STATUS WITHOUT RESOURCES?
EVIDENCE FROM THE VENTURE CAPITAL INDUSTRY*

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ABSTRACT

This paper proposes a set of conditions under which high-status firms retain their positions, even if they lose resources. Firms are considered high status if they obtain ties from other high-status firms. Within the class of high-status firms, we distinguish between those that receive ties only from high-status firms and those that also receive ties from low-status firms. Although ties from low-status firms contribute little to a firm's status, we hypothesize that they play a critical role in maintaining it in the event of resource loss. Specifically, following resource loss, high-status firms without ties from low-status firms will lose their status, but those with ties from low-status firms will retain it. Results of an empirical examination of venture capital syndicate formation in the United States yield support for these predictions.

Introduction

Developments in organizational theory, sociology and strategy suggest that firm performance depends not only on a firm's economic resources, but also on its status (Baum and Oliver 1991; Podolny, Stuart and Hannan 1996; Benjamin and Podolny 1999; Stuart, Hoang and Hybels 1999; Jensen 2003). Despite the substantial influence of this literature, the relationship between firm's economic resources and its status remains a vexing question. Most rational choice theories, including signaling models in economics, suggest that firm's status should be tightly correlated with its economic resources (Spence 1974; Kreps and Wilson 1982; Coleman 1990). In contrast, sociological theories see status as derived from deference from other high status firms and thus potentially distinct from firm's economic resources (Podolny 1993; Jasso 2001; Gould 2002).

In this paper, we seek to shed light on this debate by examining what happens to firm's status after it acquires or loses resources. Specifically, we ask whether a high-status firm loses its position after it suffers a shock to its economic resources? Conversely, we examine whether a low-status firm can improve its status after it acquires substantial economic resources?

Furthermore, we distinguish between two types of high status positions and propose that the answers to the two questions above will vary depending on the type of high status position. Specifically, we differentiate between high status positions that also receive relations from low status firms and those that do not (Mizruchi, Mariolis, Schwartz and Mintz 1986). Although the relations from low status firms contribute very little to the focal firm's status, we argue that they fundamentally change that firm's ability to maintain its status in case of resource loss. We hypothesize that high status firms without ties from low status firms will not be able to maintain their status in the event of resource loss. As a result, for these firms, status will simply reflect the strength of their underlying economic resources. In contrast, high status firms with ties from low status firms will maintain their positions regardless of their resource levels. For them, status will be independent of their resources. To the extent that status allows firms to charge higher prices for equivalent goods, obtain less expensive access to valuable inputs, or access new markets more

easily, these firms will be able to reap these benefits regardless of whether they have resources or not.

The distinction between two types of high status positions also allows us to understand the conditions under which low status firms with resources will be able to advance in the status hierarchy. Entry is easier when low status firms can target high status firms without resources, and provide them with much needed resources in exchange for status. High status firms that expect to maintain their position despite resource loss (i.e. those with ties from low status firms), have a strong incentive in reproducing the existing status hierarchy. Thus, they will avoid transferring status onto peripheral firms. In contrast, high status firms that expect to lose their position after resource loss (i.e. those with no ties from low status firms), no longer care about reproducing the existing status hierarchy. Their willingness to exchange status for resources thereby facilitates entry.

The remainder of the paper is structured as follows. First, we propose a basic model in which firms exchange economic resources and status. We use the model to propose two baseline hypotheses that link loss of resources by high status firms and acquisition of resources by low status firms with their exchange patterns. Subsequently, we distinguish between different types of high status positions and examine how the two basic hypotheses are affected by this distinction. Finally, we test the hypotheses using data on venture capital (VC) firms in the U.S. between 1984 and 1998. To capture VC resources, we focus on one of the most reliable measures: the contemporaneous monetary endowments. To capture VC firms' network positions, we use their past involvement in the co-investment syndicates. To distinguish between high-status VCs with and without ties from peripheral VCs, we rely on the well-developed, but largely forgotten, measures of derived and reflected centrality, proposed by Mizruchi, Mariolis, Schwartz and Mintz (1986). These measures decompose standard eigenvector centrality (Bonacich 1972) to identify how much centrality is derived from the centrality of others and how much is self-generated. Centrality derived from centrality of others captures VC status. In contrast, reflected

centrality captures VC centrality that arises from possession of numerous ties from low-status firms. With these measures, we model the likelihood that a firm participates in a syndicate and examine changes in that likelihood when VCs lose resources. Consistent with our hypotheses, our results show that high-status firms that possess ties from low-status firm continue to attract ties from high-status firms even after losing their economic resources – thereby maintaining their high-status position

Basic exchange model

We analyze network dynamics in which two firms are motivated to enter into an exchange if each possesses resources that are of interest to the other. If only one firm possesses resources needed by the other, the exchange is less likely to take place, or the exchange terms will privilege the firm with resources (Burt 1980; Pfeffer and Salancik 2003; Casciaro and Piskorski 2005). Firms engage primarily in exchanges of economic goods, such as tangible resources, knowledge or know-how. However, these exchanges can also become arenas for public expressions of deference between firms. For example, Podolny (1993) in his seminal work showed how in the investment banking industry syndicated deals become opportunities for firms defer to others by allowing their name to be displayed below the names of these others in tombstone advertisements. A firm that receives many such public expressions of deference from other firms will be considered high status (Blau 1955; Berger and Zelditch 1998; Gould 2002). Acts of deference expressed by high-status firms will have a greater impact on the recipient's status (Podolny 1993). Thus, a firm will be considered high status if it is obtains many directed ties conveying deference, and these ties originate from other firms that receive many such ties.

Standard economic goods and status differ in two important respects. First, firms exert fairly little control over other firms' acquisitions of economic goods. Thus, resource-rich firms will find it hard to prevent newcomers from acquiring similar resources, or to deprive them of these resources. In contrast, a firm's status is primarily controlled by other high-status firms. A

firm can only improve its status by obtaining deference from other high-status firms. It can also easily lose it if all high-status firms decide to refrain from their expressions of deference. This allows high-status firms to foreclose entry into high-status positions and punish high-status firms that fail to comply with this arrangement. Second, exchanges of economic resources entail an opportunity cost regardless of the identities of involved parties. In contrast, status can be easily preserved by deferring only to other high-status firms, and will only be depleted when a high-status firm defers to a low-status firm. Consequently, high-status firms will avoid exhibiting deference to low-status firms unless the latter are willing to compensate the former for status loss.

This basic model allows us to predict what happens to a high status firm when it loses resources. Such a firm will become much less attractive as it can no longer provide its high-status exchange partners with both resources and status—it can only provide the latter. To make itself more attractive the firm will have to defer to the other high-status firms without expecting much deference in return. Such a strategy will compensate for the lack of resources, improve firm's attractiveness and will facilitate greater access to resources. However, over time, the lack of deference from other firms is likely to deplete the low-resource firm's status.

Even though a high status firm suffers a penalty when it loses resources, the penalty is not as big as is faced by a low status firm that loses resources. High-status firms without resources can still confer status on their exchange partners, and can get some reciprocal relations. In contrast, low-status firms cannot confer status. For them, loss of valuable resources will lead to significant decline in expressions of deference. This leads to our first baseline hypothesis:

Hypothesis 1: A loss of economic resources suffered by a high-status firm decreases the likelihood of exchange with a high-status firm by less than an equivalent loss by a low-status firm

The model also predicts the fate of low-status firms which improved their stock of available resources. Such an increase will make low-status firms very interested in exchanging with high-status firms, in the hope of obtaining deference from high-status firms and advance in the status hierarchy. However, by conferring status on low status firms, high status firms lose some of their own status, so the latter are likely to avoid such relationships, unless they are compensated for the status loss.

