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Organizational Endowments and the Performance of University Start-ups

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The question of how initial resource endowments—the stocks of resources that entrepreneurs contribute to their new ventures at the time of founding—affect organizational life chances is one of significant interest in organizational ecology, evolutionary theory, and entrepreneurship research. Using data on the life histories of all 134 firms founded to exploit MIT-assigned inventions during the 1980–1996 period, the study analyzes how resource endowments affect the likelihood of three critical outcomes: that new ventures attract venture capital financing, experience initial public offerings, and fail. Our analysis focuses on the role of founders' social capital as a determinant of these outcomes. Event history analyses show that new ventures with founders having direct and indirect relationships with venture investors are most likely to receive venture funding and are less likely to fail. In turn, receiving venture funding is the single most important determinant of the likelihood of IPO. We conclude that the social capital of company founders represents an important endowment for early-stage organizations.
(*Entrepreneurship; Social Capital; Financing*)

Introduction

At inception, founders endow the organizations they create with certain resources. In this article, we ask: How do initial resource endowments affect the performance of new ventures? A number of organizational theorists have posited that initial resource stocks may have enduring effects on organizational performance (Stinchcombe 1965, Baron et al. 1996, Hannan 1998), perhaps evincing a positive feedback dynamic in the resource accumulation process in which initial advantages amplify over time. Other researchers have challenged this view, asserting that resource endowments—and the advantages they engender—often dissipate quickly (Bruderl and Schussler 1990, Fichman and Levinthal 1991).

The debate about the influence of initial resource endowments on organizational life chances has continued because systematic evidence on the subject has been elusive. One reason for this is the difficulty researchers have encountered in obtaining the information needed to explore endowment effects. The most significant obstacle has been that the study of initial endowments cannot proceed without detailed information on the earliest days of an organization's existence. Unfortunately, new organizations often fail before they are recognized in industry directories and by the popular press, which means that there are few data sets describing initial resource endowments in nonselected samples. As a result, inferences regarding the effects of endowments on organizational performance have, for the most part, been drawn from analyses of indirect relationships, such as the pattern of age dependence apparent in studies of organizational failure rates.

In this article, we analyze a unique data archive describing the life histories of 134 high technology firms founded to exploit MIT-assigned inventions during the period from 1980 to 1996. The start-ups in

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this population were founded specifically to commercialize technologies licensed from MIT. In addition to documenting the date of founding in a complete and nonselected organizational population, these data also include archival records and in-depth interviews with company founders. The data describe (i) whether company founders had (pre-existing) social relations with venture investors at the time they launched the new company, (ii) the prior industry and start-up experience of company founders, (iii) the technological assets of the company at founding, and (iv) characteristics of the industries that the new ventures entered. We also collected event histories describing the performance milestones achieved by each firm. Therefore, our analyses enable comparisons of the relative influences of social capital, human capital, technological resources, and market conditions at founding on the subsequent performance of new technology firms.

Because extant studies have established that organizational outcomes are affected by new ventures' human capital endowments (Bruderl et al. 1992), their stocks of technical assets (Stuart et al. 1999), and the environmental and market conditions at the time of founding (Hannan and Carroll 1992), we concentrate on the relationships between founders' social capital at the time of founding and later-life outcomes. An additional reason for this focus is that the organization building process is hampered by widespread information problems that make it likely that founders' social capital influences new venture performance, particularly in the case of technology-based ventures. Therefore, we concentrate the theoretical development on the social capital argument, but our analytical strategy will treat the relative influence of the endowments of these four categories of resources on organizational outcomes as an empirical question to be unraveled in the analysis. Moreover, we perceive the contribution of this article to lie in the evidence linking different types of resource endowments to organizations' critical, early-stage performance milestones.

Founders' Social Capital and Resource Acquisition

Creating new organizations involves allocating resources to novel uses. But because the entrepreneurs who discover opportunities for new ventures often do not control the resources needed to pursue them, they must enlist the patronage of outside investors. The founders of early-stage ventures vary in their ability to obtain the support of resource holders, and this variance likely has a salient effect on venture performance (Aldrich and Zimmer 1986, Stuart et al. 1999, Stuart 2000). The conjecture we explore here is that entrepreneurs' social capital contributes to new venture performance, in large part because of its effect on founders' ability to secure external financing to pursue the opportunities they discover.

A resource holder's decision to support an entrepreneurial enterprise depends on his or her appraisal of the attractiveness of the opportunity identified by an entrepreneur.[1] However, researchers in the areas of finance, economic sociology, transaction costs economics, and entrepreneurship have observed that a set of uncertainties and information asymmetries encumber the evaluation of new ventures and complicate the process of contracting between resource holders and new ventures. The contention that we make is that the presence of these factors elevates the significance of the social capital of the founding team as a basis for making investment decisions.

Uncertainty about the quality of start-ups in part arises from the simple fact that young companies have very short performance track records, and thus do not lend observable histories to the task of evaluating their quality. Stated differently, the information that resource providers would ideally use to assess a venture's quality is not observable until after the entrepreneur has obtained resources, established a

[1] Throughout the article, we will use the terms "resource holder" and "investor" as synonyms. Although we develop the social capital argument specifically in terms of the decision of the suppliers of financing to invest in an early-stage venture, the argument is qualitatively generalizable to the case of a potential supplier's or customer's decision to transact with a new organization or a potential employee to work for a particular startup.

functioning organization, and started down the path of developing products (Arrow 1974).

Uncertainty about the future prospects of young organizations is likely to be particularly high among those enterprises established to commercialize new technologies (Aldrich and Fiol 1994). Technology companies may require large resource commitments to conduct exploratory development projects, and hoped-for revenues and profits often lie far in the future. Moreover, new technology is intrinsically unpredictable. Emerging markets progress along unforeseeable paths, incompatible technologies compete for market acceptance, and technical roadblocks routinely derail once promising development projects (Tushman and Rosenkopf 1992). For these reasons, a lengthy time period and large resource outlays may stand between an early-stage technology company and the resolution of the uncertainty about its long-term viability. Thus, the quality of embryonic technology companies, the magnitude of the underlying market opportunities that venture founders wish to exploit, and the level and duration of the investment required to nurture early-stage companies elude precise delineation in ex ante evaluations.

