

Venture Capital and the Professionalization of Start-up Firms: Empirical Evidence

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Abstract

This paper examines empirical evidence on the impact that venture capitalists can have on the development path of new firms. We use a hand-collected data set on Silicon Valley start-up companies that allows us to “look inside the black box” and analyze the influence of venture capital on the professionalization of firms’ internal organization. The evidence suggests that there is a “soft” facet to venture capitalists, in terms of supporting companies to build up their human resources within the organization. Venture capital is also important at the top, in that venture capital backed companies are more likely and faster to bring in outsiders as CEOs. These CEO replacements are often accompanied with the founder departing from the company, suggesting that venture capitalists also exhibit a “hard” facet in terms of exercising control. The paper examines how these various roles are interrelated, and shows how the role of venture capital varies with the state of the company.

A substantial amount of research has been put into the question of what a firm is (see Hart (1995), Bolton and Scharfstein (1999)). Yet surprisingly little is known about the process of how the various resources that constitute a firm are brought together in the first place. A lot of things have to happen to transform a start-up, consisting of a few founders with an idea, into a modern corporation, which is a complex institution. Yet, relatively little is known about this “professionalization” process. In particular what role, if any, do financiers play?

Traditional financial intermediation theory tends to focus on information-based roles of financial intermediaries like banks, dealing with alleviation of moral hazard or adverse selection (see, e.g., Diamond (1984), Fama (1985), Stiglitz (1985)). Venture capital is a type of financial intermediary that is specialized in the financing of entrepreneurial companies. It has been widely credited for financing some of the most successful start-up companies in Silicon Valley and across the US. Venture capital backed companies such as Cisco, Intel or Yahoo developed extremely fast from start-ups to large complex organizations. An informal literature suggests that the role of venture capitalists extends beyond that of traditional financial intermediaries and that they play a broader role in the professionalization of the start-up companies they finance (See, for example, Bygrave and Timmons (1992), Gorman and Sahlman (1989)).

In this paper we set out to empirically examine whether venture capitalists play a role in the professionalization of start-up companies. To get at this issue we need to look “inside the black box” and consider the internal organization of firms. Is there a relationship between venture capital and the internal organization of firms, particularly the building of the management team? In a traditional financial relationship, investors are involved on the financial side of the business, but not on the human resource side. If venture capitalists are more closely involved than conventional investors, what roles do they play? Does their influence essentially consist of making sure that the company has the right CEO? Or does their influence also extend further down the organization? And does their influence consist of providing constructive support, or is there also a significant control dimension, such as the firing of a CEO?

To address these questions we engaged in a unique data collection effort on start-up companies. The sample consists of over 170 young high technology firms in Silicon Valley. Using a combination of survey data, interview data, commercial databases and a large variety of publicly available information, we construct a data set that allows us to observe a wide variety of information on start-up companies. We are able to construct the financing history of companies, including if and when they obtain venture capital. We are also able to observe aspects of the internal organization of these companies. Indeed, we are not only able to observe information about the CEO, such as the date of arrival of an outside CEO, but also information on human resource issues deeper down into the organization, such as about the recruitment process or the adoption of stock option plans. A strength of the data set is that it allows us to examine the role of venture capital looking at a variety of issues and using a variety of data types, such as survey responses, as well as actual event data.

Theories of financial intermediation emphasize the monitoring role, where financial intermediaries gather information about the firms they finance. The questions we are interested in here is whether venture capitalists, as financial intermediaries, perform more active roles. Economic theory provides us with some useful concepts that have been somewhat under-explored in the empirical corporate finance literature. First, there is the notion of “support” where the investor can take actions that are privately costly, but that benefit the company. We will call this support notion the “soft” facet of venture capital. Second, there is the notion of “control” where there is a conflict of interest between the entrepreneur and the investor, and where the investor can take an action that increases the value of the firm, although it may decrease the utility of the entrepreneur. We will call this support notion the “hard” facet of venture capital.

As a first step of the analysis, we ask if venture capitalists play a constructive role in building up the internal organization. We examine a variety of evidence related to the building of the organization, such as the recruitment processes, the overall human resource policies, the adoption of stock option plans and the hiring of a vice president of

marketing and sales. For each of these dimensions we find that companies that obtain venture capital are more likely and/or faster to professionalize along these various dimensions. This provides evidence for the “soft” facet of venture capital in terms of support they provide for building up the organization.

The second step is to look at the very top of the organization, namely at the question of who gets to be the CEO: the original founder or some professional outside CEO. A unique strength of our data set is that it contains data on companies with and without venture capital. We can therefore examine whether venture capitalists are distinct in terms of appointing an outsider to the position of CEO. We find that founders are more likely to be replaced by an outsider as CEO if they obtain venture capital, and venture capital backed companies are also faster in effectuating such leadership changes.

A natural question to ask is whether a CEO turnover should be thought of as a “soft” action, where the venture capitalists help to bring in a new CEO with the agreement of the founders, versus a “hard” action, where venture capitalists exercise their control rights and replace the founder. Even in public companies, where there is a large amount of information about the company, distinguishing between voluntary and involuntary turnovers is not easy. Nonetheless, we do a first approximation by distinguishing between CEO turnovers where the founders stay on in some capacity in the firm, versus CEO turnovers where they do not. We interpret the former event as one where the founder is agreeable to the change, or a “soft” event, and the latter the founder is reluctant to relinquish control, hence a “hard” event. We find the effect of venture capital is present and similar in both kinds of turnovers, suggesting that venture capitalists can play both a soft and hard role.