The level of compensation will, however, depend on the resources of the high-status firm. High-status firms with substantial resources can easily obtain resources from other high-status firms. However, if they acquire resources from low-status firms, they will incur substantial status loss. Given the choice between keeping status intact, or losing it through deference to low-status firms, these firms will demand a lot of compensation. High-status firms *without* resources will also incur the same cost of status loss if they acquire resources from low-status firms in exchange for status. However, as we argued above, they will not be able to obtain resources from other high-status firms with resources without foregoing some of their status. Given the choice between foregoing status by exchanging with high-status firms, or losing some of it through exchange with low-status firms, these firms will demand much less compensation for the status loss. As such, they will be much more attractive exchange partners for the low-status firms, which can now improve their social standing for a lower payment.

As a consequence, we expect that as a low-status firm increases its resources, it is more likely to exchange with high-status firms without resources than with high-status firms with resources. This leads to our second baseline hypothesis:

Hypothesis 2: An increase in resources of a low-status firm will increase the rate of exchange with high-status firms without resources more than with high-status firms with resources.

Two types of high-status positions

The discussion so far has focused only on high-status and low-status firms. However, we can distinguish between at least two different types of high-status firms. First, there are high-status firms that obtain deference from other high-status firms, but not from low-status firms. Second, there are high-status firms that receive deference from other high-status firms, but they also receive relations from low-status firms.[1] This difference leads to the emergence of two distinct high-status network positions: high status with no ties (S) and high status with ties (B), illustrated in Figure 1.

Insert Figure 1 around here

Although it may seem that relationships from low-status to high-status firms should diminish the status of the latter, it is important to remember that status is transferred through directional exchanges of deference. As long as high-status firms do not defer to low-status firms, status loss will not occur, even if the two types of firms enter into an economic exchange. For example, in the investment banking industry we referenced earlier some high-status firms participated in syndicates with low-status firms. However, low-status firms did not lead these syndicates, and they were prominently displayed below the high-status firms in the tombstone advertisements. Because the high-status firms did not defer to low-status firms, such joint participation did not hurt the status of the leading firms. However, not all high-status firms entered into syndicates with low-status firms. Some syndicates were composed only of high-status firms deferring to each other (Podolny 1993:856).

[1] These distinctions have been documented in a number of empirical contexts, ranging from world-system exchanges of goods and services (Wallerstein 1974; Van Rossem 1996), through studies of industrial cooperation (Gulati and Gargiulo 1999) to smaller-scale studies of elite social networks (Whyte 1943; Burt 1977; Padgett and Ansell 1993). However, the theoretical implications of this distinction have received very little attention.

Although the receipt of relations from peripheral firms does not increase the standing of high-status firms, it fundamentally changes the nature of their high status position. There are at least two different reasons why this is the case. First, high-status firms that receive ties from low-status peripheral firms are in the unique position to act as brokers between the low-status firms and other high-status firms (Burt 1992; McEvily and Zaheer 1999). For example, in the context we study here, a peripheral venture capitalist could ask a high-status venture capitalist to join a syndicate, and the high-status venture capitalist could subsequently ask another high-status venture capitalist to do the same. Firms that are just high status are unlikely to act as such brokers. Indeed, as illustrated in Figure 1, such high-status firms are unlikely to act as brokers between others.

The second mechanism pertains to the ability of high-status firms with ties from low-status peripheral firms to their maintain attractiveness in the network, independently of other high-status firms (Burt 2005). First, consider a high-status firm that does not receive ties from low-status firms (S). If this firm ceases to obtain deference from high-status firms, it will begin to lose its status until it becomes a low-status firm, and will lose its source of positional attractiveness. Now consider a high-status firm that does receive ties from low-status firms (B). If this firm ceases to obtain deference from high-status firms, it will also begin to lose its status. However, the firm will not become peripheral in the network, as it will still maintain attractiveness to the peripheral firms to which it was connected. These peripheral firms are disconnected from each other, and they would benefit from the focal firm acting as a broker between them. When the focal firm was high status, it had no incentive to act as a broker between the disconnected peripheral firms, preferring instead to broker between the low-status firms and the other high-status firms. Now, having lost connections from the high-status firms, the focal firm will likely execute these brokerage transactions between peripheral firms.

The brokerage, if executed, will lead to the establishment of an extensive set of connections between low-status firm. One important consequence of such changes is that the low-

status firms will no longer be peripheral. Instead, they will form a highly cohesive core of firms that will predominantly exchange with each other, trading both economic resources as well as deference. Such actions will allow the previously low-status firms to form an alternative network core and undermine the benefits accruing to the original network core.[2]

These two factors suggest that the fate of a high-status firm that loses its economic resources depends on the nature of its ties from low-status firms. A high-status firm with no ties from peripheral firms can be easily deprived of its sources of network attractiveness by other high-status firms. Consequently, if such a firm loses resources, other high-status firms are likely to stop deferring to it. The opposite is likely to be the case for a high-status firm with ties from low-status firms. Even if such a firm loses its economic resources, other high-status firms are likely to continue exchanging with it. Such exchanges will be a payment for continuing to act as a broker. They will also ensure that the firm does not lose its status and, therefore, does not have the incentive to use its connections to the low-status firms to build an alternative network core.[3] This leads to the central hypothesis of our paper:

Hypothesis 3: Following a loss of economic resources, a high-status firm with ties (B) will face a smaller decline in the likelihood of exchange with high-status firms than a high-status firm without such ties (S) will

The foregoing discussion also has implications for the ability of low-status firms to improve their status when they obtain resources. As we argued in the previous section, these low-status firms are most likely to achieve this goal by exchanging with high-status firms without resources.

[2] Although the formation of an alternative network core is only likely to occur if actors in the existing core fail to prevent it, existing literature attests that such separations have occurred with detrimental implications for the actors in the original core. Perhaps the most prominent case has been described by Padgett and Ansell (1993) who examined the rise of Cosimo de' Medici in Renaissance Florence. The Medici family was deeply embedded into the Florentine elite, but, unlike the rest of the elite, possessed numerous marriage and economic ties from disconnected families outside the elite. The simultaneous occupation of high-status position combined with ties to peripheral unconnected actors formed a structural precondition that allowed Cosimo de' Medici to mobilize the peripheral families to join his own party that, in turn, allowed him to found a dynasty that dominated Florence for three centuries.

[3] The two mechanisms can be identified empirically, which we undertake in Appendix B.

These firms are willing to exchange their deference to obtain the resources of low-status firms mainly because high-status firms with resources offer poor terms of exchange. However, as we argued above, high-status firms (B) will continue to obtain deference and resources from other high-status firms, even if it loses resources. Consequently, for them, there will be no reason to exchange their status for access to resources, since they can already obtain these resources from other high-status firms. In contrast, a high-status firms (S) if it loses resources will encounter more problems trying to obtain resources from other high-status firms. Consequently, such a firm will be interested in exchanging its status for the resources of peripheral firms.

As a consequence, we expect that as a low-status firm increases its resources, it is more likely to exchange with high-status firms without resources (S) than with high-status firms without resources (B). This leads us to the final hypothesis:

Hypothesis 4: An increase in resources of a low-status firm will increase the rate of exchange with high-status firms without ties (S) and no resources more than with high-status firm with ties (B) but no resources.

Setting

We test these hypotheses in the context of the American venture capital industry. Venture capitalists (VCs) raise funds from wealthy individuals and organizations that want to invest in start-ups, but lack the means to identify good investments (Sahlman 1990). VCs undertake to find such start-ups and provide them with funds and management expertise in return for an ownership stake. Funding is provided in a series of financing rounds and is contingent on achieving certain milestones. If the start-up is successful, it can be sold to the public or to other companies. Afterwards, VCs liquidate their investments to collect proceeds, keep approximately a quarter of the returns, and return the rest to the original fund providers (Gompers and Lerner 1999).

