Performance Effects of Venture Capital Firm Networks

Peter Abell
Department of Management
London School of Economics
Houghton Street
London WC2A 2AE UK
Email: p.abell@lse.ac.uk

Tahir M. Nisar
School of Management
University of Southampton, Highfield,
Southampton SO17 1BJ UK
Email: t.m.nisar@soton.ac.uk

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Abstract: This paper is primarily concerned with the question of the networking effects of venture capital (VC) firms on portfolio companies. VCs can bring specific skills and abilities to their on-going relationships with their portfolio companies and thus add value by influencing key operations. High levels of engagement also translate into giving advice and support, helping with the team culture, creating strategic alliances, or exercising corporate governance. A particular mechanism through which these support services are delivered is syndication investment. Using network theory tools we investigate the effects of syndication on VC firm performance. We find that better-networked VC firms experience significantly better performance, as measured by the proportion of investments that are successfully exited through an IPO (Initial Public Offering) or a sale to another company.

Keywords: Networking; Syndicates; Value-adding activities; Venture capital.

Introduction

Networks may be seen as an alternative to banks as intermediaries in credit markets. They may also coordinate disperse resources in factor and product markets. Networks' role in the allocation of scarce resources has been recognized both in the past and today (Cornelli and Goldreich, 2001; Ljungqvist, Marston, and Wilhelm, 2005). As an organizational form a network is distinct from both a firm and a market, as they are not limited by specific contracts to some ultimate owner of property rights, nor are they engaged in a bargaining process, having to bid for resources. Networks are rather cooperative mechanisms that arrive at allocative decisions by consensus and through the pooling of relevant information.

In the venture capital (VC) industry, networks abound. A central feature of venture capital is the way it allows investment firms to syndicate their investments- when two or more firms jointly undertake a new project (Lerner, 1994). Syndication inevitably creates a multitude of relationships spanning the syndicate members coordination and various service providers, including research & development organizations, patent lawyers, head hunters, investment bankers etc (Gorman and Sahlman,1989; Sahlman, 1990). The diverse sets of relationships with different agents (e.g., investors, co-investors, suppliers, customers), imply large variations in the quality and support offered to portfolio

companies. It is likely that these differences in investment and engagement approach will also affect VC syndicate performance.

VC firms operate in uncertain environments. The uncertainties are often linked to the risk involved in product development and commercialization. For instance, risks faced by start-up companies have their roots in both the external environment and in lack of capabilities within the organization. There may be sudden market changes and shifts in investor and consumer expectations, compelling the company to completely change the course of its strategy. Companies may also face shortage of personnel or key physical and organizational resources to carry out a new development opportunity successfully. VC literature has argued that by syndicating investments companies are able to effectively deal with all such risks and uncertainties.

Prior literature on networks has primarily been concerned with identifying their existence in various financial markets. An important issue is the likely impact of this particular form of organizational structure on VC firm performance. To this end, VC network measures of how well networked a VC is will need to be developed. Recently, there has been a surge of interest in networking theory, which freely borrows its main tools of analysis from Graph theory (Hochberg, Ljungqvist and Lu, 2006). In the present context, we use the graph theory based measurement tools to capture the following different aspects of a VC firm's influence: (i) the number of VCs with which it has a relationship as a proxy for information about deal flow, expertise, contacts, and pools of capital it has access to; (ii) its access to the best-connected VCs; and (iiii) its ability to act as an intermediary, bringing together VCs with complementary skills or investment opportunities that lack a direct relationship. As the prevailing practice of syndication investment underlines VC firms greatly benefit from having a multitudes of relationships. Our results show that the benefits from these relationships are magnified when VC firms join hands with other well-connected VC firms.

The paper is organized as follows. The next section provides a survey of the prior literature on VC firm engagement practices. This section also develops VC specific

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network theory measures. We then discuss our data and provide variable definitions, which is followed by our report of results. We establish empirical implications for the system of VC networked relations, including the impact of various measures of networks on VC firm performance. In the final section, we conclude and discuss the research's implications.