The final step of the analysis is to understand the interactions between the various roles played by venture capitalists. Do venture capitalists play the same role for all companies or is their role tailored to the state that the companies are in? Given the real time constraints faced by venture capitalists, allocation of time and effort can be particularly important. We focus on whether it is possible for venture capitalists to have an influence

both at the CEO level as well as in building the team further down the organization. To do this we re-examine the analysis of the first step in the subsamples of firms that have and have not experienced a CEO turnover. In the subsample of firms without turnover we continue to find the venture capital effects on team building, but this is no longer true in the subsample of firms that experienced a turnover. Venture capitalists seem to face some constraints, as it appears more difficult for them to have an influence further down the organization if they have a problem at the very top of the organization. We also ask in what states venture capitalists focus on leadership replacements. Of particular interest is how much progress a company has to show before it can attract an outsider to the position of CEO. We distinguish between three states a company might be in, namely if a company has “gone public,” has a “product on the market” or has “no clear sign of success” yet. We then examine in which of these states the role of venture capital is most salient. We find that venture capital is particularly important for attracting a CEO to those companies that do not have any signs of success, still important for companies with a product on the market, but no longer important by the time the company has gone public. This evidence shows that the roles of venture capital vary depending on the stage a company is in.

We believe this paper addresses a new question that has not received much attention in the literature, namely the role that financial intermediaries play in building of new companies. Prior evidence on the role of venture capital in start-ups has been largely related to the monitoring function in venture capital (see e.g., Gompers (1995), and Lerner (1995)). These papers use samples of venture capital backed firms alone and so examine changes over time and difference within venture capital backed firms, as opposed to differences in venture capital and non-venture capital backed firms. These papers do not consider the support function of venture capital on team building, or CEO turnover, that we characterize in this paper. Other related papers on venture capital include Kaplan and Strömberg (1999) who examine venture capital contracts and find considerable state-contingency of control rights at the ex-ante stage.¹ Our paper is also

¹ Further useful references on venture capital include Admati and Pfleiderer (1994), Barry (1994), Bygrave and Timmons (1992), Fenn, Liang and Prowse (1995), and Sahlman (1990).

related to the large literature on corporate governance and CEO turnover. The work of Kaplan and Minton (1994), Kang and Shivdasani (1997), and others highlight the importance played by financial institutions (such as banks) in the corporate governance of the firm (see Shleifer and Vishny (1997) for a useful survey). Baker and Gompers (1998) examine governance issues in a sample of companies that are successful and go public. Largely because of the unavailability of data on private companies, the previous literature focuses mostly on larger, more established companies that are publicly listed, or in the process of listing or de-listing.²

Our estimation approach is to consider the equilibrium effect of venture capital. In equilibrium it does not matter whether we think of venture capitalists choosing entrepreneurs or entrepreneurs choosing venture capital. Both parties have expectations about the implications of teaming up with each other, and the matching of entrepreneurs with venture capitalists may well be affected by the preferences of the two parties. Entrepreneurs, for example, may consciously seek out venture capitalists with the expectation of obtaining support for the process of professionalization. This kind of selection is part the equilibrium that we seek to describe, where entrepreneurs choose among alternative types of investors that will have different impacts on their firms. The objective of the paper is to examine what these impacts are, i.e., how in equilibrium the choice of an investor type affects the subsequent development path of start-ups.

Overall, the evidence provided in this paper suggests that a closely involved financial intermediary, such as a venture capitalist, can play roles over and above those commonly discussed in the literature. Most theoretical work emphasizes the role of financial intermediaries in overcoming moral hazard and adverse selection problems. In the context of financing start-ups, however, we find that a closely involved investor can have a broader impact on the development of the companies they finance, suggesting that there are value added inputs that venture capitalists provide that go beyond that suggested in

² The paper is also related to a large entrepreneurship literature. See Rajan and Zingales (1997) and Hellmann (2000) for some recent contributions based on economic theory, and Amit, Glosten and Muller (1993) and Bhide (1998) for some useful overviews.

traditional financial intermediation theory. Moreover, we find that venture capitalists can play different roles in different companies, and at different stages. It is our hope that these findings are also useful in guiding future theoretical and empirical work in this area.

The remainder of the paper is structured as follows. Section I describes the data. Section II examines the role of venture capitalists further down the organization. Section III looks at the role of venture capital for CEO turnover. Section IV attempts to distinguish between a soft and a hard role of venture capital. Section V examines the state-contingent nature of venture capital involvement. Section VI examines the robustness of our results. Section VII concludes.

1. The Data

To conduct this study we use a unique hand collected data set of start-ups in Silicon Valley culled from a combination of survey data, interviews, commercial databases as well as publicly available data. The data set is collated from combining two independent research efforts conducted over a period of several years, starting in 1994. The initial sample selection of Silicon Valley firms and data collection was organized by Baron, Burton and Hannan (1996a,b, 1999), which we supplemented in 1996 and 1997 by an additional financing survey and related data collection.³ To generate the initial list of companies three main data sources were used. The first two databases which listed firms in Silicon Valley were: Rich's Everyday Sales Prospecting Guide published by Rich's Guide, and Technology Resource Guide to Greater Silicon Valley published by CorpTech. A stratified random sample was selected where firms could have a legal age no older than 10 years and had to have more than 10 employees. Moreover, young and large firms were over-sampled and foreign firms were excluded. The Silicon Valley business press was used as a third data source to identify very young firms that were not even listed in the two databases mentioned above, and supplement the sample. The

³ A more detailed description of the sampling procedures and their rationale can be found in Burton (1996) and in Baron, Burton and Hannan, (1996a,b). These papers are based on a first round of interviews of some 100 companies that were performed in the summer of 1994. A second round of interviews was conducted in the summer of 1995 and follow up interviews were conducted in the summer of 1996. This paper

purpose of doing this was to alleviate concerns that relying exclusively on guidebooks such as Rich's and CorpTech to construct the sample might under represent new start ups since there is sometimes a considerable time lag before newly created firms appear in these guidebooks. Hence the sample was supplemented by adding on 22 very young firms identified by tracking the Silicon Valley business press.