At every financing round, the incumbent VCs have the option of increasing the number of investors and asking new VCs to join a financial syndicate.[4] The expansion of the syndicate benefits the incumbent VCs in at least three ways. First, to the extent that the incoming VCs bring monetary resources, syndication allows for greater risk sharing (Wilson 1968). Second, given the inherent uncertainty in deciding whether to invest in the start-up for the first time, syndication can help in judging whether a company is a good investment (Lerner 1995; Gompers and Lerner 1999). Such sequential screening has been shown to minimize investment in poor-quality start-ups (Sah and Stiglitz 1986). Finally, syndication allows the incumbent VCs to access managerial talent in the invited VC firms.

VCs that join a syndicate also can realize two main types of benefits. First, they can benefit from access to potentially profitable investments without having to incur very high costs of due diligence. Access to such opportunities is very important in this industry where the distribution of returns on investments is very skewed and a few stellar performers are responsible for the success of a venture capital firm (Bygrave 1994). Since even small differences in access to potentially profitable investments can differentiate successful VCs from the unsuccessful ones, VCs depend on joining syndicates initiated by other VCs.

Second, being asked to join a syndicate can increase the entering VC's status if the syndicate is led by a high-status VC (Podolny 2001; Sorenson and Stuart 2001). Indeed, our interviews with VCs confirmed that a VC's social standing can be improved by joining a syndicate led by Kleiner Perkins, a universally accepted high-status VC firm. As one of our informants reasoned: "Kleiner [Perkins] can easily take any start-up all the way through to the IPO without anyone's help […] so if they actually end up letting someone onto the syndicate, it sort of signals … you're good enough to help Kleiner […] everyone takes notice and you can definitely use that rep in other deals." This is consistent with the reasoning employed in this

[4] Although this process can also be initiated by the start-up organization, incumbent venture capitalists reserve he right to block the entry of new venture capitalists and will exercise it if they do not approve of a new syndicate candidate.

paper. VCs obtain status by joining syndicates led by high-status VCs. Those that can sustain such invitations despite resource loss can truly benefit from the positional benefits of high status.

Methods

Data for this paper were gathered from the Venture Economics SDC database. This database purports to record all investments of venture capital firms. It has been used extensively by sociologists as well as financial economists studying venture capital investments (Gompers 1995; Podolny 2001; Stuart and Sorenson 2001). Since the data before 1979 are considered to be at best incomplete, we utilize data from 1979 onward and end in 1998. To construct our dependent variable, we converted the raw data into a cross-sectional time-series panel with a dyad of VCs as the unit of analysis. For each dyad-year record, we coded the dependent variable, $d_{ijt,}$ as 1 if VC_j joined a syndicate led by VC_i during a period of a year t.[5] Otherwise, the dependent variable is 0.

Status Variables

To construct the status measures, we created adjacency matrices, R_t, for every period *t* representing prior relationships between VCs. The elements of the matrix indicate the number of times VC_j joined a syndicate led by VC_i during a particular period of time, divided by the number of times that VC_i was joined by other venture capitalists. The measure is bound between 0 and 1, with greater numbers indicating the higher proclivity of VC_i to defer to VC_j. In order to determine venture capitalists' network positions, we define the network using a five-year moving window, thereby starting the network analyses in 1984.[6]

[5] The lead venture capitalist, *i*, was defined as the venture capitalist who invested the largest amount of money in that start-up in all years prior to the observation year. Because the amount of money invested in a venture increases with subsequent rounds of financing, it is possible for the lead venture capitalist to change over time. This can potentially introduce biases to this study, as wealthy venture capitalists are significantly more likely to be classified as lead VCs. To prevent this possibility, we also constructed the dependent variable by designating the lead to be the VC that invested the most money in the first round of financing. The results are insensitive to this specification of the dependent variable.

[6] Neither the normalizing division nor the window length (e.g., a three-year window or a seven-year window) had much effect on the findings.

Before we moved into detailed analyses, we wanted to ascertain that the network we observe is consistent with Figure 1. To do that we identified role-equivalent actors in the network. Actors are role equivalent to the extent that they have similar relations with similar kinds of actors (Winship and Mandel 1983). To compute role equivalence measure, we used an approach developed by Hummel and Sodeur (1987) (see Burt (1990) for a discussion). This measure uses a triadic census, excluding the null dyad, and calculates Euclidian distances between the vectors of triadic patterns for each actor. We used this procedure for the 15 matrices R_t and identified actors within every R_t. On average this procedure yielded a core-periphery network with four main network roles: Core I, Core II, Periphery and Isolates.[7] As indicated in the density table reproduced as Table 1, VCs in Core I extend ties to each other and to VCs in Core II. VCs in Core II extend ties to each other and to VCs in Core I.[8] VCs in Periphery extend ties mainly to VCs in Core I, very few to each other, and almost none to VCs in Core II. Finally, Isolate VCs extend ties neither to other venture capitalists in the same role nor to venture capitalists in other roles.[9] This confirms that our network looks like the one illustrated in Figure 1.

We used the eigenvector centrality measure to capture VCs' centrality (Bonacich 1972). In this measure, the contribution of each tie to VC centrality is weighed by the centrality of the VC to which the focal VC is connected. Formally, if R_t is the relational matrix and λ_t is the eigenvalue of the first principal component of R_t, a vector of centrality measures, C_t, can be derived by solving the following equation: $\lambda_t C_t = R_t C_t$. The foregoing centrality measure is a function of the number of ties to other actors and the centrality of these actors. In their seminal

[7] Note that the identity of actors within roles across years can change. This is why this analysis has to be done on the per-annum basis and only then can it be aggregated.

[8] This table also dispels are concern that high-status firms (B) have higher eigenvector centrality and hence are less likely to suffer less likely to suffer the ill effects of losing resources. As seen in the table, tie receipts in Core I and Core II are not significantly different from each other. This pattern is consistent with theoretical discussion of independence between status and network redundancy in Mizruchi *et al* (1986) and Tam (1989).

[9] Isolates occupy their role mainly due to infrequent participation in funding start-ups, investing on average no more than $2.5 million per year, as compared to the average of $90 million a year for the VCs in other three positions. As these VCs are unlikely to aspire to become high status actors, we excluded them from the analysis—yielding the final sample of 443 venture capitalists.

paper, Mizruchi, Mariolis, Schwartz and Mintz (1986) showed that the two ways of acquiring centrality can be formally separated from each other. To capture the part of centrality that is determined by an actor's ties, Mizruchi et al. (1986) exploited the fact that actor *i*'s centrality is partly determined by actor *j*'s centrality, but, at the same time, actor *j*'s centrality is also determined by *i's* centrality. Thus, actor *i* sends some of its centrality to *j,* which is then reflected back to actor *i*. Mizruchi et al. (1986) called this component of centrality reflected centrality. Actors connected to large numbers of other actors, even if these actors, in turn, are peripheral, will be high in reflected centrality. Having accounted for the self-generated centrality, Mizruchi et al. (1986) argued that the remainder of actor *i*'s centrality is derived purely from the centrality of actor *j*. They called this component derived centrality. Actors affiliated with other high-status actors will be high in derived centrality. Derived centrality thus captures actors' status. The two types of centralities are exhaustive, and the sum of reflected and derived centrality is equal to the total eigenvector centrality, C_t.[10]

The concepts of reflected and derived centrality map onto the three network positions we discussed earlier. High-status VCs will be high in derived centrality. Low-status VCs will be low in derived centrality. For the purposes of our analysis, we classified each VC as "high" or "low" status for each time period.[11] Venture capitalists were classified as high status if their derived centrality was higher than the 80th percentile of derived centrality distribution for a particular year, and low status otherwise[12]. Among high-status VCs, those that are low in reflected centrality did not receive ties from peripheral low-status firms. In contrast, those VCs that are high on

[10] Mizruchi et al. (1986) also showed that "the proportions of centrality that each actor derives in *n* steps can be calculated by raising the original matrix $\mathbf{R_t}$ to the n^{th} power ($\lambda_t^n C_t = R_t^n C_t$). The elements in the diagonal of the R_t^n matrix constitute the portion of unit *i*'s centrality that is reflected. The sum of off-diagonal elements along row *i* constitute the portion of *i*'s centrality that is derived." For purposes of this paper, we use two-step (n=2) measures of derived and reflected centrality. Re-analysis of the results using higher powers yields similar results.