Information asymmetries also obscure evaluations of new ventures. Relative to outside evaluators, entrepreneurs are privy to more information about the prospects of their ventures and the abilities and level of commitment of the founding team. This increases the risk borne by investors in new companies because entrepreneurs may exploit their superior knowledge of their company's position to gain concessions from investors, for example, by extracting a higher valuation or larger resource commitment than a fully (or more) informed investor would provide. Like the level of uncertainty, information asymmetries may be particularly acute in the case of early-stage technology companies. In these instances, firm founders are often the leading experts in the relevant area of technology, and therefore are the best informed about the feasibility of a proposed technology.

Prior research identifies two types of responses from resource holders when the decision to invest is complicated by the presence of uncertainty and information imbalances. The economics literature emphasizes the design of contracts—particularly the allocation of control rights between trading partners—that minimize agents' capacities to behave opportunistically vis-à-vis their transaction partners when one party in a deal has more information than the other and unforeseeable contingencies obfuscate the future terms of the relationship (Gompers and Lerner 1999, Kaplan and Stromberg 1999).[2]

However, contractual controls rarely succeed at fully eliminating the entrepreneur's ability or incentive to take actions that conflict with the interests of outside investors (Venkataraman 1997, Arrow 1974). Moreover, when there is high uncertainty about how an early-stage business might evolve, it is very difficult to design contracts that attend to all possible, future contingencies that might impact the terms of the relationship between entrepreneurs and their investors. As a result, the agreements between entrepreneurs and investors are often subject to ex-post opportunism (Williamson 1975).

Whereas the economics literature has focused on how formal contracts and the allocation of control rights between the parties in an exchange can minimize transactional risks under conditions of uncertainty and information asymmetry, the sociological literature on the subject has emphasized the implications of these conditions for the selection of exchange partners. Sociologists observe that when the circumstances surrounding a transaction preclude an actor from entering a relationship without the risk that his partner will behave opportunistically, he often chooses to conduct business only with exchange partners he knows (Macaulay 1963, Granovetter 1985, Bradach and Eccles 1989, Coleman 1990, Stuart and Robinson 2000).

The sociological argument distills to the contention that actors rely on social networks to select transaction partners who they believe will behave reliably, even when a partner is not contractually obligated to do so. In general, networks serve two functions

[2] Types of opportunistic behavior that investors may be exposed to include failure on the part of entrepreneurs to exert promised effort to develop a new company, entrepreneurs undertaking actions that yield private gains at the company's expense, and company founders holding up investors by threatening to depart.

that facilitate, respectively, the enforcement of implicit contracts and the selection of reliable partners. First, the network is a mechanism for sanctioning actors who behave opportunistically; second, it delineates the pathways through which information is relayed about its members. Because information about actors' conduct in previous transactions diffuses through the connections in a network, actors will know of the past behavior of the other members of the network within their information spheres, and they will have the power to sanction their transaction partners by disseminating negative information about them in the event of malfeasant behavior (Granovetter 1985, Raub and Weesie 1990).

These functions of the network may influence the resource holder's decision to support the entrepreneur. When an investor evaluates a new venture, she produces estimates of the expected value of the investment under different scenarios. Because opportunistic behavior on the part of the entrepreneur reduces the expected payoff from the investment, investors will be less likely to finance projects in which they question the reliability of the entrepreneur. Ceteris paribus, as the probability that an exchange partner will behave opportunistically declines, the expected value of transacting with that partner increases.

One of the more robust findings in the literature on intercorporate and interpersonal relations is that actors with established trading histories are likely to trust one another. This is because past partners are of known character, and the counterparties in an ongoing relationship have an incentive to behave with good faith to preserve the health of the relationship for future exchanges. Further, a history of past exchanges often produces feelings of obligation between exchange partners, in part because the relationship may double as a friendship. We therefore posit, *new ventures with founding teams that have pre-established relationships with venture investors are more likely to acquire external funding for their ventures*.

Just as a history of direct exchange reduces the perceived threat that a partner will behave opportunistically, indirect ties between two parties may facilitate exchange by increasing the level of trust in the relationship. When ties to a mutual third party link two actors, the third party may play the role of "intermediary in trust" (cf. Coleman 1990). In this situation, the relationship between would-be trustor and trustee is facilitated when the trusting party has confidence in the advisor's judgment, who, in turn, has confidence in the ability of the trustee.[3] In effect, the intermediary certifies the counterparties in a potential transaction by relaying subject evaluations about qualities like an actor's reliability. This process suggests that *new ventures with founding teams that have pre-established relationships with third parties who are connected to venture investors are more likely to acquire external funding for their ventures*.

There is one additional factor that may reinforce the role of direct and indirect ties in increasing the likelihood of an investment: Ties between investors and entrepreneurs may also affect investors' assessments of the quality of the entrepreneur's project when uncertainty is high (e.g., when the new venture aims to develop an unproven technology). By definition, uncertainty increases the problem of identifying quality. As the task of assessing competence becomes increasingly imprecise, evaluators' appraisals of quality are opened to the influence of indirect signals, such as the social status of the actors under scrutiny and the prestige of their affiliates (Podolny 1994, Stuart et al. 1999). To the extent that the social structural proximity of other actors becomes a basis for making quality inferences, the estimates of the potential value of an investment opportunity, in addition to expectations of the trustworthiness of entrepreneurs who propose the project, are also positively influenced when a potential investor and entrepreneur are near in social space. Consistent with this view, Wilson (1985) emphasizes the importance of referrals

[3] In this case, the advisor's incentives are linked to the credibility of his advice. If his advice proves incorrect, he loses the confidence of those he has advised, and his position as a trusted intermediary is compromised. There are a number of perspectives on the interests of the intermediary in three party systems, most of which build from Simmel's (1950) analysis of triad structures. For example, in Blau's (1964) exchange theory, advice is exchanged for deference and thus the intermediary's incentives are also linked to the accrual of status. Burt's (1992) discussion of the *tertius* role stresses that intermediaries can extract "profit" by brokering the direct relationship between two disconnected parties.

to signal quality to venture capitalists, as does a survey performed by Tyebjee and Bruno (1984).

Endowments: A Shadow Over the Future

The preceding section outlined arguments for why we expect new ventures with founders who are within the social circles of venture investors to be advantaged in the resource acquisition process. Before presenting the empirical analysis, we return briefly to the question of how long this and similar initial advantages are likely to persist. Although the notion of a "liability of adolescence," in which organizational mortality rates increase as new ventures deplete their initial resource endowments, has found some empirical substantiation in the ecology literature (Bruderl and Schussler 1990, Fichman and Levinthal 1991), others argue that early resource endowments set a new venture on the path toward the establishment of long-term, robust positions (cf. Hannan 1998).