Literature Survey

The evolution of interdependencies between different organizational tasks is a manifestation of how linkages between different actors play a critical role in enterprise development. To better understand the increasingly complex relationships among organizations, which often arise, as we pointed out above, as a result of their uncertain market environments (Kenis and Knoke, 2002; Provan and Sebastian, 1998), researchers have often resorted to analysing resources and capabilities as catalysts for interorganizational relations. Such an approach is often couched as the resource-based view of the firm (Barney, 1991; Wernerfelt, 1984). Although this approach recognizes the role of unique firm history and specific nature of capabilities, it pays scant attention to network 'complementarities' that motivate firms' participation in interfirm networks. It is important to note that interfirm networks can be useful in this framework as they channel valuable information about the resource advantage (e.g., key information, useful contacts, capital) that can be obtained from firm network resources.

Prior literature on syndication has generally focused on ex-anti motives of VC firms, namely how syndication may improve the selection process through improved screening, due diligence and decision making. Following traditional finance theory, syndication is considered as a means by which VC firms secure a well-diversified portfolio, enabling the VC firm to reduce the unsystematic risk of the portfolio. There are also expectations of reciprocity and better future financial deals when VC firms are able to syndicate with other reputable firms.

For a number of reasons, determining the ex-post motives of syndication, especially how investors can share their complementary skills or specific knowledge, and as a result, add value to a portfolio company is also important (Bygrave, 1988). The management of the ex-post investment may significantly affect its performance. Brander et al. (2002) compared Canadian-syndicated VC deals with stand-alone projects and found that the need to access specific resources from the ex-post management of investment, rather than for the selection of investment resulted in the syndication of projects which also enjoyed higher rate of returns than stand-alone projects. The study of such investments provides an opportunity to examine the key factors driving the VC firm performance.

Network Methodology

Network analysis is conducted at various levels of social interaction. One can either analyse clusters (networks) of organizations and their patterns of interaction, involving a study of the complete network or focus solely upon one or more specific operations in a network (Powell, 1990; Burt, 1992; Powell et al., 1996). Within the field of business studies, one common practice is to take the firm as a unit of analysis and examine the links or ties it is able to build with actors outside the firm. This helps to understand how the firm develops and operates a network (Birley, 1985; Aldrich and Zimmer, 1986; Dubini and Aldrich, 1991; Larson, 1992). Notwithstanding the fact that counting the number of ties a firm has established provides important insights into its network size, the various dimensions of a network and/or the way they influence the development of a new business is also a key question in network analysis (Chu, 1996). For example, questions such as how socio-economic contexts in which actors operate are linked to strategic networks have not yet been fully explored.

The social network model of organization formation (Granovetter, 1973, 1985; Aldrich and Zimmer, 1986; Dubini and Aldrich, 1991; Burt, 1992; Larson, 1992) views new organizations as created by entrepreneurs 'embedded' (Granovetter, 1985) in a series of network relationships. Specifically, the pattern and process through which network relationships are developed and maintained are the main areas of research interest. Dubini

and Aldrich (1991) define a network as 'patterned relationships between individuals, groups, and organizations'. This suggests that a network consists of *structure* and *content* (Burt, 1992), where structure is the pattern by which individuals and organisations are linked, including interaction frequency and the ways in which they are connected (e.g. by contracts, equity, kinship, etc.), while content describes the resources exchanged within networks.

Network size

Extant literature examines the structure of organizational networks in terms of *size* and *strength* (Dubini and Aldrich,1991). There are many ways in which network size is analysed. A common approach is to study the number of ties or links between an organization and outside contacts. In this respect, one can usefully distinguish between a 'personal' network, i.e. 'those persons with whom an entrepreneur has direct relations and an 'extended' network, i.e. relationships between an organization and the external world (Dubini and Aldrich, 1991). A related distinction is between the actor's direct 'personal' links and 'total' links which cover direct and indirect links – Shulman's 'anchorage' points within the focal organization (1976). Shulman emphasizes the importance of both direct and indirect links as they are used as a means of accessing resource nodes. For example, Steier and Greenwood (1995) show how venture capitalists act as brokers, linking entrepreneurial ventures with such players as retail outlets, marketing consultants and other financial sponsors. In this line of research, the main unit of analysis is the *number* of links between an organization and its context. Irrespective of whether the links are direct or indirect, what matter is the number of links (Larson, 1992).

Another strand of research emphasizes the number of links to different clusters of information and resources accessed by those resources, rather than the number of ties *per se* (Burt, 1992). 'Size is a mixed blessing. More contacts can mean more exposure to valuable information, more likely early exposure, and more referrals. But increasing network size without considering diversity can cripple the network (Burt, 1992). Burt stresses the role of diversity as a key attribute of size, implying that several single ties to

multiple sources - ties to clusters of people not in communication with other clusters - than multiple ties to the same source, are more important.