[11] It is possible to undertake the analysis using continuous variables. However, doing so involved interpreting three-way interactions, which makes it hard to convey the intuition behind the results. For this reason we prefer this simpler approach.

[12] We employ the 80th percentile split to account for the skewed distribution of derived centrality scores. We also coded VCs as high status if their derived centrality was higher than the median of derived centrality scores for a particular year and obtained comparable, though weaker, results.

reflected centrality obtain a significant number of relations from peripheral firms. Accordingly, we coded each VC as obtaining substantial ties from peripheral firms (B in Figure 1) if their reflected centrality was above the median reflected centrality for that year. Otherwise, we coded the VC as not possessing ties from peripheral firms (S in Figure 1).

Resources

We use a measure of cash that a venture capitalist can disburse in time period *t* as a metric of a venture capitalist firm's resources. For every period *t*, the measure is calculated by summing all of the funds raised by a venture capitalist firm up to period *t-1*, and subtracting all of the investments that it made between the inception of the fund and period *t-1*. We code a venture capitalist as having high cash (H) if the funds available to it in period *t* exceed the median available cash of all venture capitalists in the network in that period.[13] Otherwise, the venture capitalist is coded as low cash (L).

These distinctions assign every VC to one of three centrality categories (B, S or N) and one of the two resource categories (H or L). Thus, every VC is assigned to one of six categories jointly defining network position and resource position. These are: BH, BL, SH, SL, NH and NL. Furthermore, every VC_i, occupying one of the six categories, can then invite a VC_j in the same or another category. This creates a set of 6 * 6 = 36 parameters, which are listed in Table 2. The lead VCs are listed in the rows, while the joining VCs are listed in the columns. The coefficients indicate the likelihood that a VC of one type will be joined by a VC of another type. For example, β_{41} indicates the likelihood that a high-status VC with ties and substantial resources allows a high-status actor without ties and resources to join a syndicate. Table 3 provides information on classification of VCs in our sample.

[13] We utilize the median split here because the distribution approximates a normal distribution.

Insert Table 2 and Table 3 around here

Within the universe of the coefficients, it is useful to distinguish between two types. First, there are coefficients that capture exchanges in which a high status VC with low resources asks a high status VC with high resources to join a syndicate. Since joining a syndicate can be quite valuable, the high resource VC will likely accept it, even though it will have to invest more cash to satisfy the funding needs of such a syndicate. Since status is obtained through invitations to join syndicates, such an exchange on its own will not allow the inviting VC to retain status.

The second set of coefficients captures exchanges in which a high-status VC with resources invites a high-status VC with low resources to join a syndicate. This type of exchange is of greater interest to us. Since status is conferred through invitations to join a syndicate, such an invitation allows the VC with low resources to retain high status. Furthermore, such a syndicate implies substantial opportunity cost on the inviting VC. Not only does the inviting VC offer access to a deal, but also offers to compensate for the relative lack of resources of the invited VC. As a consequence, we expect the second type of relationship less likely to happen.[14] However, when they occur, they signal true deference to the invited VC. For the rest of the paper, we use this more conservative approach in which high status VC with resources invites a VC *without* resources.

Hypothesis tests

We map our four hypotheses into predictions of coefficients in Table 2. Hypothesis 1 suggests that a loss of economic resources suffered by a high-status VC decreases the likelihood of invitation from a high-status VC by less than an equivalent resource loss by a low-status VC. Take, for example, a high-status VC (BH) inviting another high-status VC (B). To evaluate the

[14] This expectation can be easily tested by checking if: $\beta_{11} > \beta_{12} > \beta_{21} > \beta_{22,}$ $\beta_{13} > \beta_{14} > \beta_{23} > \beta_{24,}$ $\beta_{31} > \beta_{32} > \beta_{41} > \beta_{42,}$ $\beta_{33} > \beta_{34} > \beta_{43} > \beta_{44.}$

first part of the hypothesis, we take the likelihood that a high-status VC (BH) invites another high-status VC (BH), β_{11}, and subtract the likelihood that a high-status VC (BH) invites a high status VC without resources (BL), β_{21}. To evaluate the second part of the hypothesis, we take the likelihood that a high-status VC (BH) invites a low-status VC with resources (NH), β_{51}, and subtract the likelihood that a high-status VC (BH) invites a low-status VC with low resources (NL), β_{61}. If Hypothesis 1 is correct, the first difference should be smaller than the second. Formally, this yields:

$$\text{(i) } \beta_{11} - \beta_{21} < \beta_{51} - \beta_{61}$$

We can test Hypothesis 1 further by examining high-status VCs (BH) inviting high-status VCs (S), or high-status VCs (SH) inviting high-status VCs (B), or high-status VCs (SH) inviting high-status VCs (S). In all cases, the decline in resources should always have a smaller effect for high-status VC than a peripheral VC. Formally, this yields:

$$\text{(ii) } \beta_{31} - \beta_{41} < \beta_{51} - \beta_{61}$$

$$\text{(iii) } \beta_{13} - \beta_{23} < \beta_{53} - \beta_{63}$$

$$\text{(iv) } \beta_{33} - \beta_{43} < \beta_{53} - \beta_{63}$$

Hypothesis 3 implies that high-status VCs are more likely to continue to invite high-status VCs (BL) than high-status VCs (SL). Take, for example, invitations from the high-status VCs (BH). To evaluate the first part of the hypothesis, we take the likelihood that a high-status VC (BH) invites another high-status VC (BH), β_{11}, and subtract the likelihood that a high-status VC (BH) invites a high-status VC (BL), β_{21}. To evaluate the second part of the hypothesis, we take the likelihood that a high-status VC (BH) invites a high-status VC (SH), β_{31}, and subtract the likelihood that a high-status VC (BH) invites a high-status VC (SL), β_{41}. If Hypothesis 3 is correct, the first difference should be smaller than the second. Hence,

$$\text{(v) } \beta_{11} - \beta_{21} < \beta_{31} - \beta_{41}$$

We then repeat the comparison, but focus on invitations from high-status VC (S). This yields an analogous prediction:[15]

$$\text{(vi) } \beta_{13} - \beta_{23} < \beta_{33} - \beta_{43}$$

Hypotheses 2 and 4 pertain to the low-status VC's ability to obtain invitations from high-status VCs. Hypothesis 2 implies that an increase in resources of a low-status VC will increase the likelihood of invitation from a high-status VC without resources than from a high-status VC with resources. Take, for example, invitations from high-status VCs (B). To evaluate the first part of the hypothesis, we take the likelihood that a high-status VC (BH) inviting a low-status VC with resources (NH), β_{51} and subtract the likelihood that a high-status VC (BH) invites a low-status VC without resources (NL), β_{61}. To evaluate the second part of the hypothesis, we take the likelihood that a high-status VC (BL) invites a low-status VC with resources (NH), β_{52}, and subtract the likelihood that a high-status VC (BL) invites a low-status firm with low resources (NL), β_{62}. If Hypothesis 2 is correct, the first difference should be smaller than the second. Formally, this yields:

$$\text{(vii) } \beta_{51} - \beta_{61} < \beta_{52} - \beta_{62}$$

We can repeat the same comparison for invitations from high-status VCs with no ties (S). This yields:

$$\text{(viii) } \beta_{53} - \beta_{63} < \beta_{54} - \beta_{64}$$

In Hypothesis 4, we refined Hypothesis 2 and argued that an increase in resources of a low-status VC will increase the likelihood of an invitation from a high-status VC (SL) than from a high-status VC (BL). To evaluate this hypothesis, we first take the likelihood that a high-status VC (BL) invites a low-status VC with resources (NH), β_{52}, and subtract the likelihood that a high-status VC (BL) invites a low-status VC with low resources (NL), β_{62}. Second, we take the likelihood that a high-status VC (SL) invites a low-status VC firm with resources (NH), β_{54}, and