In support of Stinchcombe's (1965) imprinting argument, a number of recent papers exploring the evolution of technology companies have produced some of the strongest evidence yet that the early decisions made by organizations persist for considerable periods of time (Sorensen and Stuart 2000, Baron et al. 2001). To the extent that endowment levels directly constrain organizational decision making, the level of initial resource endowments may position organizations on different developmental trajectories. For example, a lack of resources at founding might compel an organization to adopt a set of decision rules aimed at cost minimization, such as "buying cheap materials" or "avoiding high salary employees" (Swaminathan 1996, Burderl et al. 1992). A resource shortage may also discourage employees from investing in organization-specific skills because they are doubtful of their employer's viability and thus their ability to recoup investments in firm-specific knowledge (Swaminathan 1996). Similarly, resource-poor start-ups may have weak bargaining positions with their customers and suppliers (Stinchcombe 1965). This can be a particularly severe disadvantage in high technology industries, where a lack of resources may force young firms to cede to alliance partners significant rights to future products and technologies in exchange for assistance in supporting a research program (cf. Lerner and Tsai 1999).

All of these factors combine to suggest that new ventures lacking initial resource endowments might develop inferior structures, internal processes, and human resources relative to their competitors, and thus may develop a reputation for low quality that can be extremely difficult to escape. We therefore believe that initial resource endowments are likely to be parlayed into sustainable advantage, and we present suggestive evidence to this effect.

Methodology

Sample and Data Sources

The data set we analyze includes the population of 134 firms founded to exploit inventions assigned to the Massachusetts Institute of Technology between 1980 and 1994.[4] Like many other research universities, the institute often takes title to commercially useful inventions that are developed by faculty, staff, or students and that emerge from work making material use of MIT resources (e.g., laboratory facilities). MIT then attempts to commercialize some of these discoveries. The study population was identified from the records of the MIT Technology Licensing Office (TLO), to which we were permitted access to perform this analysis. The TLO's mission is to commercialize MIT technology. Although many of the enterprises licensing MIT's intellectual property are established companies, a subset of these licensees includes new ventures founded to develop the institute's technology. We examine these entities here.

The TLO archives describe the contracts between MIT and its licensees, characteristics of the licensed intellectual property, and start-ups' business plans. In addition, the TLO tracked the sales growth and

[4] This paper examines the MIT-originated start-ups from the point of incorporation forward. Shane and Khurana (2000) and Shane (2001, 2002) exploit data from the MIT TLO to explain why some patented inventions are more likely than others to be exploited by new firms. The analysis here begins where those studies end: at the point of firm formation.

financing obtained by its licensees. To supplement the TLO data, we conducted unstructured interviews with company founders and consulted online databases including Lexis/Nexis, Diolog Business Connection, and ABI Inform. These sources were used to verify information and fill in gaps in the TLO records. Finally, we obtained additional information on the venture capital financing received by the TLO firms from the Venture Economics and Venture One databases. All variables were coded from these data sources. The objective of the data collection effort was to create detailed profiles of all firms at the time of founding, along with a (retrospective) life history for each firm in the data set.

Although MIT-based start ups clearly do not constitute a representative sample of all technology-based companies, these data have two important advantages relative to other samples of new ventures. The most important feature of these data is that the TLO has a record of *every* company established to commercialize MIT's intellectual property since 1980. As a result, the TLO data are free from survivor bias—a sample selection problem that is endemic to studies of early-stage companies. Sample selection bias is rampant in research on new ventures because archival data sources rarely record the existence of companies that fail at a very young age. In fact, the data we utilize evince the general difficulty of obtaining a nonselected sample of startup companies: A number of the firms in the TLO sample fail before they are acknowledged in any publicly available database. Although we possess information on these organizations from the TLO archives and interviews with company principals, it would not have been possible to learn about them from secondary sources. Moreover, interviews with founders and TLO staff indicated that many of these failures occurred because companies were unable to obtain financing from external sources, thus demonstrating the limitations of explaining how initial endowments affect new venture performance in samples that exclude early failures.[5]

A second advantage of the TLO data is that there are no left censored firm histories (i.e., all firms in the sample are observed from the time of incorporation until a performance outcome is recorded, or until the observation is right censored at the end of calendar 1996). Because we employ event history methods to analyze firm performance, we require a sample without left censored observations to obtain reliable parameter estimates.

Method

The events we model include receiving venture capital funding, IPO, and failure.[6] As a general rule, the most desirable type of liquidity event (from the perspective of the owners of the firm) is an initial sale of securities on the public equity markets. From the perspective of company founders and owners, selling equity to the public often generates much-needed capital and the opportunity for equity holders to exchange stock for cash. We analyze the three organizational transitions (financing, IPO, and failure) in terms of the instantaneous transition rate, r, defined as

$$r_k(t) = \lim_{\Delta_t \downarrow 0} \frac{\Pr(t \le T < (t+\Delta t), D = k \mid T \ge t)}{\Delta t},$$

where k refers to one of three mutually exclusive destinations in D (the performance events). The variable T measures the time spent at risk of making one of these possible transitions, and the probability Pr refers to the likelihood of experiencing one of these transitions during the small interval from t to $(t + \Delta t)$, conditional on a start up being at risk of making a

[5] Of course, there is still a selection process that operates on these data: The TLO, MIT inventors, and entrepreneurs all influence which MIT technologies will be licensed to start-up companies. All new organizations emerge from an opportunity identification process that precedes the incorporation of the firm, but these data are once again unique in allowing this issue to be examined empirically (see Shane and Khurana 2000, Shane 2001, 2002).

[6] Although we possess data on angel financings, the time-to-VC-funding regressions are limited to the first occurrence of financing from a VC firm. Because the sample consists entirely of early-stage technology companies, traditional performance metrics such as accounting-based indicators of profitability are inappropriate for these data. For example, many of the firms in the sample are in the biotechnology industry, and these organizations can have highly successful IPOs even with no revenues from the sale of internally developed products. For this reason, we analyze performance in terms of the rate of occurrence of a set of important milestones for new ventures.

transition as of time t (Tuma and Hannan 1984). The waiting time clock in the firm event histories turns on at the time of incorporation.

