<td>0.01</td>
<td>3200</td>
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<td></td>
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<tr>
<td>(1) Log (raised amount)</td>
<td>2.13</td>
<td>1.05</td>
<td>-4.42</td>
<td>8.07</td>
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<tr>
<td>(2) Burt’s constraint measure</td>
<td>0.36</td>
<td>0.31</td>
<td>0.04</td>
<td>1.68</td>
<td>-0.9</td>
<td></td>
<td></td>
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<tr>
<td>(3) Degree / N total investments</td>
<td>1.07</td>
<td>0.55</td>
<td>0.07</td>
<td>5</td>
<td>0.17</td>
<td>-0.25</td>
<td></td>
<td></td>
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<tr>
<td>(4) Network specialization index</td>
<td>0.19</td>
<td>0.09</td>
<td>0</td>
<td>1</td>
<td>-0.02</td>
<td>0.34</td>
<td>0.03</td>
<td></td>
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<tr>
<td>(5) E-I index</td>
<td>-0.89</td>
<td>0.28</td>
<td>-1</td>
<td>1</td>
<td>-0.06</td>
<td>0.00</td>
<td>-0.13</td>
<td>0.04</td>
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<tr>
<td>(6) N total investments</td>
<td>20.15</td>
<td>22.11</td>
<td>2</td>
<td>138</td>
<td>0.13</td>
<td>-0.57</td>
<td>-0.07</td>
<td>-0.25</td>
<td>-0.06</td>
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<tr>
<td>(7) % of prior investments in start-up’s industry</td>
<td>0.21</td>
<td>0.25</td>
<td>0</td>
<td>1</td>
<td>-0.04</td>
<td>0.26</td>
<td>0.00</td>
<td>0.32</td>
<td>0.02</td>
<td>-0.18</td>
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<td>(8) Investor is VC</td>
<td>0.98</td>
<td>0</td>
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<td>0.38</td>
<td>-0.08</td>
<td>-0.02</td>
<td>-0.07</td>
<td>0.24</td>
<td>-0.12</td>
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<td>(9) Investor is business angel</td>
<td>0.003</td>
<td>0</td>
<td>1</td>
<td>-0.41</td>
<td>0.02</td>
<td>0.01</td>
<td>0.05</td>
<td>0.01</td>
<td>-0.22</td>
<td>0.11</td>
<td>-0.90</td>
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<tr>
<td>(10) Investor is strategic investor</td>
<td>0.02</td>
<td>0</td>
<td>1</td>
<td>0.01</td>
<td>0.08</td>
<td>0.02</td>
<td>0.07</td>
<td>0.72</td>
<td>-0.08</td>
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<tr>
<td>(11) N participants in funding syndicate</td>
<td>3.22</td>
<td>1.74</td>
<td>1</td>
<td>18</td>
<td>0.03</td>
<td>-0.01</td>
<td>0.14</td>
<td>0.07</td>
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<td>0.09</td>
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<td>(12) Seed round</td>
<td>0.08</td>
<td>0</td>
<td>1</td>
<td>-0.44</td>
<td>0.01</td>
<td>-0.10</td>
<td>-0.02</td>
<td>0.09</td>
<td>-0.05</td>
<td>0.02</td>
<td>-0.27</td>
<td>0.28</td>
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<tr>
<td>(13) Log (age of start-up)</td>
<td>1.29</td>
<td>0.40</td>
<td>-1.82</td>
<td>5.35</td>
<td>0.34</td>
<td>-0.05</td>
<td>0.09</td>
<td>0.03</td>
<td>-0.02</td>
<td>0.12</td>
<td>0.02</td>
<td>0.26</td>
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Notes: S.D. = standard deviation
N = 5,120 obs.; correlations with an absolute value larger than 0.03 are significant at p≤0.05.