Our sample consists of 173 start-up companies that are located in California's Silicon Valley. In order to collect the data a number of surveys were sent to different key people in the firm that covered a wide range of questions about historic and current aspects of the companies. Further, trained MBA and Ph.D. students conducted semi-structured interviews with key informants of the sample companies. An effort was made to interview the founders, the current CEO and the human resource manager for each company. This data was then augmented with any information provided by the company (such as a business plan). Additionally, publicly available information about each of the firms in the study was gathered from on-line data sources such as Lexis/Nexis, Dialog, Business Connection, ABI Inform. Further, for firms that had gone public, annual reports, 10-K or IPO prospectuses, where available were also collected, and used to augment the data. To obtain financing data, from autumn 1996 to October 1997 we sent out a survey addressed to the most senior member of the company in charge of finance. The survey asked for a complete financing history of the company since the time of founding. The information was augmented with data available from two commercial databases; Venture Economics and Venture One largely for the purpose of ascertaining which firms in our sample received venture capital.⁴ We performed additional cross checks on the data using the interview transcripts, researching public sources and placing calls to the companies to resolve remaining ambiguities. We also continued to augment the data coming in from the companies again using public information as well as the interview and survey material. Considerable emphasis was put on measuring the timing of events such as the date of founding, the timing of all financing rounds or the date of CEO turnover.

obviously uses the updated information. Where possible, we also augmented the publicly available information up to the end of our observation period, which we defined to be October 1997.

In what follows below we describe the main variables, the way they are defined and collated. Table 1 shows the descriptive statistics.

TURNOVER is a dummy variable that takes the value 1 if a firm hired an outside CEO; 0 otherwise. An outsider is any person that is not one of the original founders. If one founder replaces another founder as CEO, he or she is not considered an outsider. We obtain this data from the interviews, surveys and from publicly available data. TIME-TO-TURNOVER measures the time from the birth of the company to the date of arrival of the first outside CEO. We succeeded in obtaining reliable data for all but three companies, so that our base sample consists of 170 companies.

VC is a dummy variable that takes the value 1 if a firm has received venture capital; 0 otherwise. From the interviews, surveys and commercial databases we identify which firms are financed by venture capitalists and the timing of such financing. Venture capitalists are professional investors that specialize in the financing of young private companies. We also create other venture capital related variables based on the timing of the venture capital. TIME-TO-VC measures the time from the birth of the company to the date of obtaining venture capital for the first time. VC(T) is a dummy variable that takes the value 1 if the company obtained venture capital before the date of the first CEO turnover. And VC(t) is a time-varying dummy variable that takes the value 0 as long as a firm has no venture capital, and 1 thereafter.

RECRUIT(SA), RECRUIT(AM) and RECRUIT(SM) are dummy variables that take the value 1 if a firm reported the use of business and professional contacts to recruit sales and marketing personnel (SA), administrative and managerial personnel (AM), or senior managers (SM) respectively; 0 otherwise. We obtain these variables from a survey that was sent to the most senior person in charge of human resources.

⁴ See Lerner (1995) for a discussion of the Venture Economics database and Gompers and Lerner (1999) for a discussion of the Venture One database. We found 107 of the sample companies in Venture One and 95 were found in Venture Economics. 66 companies (38%) replied to our financing survey.

HRPOLICY is a dummy variable that takes the value 1 if a firm reported “venture capitalists or other financiers” to be “influential in shaping human resource management;” 0 otherwise. We obtain this variable from a survey that was sent to the most senior person in charge of human resources, which asked them about their recruitment and selection practices.

TIME-TO-SALES-VP measures the time from the birth of the company to the first date of appointing a vice president of sales and marketing. We obtain this data from survey responses, interviews and publicly available information.

TIME-TO-OPTION-PLAN measures the time from the birth of the company to the date of implementing a stock option plan. We obtain this variable from a survey that was sent to the most senior person in charge of human resources, which asked them about compensation eligibility.

STATE is a variable that describes three distinct stages that a company may be in. It may have gone public and we call this state IPO. It may have a product but not gone public. We call this state PRODUCT. Or it may neither have a product nor have gone public, and we call this state NOTHING-TO-SHOW. We evaluate the state at the time of a turnover or else at the end of the sample period. We obtain information on whether a firm has a product on the market and the timing of doing so from a targeted survey question to the company. We augment this information with publicly available data on the company’s product, using in particular the earliest product mention in Rich’s guide or other public sources. The IPO dates are obtained from publicly available sources such as prospectus, and Securities Data Corporation’s New Issue Database.

COMPUTER, TELECOM, and MEDICAL are dummy variables which take the value 1 if the firm is in the computer, telecommunications or medical-related industry respectively; 0 otherwise. OTHER is a dummy variable which takes the value 1 if the firm is in another industry (mostly semiconductors); 0 otherwise.

LNAGE is the logarithm of the age of the company in October 1997 measured from the birth date of the company. The date of legal incorporation is often taken as the birth date for companies and would appear to be a natural choice. However, for entrepreneurial firms this is far from obvious. In particular, in our sample, over half of the companies, had some other significant event that preceded the date of incorporation, such as the beginning of normal business operations or the hiring of a first employee. Moreover, there does not appear to be any clear sequence of events that these companies follow in this initial period of creation. In this paper we therefore take a conservative approach and use the earliest date recorded in any of our data sources corresponding to the earliest evidence of firm activity as the date of birth. Also, SAMPLE-AGE is the age of the company at the time of sampling measured from the date of birth of the company.

II. The impact of venture capital on team building

As companies develop from being a start-up to large complex organizations, attracting highly talented employees becomes a key challenge. The development of human resource functions, broadly defined, thus becomes an important aspect of professionalization, especially in high technology sectors where human capital is critical. The question we want to ask is whether venture capitalists take any role in the professionalization of the firms. In traditional financial arrangements, investors concern themselves mostly with the financial aspects of the firm, but leave matters of internal organization to the entrepreneurs. The notion of venture capitalists being closely involved investors suggests that they may even go as far as helping companies with their internal organization, including their human resource management.

To address this question we look at a variety of evidence. We use both survey data on firms' perception of venture capitalist's influence as well as data on events relating to the venture capitalists' influence on the achievement of professionalization milestones. These approaches complement each other in terms of using very different kinds of data to address the role of venture capital in multiple dimensions. In this section we will examine how venture capital is related to the kind of recruitment process that firms undertake, how firms view venture capital's contribution to the human resource development

process, and how venture capital affects the timing of key professionalization events in the company such as introduction of a stock option plan or the hiring of a vice-president of marketing and sales.