The transition to IPO and failure are treated as "competing risks" and are modeled using the approach discussed in Kalbfleisch and Prentice (1980). These events are terminal in the sense that the occurrence of either of them obviates the possibility that the other transition will take place within our observation window, so an organization exits the risk set after experiencing either event.[7] The hazard of receiving venture financing is estimated in a separate set of regressions because we model only the first occurrence of this event. Although VC funding could be treated as a repeatable event and included as a competing risk in the models of the other two performance-related transitions, our interest in how initial conditions affect performance outcomes makes the first round of venture financing the milestone of greatest significance to us.[8] In both the time-to-VC funding and the IPO/ failure rate models, we create annual spells to update the values of the time changing covariates. Each spell ends in censoring unless an event occurs within the focal firm-year observation.

We specify each rate as varying according to the piecewise-exponential functional form

$$r_k(t) = \exp[\gamma_p + B'X_t],$$

where γ_p includes three duration-period effects, X_t contains independent variables (some of which vary over time), and B are the parameters to be estimated. We adopt the piecewise specification of duration dependence because it permits the rate to vary flexibly with duration (in this case, firm age) without requiring strong parametric assumptions. The age pieces we include are less than four years old, four to seven years old, and greater than seven years old; the baseline rate is assumed to be constant within each period, but is unconstrained across periods. The transition rate models were estimated using TDA (Blossfeld and Rohwer 1995).

Covariates

Endowments-Social Capital. Our first prediction is that company founders with pre-established ties to angel investors or venture capitalists will be more likely to obtain external funding for their fledgling companies and also are more likely to achieve an IPO. We measure the presence of a direct tie as a dummy variable denoting that at least one member of the founding team had a direct business or social relationship with a venture investor prior to the founding of the firm.[9] To ensure against the risk that this variable may be miscoded in the affirmative for firms that

[7] Twenty-two firms in the sample were acquired. In the hazard rate models, we handle acquisition by censoring the event histories of acquired companies at the time of the deal. In unreported regressions, we have estimated the rate of acquisition as an additional competing risk, but chose not to report the acquisition models both to conserve space and because the meaning of an acquisition varies across events. This variance occurs because some of the firms in the sample were acquired at relatively high valuations, whereas others were acquired at low valuations or when a venture was on the verge of liquidation. The former type of acquisition was in all likelihood construed by company principals as a successful exit, whereas the latter type of acquisition would be viewed as a failure. Unlike some researchers, we opted to not categorize acquisitions as "successful" or "unsuccessful" and include the successful acquisitions with IPOs and unsuccessful acquisitions with firm failures. That approach would introduce subjectivity into our measurement of the dependent variable.

[8] The reason for this is that venture capitalists typically fund their portfolio companies in a series of financing rounds (Lerner 1994). Thus, a new venture must receive a first round of funding to be eligible for a second round, and market conditions and the development of the firm between rounds should be the predominant determinants of second- and later-stage financing rounds. This illustrates the path dependencies in the VC funding process, but also suggests that initial conditions may not play a substantial role in later-stage funding decisions net of their effect on the occurrence of the first financing round.

[9] This variable indicates simply whether a relationship between a founder and an investor predated the founding of a company; it does not necessarily indicate a pre-established tie to the specific investor(s) who funded a focal venture (if the company did receive funding at some point in the future). Obviously, coding the variable as 1 if a founder had a tie with the investor that ultimately funded the company would be tantamount to using the dependent variable (in the case of funding) to predict itself (i.e., the direct tie variable would be 1 for all companies that received funding, and 0 for all other firms). For more direct evidence of the effect of a pre-established relationship between an entrepreneur and an investor on the likelihood that a VC funds a new venture, see Shane and Cable (1998) and Sorenson and Stuart (2001).

did receive venture funding but may not have had a relationship with investors that predated the time of funding, we coded direct ties as a 1 only when another data source confirmed that the relationship existed prior to the time of firm founding.[10]

The second contention we make is that founders with ties to third parties who in turn have relationships with angels or venture capitalists are more likely to obtain external funding for their companies and also are more likely to achieve positive performance milestones.[11] We measure indirect ties as a dummy variable denoting whether at least one member of the founding team had a business or social tie to a third party who had a direct tie with a venture capitalist or angel investor prior to the founding of the firm. As in the case of direct ties, we required documentation from at least two information sources to code this variable in the affirmative.

Endowments-Human Capital. New ventures with founders that have previous experience in the industry of the start-up are likely to perform well relative to companies with management teams that lack industry familiarity. Founders with industry experience presumably have knowledge of effective strategies and customer preferences, as well as valuable contacts with customers, suppliers, and other industry participants (Bruderl et al. 1992, Gimeno et al. 1997). We therefore create a dummy variable, industry experience, which is coded 1 if at least one member of the founding team had previous experience in the new firm's industry.

Companies founded by individuals with previous start up experience also may have an advantage relative to organizations created by first-time entrepreneurs. Start-up experience enhances entrepreneurs' understanding of how to staff and lead early-stage organizations, to develop new products, and to manage relationships with investors, employees, suppliers, and customers (Bruderl et al. 1992). We construct a dummy variable, start-up experience, which is coded 1 if at least one member of the founding team had previously launched a new company.[12]

Endowments-Technical Assets. All firms in our sample were established to commercialize MIT inventions, but they vary in the magnitude and quality of their technical endowments. The strength of a new firm's intellectual property position is thought to be an important determinant of its success, particularly because new firms, by definition, do not have complementary assets in place (Merges and Nelson 1990, Teece 1986). We include a number of measures of the technological strength and quality of the firms in the sample *at the time of founding*. First, we define a variable, patent stock, to designate the number of MIT patents that were licensed to the new venture at founding (many of the firms in the sample license more than one MIT-assigned patent). We also coded a second variable, exclusive license, which indicates whether the new venture has an exclusive right to use MIT technology in a particular field of use.[13]

[10] In the modal case, the two information sources were interviews with a company founder and the TLO archives. For example, the direct tie variable would be coded 1 when (i) a company founder stated that he had a pre-existing professional relationship with a venture capitalist, and (ii) the TLO record for the founder's company contained a memo from a licensing officer indicating that the firm would target a particular venture capitalist for funding because one of the founders had previously conducted technical due diligence work for that venture capitalist.