[15] By putting together inequalities (i), (ii) and (v), we obtain $\beta_{11} - \beta_{21} < \beta_{31} - \beta_{41} < \beta_{51} - \beta_{61}$. Similarly, by putting together (iii), (iv) and (vi), we obtain $\beta_{13} - \beta_{23} < \beta_{33} - \beta_{43} < \beta_{53} - \beta_{63}$.

subtract the likelihood that a high-status VC (SL) invites a low-status VC firm without resources (NL), β_{64}. If Hypothesis 4 is correct, the first expression should be smaller than the second. Formally, this yields:

$$\text{(ix) } \beta_{52} - \beta_{62} < \beta_{54} - \beta_{64}$$

Control Variables

In addition to the centrality measures and their interactions with resources, we also used two network control variables. First, we used the strength of the tie between the two VCs. Second, we calculated the number of common alters that a dyad of VCs has (Gulati and Gargiulo 1999). If VC_i and VC_j have not syndicated together in the past, but they have both syndicated with VC_h, h can act as an information intermediary. Such common alters should increase the likelihood of syndication between i and j.[16]

Finally, we added controls for the ecological overlap between the VCs (Hannan and Freeman 1989). We expect that the greater the similarity in these profiles, the more likely two organizations are to establish a tie (Pfeffer and Salancik 1978; Stuart 1998). To capture this similarity between two VCs, we use their niche overlap along three main dimensions of competition salient in this industry: geographic focus, industrial focus and stage of investment (Sorenson and Stuart 2001). We draw on Podolny, Stuart and Hannan (1996) and Hansen and Haas (2001) to determine the degree of crowding_i, defined as:

$$\rho_{ijt} = \frac{\sum_{k=1}^{K} V_{ijk}}{\sum_{k=1}^{K} V_{ik}}$$

where K is the number of categories along a dimension of a niche, V_{ijk} is the smaller amount of total investment of VC_i and VC_j in category *k* during time t-5 to t-1, and V_{ik} is the amount of investment in category *k* by venture capitalist *i* during time t-5 to t-1. This measure is bound

[16] We also estimated a specification in which the number of alters was greater than 0 only if two VCs have not interacted with each other in the past. Though coefficient estimate is different, it is still positive and significantly different from 0.

between 0 and 1. For geographic niche overlap, we use five major venture capital markets: California, Massachusetts, New York, the Midwest and Texas. For the industrial niche overlap, we use five categories: biotechnology, communications, semiconductors, computer-related, medical and life sciences and non-high technology. For the stage of investment niche overlap, we also use five categories: seed and start-up, first stage, second stage, third stage and no ties. For all three measures, the information is updated for every observation period *t*.

Model

We estimate the following model: $\Pr(Y_{ijt} = 1) = \Phi(\gamma + \delta' X_{ijt-1} + \zeta u_{ij} + \theta t + \varepsilon_{ijt})$, where $\Pr(Y_{ijt} = 1)$ is the probability that the VC_j joins a syndicate led by VC_i at time t, Φ represents the cumulative distribution function, X_{ijt-1} is a matrix of time-changing independent variables that represent attributes of each dyad, u_{ij} are unobserved time-constant effects not captured by other variables, t is a matrix of year dummies, and γ, δ, ζ and θ are sets of coefficients to be estimated. All covariates describe a dyad and are lagged by one year.

We estimated this model using fixed-effect probit, with every directed pair of VCs receiving its own dummy. The inclusion of dyadic fixed effects is important because network variables might reflect stable attributes of the venture capitalists we did not observe. For example, the higher propensity of engaging in syndicates among prestigious organizations could reflect the fact that they are particularly skilled at providing management advice to start-up companies. By including the fixed effect, we can separate such unobserved heterogeneity from the state dependence that is reflected in the high-status network position.[17]

Finally, one concern with analyzing dyadic data is possible interdependence across observations, which can lead to systematic underestimation of the standard errors. To ensure the

[17] We re-run the models with random effects, assuming that all possible venture capital dyads in the sample were at the risk of forming a syndicate. The results are shown in Appendix A. The coefficient estimates on the network variables are larger, suggesting that when network variables proxy for unobserved VC characteristics, the substantive results of interests remain the same. We also restricted the risk set to include only dyad-years in which both venture capitalists have engaged in any financing of start-up companies, whether individually or in a syndicate. This restriction leaves the substantive results unchanged.

robustness of our results, we followed Gulati and Gargiulo's (1999) modification of the Multivariate Regression Quadratic Assignment Procedure (Krackhardt 1987, 1988). The procedure generates networks based on random permutations of rows and columns of the adjacency matrices and then estimates the fixed effect model with the new independent variables (Simpson 2002). The percentage of frequency with which the coefficient estimates on independent variables exceed their original values, divided by the number of permutations plus 1, indicates the statistical reliability of the original estimates (pseudo *t*-test). We report the significance levels for the independent variables as generated by this procedure.

Results

Table 4 presents the coefficient estimates. In Model (1), we include only the control variables. All of these are in the expected direction. As previously documented, geographic niche overlap increases the likelihood of interaction (Sorenson and Stuart 2001). Niche overlap in terms of investment stage, e.g., being focused on early financings or pre-IPO financings, increases the likelihood of invitation as well. Industrial niche overlap also has a significant positive effect. The existence of prior syndication between two VCs increases the likelihood of their syndication (Gulati 1995; Stuart and Sorenson 2001). The presence of common alters also increases the likelihood of their syndication (Gulati and Gargiulo 1999). All of these estimates are significant at the 1 percent level.

In Model 2, we keep all of the control variables and include the centrality by resource interactions from β_{11} to β_{65}. β_{66} is the baseline for all of the estimated coefficients. To improve the readability and comparison of the coefficients, we present them in a square table within Model 2. As expected, all of the estimates are positive and, with the exception of β_{63}, β_{64} and β_{65}, are significantly different from 0. With these estimates, we examine the inequalities suggested by our hypotheses. To test the statistical significance of the differences, we rewrite the inequalities as linear combinations of coefficients and test if they are different from 0 (e.g., (i) $\beta_{11} - \beta_{21} < \beta_{51} -$

β_{61} becomes $\beta_{11} - \beta_{21} - \beta_{51} + \beta_{61} < 0$). These linear combinations can be tested using a standard Wald test with $\chi^2_{(1)}$ distribution (Greene 2000:581)

In Hypothesis 1, we asserted that a loss of economic resources suffered by a high-status VC decreases the likelihood of exchange with another high-status VC by less than that faced by a low-status VC. This hypothesis is tested with four different inequalities. In the first case, this implies that a loss of resource by a high-status VC (B) decreases the likelihood of receiving an invitation from another high-status VC (BH) by less than an equivalent loss by a low-status VC. This yields (i) $\beta_{11} - \beta_{21} < \beta_{51} - \beta_{61}$. Substituting the numbers we obtain: 1.885 – 1.824 < 1.177 – .611, which then gives us .061 <.566. The Wald test yields $\chi^2_{(1)}$ = 7.88, implying that this difference is statistically significant at the .01 level. This is consistent with Hypothesis 1.

In the second case, the hypothesis implies that a loss of resources by a high-status VC (S) decreases the likelihood of receiving an invitation from a high-status VC (B) by less than an equivalent loss by a low-status VC (N). This yields (ii) $\beta_{31} - \beta_{41} < \beta_{51} - \beta_{61}$. Substituting the numbers we obtain: 1.774 – 1.239 < 1.177 – .611, which then gives us .535 < .566. The Wald test yields $\chi^2_{(1)}$ =0.07, implying that this difference is statistically significant only at the .79 level. Consequently, we cannot conclude that the difference is statistically significant at the regular .05 level. This finding does not provide support for Hypothesis 1.