<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Model I</th>
<th>Model II</th>
<th>Model III</th>
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</thead>
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<tr>
<td><strong>Investor’s social capital</strong></td>
<td></td>
<td></td>
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<tr>
<td>Burt’s constraint measure</td>
<td>-0.17 (0.07) *</td>
<td>-0.15 (0.07) *</td>
<td>-0.15 (0.07) *</td>
</tr>
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<td>Degree/ N total investments</td>
<td>0.13 (0.03) **</td>
<td>0.21 (0.08) **</td>
<td>0.21 (0.08) *</td>
</tr>
<tr>
<td>(Degree / N total investments)²</td>
<td>-0.03 (0.02)</td>
<td>-0.03 (0.02)</td>
<td></td>
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<tr>
<td>Network specialization index</td>
<td>-0.48 (0.20) *</td>
<td>-0.50 (0.20) *</td>
<td></td>
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<tr>
<td>E-I index</td>
<td>-0.14 (0.09)</td>
<td>-0.13 (0.09)</td>
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<tr>
<td>Absolute value of network</td>
<td></td>
<td>0.24 (0.11) *</td>
<td></td>
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<tr>
<td>specialization index</td>
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<tr>
<td>Absolute value of E-I index</td>
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<td>-0.06 (0.12)</td>
<td></td>
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<tr>
<td><strong>Other investor characteristics</strong></td>
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<tr>
<td>N total investments</td>
<td>0.003 (0.001) **</td>
<td>0.003 (0.001) **</td>
<td>0.003 (0.001) **</td>
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<tr>
<td>% of prior investments in</td>
<td>-0.04 (0.06)</td>
<td>-0.04 (0.06)</td>
<td>-0.05 (0.06)</td>
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<tr>
<td>start-up’s industry</td>
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<tr>
<td>Investor is VC A</td>
<td>-0.51 (0.26) †</td>
<td>-0.50 (0.26) †</td>
<td>-0.28 (0.24)</td>
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<td>Investor is business angel A</td>
<td>0.07 (0.09)</td>
<td>0.06 (0.09)</td>
<td>0.07 (0.09)</td>
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<td><strong>Funding round characteristics</strong></td>
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<tr>
<td>N participants in syndicate</td>
<td>0.26 (0.03) **</td>
<td>0.26 (0.03) **</td>
<td>0.25 (0.03) **</td>
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<tr>
<td>(N participants in syndicate)²</td>
<td>-0.017 (0.004) **</td>
<td>-0.017 (0.003) **</td>
<td>-0.017 (0.004) **</td>
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<td>Funding round dummies</td>
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<td>11 cat. (p&lt;0.01)</td>
<td>11 cat. (p&lt;0.01)</td>
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<tr>
<td>(reference cat: Series A)</td>
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<tr>
<td><strong>Start-up characteristics</strong></td>
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<tr>
<td>Log (age of start-up) B</td>
<td>0.36 (0.07) **</td>
<td>0.36 (0.07) **</td>
<td>0.36 (0.07) **</td>
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<td>Industry dummies C</td>
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<td>10 cat. (p&lt;0.01)</td>
<td>10 cat. (p&lt;0.01)</td>
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<td>Year dummies D</td>
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<td>9 cat. (p&lt;0.01)</td>
<td>9 cat (p&lt;0.01)</td>
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<tr>
<td>Constant</td>
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<td>1.15 (0.34) **</td>
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<td><strong>N (observed funding rounds)</strong></td>
<td>5,120 (2,529)</td>
<td>5,120 (2,529)</td>
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<td>F-test</td>
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<td>p&lt;0.01</td>
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<tr>
<td>R²</td>
<td>0.32</td>
<td>0.32</td>
<td>0.32</td>
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</table>

**Notes**
- Two sided tests: † p≤0.10  * p≤0.05  **p≤0.01
- Coeff=coefficients; SE=robust and clustered standard errors; cat.=category
- A Reference category: Investor is strategic investor
- B Observations with missing values are proxied by the sample mean. To control for this, we included also a dummy variable which indicates whether the firm age was missing or not. The variable shows an insignificant effect (e.g., β=0.07, p>0.1 in Model I)
- C Reference category: Investor is strategic investor
- D Reference category: Year 2003