The number of relationships an actor in a network manages is captured by degree centrality measure. For research purposes, a network is represented by a square "adjacency" matrix, the cells of which reflect the ties among the actors in the network. For example, two VCs coinvesting in the same portfolio company can be considered as having a tie. With the number of ties increasing, the VCs would have more opportunities for exchange and so become influential, or central, in a network. We examine this by looking at whether at least one syndication relationship exists between VCs i and j. Adjacency matrices can be "directed" or "undirected". In the case of directed matrices, we can differentiate between the originator and the receiver of a tie. Thus, we can have information about syndicates led by VC i versus those led by VC j. It allows one to distinguish between VCs who receive many ties and those who originate many ties. In the first case, VCs are invited to be syndicate members by many lead VCs, whilst, in the other case, lead VCs syndicate with many other VC members. This produces two directed measures of degree centrality. VC i's *indegree* counts if at least one syndication relationship exists in which VC j is the lead investor and VC i is a syndicate member. When one counts the number of other VCs a VC firm has invited into its own syndicates (i.e., reciprocity), one has an *outdegree* measure.

Network strength

Granovetter (1973, 1985) argues that network 'strength' where ties with close friends and associates who are likely to know one another, is critical for understanding the network relations. Whilst recognizing the value in weak ties as they represent diverse conduits of information, this framework focuses on 'strong' ties as, for example, relations within personal networks, that allow trust and/or moral obligation to play its role as an underlying support mechanism, thus reducing the risk of opportunism and cheating (Johanson and Mattson, 1987; Powell, 1990). Therefore, in addition to counting the number of actor relationships (i.e., degree), it would also be useful to measure their

'strength' or 'quality' or closeness in our setting. "Eigenvector centrality" is generally used to measure "closeness" (Bonacich, 1987), which is an actor's total ties to other actors weighted by their respective centralities. Thus, we can measure the extent to which a VC is connected to other well connected VCs.

Network content

In addition to *structure*, understanding network *content* is also important in the way it affects individual actors and organizations. In this respect, Tichy (1981) develops a typology of four types of resources accessed through networks: information, goods and services, expressions of affect or emotional support, and political influence. Information resources can be envisaged in terms of management expertise, and professional advice provided by accountants, lawyers and consultants. In the present context, goods and services are financial resources, as well as assets such as plants and equipment. Steier and Greenwood (1995) discuss effective support in relation to its significance for start-up companies. They also provide an example of how networks can be used for political purposes or for the mobilisation of influence. Thus, it will be useful to know those actors on whom many others must rely to make connections within the network. When a VC acts as an intermediary by bringing together VCs with complementary skills that lack a direct relationship between them, this can be captured by 'betweenness' measure. It is measured by the proportion of all paths linking actors j and m that pass through actor i.

Indirectly, these network measures also capture the involvement of VC firms in portfolio companies. Elango, Fried, Hisrich and Polonchek (1995) identify three levels of involvement: inactive, active advice-giver, and hands-on. Involvement by the inactive group is mainly confined to attendance at board meeting. One example of 'hands-on' involvement approach is the firms' emphasis on networking among its portfolio companies. The concept refers to networks of companies bound together by mutual obligations and contacts. Entrepreneurs gain access to VC's portfolio of companies and associations with market leaders. These relationships are the foundations for strategic alliances, partnership opportunities and the sharing of insights to help build new ventures

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faster, broader and with less risk (Norton and Tenenbaum, 1993). Networking also allows the development of a network of companies that helps create synergies and pooled resources for growth and development (Franke et al., 2006). The professional respect and regard in which VC is generally held and the influence that it enjoys with other investors are major sources of networking success.

Empirical Specifications

VCs often engage in joint projects that allow them to participate in more projects, especially when they are constrained by available resources. There is empirical evidence that suggests that syndicated projects offer higher returns than projects financed by a single VC (stand-alone projects) (Brander et al., 2002). The way syndicated VCs offer improved managerial support in the form of higher reputation, and a larger variety of contacts for their portfolio firms than a single VC, accounts for the higher return. The syndication investment strategy is primarily aimed at high risk environments, where it reduces the asymmetries of information and select the projects of the highest quality (Wilson, 1968). By combining equities in an investment, either in the same investment round or, more broadly defined, at different points in time, syndicated projects mitigate investment risks.