The process of building up the internal organization, and in particular the employee base of a company, begins with the recruitment process. We first ask whether venture capital-backed firms use different processes to hire various kinds of employees. We use evidence from the human resource surveys that asks firms what contacts they use in their recruitment process. We identify those firms that report to use business and professional contacts for the recruitment of various positions. Using business and professional contacts reveals whether a firm has reached a certain level of professionalization in terms of how it interacts with its business environment. It also reveals something about the commercial as opposed to purely technical orientation of the firm. Obviously, the venture capitalists themselves are also part of this network of business and professional contacts.

The variables RECRUIT(SA), RECRUIT(AM), RECRUIT(SM) capture whether a firm reported to use business and professional contacts for recruiting sales and marketing personnel (SA), administrative and managerial personnel (AM), and senior management (SM) respectively. We examine whether the firm's approach to recruiting is related to whether it received venture capital or not, as measured by the VC dummy variable. We first perform χ^2 tests and find significant positive correlations with P-values of 5.7%, 0.1% and 3.1% respectively. The χ^2 tests are useful to identify a correlation between venture capital and the recruitment variables, but they do not control for other factors. We therefore move to a multivariate probit regression framework, where we control for firm characteristics, in particular firm age (LNAGE) and the firm's industry. The results are reported in table 2. We find that the coefficient on VC tends to be not only statistically significant, but also economically large. A venture capital backed firm is significantly more likely to use business and professional contacts for recruiting sales and marketing personnel and as well as for recruiting administrative and managerial personnel. This is also the case for recruiting senior management, although this coefficient is only marginally significant at 14%.

Together these results suggests that obtaining venture capital is related to how firms recruit personnel, and that venture capital backed firms make greater use of business and professional contacts for recruiting, especially for recruiting deeper down into the organization. While venture capitalists are part of that network, we would argue that the evidence should be interpreted conservatively, indicating an overall pattern of firm conduct, rather than a specific contribution of venture capital.

To address the contribution of venture capitalist more directly, we use a different part of the human resource survey that asks specifically about the contribution of the investors to the development of human resource policies. The variable HRPOLICY measures whether a firm reported whether investors (venture capitalists or other financiers) were influential in shaping the human resource policies of the company. We examine the relationship of this variable to obtaining venture capital. The χ^2 test shows a positive correlation that is significant at 0.1%. Again, we then examine the effect of venture capital in a probit framework that controls for age and industry. We find that venture capital is strongly associated with the financier playing an influential role in the shaping of human resource policies. The marginal increase in the likelihood is 48%, which is significant at 1% (see table 3). This evidence thus suggests that in the eyes of the entrepreneurs, venture capitalists exert influence on the internal organization of the firm.

The survey evidence of the entrepreneurs' perception is important, but for further confirmation we also want to examine evidence on realizations of what actually happens within the firms. For this we look at the timing of certain milestone events that occur within the organization. We examine if and when companies adopt stock option plans and we look at the first hiring of a vice president of marketing and sales. Stock option plans are important for a variety of reasons. They help to attract talent to the firm, they provide incentives for the employees within the firm, and they may help to retain employees (see, for example, Saxenian (1994)). Stock options are also a sign of professionalization, in that they formalize the incentive contract between the owners of the firm and its employees. The data on the hiring of a vice president of sales and marketing is interesting

for two related reasons. First, it provides us concrete evidence on a specific aspect of team building. Second, the position of marketing and sales is of particular importance, since it holds responsibility for pushing a commercial orientation in the start-up, which is a significant aspect of professionalization.

The evidence on stock option plans or hiring of a VP concerns the timing of these events. We therefore need to examine our data in a duration framework. A standard way of dealing with duration data is employing a hazard model (see Kalbfleisch and Prentice (1980), Kiefer (1988)). We can choose from a number of parametric models (such as Weibull) or we can use a semi-parametric model. We choose a Cox proportional hazard model, which is a parsimonious semi-parametric model, and a common choice for modeling duration. The duration model also lets us explicitly take into account the fact that venture capital is obtained by different companies at different points of time. For robustness we reran all out tests using a Weibull model, which is a fully parametric model, and obtained similar results. In the appendix we provide a brief explanation of these estimation techniques.

Table 4 reports the results from our duration regression where the independent variable is TIME-TO-OPTION-PLAN, which measures the time between the birth of the company and the time the company adopts a stock option. The independent variables are industry controls and the time-varying VC dummy. The duration model explicitly takes into account the timing of events. Thus, if venture capital is obtained after the stock option plan is adopted the “spell” in question will take the company as not having venture capital prior to the adoption of the stock option. We find that obtaining venture capital is associated with a significant increase in the likelihood of adopting a stock options plan. The likelihood ratio is slightly greater than 2, indicating that venture capital backed firms are more than twice as likely to adopt a stock option plan. This result is significant at 2%.

Table 5 reports the results from our duration regression where the independent variable is TIME-TO-SALES-VP, which measures the time from the birth of the company to the first date of appointing a vice president of sales and marketing. The dependent variables

are industry controls and the time-varying VC dummy. We find that obtaining venture capital is associated with a significant increase in the likelihood of appointing a vice president of sales and marketing. The likelihood ratio is 1.79, and this result is significant at 2%.

The results from table 4 and 5 show that firms that obtain venture capital, are more likely (or faster) to professionalize. If we put this evidence together with our previous evidence a picture emerges where venture capitalists are closely involved investors that influence the professionalization of the internal organization of firms. Our data stems from different sources. We ask for firms' perception of the influence of venture capital but also complement this with event-based data. Each of our individual data tests concern aspects of the internal organization that are quite distinct. Yet all of our results show that venture capital is associated with each of these aspects of professionalization. While one may have reservations about the significance of any one of these individual tests, the consistency of the finding is remarkable. When we put the evidence all together it conveys its main message more powerfully. And the consistency of our results is all the more remarkable given that the individual tests use very different kinds of data, including data on the participants' perception as well as data on hard facts.