In the third case, the hypothesis implies that a loss of resources by a high-status VC (B) decreases the likelihood of receiving an invitation from a high-status VC (SH) by less than an equivalent loss by a low-status VC (N). This yields (iii) $\beta_{13} - \beta_{23} < \beta_{53} - \beta_{63}$. Substituting the numbers we obtain: 2.101 – 1.641 < .998 – .102, which then gives us .460 < .896. The Wald test yields $\chi^2_{(1)}$=7.61, implying that this difference is statistically significant at less than the .01 level. This is consistent with Hypothesis 1.

Finally, Hypothesis 1 implies that a loss of resources by a high-status VC (S) decreases the likelihood of receiving an invitation from a high-status VC (SH) by less than an equivalent loss by a low-status VC (N). This yields (iv) $\beta_{33} - \beta_{43} < \beta_{53} - \beta_{63}$. Substituting the numbers we

obtain: 1.795 – .832 <.998 –.102, which then gives us .963 < .896. The Wald test yields $\chi^2_{(1)}$ = .17, implying that this difference is statistically insignificant. This finding does not support Hypothesis 1.

This pattern of results indicates that the protective properties of high status, asserted by Hypothesis 1, only work for high-status VCs (B). These VCs experience a lower decline in the likelihood of invitation than peripheral VCs. However, high-status VCs (S) do not benefit from such protection. For them, a loss in resources leads to an equivalent decline in the rate of invitation, as suffered by peripheral VCs. These results indicate that status can be protected absent resources when a VC possesses ties from peripheral VCs.

These conclusions are reinforced in the tests of Hypothesis 3. There, we asserted that following a loss of economic resources, a high-status VC (B) will face a smaller decline in the likelihood of invitation from a high-status VCs than a high-status VC (S) will. This can be tested through two inequalities. In the first one, we test if the decline in the level of invitations from a high-status VC (BH) to a high-status VC (B) is less than to a high-status VC (S) as they lose resources. This yields (v) $\beta_{11} - \beta_{21} < \beta_{31} - \beta_{41}$, which gives us: 1.885 – 1.824 < 1.774 – 1.239, which yields .061 < .535. The Wald test yields $\chi^2_{(1)}$ = 8.79, implying that this difference is statistically significant at the .01 level. This is consistent with Hypothesis 3.

In the second case, we examine if the decline in the level of invitations from high-status VCs (SH) to high-status VCs (B) is less than to high-status VCs (S) as they lose resources. This yields (vi) $\beta_{13} - \beta_{23} < \beta_{33} - \beta_{43}$, which gives us: 2.101 –1.641 < 1.795 – .832, which yields .460 < .963. The Wald test yields $\chi^2_{(1)}$ = 7.80, implying that this difference is statistically significant at less than the .01 level. Again, these results are consistent with Hypothesis 3, and they suggest that VCs (B) are much more protected from losing their status when they lose resources.[18]

In Hypotheses 2 and 4, we made predictions regarding the entry of low-status VCs that gain resources. In Hypothesis 2, we asserted that following an increase in economic resources, a

[18] See Appendix B for further discussion of these effects.

low-status VC will experience a greater increase in the likelihood of exchanging with a high-status VC with limited resources than with a high-status VC with resources. We test this hypothesis with two different inequalities. First, we test whether a low-status VC will experience a greater increase in the likelihood of receiving an invitation from a high-status VC (BL) than from a high-status VC (BH). This yields (vii) $\beta_{51} - \beta_{61} < \beta_{52} - \beta_{62}$, which upon substitution gives us: 1.177 – .611 < 1.339 – .586, which is equivalent to .566 < .753. The Wald test yields $\chi^2_{(1)}$ =1.56, implying that this difference is statistically significant at the .20 level. Consequently, we cannot conclude that the difference is statistically significant at the regular 0.05 level. This result does not support Hypothesis 2.

Second, we examine whether a low-status VC will experience a greater increase in the likelihood of exchanging with a high-status VC (SL) than with a high-status VC with (SH). This yields (viii) $\beta_{53} - \beta_{63} < \beta_{54} - \beta_{64}$, which upon substitution gives us: .998 –.102 <1.720 – .092, which yields .896 <1.628. The Wald test yields $\chi^2_{(1)} = 25.32$, implying that this difference is statistically significant at level .01. This is consistent with Hypothesis 2.

These results indicate that the strategy of low-status VCs to use their resources to acquire status from high-status VCs without resources will only work with high-status VCs (S). These conclusions are reinforced through the test of Hypothesis 4. There, we asserted that an increase in resources of a low-status VC will lead to a smaller increase the rate of invitation from a high-status VC (BL) than from a high-status VC (SL). This hypothesis yields (ix) $\beta_{52} - \beta_{62} < \beta_{54} - \beta_{64}$, which upon substitution gives us: 1.339 – .586 < 1.720 –.092, which then yields .753 < 1.628. The Wald test yields $\chi^2_{(1)} = 15.81$, implying that this difference is statistically significant at less than the .01 level. This is consistent with Hypothesis 4.

Conclusions

Organizational theorists and sociologists have shown that status can have a positive effect on firm performance. Critics of this line of research have pointed out that status is merely a reflection of

firm resources and, as such, cannot have a causal effect on performance. Students of status have countered the criticism by positing that status is derived from relations of deference from other high status firms and hence can be very distinct from firm's resources. For this counterargument to hold, however, it has to be the case that firm continues to receive deference from other high-status firms, despite the lack of resources. In this paper, we argued that high-status firms with ties from low-status firms will be able to achieve this for two reasons: (i) to compensate them for brokerage between high-status firms and low-status firms and (ii) to ensure that they do not establish an alternative core in the network. Our empirical results confirm this prediction.

The distinction we propose in this paper has a number of implications across a number of theoretical domains. First, it provides an important modification of the existing theories of status in exchange networks. These theories focused on deference from high-status firms and warned high-status firms against exhibiting deference to low-status firms. However, they have ignored the role of deference relations *from* low-status firms. This omission, combined with the advice to avoid deference to low-status firms, is often taken to mean that firms, in general, should avoid relationships with low-status firms. We show that this is not necessarily true. While deference towards low-status firms is harmful, deference from low-status firms is extremely important to maintaining high-status. Thus, rather than advising firms to avoid relationships with low-status firms, we should instruct them to become targets of their deference (without paying the price of deferring to them).

Second, the distinctions between different types of high-status positions have implications for the debate regarding whether status can have a direct effect on firm performance. Sociologists claim that it does, but critics who see status as a mere by-product of underlying firm qualities argue that there is no causal effect on performance. Our analysis shows that both views can be correct, and a high-status position can exhibit either type of characteristics, depending on fairly small differences in tie configurations. Thus, instead of issuing blanket statements for or against the sociological conception of firm performance, we should pay careful attention to the

process through which firms acquire and lose positions. If we can identify a set of reasons why a firm can retain a position despite resource loss, the sociological perspective can hold. Otherwise, the occupation of a particular position is unlikely to have direct effects on firm performance.