Syndication may also be advantageous when inexperienced VCs join in. Experienced VCs are likely to contribute to the project's success with their knowledge and expertise, and thus increase the expected project value. In the process, they are also likely to help inexperienced VCs to gain valuable know-how for future deals when they invest in a project together with skilled partners. To fully investigate the effects of syndication investment, we examine directed and undirected centrality measures as discussed above (see also Hochberg, Ljungqvist and Lu, 2006). Entry to and exit from the network may change each VC's centrality, thus changing the structure of the network and the relationships it supports. To keep track of these changes, we construct our adjacency matrices over trailing three-year windows.

Descriptive statistics are presented in Table 1. The parent of the average sample fund has normalized *outdegree* of 8.13%, *indegree* of 7.12%, and *degree* of 12.14%. This suggests a number of interesting features of syndication investment in the UK and Continental Europe: the average VC, when acting as lead, involves a little over 8% of all VCs active in the market at the time as coinvestors; has been invited to become a syndicate member by around 7% of all VCs; and has coinvestment relationships with a little over 12% of the other VCs (ignoring its and their roles in the syndicate). These relatively low degree centrality scores suggest that VC relationships are relatively exclusive and stable as they often coinvest with a small set of other VCs. There is also the existence of a special class of VCs who as a policy do not syndicate their investments.

Variables Definition

The sample consists of 624 venture capital funds based in the U.K and Continental Europe. We examine the period between 1995 and 2005. The classification into seed or early-stage funds follows Venture Economics' fund focus variable. Corporate VCs are identified manually starting with Venture Economics' firm type variable. We augmented the Venture Economics data with information from FAME, VentureExpert, and Diane.

Exit rate: percentage of portfolio companies exited

   IPO rate: percentage of portfolio companies sold via IPO

   M&A rate: percentage of portfolio companies sold via M&A

Dollar exit rate: percentage of invested $ exited.

   Dollar IPO rate: percentage of invested $ exited via IPO

   Dollar M&A rate: percentage of invested $ exited via M&A.

B/M is the book/market ratio of public companies in the sample fund's industry of interest.

Size is the amount of committed capital reported by a VC fund.

VC experience is defined as the average number of years of VC firm's experience in venture capital industry**.**

Partner experience is defined as the average number of years of partners' experience in venture capital industry.

Corporate board is a dummy variable that takes the value 1 if the venture capital firm is reported to sit or have sat on the board of directors of the company; 0 otherwise.

Each of the following network measure is normalized by the theoretical maximum (e.g., the degree of a VC who has syndicated with every other VC in the network).

Degree is defined as the number of unique VCs a firm has syndicated with (regardless of syndicate role).

Indegree is defined as the number of unique VCs that have led syndicates the firm was a non-lead member of.

Outdegree is defined as the number of unique VCs that have taken part as non-lead investors in syndicates led by the firm.

Eigenvector is a variable that measures 'closeness' in terms of how close to all other VCs a given VC is.

Betweenness is defined as the number of shortest distance paths between other VCs in the network with which the VC interacts.

Industry is a set of dummy variables that we obtain from our survey instrument, which gave the following choices: Biotech and pharma; Medical products; Software and internet; Financial services; Industrial services; Electronics; Consumer services;

Telecom; Food and consumer goods; Industrial products (incl. energy); Media & Entertainment; Other (specify).

Table 1: Descriptive Statistics

	Mean	Median	Min	Max	No.
Fund characteristics					
-fund size ($m)	34.0	11.0	0.1	2,700	624
-first fund (fraction, %)	13.2				
-seed or early-stage fund (fraction, %)	18.7				
- corporate VC (fraction, %)	8.3				
Fund performance					
-exit rate (% of portfolio companies exited)	16.7	17.0	0	100	624
- IPO rate (% of portfolio companies sold via IPO)	9.2	7.8	0	100	624
- M&A rate (% of portfolio companies sold via M&A)	6.3	4.7	0	100	624
- dollar exit rate (% of	17.1	14.6	0	100	624