III. The impact of venture capital on CEO turnover

The evidence of the previous section shows that venture capitalists play a role in the building of the internal organization – and specifically building of human resources – of the companies they finance. An important question is whether venture capital affects the leadership at the very top of the organization. Presumably one of the most important positions in any company is the position of chief executive officer (CEO). This person has a particularly large role in building up all aspects of the company. To begin with the founders naturally take the leadership position in their own company. While founders may be very suited for the initial phases, not all founders can make the transition from entrepreneur to manager. It could be that as companies develop, they could benefit from

bringing in an outsider into the position of a CEO. Bringing in an outside CEO thus constitutes a significant step in the professionalization of a start up company.

The transition from founder to outside CEO, however, is not always simple. Some founders may be glad to have an experienced outsider take the leadership position in their new firm, so that they can focus on other aspects of their start-up. For other founders, however, there may be an issue with relinquishing control to an outsider. While the entrepreneurs may be interested in the maximization of their own benefits (which includes not only the profitability of the firm, but also the various private benefits), the investors will be solely concerned with the maximization of shareholder value. This in turn suggests that founders and investors may disagree on the desirability of appointing an outside CEO. Hellmann (1998) develops a formal model of this conflict of interest which suggests that the allocation of control rights is important. In particular, Hellmann shows that efficient contracts may allocate control to the venture capitalists over the decision to hire an outside CEO. Kaplan and Stromberg (1999) provide empirical evidence from venture capital contracts indicating that a significant amount of control rights are allocated to the venture capitalists.

We examine whether venture capitalist are more likely to bring in an outsider into the position of CEO. To address this question we collect evidence on whether and when a company experienced its first turnover of CEO. The variable TURNOVER is a dummy variable that takes the value 1 if a company has experienced the replacement of a founder with an outside CEO; 0 otherwise. In measuring the possible effect of venture capital on turnover, we are careful to verify that the turnover event does not precede the venture capitalists. We therefore use VC(T) as the dependent variable, which is the VC dummy, only altered so that it is 0 if venture capitalists first appear only after a turnover event. We first perform a χ^2 test and find a positive correlation between venture capital and turnover that is significant at 5%. We then examine a probit regression that also controls for firm age and industry. From table 6a we see that the replacement of a founder with an outside CEO is more likely for firms that have venture capital, with the coefficient of venture capital being significant at 8%.

The probit regression does not take into account the timing of the events. We therefore also examine a Cox duration regression. The independent variable is now TIME-TO-TURNOVER, which measures the time from the birth of the company to the first date of appointing an outside CEO. The dependent variables are venture capital as a time-varying dependent dummy variable, as well as industry controls. Table 6b shows a hazard ratio of 2.32, indicating that firms are more than twice as likely to have a turnover event once they have venture capital. This is significant at 1%. The duration regression thus shows that obtaining venture capital increases the rate at which firms bring in an outside CEO. Another way of expressing this is to note that the likelihood rate is inversely related to the expected duration, i.e., with venture capital, the expected time it takes a firm to bring in an outside CEO is reduced.

The analysis of this section suggests that obtaining venture capital is associated with a higher likelihood of appointing an outsider to the position of CEO. Both the probit and the duration model suggest that the advent of a venture capitalist significantly increase the chances that the firm will go beyond its original founder to lead the direction of the firm. This evidence thus suggests that venture capitalists also play an important role in the professionalization of top leadership.

IV. Soft versus hard CEO turnovers

The results from the previous section suggest that venture capitalists play a significant role in bringing in outsiders into the position of the CEO. An interesting question arises on whether we should interpret this as evidence for a “soft” or a “hard” facet of venture capital? Different founders may have different attitudes towards bringing in an outside CEO. Some founders may want to focus their attention to other aspects of the business and may be glad to relinquish management control to a professional CEO. In this case, they may seek help from their investors in finding and convincing a new CEO. The venture capitalists can lend support to the process, which would point towards a “soft” role for venture capitalists. Other founders, however, may not be inclined to

relinquish management control. In this case there may be a role for the venture capitalists to take a control action, replacing the founder with an outsider in the position of CEO. This points towards a “hard role” for the venture capitalist.

To further distinguish between these two roles, it is worth considering what happens to the founders after the arrival of the new CEO. If the founder is willing to relinquish management control, we would expect a smooth transition, where the founders continue to be involved with the start-up after the arrival of the new CEO. After such a “soft” turnover, the founders may want to focus on a variety of roles, such as taking leadership on the technological side (e.g., becoming the CTO), focusing on business development (e.g., becoming the VP of Corporate Development), or simply playing a role on the board of directors. But if the venture capitalists need to take a control action to induce an involuntary (or “hard”) turnover, we would expect a separation between the founder and the start-up.⁵

We therefore gathered additional evidence on whether the founder continues to be involved with the start-up after the arrival of the outside CEO. We speak of an “accommodating” turnover if the founder retains some position in the start-up and a “separating” turnover if the founder leaves from all positions in the company. “Accommodating” turnovers point toward a “soft” investor role, where the founders are willing to work under an outside CEO and the investors play a role in facilitating the transition. “Separating” turnovers, however, point more toward a “hard” role of venture capitalists, where the arrival of the new CEO also implies the departure of the founder, and the investors play a controlling role.