[11] Our analysis excludes indirect ties to investors created by the TLO officers. Shane and Cable (1998) report that university technology licensing officers often introduce entrepreneurs to venture investors. Although this process operates in the setting we examine, we cannot explore it with our data because this source of referrals is likely invariant across the firms in the sample. Measuring the effect of variation in ties between licensing officers would be problematic because MIT's licensing officers specialize by technology and industry. As a result, variation in social ties across licensing officers would be confounded with differences across industries and technologies.

[12] In unreported models, we included continuous measures of founders' human capital, including the total number of start ups previously begun by all members of the founding team and the total number of years of industry experience possessed by all founders. In both cases, the model fit was improved when we included the dichotomous human capital proxies.

[13] In addition to patent stock and exclusive license, we included in unreported regressions the following proxies for the technological endowments of the firms in the sample: the total number of international patent classes in which a new venture's patents were listed, the total number of claims made by all patents licensed to a start up, the total number of inventors associated with all licensed

We also include a variable that measures the highest rank obtained by any of the MIT inventors of the technology licensed by the new venture. This variable represents the prestige of the scientists on whose knowledge the venture is based. The right to use an invention often does not imply access to all of the information necessary to commercialize it, nor does it convey the knowledge necessary to develop subsequent (follow-on) technologies. In many instances, the new ventures in our sample negotiate access to the MIT personnel who developed the licensed technology (either on a full-time or consulting basis). We suspect that potential investors may favor firms with access to experienced and high status investors because having well-known affiliates is often considered a signal of new venture quality (cf. Stuart et al. 1999). As a proxy for the status and depth of knowledge of the MIT inventors who developed a licensed technology, we measure for each firm the highest university rank achieved by any member of the team of inventors that created the technology licensed by the firm. We coded this variable as follows: student = 0, research associate = 1, assistant professor = 2, untenured associate = 3, tenured associate = 4, full professor = 5, department chair or research center director = 6, and institute professor = 7.[14]

Endowments-Industry Attractiveness. The new ventures in our sample are in a variety of industries, which differ significantly in terms of the competitive environment and growth prospects they present. We include two variables reflecting industry conditions at the time of founding (and an additional set of time-changing covariates, which we discuss below, that capture changes in industry circumstances). First, we include the size of the industry each organization enters measured in the year that the new venture is founded. The size measure, obtained from the Census of Manufacturers, is the total value of shipments in the industry. Large industries may offer superior growth chances to new ventures, because start ups in large industries may grow without securing a large market share.

The strength of intellectual property protection afforded by patents varies greatly by industry. This variance will influence new firms' abilities to protect their technology from imitators, and thus to attract investments and grow. To capture this heterogeneity, we include the Levin et al. (1987) measure of patent effectiveness, which is obtained from a survey of R&D managers and gauges the extent to which patents are perceived to be successful at protecting intellectual property.

Control Variables—Industry Level. Technology-intensive industries are notoriously cyclic, bouncing between "hot" and "cold" periods (Ritter 1984). The cycles in high technology industries largely reflect shifts in the openness and enthusiasm of the public equity markets for new security issues in an industry, and almost surely affect the general munificence of the resource environment faced by high technology startups. In hot periods, investment capital is often (relatively) plentiful; in cold periods, it may be very scarce. We therefore include two time-changing measures of the resource richness of the industry occupied by each venture in the sample. The first variable, the industry IPO rate, is the percentage of all VC-backed firms in an industry-year that have IPOs in the year (i.e., the number of private, venture-backed companies that have IPOs in an industry year, divided by the total number of VC-backed firms at risk of an IPO in the industry year; this variable was coded from the full Venture Economics database). In addition to the IPO rate, we also include for each start up-year observation a simple count of the number of venture-backed firms that had IPOs in the start up's industry in the focal year. We chose to include the count and the rate because, while the rate better reflects actual market conditions, the IPO count

patents, and a variety of citation-based indicators of the importance and radicalness of the patents licensed to each new venture. In the innovation literature, all of these variables have been proposed as measures of the value of patents, but none had significant effects in any of the models we estimated. For the sake of parsimony, we exclude these measures from the reported regressions.

[14] Highest inventor rank could also be construed as a measure of a firm's human and social capital endowment. Presumably, inventor rank and technical competence are positively correlated, as is rank and the extensiveness of an individual's contact network.

is more readily observable and thus may be a better measure of the salience of successful outcomes for early-stage companies in an industry.

Net of the industry attractiveness endowment variables and the time-changing measures of the industry-specific state of the equity markets, we found few industry effects and thus report models without industry dummies. However, we did include an indicator for the semiconductor industry in the VC funding regressions because the semiconductor firms in the sample has a very high rate of receiving venture funding. By including this dummy variable, we reduce the likelihood that a time-invariant industry effect is misattributed to another (correlated) covariate.

Control Variables—Firm Level. Although our primary focus is on how initial conditions affect new venture performance, we report some regressions accounting for firms' development over time. In the models of IPO and failure, we include a number of variables that reflect the financial status of each firm. First, we include the annually updated, cumulative amount of venture financing received, reflecting our expectation that firms with more funding are able to quickly progress through the development process and are more likely to IPO. In addition to VC funding, some of the firms in our sample obtained funding from two other sources: Small Business Investment Research (SBIR) grants and MIT. Thus, we include for each firm an annually updated, cumulative total of the amount of SBIR funds received. We indicate an investment from MIT with a dummy variable denoting the presence of equity funding from the institute. Finally, we include the cumulative sales generated by each new venture, which is again updated on an annual basis. The sales variable is a proxy for the extent to which a venture has progressed through the product development cycle.

Results

Table 1 reports results from the piecewise constant models of the hazards of IPO and failure. The first model in the table serves as a baseline for statistical tests and includes only the age periods for the IPO and failure models. The pattern of duration dependence varies somewhat across the two outcomes. In the IPO model, it is highest during the middle age period (four to seven years); in the mortality analysis, the baseline failure rate increases in each successive period. The pattern of duration dependence in the failure rate may be consistent with that of a liability of adolescence, in which the rate initially rises and later declines, but this would depend on a subsequent decline in the failure rate beyond the time period covered by these data.

Model 2 in the table adds the technology endowment variables. The number of patents licensed, the highest rank of the MIT inventor associated with the licensed intellectual property, and whether or not the license was exclusive all have positive coefficients in the IPO regressions, and both the patents stock and inventor rank variables are statistically significant. In the failure rate model, both the patent stock and inventor rank variables significantly reduce the hazard of mortality. On balance, the regressions suggest that firms with large initial technology endowments are more likely to IPO and less likely to fail at an early age.