invested $ exited)					
- dollar IPO rate (% of invested $ exited via IPO)	12.3	6.8	0	100	624
- dollar M&A rate (% of invested $ exited via M&A)	7.2	2.4	0	100	624
Investment climate					
-average B/M ratio	0.273	0.258	0.09	0.873	624
VC experience	7.5	4	1	45	624
Partner experience	11.34	14	0	25	624
Corporate board	0.622	-	0	1	621
Network measures					
-Outdegree	8.13	6.24	0	24.2	624
-Indegree	7.12	5.20	0	14.2	624
-Degree	12.14	10.32	0	45.17	624
-Betweenness	0.311	0.11	0	10.87	624
-Eigenvector	4.86	2.74	0	42.53	624

Benchmark Analysis

Earlier studies on venture capital and VC fund performance have often found the significant impact of log fund size and a set of vintage year dummies on performance (Kaplan and Schoar, 2005; Hochberg, Ljungqvist and Lu, 2006). Table 2 presents a similar type analysis.

In the first Column, we report results for when only size is included. In this case, we do not find any significant relationship. We then use a dummy that equals one for first-time funds in Column 2. Assuming that seed or early-stage funds invest in riskier companies and thus have relatively fewer successful exits, we also include in this Column a control for such investment vehicles. Similarly, we control for corporate VCs. As expected, first-time funds perform significantly poorly. The results for the seed and early stage funds are similar, but the coefficients on corporate VCs are positive. Our subsequent analysis (Column 3) includes a proxy for the investment opportunities available to funds when deploying their committed capital (using B/M ratio). In this case, we observe the impact of a more favourable investment climate at the time a fund invested its capital as significantly higher exit rates are recorded thereafter.

The right of venture firms to nominate directors of portfolio companies is an important component of their control rights. The role of VC firm nominees may, however, extend beyond control. Goodstein, Gautman and Boeker (1994) identify three functional duties of company boards: (1) networking activities which are to do with forming links between the company and its external environment, and securing critical resources; (2) monitoring activities which include dealing with internal governance issues, monitoring company performance and providing mechanisms to align the interests of management with shareholders; and (3) strategy-making activities contributing to the company's strategic decision-making processes. Wijbenga, Postma, van Witteloostuijn and Zwart (2003) follow this framework in reviewing the role of private equity investors in the boards of portfolio companies.

First, in relation to networking activities, they suggest that there is evidence that the boards of portfolio companies (on which general partners usually sit) provide an interface with other investor group members, provide industry contacts and contacts with professionals. Private equity firms also assist in obtaining alternative equity capital. Second, in relation to monitoring activities, there is evidence that the boards of portfolio companies monitor financial performance, monitor operational performance, and evaluate the portfolio company's strategy and product market opportunities in order to develop the new venture's strategy to changing circumstances. Finally, in relation to strategy-making activities, there is evidence that the boards of portfolio companies serve as a sounding board, assist in formulating business strategy, assist in dealing with short-term crises or problems, and recruit and/or replace managers.

To investigate these matters, in Column 4 our variables of interest are the venture and investment experience of the fund's parent firm and firm's partners. We find a significantly improved performance for funds with more experienced parents and individual partners. We find similar results for portfolio company board membership, thus emphasizing the literature's conclusions, as discussed above.

Table 2: Benchmark Analysis (ordinary least-squares regressions)

	(1)	**(2)**	**(3)**	**(4)**
Fund characteristics				
In fund size	0.031 (0.011)	0.053*** (0.012)	0.042*** (0.011)	0.039*** (0.011)
In fund size squared	-0.003 (0.001)	-0.006*** (0.001)	-0.003** (0.002)	-0.004*** (0.001)
=1 if first fund		-0.067*** (0.017)	-0.041*** (0.012)	0.007 (0.012)
=1 if seed or early-stage fund		-0.053*** (0.013)	-0.016*** (0.009)	-0.024** (0.009)

=1 if corporate VC		0.048** (0.011)	0.031 (0.016)	0.033 (0.016)
Investment climate -average B/M ratio			-0.423*** (0.012)	-0.276*** (0.019)
VC experience				0.033*** (0.015)
Partner experience				0.031*** (0.010)
Corporate board				0.024*** (0.009)
-Adjusted-R^2 -Test: all coefficients = 0 (F) -No. of observations	18.2% 41.6*** 621	16.1% 32.5*** 621	19.4% 47.9*** 621	24.3% 33.7*** 621

Notes: The dependent variable is a firm's exit rate, as defined above. Year dummies controlling for vintage year effects are included but not reported. White heteroskedasticityconsistent standard errors are shown in italics. ***, **, and * denote significance at the 1%, 5%, and 10% level.