Out of a total of 91 turnovers observed over the entire sample, we find that in 38 cases (i.e., in a little over 40%), the founders remained involved in their companies. Clearly

⁵ Note that just leaving the company is not synonymous with a “hard” turnover. If a founder voluntarily leaves to pursue other interests, it is common practice that the founder resigns from all management positions, but retains a seat on the board of directors. This signals the amicable nature of the departure and we therefore think of it as a soft turnover. It is only when we observe no ties at all with the company that we consider a turnover “hard.”

both types of turnover are important. The question is then whether venture capitalists are associated with a particular type of turnover event. Table 7 looks at a breakdown of the effect of venture capital on turnover into “accommodating” and “separating” turnovers. Table 7(a-b) considers “separating” turnovers, by excluding all those turnover events where the founder stayed with the start-up. And Table 7(c-d) considers “accommodating” turnovers, by excluding all those turnover events where the founder left. The evidence suggests that venture capitalists play an important role for both types of turnover. The results are very similar across the two subsamples, and the full sample.⁶

V. The state-contingent nature of venture capital involvement

So far we have seen evidence that suggests that venture capitalists get involved with the professionalization of start-up firms, and that there can be different facets to this involvement. On the one hand, venture capitalists frequently concern themselves with inducing leadership changes at the top of the organization. On the other hand they are involved in team building and professionalization further down the organization. Presumably venture capitalists would want to play all of these roles in the companies they finance, but they may also face some constraints. And companies in different development states may require different levels of attention. In this section we therefore examine how the various roles of venture capitalists that we identified in the previous sections are interrelated.

We first ask whether venture capitalists engage in a similar set of activities for all companies or whether they face some constraints, so that they selectively engage in different aspects for different firms. There may be a variety of constraints. It is often argued that the most scarce resource for venture capitalists is time. If venture capitalists already focus on leadership changes, they may not have as much time left to devote themselves to team building activities further down the organization. Moreover,

⁶ Because there are fewer observations, there is a slight loss of power in the probit regressions. The coefficients, however, remain very similar. And the results in the duration model remain statistically significant even in for these smaller samples.

they may not even be able to have an influence further down the organization, if there is a problem at the top.

To examine this issue, we divide our sample into two subsamples: firms that experience a CEO turnover and those that do not. We then rerun our regressions from section II for those two subsamples. Table 8(a-c) shows the results for the two subsamples where the dependent variable is RECRUIT(SA), RECRUIT(AM), RECRUIT(SM) respectively. Table 8d shows the results for the turnover and no turnover sample when the dependent variable is HRPOLICY. Table 8(e-f) shows the results for the two subsamples where the dependent variable is time to adopting a stock option plan, and time to hiring VP Sales and Marketing respectively. In general, we find that the venture capital variable is large and significant in the sample where no turnover occurred, but smaller and insignificant in the sample where turnover did occur. The results are quite similar across the various regressions that are based on a variety of approaches and data sources. The difference in the venture capital coefficient is in the same direction for all the tests though the difference is not always significant, which is not surprising given the small sample sizes and consequent loss of power. These findings suggests that venture capitalists tend to focus on professionalization further down the organization only for those companies where they do not need to focus on the CEO level itself. This evidence is consistent with the notion that venture capitalists do face some constraints in the attention that they can give to the various aspects of professionalization.⁷

This naturally leads us to ask in what kind of situations venture capitalist will want to focus on founder replacements. For instance, is it possible for a company to attract an outside CEO if it has yet to prove its viability? While it may be important for a company to get an outside CEO in the earlier stages of development, it may also be harder for the company to attract a CEO before reaching key milestones, such as having a product on the market or even going public.

⁷ If the constraint is that it is difficult to have an influence further down the organization if there is a problem with the CEO, we should see these effects in firms with a separating turnover. Rerunning the regressions using subsamples conditioned only on separating turnovers produces similar results.

To examine how turnovers are related to the underlying state of the company, we unfortunately do not have the benefit of any reliable performance data. Since we sample private companies, there are no stock prices, and we do not have balance sheet or profit and loss statements for our sample companies. To measure the state that a company is in, we therefore have to use a very coarse yet fairly intuitive measure. In particular, we identify three distinct stages in the development of the company. A first important milestone in the development of a start-up is to bring a product to market (see also Hellmann and Puri (1999)). Prior to having a product on the market, there is considerable uncertainty about the viability of a company's business plan. As such, we can think of a company without a product on the market as being in a more fragile position than those with a product on the market. A second important milestone is when a company goes public. In order to go public a company has to meet many criteria that provide some assurances about its viability and quality. We thus distinguish between three states. If a firm has gone public, we call the state IPO, if it has a product on the market, we call the state PRODUCT, and if the firm has neither a product on the market, nor has it gone public, we call the state NOTHING-TO-SHOW. We evaluate the state of the company at the time of the first turnover or otherwise the end of the sample period.

We divide our sample into three subsamples and ask whether the rate of turnover is similar across these subsamples. We find that the rates are very similar with the difference not being statistically significant. This, however, does not yet reveal anything about whether venture capitalists behave distinctly in those different states. For that we rerun the results from section III, to examine when the effect of venture capital on turnover is particularly important. Table 9 shows the results from both the Probit and the Cox regressions for the respective subsamples. Both of these two estimation models show the same pattern. The effect of venture capital is strongest for companies that have nothing to show yet, is still strong for companies with a product on the market, and it becomes insignificant for companies that have already gone public. These results suggest that there is some state-contingency to the exercise of control by venture capitalists. If the company is already well on track and the founders can point to having achieved some milestones, venture capitalist are not more likely than other investors to replace the

founders with an outside CEO. But in those states where the company does not have much to show, venture capitalists play a significant role in attracting professional CEOs.

We also reran those regressions for “accommodating” and “separating” turnovers, and obtained very similar results. Hard turnovers of companies with few signs of success might be a manifestation of a company in trouble. In this case, the evidence suggests that venture capitalists are particularly good at imposing control if the firm is in a difficult state.⁸ And the result on soft turnovers in companies with few signs of success, suggests that venture capitalists may allow companies to attract a new CEO in a fragile state when other companies have greater difficulty in accessing outside CEOs.

VI. Robustness checks and alternative explanations

In this section we discuss some robustness checks as well as some alternative explanations of our results.

A concern with the data is potential survivorship bias, since companies are not sampled at birth. A number of arguments, however, suggest that this survivorship bias is relatively minor. First, in terms of sampling design, a particular effort was made to include many young companies, precisely to reduce any survivor bias. As a consequence our sample captures firms at a much earlier stage than most other databases. Further, unlike many other studies in finance relating to venture capital, we are able to sample companies independent of their financial choices. In fact, our sampling criterion is essentially based on the existence of the company, and not on any endogenous financial measure. In particular our sampling criteria is not affected in any way by the firm getting venture capital. Second, a number of companies fail within our sample and we estimate a probit to see if the probability of failing is systematically related to any known characteristic. We find that the neither the presence of venture capital, age of the firm, turnover, nor industry effects are statistically significant in predicting exit from the sample. The

⁸ This effect is along the lines of the theory of contingent control by Aghion and Bolton (1992).

within-sample behavior thus suggests that survivorship issues are unlikely to have a major effect on our results.