The third model in the tables reports the effects of the human capital endowment proxies. The signs of these variables are consistent with expectations: Positive in the time-to-IPO model and negative in the mortality analysis, but only the industry experience variable in the IPO regression approaches statistical significance.

Model 4 reports the effects of industry characteristics on the two performance measures. The Table 1 coefficients show that startups in large industries (recall that industry size is measured in the year of founding and is not updated over time) and those in industries with stronger patent protection are more likely to IPO. Although industry size does not affect the likelihood of failure, the high technology start ups in the sample in industries with effective patent protection are less likely to fail.

The two social capital variables are displayed in Column 5 of Table 1. Both the measures of direct and indirect ties to investors have statistically significant, economically meaningful, negative effects on the probability of failure. For example, if a member of a

Table 1 Piecewise Constant Models of the Hazard of IPO and Mortality

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
Variable	IPO	Failure	IPO	Failure	IPO	Failure	IPO	Failure	IPO	Failure	IPO	Failure	IPO	Failure
Age < 4 year	−3.231**	−3.295**	−5.570*	−1.935*	−3.613**	−3.003**	−6.014**	−0.911	−3.263**	−2.443**	−7.886**	0.040	−7.280**	−0.32
	(12.92)	(12.76)	(5.04)	(4.55)	(9.77)	(10.17)	(5.17)	(0.79)	(7.78)	(7.86)	(4.77)	(0.03)	(3.18)	(0.19)
Age 4–7 years	−3.100**	−2.917**	−5.482*	−1.457*	−3.467**	−2.620**	−5.784**	−0.507	−3.101**	−2.057**	−7.549**	0.655	−7.618**	0.586
	(6.93)	(7.14)	(4.74)	(2.78)	(6.66)	(6.03)	(4.82)	(0.42)	(5.61)	(4.59)	(4.66)	(0.54)	(3.34)	(0.35)
Age > 7 years	−3.423**	−2.730**	−5.696*	−1.089*	−3.670**	−2.436**	−6.019**	−0.374	−3.449**	−1.518**	−7.379**	1.277	−7.160**	1.701
	(5.92)	(6.68)	(4.80)	(1.85)	(5.83)	(5.46)	(4.93)	(0.31)	(4.92)	(2.93)	(4.59)	(1.01)	(3.12)	(0.95)
Technology endowment														
Patent stock			0.045*	−0.119*							0.044*	−0.099	0.047	−0.143*
@ founding			(1.93)	(1.70)							(1.66)	(1.42)	(1.37)	(1.72)
Highest rank of			0.204*	−0.253**							0.199	−0.210**	0.087	−0.153
MIT inventor			(1.70)	(2.82)							(1.51)	(2.25)	(0.63)	(1.53)
Exclusive license			1.495	−0.450							1.205	0.203	0.898	0.180
dummy			(1.43)	(1.05)							(1.08)	(0.36)	(0.75)	(0.26)
Human capital endowment														
Founder has industry					0.713	−0.500					0.921*	−0.292	1.127*	−0.155
experience					(1.62)	(1.09)					(1.92)	(0.61)	(1.95)	(0.28)
Founder has startup					0.021	−0.420					−0.180	−0.001	0.105	−0.121
experience					(0.04)	(0.91)					(0.38)	(0.00)	(0.19)	(0.20)
Initial industry conditions														
Industry size							0.001**	−0.000			0.001**	0.000	0.001**	0.000
@ founding							(3.20)	(0.16)			(3.30)	(0.00)	(2.31)	(0.35)
Patent effectiveness							0.696**	−0.688**			0.569*	−0.526	0.445	−0.372
							(2.47)	(2.04)			(1.79)	(1.41)	(0.81)	(0.73)
Social captial endowment														
Direct tie to									−0.321	−1.082**	−0.628	−0.861*	−0.256	−0.847
investor									(0.70)	(2.24)	(1.17)	(1.72)	(0.41)	(1.62)
Indirect tie									0.205	−1.247**	−0.079	−1.127**	−0.861	−1.326**
to investor									(0.46)	(2.98)	(0.15)	(2.43)	(1.36)	(2.63)
IPO rate													−0.055	−0.227
in industry-year													(0.15)	(0.65)
IPO count in													0.002	−0.002
industry-year													(0.47)	(0.65)
Cumulative													0.010**	−0.016
VC funds raised													(5.18)	(1.24)
MIT invested dummy													0.51	1.558**
													(0.98)	(2.86)
Cumulative SBIR funding													0.000	−0.000
													(0.64)	(0.80)
Log of cumulative revenues													0.006	−0.168
													(0.09)	(1.60)
[3pt] Log likelihood	−211.8		−199.26		−208.78		−204.6		−205.1		−187.34		−164.88	

Note. Analysis file consists of 134 firms. 644 spells. 28 IPOs, and 34 failures. t statistics in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$ (two-sided tests).

new venture's founding team had an existing relationship with a venture investor that predated the time her firm was founded, she could anticipate an approximately 70% lower chance of failure. Although ties to venture investors appear to forestall failure, neither of the social capital variables has a significant effect on the hazard of IPO.

The sixth model in Table 1 reports regressions including all of the endowment effects together. The results in the Model 6 regressions remain virtually unchanged from earlier models. It is important that the social capital effects persist in the failure rate models even when the measures of founders' industry and start-up experience are included in the same model, because founders with past industry and start-up experience may be more likely to have relationships with venture investors. Thus, the effects of human and social capital may be confounded in regressions that do not include both sets of variables.

The fully specified model including all endowment effects and control variables is reported in Model 7 of Table 1. Among the newly added variables, the cumulative amount of venture capital funding has by far the greatest effect on the rate of IPO. The results indicate that a one standard deviation increase in the cumulative amount of VC raised multiplies the rate of IPO by a factor of two. Unreported models show that the VC effect is obtained simply by including a dummy variable denoting the presence of VC funding, and these models also show this to be the single largest determinant of IPO.[15]

The control variables generally have negligible effects in the failure rate models, with two significant exceptions. One exception is the negative coefficient on the log of cumulative firm revenues, indicating that firms that have developed and sold products are less likely to fail. On the other hand, the MIT invested dummy variable is positive and significant. One possible explanation for this is that MIT often exchanges an equity position in a start-up for the up-front licensing fee it normally charges licensees. It may be that founders who capitalize patent costs by granting an equity stake in their companies to the Institute are less willing or able to bear the costs associated with developing their ventures; stated differently, the MIT invested dummy may increase the hazard of mortality because it is correlated with the scarcity of resources at the new venture.