VC Networks and Performance

In the previous section, we investigated a benchmark VC firm performance model, while controlling for fund characteristics, competition for deal flow, investment opportunities, corporate board and venture and parent firm experience. Now, we investigate the extent to which VC's networking improve the performance of its fund. The results are largely consistent with the predictions of our framework. In Table 3, we add our five network measures to the specifications shown in Table 2, thus presenting estimates for four

separate regression models. We find that networked VC firms are associated with significantly better fund performance in each of the specification.

The results show that there are three significant network effects; *indegree* stands out as the most important factor in relation to its effect on network relations. This is closely followed by two other measures – *eigenvector* and *degree*. Overall, these results suggest that large benefits accrue to VC firms when they have many ties (degree). These ties have more store when VCs are invited into many syndicates (*indegree*), and when they involve other well-connected VCs (*eigenvector*). Another measure, *outdegree*, has a similarly relatively large effect, which implies that a VC firm's investment in future reciprocity pays off handsomely (see also Lerner, 1994). When we examine the significance of a VC firm's ability to act as an agent between other VCs (*betweenness*) we do not find a significant relationship. This reveals the fact that indirect relationships (those requiring intermediation) are much less important in the way venture capital industry is organized.

From these results, one can also argue that networked firms are best placed to adopt a hands-on approach to managing their portfolio companies. As discussed, VC firms taking a hands-on approach both monitor portfolio firms through, for example, reviewing management accounts and board minutes, and through involvement in decisions such as the purchase of major capital items, acquisitions and disposals, changes in strategic direction, appointment of directors and auditors, and changes in capital structure. The alternative hands-off, or passive approach, mainly involves monitoring portfolio firms, for example through management accounts. VC firms taking a hands-off approach are, however, likely to become actively involved with the portfolio company under certain circumstances such as failure to meet agreed targets or default of payments.

Table 3: VC Networks and Performance (ordinary least-squares regressions)

	(1)	**(2)**	**(3)**	**(4)**
Fund Characteristics				
-In firm size	0.044***	0.041***	0.042***	0.039***
	(0.016)	(0.016)	(0.016)	(0.016)

-In firm size squared	-0.004**	-0.005**	-0.004**	-0.004**
	(0.001)	(0.001)	(0.001)	(0.001)
=1 if first fund	0.008	0.008	0.008	0.011
	(0.013)	(0.013)	(0.013)	(0.013)
=1 if seed or early-stage fund	-0.035**	-0.036**	-0.028**	-0.036**
	(0.011)	(0.011)	(0.011)	(0.011)
=1 if corporate VC	0.042	0.039	0.034	0.032
	(0.017)	(0.017)	(0.017)	(0.017)
Investment climate -average B/M ratio	-0.411***	-0.414***	-0.408***	-0.404***
	(0.045)	(0.045)	(0.045)	(0.045)
VC experience	0.011**	0.013***	0.011**	0.013**
	(0.009)	(0.009)	(0.009)	(0.009)
Partner experience	0.017**	0.014**	0.015**	0.014**
	(0.003)	(0.002)	(0.001)	(0.002)
Corporate board	0.007***	0.009***	0.008***	0.010***
	(0.001)	(0.001)	(0.001)	(0.001)
Network measures -Degree	0.016***	0.014***	0.018***	0.016***
	(0.008)	(0.008)	(0.005)	(0.008)
-Indegree	0.019***	0.021***	0.021***	0.019***
	(0.002)	(0.009)	(0.009)	(0.002)
-Outdegree	0.017***	0.016***	0.017***	0.019***
	(0.003)	(0.003)	(0.003)	(0.007)
-Eigenvector	0.014***	0.016***	0.016***	0.014***
	(0.002)	(0.005)	(0.005)	(0.002)
-Betweenness	0.009***	0.007***	0.007***	0.007***

	(0.002)	(0.001)	(0.001)	(0.001)
-adjusted-R^2	22.4%	23.8%	21.6%	25.7%
-Test: all coefficients = 0 (F)	54.2***	56.6***	53.4***	55.1***
-No. of observations	621	621	621	621

Notes: Notes: The dependent variable is a firm's exit rate, as defined above. Year dummies controlling for vintage year effects are included but not reported. White heteroskedasticityconsistent standard errors are shown in italics. ***, **, and * denote significance at the 1%, 5%, and 10% level.