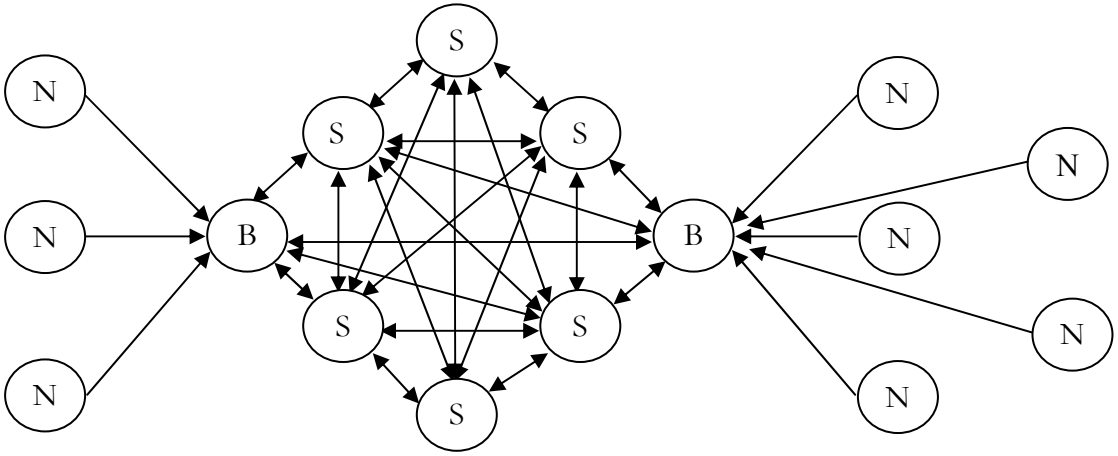
Third, our paper also informs the understanding of how firms with plentiful resources but no status can advance in the hierarchy. Most status theories assume that high-status firms are successful at foreclosing entry, thereby making it very difficult for entrants to acquire status. Given that status mobility has been observed in reality, these theories can be criticized for being unable to account for this. In contrast, resource dependence theories predict that firms with resources will find it easy to acquire privileged network positions. These theories can be criticized for overestimating the ease with which high-status positions can be obtained. We reconcile these mutual criticisms by providing conditions under which entry will be hard, as predicted by the status theories, or fairly easy, as predicted by the resource dependence theories. Specifically, the ability of low-status firms to improve their standing depends on two characteristics of high-status firms. First, the network needs to include some high-status firms that are short on resources. Second, these firms need not already possess ties from low status firms. Thus, networks in which high-status firms consistently possess resources, or those in which most firms receive ties from peripheral firms, will be hard to penetrate. In these conditions, the predictions of the status theories will hold, while those of the resource dependence theory will not. In contrast, when there are some high-status firms without resources, *and* they do not possess ties from peripheral firms, entry should be very easy, and the predictions of status theories will not hold.

Finally, we hope that our distinction between different types of high-status positions will elicit developments in other areas of organizational theory. One possibility is to argue that high-status firms can consciously confer deference on low-status firms in order to try to build relations from them. Although initiating such relations entails the cost of losing status, the reciprocal relations form a protective cushion. We should then expect firms that anticipate minimal variance

in the level of their resources will concentrate on maximizing their status and will avoid deference towards low-status firms. In contrast, firms that anticipate significant variance in their resource levels will likely want to trade-off some of their status for ties from low-status firms. The status loss will reduce the benefits they obtain when they have resources, but, in return, they will have insurance against losing position when they lose resources. This line of reasoning can also be extended to help us predict the kinds of high-status firms will engage in risky projects or deviant behaviors that can potentially undermine their future access to resources. To the extent that firms that feel secure about the retention of their prestige are more likely to engage in such behavior (Zuckerman and Phillips 2001), the theory proposed here suggests that high-status firms with ties from low-status firms are more likely to engage in such behavior.

FIGURE 1

TWO TYPES OF STATUS POSITIONS



B – Both high status and ties from low-status actors
S – High status only
N – Low status

TABLE 1
DENSITY MATRIX BETWEEN NETWORK ROLES

	Core I (B)	**Core II (S)**	**Periphery (N)**	**Isolates**
***Core I* (B)**	0.422	0.420	0.053	0.000
Core II (S)	0.325	0.395	0.030	0.000
Periphery (N)	0.201	0.080	0.042	0.000
Isolates	0.000	0.000	0.000	0.000

TABLE 2
CENTRALITY BY RESOURCE DYADIC INTERACTIONS

		Receiver					
		BH	**BL**	**SH**	**SL**	**NH**	**NL**
Sender	**BH**	β_{11}	β_{21}	β_{31}	β_{41}	β_{51}	β_{61}
	BL	β_{12}	β_{22}	β_{32}	β_{42}	β_{52}	β_{62}
	SH	β_{13}	β_{23}	β_{33}	β_{43}	β_{53}	β_{63}
	SL	β_{14}	β_{24}	β_{34}	β_{44}	β_{54}	β_{64}
	NH	β_{15}	β_{25}	β_{35}	β_{45}	β_{55}	β_{65}
	NL	β_{16}	β_{26}	β_{36}	β_{46}	β_{56}	β_{66}

TABLE 3
VC CORE CLASSIFICATION IN 1992

High Derived and High Reflected Centrality	High Derived and Low Reflected Centrality
Kleiner Perkins Caufield & Byers	TA Associates, Inc.
Mayfield Fund	J.H. Whitney
Hambrecht & Quist	DLJ Capital
Sequoia Capital	First Chicago Venture Capital
Merrill, Pickard, Anderson & Eyre	Welsh, Carson, Anderson & Stowe
Institutional Venture Partners	AVI Capital, L.P.**
Venrock Associates	Patricof & Co. Ventures, Inc.
Asset Management Associates**	Crosspoint Venture Partners
Oak Investment Partners	Morgenthaler Ventures**
Sutter Hill Ventures	Hillman Ventures
Brentwood Venture Capital**	Adler & Co.
U.S. Venture Partners**	Delphi Ventures**
Mohr, Davidow Ventures**	Walden International Investment**
BAY Partners**	Warburg, Pincus & Co.
Sprout Group**	Inco Venture Capital Management
Technology Venture Investors**	Fairfield Venture Partners
New Enterprise Associates	Advanced Technology Ventures**
Citicorp Venture Capital, Ltd.	N.V. Bever Beleggingen
Bessemer Venture Partners	Partech International
Burr, Egan, Deleage & Co.	Enterprise Partners**
InterWest Partners	BancBoston Capital
Greylock	Domain Associates**
Weiss, Peck & Greer	Sierra Ventures
Accel Partners	Arthur Rock & Co.
Menlo Ventures	Oxford Bioscience Partners
Charles River Ventures**	Advent International Corp.
Robertson Stephens & Company**	Rothschild Ventures
Sevin Rosen Management Co.	Sigma Partners
J.F. Shea & Company	Montgomery
Norwest Venture Partners	Continental Illinois Venture Corp.
Matrix Partners**	Austin Ventures
	Vanguard Venture Partners
	Glenwood Management**
	HarbourVest Partners, LLC.
	First Analysis
	Bryan & Edwards**
	North Star Ventures, Inc.
	MedVenture Associates**
	Atlas Venture**
	Indosuez Ventures
	Dillon Read Venture Capital**
	First Century Partners
	Marquette Venture Partners
	ABS Ventures
	CW Group, Inc.**
	Pathfinder Venture Capital Funds
	Harvest Ventures, Inc.**

** indicates that this VC possessed less financial resources than the population median for at least three years during the observation period.