The endowment effects in the full models are fairly consistent with the previous specifications and hold up surprisingly well. Recall that all of the endowment effects are measured at organizational inception and the covariates are not updated over time. It is therefore notable that many of the endowment effects continue to have explanatory power in the full model, despite being causal in intermediate outcomes such as the amount of funding and revenues obtained by the firms in the sample, which are accounted for in the full models. The patent stock, the industry experience of the founding team, and the size of the industry at founding are the three covariates that continue to have positive influences on the hazard of IPO. In the failure rate models, inventor rank and the social capital effects dominate; firms that license patents created by high status inventors and those with founders having pre-established ties to investors fail at a lower rate.

The Table 1 results suggest obtaining VC funding has a very substantial influence on the likelihood of IPO, which in turn implies that much of the variance in new venture performance is attributable to the factors that affect the likelihood of VC funding. The regressions of time-to-VC funding are presented in Table 2. The baseline model in Column 1 includes only the age pieces and a semiconductor dummy variable. As in the other regressions, we include three age (duration) periods, but because venture funding typically occurs at a much earlier organizational age than does failure or IPO, the age pieces in the VC funding models are defined over shorter intervals. The coefficients on the age pieces exhibit a consistent pattern throughout the table: The baseline rate declines sharply as organizations age. If new firms do not

[15] When we include VC funding as a dummy variable (coded 1 in all firm spells after an organization first receives venture capital funding) rather than as a cumulating total of the dollar amount of money raised, the coefficient on the dummy is 2.18 ($p < 0.001$). This translates to a rate multiplier of exp(2.18) or 8.8. In other words, new ventures that obtain VC funding experience a hazard of IPO that is 8.8 times greater than the other firms in the population.

Table 2 Piecewise Constant Models of the Time Until Venture Capital Funding

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Age <1 years	−1.621**	−1.911**	−2.013**	−3.981**	−2.499**	−5.204**
	(7.87)	(4.16)	(7.15)	(4.89)	(6.57)	(4.06)
Age 1–3 years	−2.401**	−2.685**	−2.753**	−4.694**	−3.254**	−5.601**
	(9.88)	(5.65)	(9.14)	(5.82)	(8.18)	(4.47)
Age >3 years	−4.241**	−4.554**	−4.476**	−6.553**	−4.476**	−6.90**
	(8.54)	(7.02)	(8.54)	(7.10)	(8.54)	(5.23)
Seminconductor dummy	1.984*	1.984*	1.853*	2.443*	1.871*	2.556*
	(3.773)	(3.19)	(3.03)	(3.85)	(3.85)	(3.46)
Technology endowment						
Patent stock		0.026				0.027
		(1.11)				(1.04)
Highest university rank of an inventor		0.038				−0.116
		(0.537)				(1.38)
Exclusive license dummy		0.068				−0.801
		(0.158)				(1.61)
Human capital endowment						
Founding team industry exp. dummy			0.979**			0.379
			(3.06)			(1.04)
Founding team startup exp. dummy			−0.337			−0.662*
			(1.01)			(1.82)
Initial industry conditions						
Size of industry, year of founding				0.001**		0.001
				(2.04)		(1.63)
Effectiveness of patents in industry				0.615**		0.572*
				(3.05)		(1.71)
Social capital endowment						
Direct tie to VC or angel investor					0.452	1.016**
					(1.56)	(2.78)
Indirect tie to VC or angel investor					1.025**	1.513**
					(2.86)	(3.67)
Control variables						
Rate of IPO in industry-year						0.264
						(1.25)
Count of IPOs in industry-year						0.005*
						(1.84)
MIT invested dummy						0.175
						(0.43)
Log of cumulative sales						0.175
						(0.43)
Cumulative SBIR funding						−0.002
						(1.46)
Log of cumulative sales						−0.135**
						(2.25)
Log likelihood	−141.18	−140.30	−136.46	−135.98	−135.64	−112.17

Note. Analysis file consists of 134 firms and 47 funding events. t statistics in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$ (two-sided tests).

attract VC funding in the initial years after founding, they are unlikely to do so in the future.[16]

Column 2 includes the technology endowment variables, none of which has a significant effect on venture capital funding. As Model 3 shows, one of the human capital variables affects the hazard of VC funding: The rate is increased by a factor of 2.6 for new ventures with founding teams that possess prior experience in the industry of the start-up. Model 4 demonstrates that industry attributes factor into the VC funding decision. New ventures launched in large industries and those in industries that afford stronger patent protection are more likely to receive venture funding.

Model 5 reports the effects of the two social capital variables. Although the coefficient is just shy of statistical significance, the presence of a direct tie to a venture capitalist prior to firm founding has a positive influence on the rate of VC funding. The existence of an indirect tie to a venture investor prior to firm founding very sharply increases the hazard of receiving venture financing; the rate of VC funding increases by a factor of 2.8 for firms with founders that have a relationship with a third party who can refer them to a venture investor. Moreover, the social capital endowments result in a greater improvement in model fit in Table 2 than does the introduction of any of the other variables capturing differences in initial endowments.

The Column 6 regression includes all of the endowment effects together, as well as the two time-changing measures of the openness of the IPO market to new issues in the industry of each new venture. Both the IPO rate and the IPO count in an industry-year increase the hazard of VC funding. At least with regard to high technology firms striving to commercialize relatively basic technology, VCs appear to be highly sensitive to current equity market conditions when they decide how to allocate their capital to projects in different industries. Although current market conditions have a large effect on the likelihood of VC funding, the social capital variables continue to have statistically strong effects, and in fact, the net effects of the two variables are even greater in the model that controls for market conditions than they are in the paired-down specification. For the most part, the other endowment effects remain intact, with the measures of industry conditions at founding continuing to have a large impact on the rate of obtaining funding.

The final model in Table 2 includes the MIT invested dummy, the cumulative amount of SBIR funding received, and the log of cumulative revenues. The MIT dummy has no effect on the likelihood of funding, but the SBIR variable has a negative and almost significant effect. One possible justification for this is that the negative coefficient on SBIR funding is that it is capturing unobserved differences between the technologies being pursued by the firms in the sample, with SBIR grants perhaps going to more speculative technologies. Although it may seem counterintuitive, cumulative sales also has a negative effect on the hazard of VC funding. The likely explanation for this effect is that firms with substantial sales that have not yet received VC funding (and thus already exited the risk set) may not be actively looking for funding from venture capitalists because they are able to support their operations with internally generated cash flows.