A second concern with the survey evidence might be that of response bias. Not all firms responded to our survey questions, raising the question of whether there is any systematic bias in our responses that might affect some of our results. Our main survey question is when we ask firms whether investors (venture capitalists or other financiers) were influential in shaping the human resource policies of the firm. We do selectivity adjustments to correct for potential response bias (see Maddala (1983), Greene (1997)). We implement selectivity adjustments in the following manner. First, we estimate a probit where the dependent variable is 1 if we obtained a response from the firm on our survey question; 0 otherwise. The independent variables include VC, TURNOVER, LNAGE and industry controls. We use the estimates of the coefficients in the probit equation to form the expected value of the residuals conditional on obtaining a response. This is the inverse Mills ratio. In the second step we rerun the regression in table 3 where the dependent variable is HRPOLICY, but now additionally include the inverse Mills ratio obtained from the first step regression. We find that even after taking this selectivity correction into account, the coefficient on VC is positive and significant, suggesting that our results are not being driven by response bias.⁹

Our empirical approach is to estimate the equilibrium effects of venture capital. In equilibrium, we can alternatively think of this as a process where venture capitalists choose entrepreneurs or entrepreneurs choose venture capitalists. The equilibrium matching of entrepreneurs with investors will obviously take into account the entrepreneur's preferences, and the implications of choosing a venture capitalist. Entrepreneurs, for example, want deliberately seek out venture capitalists in the hope of obtaining support for professionalization. Our analysis then traces out the implications of these equilibrium choices.

⁹ We also perform selectivity bias adjustments for our second survey question, which deals with recruitment from business and professional contacts. The results are quite similar suggesting that our survey results are not being driven by response bias.

A natural question arises, however, whether the observed effects of venture capital are only due to the selection of companies they finance, rather than the actual presence of the venture capitalist per se. There are a number of arguments that suggest that is this not the most plausible explanation. First, any alternate explanation, including one based on selection, would have to explain all our results. It is unclear how some of the results, such as the substitutability between CEO replacement versus team building and the state-contingent nature of CEO turnovers could be explained on the basis of selection alone. Further, one of the advantages of this paper is that it uses different kinds of data to get at the same set of issues. For example, the result on the recruitment process could be affected by selection: it might be that venture capitalist prefer to invest in companies that also have a professional recruitment process. But the selection argument does not apply to the results on human resource policies, since the survey question explicitly asked for the influence that investors have. For the CEO turnover results (as well as the other timing events), the issue of selection is somewhat different. One of the strength of the duration analysis is that it explicitly takes timing into account. Indeed, in all our duration models venture capital predates the occurrence of the events. The only way that selection effects would enter here is through expectations of future events. But if anything, this kind of selection should affect our results in the opposite way. If there were an anticipation of a future replacement of the founder with an outside CEO, then we would expect those entrepreneurs who are most at risk to be less likely to select venture capital.¹⁰ The point that selection alone cannot account for the observed pattern is further corroborated by the fact that we continue to find a strong venture capital effect when we examine only those turnovers where there is a separation of the founders with their own firm.¹¹

¹⁰One may wonder at this point if there may also be other founders who may have a preference for relinquishing control, and that they may choose venture capital in the hope of maybe finding an outside CEO sometime in the future. But this kind of selection is actually predicated on the very role of venture capital that we identified, and thus only reinforces the interpretations of our findings.

¹¹ Another related concern maybe that there may be some inter-related contracting, where the acceptance of a new CEO is conditional on obtaining venture capital, or vice versa. In this case, we would expect the new CEO to appear around the time of obtaining venture capital. Out of a total of 72 companies that are venture-backed and had a turnover event, only 3 occurred in a six months window around the date of obtaining venture capital and 5 in a one-year window. This suggests that the results are not due to conditional contracts, where the turnover event is an automatic consequence of obtaining venture capital.

VII. Conclusion

In this paper we examine the conjecture that venture capitalists are a distinct type of investor that is characterized by being particularly closely involved with the companies they finance. We open up the black box of the firm and examine whether venture capitalists play a role in the professionalization of the internal organization. Overall, our findings show that venture capitalists play a significant role in the development of the start-up companies. The influence of venture capitalists concerns not only the choice of the CEO, but it also seems to extend further down into the organization. The presence of venture capitalists can have a “soft” facet, in terms of providing support for building up the human resources of the company. But it may also have a “hard” facet, in terms of exercising control over CEO leadership changes, possibly at the cost of having founders leaving the company that they created.

The paper is of interest to the growing literature on the theory of firm, providing evidence on a question that has received surprisingly little attention so far, namely the process by which resources are put together into a new firm. The paper contributes to the large literature on corporate governance, which has tended to focus on large, public companies. In a private company setting of start-ups, we show that CEO turnover is affected by the type of investor. And the paper speaks to the large literature on the role of financial intermediaries. In most of this literature, the role of the intermediary is to monitor information about firms. The evidence presented in this paper hints at a broader role, where the financial intermediary (in our case the venture capitalist) promotes certain business processes (in our case professionalization of a start-up).

The paper suggests some new research direction not just for empirical but also for theoretical work. By now, we understand that financial intermediaries play a monitoring role, gathering information about individual firms. In the context of venture capital, however, it appears that this role is only part of a much larger role that has received much less attention. Is there a role for financial intermediaries more generally,

in terms of providing expertise, contacts and other business services? And to what extent are the standard roles inversed, in the sense that financial intermediaries not only gather information *about* firms, but also *for* firms? This paper hopes to provide a starting point for further theoretical and empirical research on these important questions.