In our analysis, we find that the better-networked VCs generate rents by developing superior relational approaches. For example, when a VC in a network reports to the other members about the accomplishment of pre-set performance targets, both partners generate rents through exchange of knowledge valuable to one another. Frequent interactions between the parties may enhance access to each other's knowledge base and increase the capability of processing complex knowledge. However, this analysis does not take into account the possibility that this networking approach is valued only when it affects performance. To account for the endogenous relation between VC networks and performance, we also estimate the performance effects of VC network characteristics with two stage least squares (2SLS). Table 4 provides 2SLS results, which show that VC networks indeed raise firm performance. In fact, the results are stronger than the OLS regressions, especially the association between *degree* and VC performance.

Table 4: Endogeneity: The Effects of VC Networks (2SLS)

	(1)	**(2)**	**(3)**	**(4)**
Firm Characteristics				
In Firm size	0.042***	0.045***	0.046***	0.048***
	(0.014	(0.014)	(0.014)	(0.016)
In Firm size squared	-0.006**	-0.007**	-0.007**	-0.007**
	(0.003)	(0.003)	(0.003)	(0.003)

=1 if first fund	0.009	0.007	0.006	0.006
	(0.013)	(0.013)	(0.013)	(0.013)
=1 if seed or early-stage fund	-0.028**	-0.021*	-0.021*	-0.021*
	(0.011)	(0.011)	(0.011)	(0.011)
=1 if corporate VC	0.023	0.021	0.022	0.023
	(0.017)	(0.017)	(0.017)	(0.017)
Investment climate				
-average B/M ratio	-0.413***	-0.386***	-0.374***	-0.422**
	(0.052)	(0.052)	(0.052)	(0.052)
VC experience	0.014***	0.011***	0.014***	0.016***
	(0.011)	(0.010)	(0.011)	(0.013)
Partner experience	0.004***	0.005***	0.004***	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)
Corporate board	0.018***	0.016***	0.015***	0.018***
	(0.005)	(0.005)	(0.005)	(0.005)
Network measures				
-Degree	0.023***	0.024***	0.024***	0.023***
	(0.014)	(0.016)	(0.016)	(0.014)
-Indegree	0.026***	0.025***	0.026***	0.025***
	(0.017)	(0.011)	(0.017)	(0.011)
-Outdegree	0.019**	0.021**	0.019**	0.021**
	(0.008)	(0.008)	(0.008)	(0.008)
-Eigenvector	0.015***	0.015***	0.017***	0.015***
	(0.011)	(0.011)	(0.012)	(0.011)
-Betweenness	0.011***	0.011***	0.011***	0.011***
	(0.002)	(0.002)	(0.002)	(0.002)

-adjusted-R^2	21.1%	23.4%	25.8%	27.1%
-Test: all coefficients=0 (F)	51.3***	52.4***	53.4***	55.1***
-No of observations	621	621	621	621

Notes: The dependent variable is a firm's exit rate, as defined above. Year dummies controlling for vintage year effects are included but not reported. White heteroskedasticityconsistent standard errors are shown in italics. ***, **, and * denote significance at the 1%, 5%, and 10% level.

Conclusion

Networks perform several important roles in venture capital (Dubini and Aldrich, 1991): allowing access to resources without incurring the costs of vertical integration; acting as conduits for information; and providing legitimacy to new market entrants (Burt, 1992; Larson, 1992). Given the important role of syndicates in the financing of new ventures, understanding the process by which syndicate networks are developed and managed remains a significant aspect of the entrepreneurial process. In this study, we examine the performance consequences of a particular form of organizational choice: when market transactions are characterized by strong relationships and networks. Using VCs syndicate portfolio company investments in a comprehensive sample of U.K. and Continental Europe based VCs over the period 1995-2005, we examine the relation between fund performance and various measures of networking among VCs. We control for various determinants of VC investment performance, and find that networked VCs realize significantly better performance. These results suggest that VC firms need to pay close attention to their relational strategies as networking is likely to add value to firm operations.

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