Putting the results from the two tables together, the factors that increase the likelihood of an IPO also positively impact the hazard of venture funding and negatively influence the probability of firm failure. This is as we would expect; since dissolutions and IPOs are at opposite ends of the performance continuum and the aim of venture investors is to liquidate their positions in start-ups via public stock offerings, we should observe that venture investors

[16] One potential problem with modeling the time-to-VC funding is that very high quality start-ups may prefer to delay venture funding because companies that are funded later often are in stronger positions when negotiating with investors. To address this issue, we ran a simple logit model of the probability of obtaining venture funding without taking into account the timing of funding. In this analysis, we excluded all companies that were founded in the last two years of the observation period and that had yet to receive venture funding (these organizations were excluded because there is some chance that they received funding after the point of right censoring). Start-ups were coded as 1 if they received venture funding prior to failing, going public, or being acquired, and 0 otherwise. The coefficients on the endowment variables in this analysis almost exactly mirrored those in Model 6 of Table 2, confirming that similar results are obtained in analyses that ignore the timing of the investment.

are drawn to companies with high likelihoods of achieving public offerings. The primary exception to this pattern concerns the technology endowment variables; although these increase the propensity to IPO and reduce hazard of failure, they have no statistical effect on obtaining venture funding. Although we cannot definitively rule out the possibility that some firms with significant technology endowments simply opted not to pursue venture funding, the findings that the technology endowment has an insignificant effect on VC funding, but experienced founding teams and start-ups in more attractive industries are more likely to receive venture backing, is consistent with the common claim in the popular press and the entrepreneurship literature that VCs often place the greatest weight on the management team and the market opportunity in making investment decisions. Because evaluations of industry conditions and founders' experiences are relatively precise as compared to assessments of early stage technology, this pattern of results is perhaps unsurprising.

Discussion and Conclusion

This study has examined the influence of start-ups' initial resource endowments on the incidence of critical, early-life performance milestones. Particular emphasis was placed on how founders' social capital endowments affect the development of entrepreneurial ventures. Analyzing the population of new firms founded to exploit MIT-assigned inventions during the 1980–1996 period, we show that two measures of founders' social capital—the presence of direct and indirect ties to venture investors prior to firm founding—sharply decrease the hazard of mortality and increase the likelihood that start-ups obtain external funding. Moreover, comparing the effects of many different firm and industry characteristics, we find that the presence of venture capital funding is the single largest contributor to the likelihood that a start-up undergoes an IPO. We interpret these results to mean that social capital endowments, through their impact on the fund-raising process, have long-term, positive influences on the performance of new ventures.

One important shortcoming of the present analysis arises from collecting retrospective data. Although the TLO sample offered a unique opportunity to overcome the sample selection biases that draw into question the findings of many of the existing studies of organizational endowments (as well as the indirect evidence on the subject gleaned from analyses of age dependence in organizational populations), the fact that the measures of founders' social capital had to be collected after the time of start-up precluded precise measurement of the construct. Because we could not be certain that entrepreneurs would have accurate memories of the relationships they had during the past, we were only comfortable creating dichotomous indicators of the presence of ties to venture investors, and even then we required verification of a relationship from a second information source. Moreover, there is always potential for recall bias in retrospective data. For example, founders who did not receive venture funding may have been less likely to remember their contacts to venture investors than founders who received venture funding. This would lead to an overestimate of the actual effects of the social capital variables on the likelihood of receiving venture financing.

Our inability to specify the details of entrepreneurs' social network creates two related problems in addition to the (probably) less significant one of measurement error. First, the dichotomous tie variables offer an indirect test of the social mechanisms that we believe underlie them; namely, that trust emerges from a history of past direct and indirect relationships, and thus entrepreneur-investor dyads situated within such a network are likely to represent trusting relationships. Because the measures of entrepreneurs' social networks are so coarse, it was not possible for us to be very precise about elucidating the particular mechanisms at work. For example, do investors who are relationally proximate to entrepreneurs perceive company founders to be more competent? Do they anticipate greater transactional reliability from close contacts, and thus perceive less risk even though they have less information than do company founders? Or, are investors more confident because mutual third parties confirm their opinions about an entrepreneur? Moreover, the dichotomous tie variables obviously do not capture any dimension of relationship strength,

either social structural (i.e., the level of embeddedness of the cited relationships) or affective (i.e., the strength of the bonds between entrepreneurs, referrers, and investors).

A related limitation arising from the imprecision in the measurement of entrepreneurs' social capital is unobserved heterogeneity. The binary measures of direct and third-party ties to venture investors are potentially correlated with other characteristics of founders' backgrounds, such as founding team size, start-up experience, areas of technical specialty, previous work experiences, financial status, and so on. Although we are aware of a number of the potential correlates of the social capital variables and include these in the regressions, we clearly cannot take into account all such possibilities given available information. For example, while we do measure the prior start-up and industry experience of the founding team, we cannot measure entrepreneurial talent. Not only would fine-grained measures of the quality differences between founders be costly to collect, some dimensions, like the founder's charisma, might be virtually unmeasurable. Unfortunately, if entrepreneurs who have a keen eye for indentifying new business opportunities or who are charismatic are more likely to be in contact with venture investors than entrepreneurs who lack these characteristics, the social capital effects may be biased upwards because they correlate with entrepreneurial talent. As the delineation of founders' network position becomes more exact, however, the likelihood of correlation with unobserved factors diminishes, as does the possibility of more precisely distinguishing between potential mechanisms. Thus, more detailed network measures permit more convincing empirical demonstrations, and we therefore consider the results of the present to be suggestive rather than conclusive.

We do, though, view the results as a step in the direction of developing the literature on the social context of entrepreneurial finance. While there is a large literature in entrepreneurial finance addressing the information and agency problems in financial contracting, explicit contracts often cannot completely redress possible incentive problems and, moreover, meticulous financial contracts have only been used for the last half century and only in developed economies. Furthermore, although elaborate contracts are now used regularly in venture capital, they are less frequently employed in angel finance. For these reasons, we believe that network-based theories have much to contribute to our understanding of entrepreneurial finance (cf. Shane and Cable 1998, Sorenson and Stuart 2001).

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