TABLE 4

LIKELIHOOD THAT VC_J WILL JOIN A SYNDICATE LED BY VC_I IN PERIOD T

	(1)	(2)						
Geographic niche overlap$_{ijt}$	.307***	.212***						
	(.036)	*(.036)*						
Industrial nice overlap$_{ijt}$	.419***	.256***						
	(.043)	*(.043)*						
Stage niche overlap$_{ijt}$	.684***	.704***						
	(.025)	*(.025)*						
Syndicated in the past$_{ijt}$	1.308***	1.012***						
	(.036)	*(.039)*						
Common alters$_{ijt}$	.026***	.019***						
	(.001)	*(.001)*						
			Joining VC_j centrality and resource classification					
				BH	BL	SH	SL	NH	NL
			BH	1.885***	1.824***	1.774***	1.239***	1.177***	.611***
				(.074)	*(.081)*	*(.161)*	*(.102)*	*(.099)*	*(.072)*
			BL	1.784***	1.424***	1.828***	1.289***	1.339***	.586***
				(.074)	*(.071)*	*(.172)*	*(.101)*	*(.052)*	*(.068)*
			SH	2.101***	1.641***	1.795***	.832**	.998***	.102
Lead VC_i centrality and resource classification				*(.046)*	*(.040)*	*(.050)*	*(.157)*	*(.105)*	*(.047)*
			SL	1.775***	1.602***	1.141***	1.191**	1.720***	.092
				(.158)	*(.144)*	*(.090)*	*(.235)*	*(.107)*	*(.183)*
			NH	1.004***	.993***	.539*	1.253**	.532**	.233
				(.124)	*(.115)*	*(.124)*	*(.133)*	*(.091)*	*(.113)*
			NL	1.025***	.793***	.522*	.347	.474*	
				(.081)	*(.072)*	*(.101)*	*(.133)*	*(.113)*	
Log Likelihood	-29,093	-28,596							
Log Likelihood Change		497							
$\chi^2_{(35)}$		945***							
Observations	109,185	109,185							

Yearly dummies and fixed effects included in regression, but coefficients not reported

Standard errors are in parentheses, * p <.10; ** p < .05; *** p < .01 from QAP one-tailed tests, not regular t-tests

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APPENDIX A: SUPPLEMENTARY ANALYSIS WITH RANDOM EFFECTS ONLY (Stability check only)

LIKELIHOOD THAT VC_J WILL JOIN A SYNDICATE LED BY VC_I IN PERIOD T

Geographic niche overlap$_{ijt}$	*.408****
	(.023)
Industrial nice overlap$_{ijt}$	*.262****
	(.029)
Stage niche overlap$_{ijt}$	*.457****
	(.018)
Syndicated in the past$_{ijt}$	*.075****
	(.003)
Common alters$_{ijt}$	*.025****
	(.001)

Lead VC_i centrality and resource classification × *Joining VC_j centrality and resource classification*

	BH	*BL*	*SH*	*SL*	*NH*	*NL*
BH	*1.941****	*1.910****	*2.813****	*2.017****	*1.925****	*1.321****
	(.062)	*(.060)*	*(.150)*	*(.091)*	*(.083)*	*(.053)*
BL	*1.763****	*1.355****	*2.225****	*1.587****	*1.358****	*.722****
	(.062)	*(.057)*	*(.155)*	*(.089)*	*(.083)*	*(.052)*
SH	*2.281****	*1.567****	*3.325***	*.330*	*.801***	*.344*
	(.083)	*(.123)*	*(.502)*	*(.103)*	*(.102)*	*(.387)*
SL	*1.653****	*.980****	*.854****	*1.485***	*1.357**	*.281*
	(.133)	*(.122)*	*(.059)*	*(.215)*	*(.263)*	*(.165)*
NH	*1.560****	*1.218****	*1.072**	*1.434**	*.982***	*.538**
	(.106)	*(.099)*	*(.194)*	*(.223)*	*(.136)*	*(.098)*
NL	*1.116****	*.728****	*.996**	*.503**	*.681***	
	(.061)	*(.056)*	*(.185)*	*(.116)*	*(.093)*	

Log Likelihood	*-63,592*
Observations	*2,533,815*

Yearly dummies included in regression but coefficients not reported

Standard errors are in parentheses, * p <.10; ** p < .05; *** p < .01 from QAP one-tailed tests, not regular t-tests.

Appendix B

As reported in Table 4, high status VCs (B) do not suffer a significant penalty in the rate of invitation when they lose resources. We argued in the theory section that two mechanisms can generate this result. First, these VCs are in the unique position to act as brokers between low status VCs and other high status VCs. Second, these VCs can maintain attractiveness in the network independently of high status actors and form an alternative network core. Though these VCs can provide the two types of benefits to other VCs, not all VCs will value them equally. Certain types of VCs benefit from access to brokerage more than others. Similarly, certain VCs care more strongly about the maintenance of the existing network core, while others may find it less important. It is possible to extend the exchange model we proposed in the paper to predict what these differences are and how they translate into patterns of invitations. To the extent that we see these patterns in the data we can identify which mechanism (or both) generates the central result.

As for the brokerage benefit, we expect that the benefit will be highest for high-status VCs (SH). As can be seen in Figure 1, these VCs are connected to a tightly connected set of high status VCs and so have few opportunities to access unique deals. High-status VCs (BH) already have many connections to disconnected actors, so they will be able to access original deals on their own. Consequently, they will value access to brokers less than high-status VCs (SH) will. Thus, if the brokerage mechanism is in operation, we would expect that high-status VCs (SH) will be more likely than high-status VCs (BH) to extend invitations to high-status VCs (BL). This implies that $\beta_{11} - \beta_{21} > \beta_{13} - \beta_{23}$.

The maintenance of network core mechanism predicts the opposite pattern of invitations. The benefits of maintaining the core intact are highest for high-status VCs (BH). These VCs obtain substantial benefits from receiving invitations to join syndicates from low status VCs in return for an occasional reciprocal invitation. The establishment of an alternative network core is likely to reduce the number of such ties form low-status VCs who will now move some of their

ties to the other core. Thus, if this mechanism is in operation, high status VCs (SH) should be less likely than high status VCs (BH) to extend invitations to high-status VCs (BL). This implies that $\beta_{11} - \beta_{21} < \beta_{13} - \beta_{23}$.

To test these predictions, we used the parameter estimates from Model (2). The first part of the inequality is given by: $\beta_{11} - \beta_{21} = 1.885 - 1.824 = .061$, while the second part is given by: $\beta_{13} - \beta_{23} = 2.101 - 1.641 = .460$. The results indicate that $\beta_{11} - \beta_{21} < \beta_{13} - \beta_{23}$ and the difference between the two estimates is significant at .03 ($\chi^2_1 = 4.92$) suggesting that the network core maintenance effect is definitely at work here.

However, this result does not necessarily rule out the possibility that the brokerage mechanism is active, too. Because the two mechanisms work in opposite effects, it is possible to obtain this result even if both of them are in operation, but the network core maintenance effect is stronger.

To explore the hypothesis that the brokerage mechanism could also be at work here, we undertake further analysis and differentiate between the inviting VCs that are and are not directly connected to the high-status VCs (BL). The distinction is helpful, because brokerage benefits are most likely to benefit VCs that are already connected to the receiving VC. This is because the receiving VC is more likely to refer a deal to VC they already know rather than to a stranger. If this is the case, then the brokerage mechanism predicts that VCs connected to the high status VC (BL) should be more likely to continue inviting that VC even it loses resources. In contrast, cost of establishing an alternative network core will equally affect both the connected and disconnected actors.

To understand the difference between the rates of invitation by connected and unconnected VCs, we re-estimate Model (2), but split β_{21} and β_{23} each into two parameters – one for connected VCs and the other for unconnected ones. To save space, we do not report the entire set of results, just the four parameters of interest.

Rates of invitation to high status VC (BL)

	(B)	(S)
Connected	1.955***	1.710***
	(.081)	*(.050)*
Unconnected	1.501***	.911***
	(.102)	*(.041)*

The results reveal a pattern consistent with the operation of both mechanisms. First, consistent with earlier results and the core maintenance mechanism, on average high status VCs (BH) invite at a higher rate than VCs (SH) do. Second, within the class of high status VCs (BH) those that are directly connected to the VC (BL) without resources are more likely to extend invitations that VCs (BH) that are not connected. This suggests that even for these VCs, brokerage is still important. Third, high status VCs (SH) that are directly connected to the focal VC (BL) extend invitations to that actor almost at the same rate as VC (BH) do. Finally, and most importantly, the difference in the rate of invitations by high status VCs (SH) that are directly connected and VCs (SH) that are not connected is .82. This is very substantial decline – twice the magnitude than the corresponding decline for high status VCs (BH). This is very consistent with our expectations for brokerage. These VCs have very little to benefit from sustaining the high-status VC (BL) with few resources unless they are directly connected to them. This suggests that the brokerage mechanism is most likely at work here too.