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Appendix

A standard procedure for dealing with duration data is employing a hazard model (see Kalbfleisch and Prentice, 1980; Kiefer, 1988). To proceed we have to specify the exact nature of our hazard model. We can choose from a number of parametric models (such as Weibull) or we can use a semi-parametric model. The parametric models are attractive because of their simplicity but by imposing as much structure as they do the models can distort the estimated hazard rate. Since fewer restrictions can result in a more accurate representation we use the proportional hazard model – a common choice among researchers for modeling duration. The formal model is

$$h(t) = h_0(t) \exp\{\beta X(t)\}$$

The Cox proportional hazard model does not impose any structure on the baseline hazard $h_0(t)$. Cox's partial likelihood estimator provides a way of estimating β without requiring estimates of $h_0(t)$. Suppose the complete durations are ordered $t_1 < t_2 < \dots < t_n$. The risk set with respect to any moment of time is the set of firms who have not yet exited just prior to that time. The conditional probability that observation i exits at time t_i given that any of the observations in the risk set R_i could have been concluded at duration t_i is

$$\frac{\exp\{\beta' X_i(t)\}}{\sum_{j \in R_i} \exp\{\beta' X_j(t)\}}$$

This conditional probability is independent of the baseline hazard function.

The partial log likelihood is:

$$\ln L = \sum_{i=1}^n [\beta' X_i - \sum_{j \in R_i} \exp\{\beta' X_j\}]$$

Technically, this is for the simplest case where exactly one firm exits at each distinct time and there are no censored observations. The partial log likelihood can handle censoring easily, which is one of the features of our data. An observation whose spell is censored between duration t_j and t_{j+1} appears in the summation in the denominator of the likelihood function of observation i through j but not in any others, and does not enter in the numerator. To account for the fact that the same firm can appear repeatedly in the risk pools, we compute standard errors as in Lin and Wei (1989).

Note that the dependent variable can be varying over time, a feature that we will use in our estimation. We report both the coefficients and the hazard ratios (i.e. the relative risks). A positive coefficient on x implies a higher x is linked to a higher hazard rate and thus a lower expected duration. For ease of interpretation we also give the hazard ratios. The hazard ratio tells us how much the hazard (i.e. the instantaneous risk) of the event increases for a unit change in the independent variables. In the case of a dummy variable, this is equal to the ratio of the (instantaneous) probabilities of the two possible states. A coefficient greater than 1 implies a higher hazard rate and thus a lower expected duration.

Table 1

This table provides descriptive statistics of variables used in the paper. TURNOVER is a dummy variable that takes the value 1 if a firm hired an outside CEO; 0 otherwise. VC is a dummy variable that takes the value 1 if a firm has received venture capital; 0 otherwise. VC(T) is a dummy variable that takes the value 1 if the company obtained venture capital before the date of the first CEO turnover. RECRUIT(SA), RECRUIT(AM) and RECRUIT(SM) are dummy variables that take the value 1 if a firm reported to use business and professional contacts to recruit sales and marketing personnel (SA), administrative and managerial personnel (AM) or senior managers (SM) respectively; 0 otherwise. HRPOLICY is a dummy variable that takes the value 1 if a firm reported their venture capitalists or other financiers influential in shaping human resource management; 0 otherwise. STATE is a dummy variable that takes the value 1 if a firm has a product on the market or has gone public at the time of a turnover or else at the end of the sample period; 0 otherwise. COMPUTER, TELECOM, and MEDICAL are dummy variables which take the value 1 if the firm is in the computer, telecommunications or medical-related industry respectively; 0 otherwise. OTHER is a dummy variable for other industries. SAMPLE-AGE is the age of the company at the time of sampling. LNAGE is the natural logarithm of the age of the company at the end of the sample period, in October 1997.

Variable	Number of observations	Mean	Standard Deviation
TURNOVER	170	0.5352941	0.5002262
VC	170	0.6882353	0.4645827
VC(T)	170	0.6470588	0.4792964
RECRUIT(SM)	100	0.76	0.4292347
RECRUIT(AM)	100	0.71	0.456048
RECRUIT(SA)	99	0.7676768	0.4244632
HRPOLICY	92	0.4347826	0.4984448
STATE	170	0.8294118	0.37726
COMPUTER	170	0.4882353	0.5013383
TELECOM	170	0.2	0.4011817
MEDICAL	170	0.1411765	0.3492322
OTHER	170	0.1705882	0.37726
SAMPLE-AGE	170	6.707927	2.828072
LNAGE	170	2.255077	0.3306824

Table 2

These tables present results from probit regressions. The dependent variables are RECRUIT(SA), RECRUIT(AM) and RECRUIT(SM), which are dummy variables that take the value 1 if a firm reported to use business and professional contacts to recruit sales and marketing personnel (SA), administrative and managerial personnel (AM), or senior managers (SM) respectively; 0 otherwise. The independent variables are VC, which is a dummy variable that takes the value 1 if a firm has received venture capital; 0 otherwise; LNAGE which is the natural logarithm of the company's age; and COMPUTER, TELECOM, and MEDICAL which are dummy variables which take the value 1 if the firm is in the computer, telecommunication or medical industry respectively; 0 otherwise. Marginal increase measures the change in probability of the dependent variable to a change in the independent variable implied by the probit coefficients evaluated at the sample mean. T-ratios are computed using White's heteroskedasticity-adjusted standard errors. Model p-value reports the joint significance of the coefficients of the independent variables. Pseudo $R^2 = 1 - \log L / \log L_0$ where $\log L$ is the maximized value of the log-likelihood function, $\log L_0$ is the log-likelihood computed only with a constant term. *, ** or *** mean that the coefficient is significant at 10%, 5% or 1% level respectively.

Dependent Variable: RECRUIT(SA)

Independent Variables	Marginal increase in probability	Coefficients	T-ratio
VC	0.2553321**	0.7683741**	2.238
LNAGE	0.0289683	0.0980365	0.235
COMPUTER	-0.0687642	-0.2302481	-0.526
TELECOM	-0.1962421	-0.5976361	-1.196
MEDICAL	-0.2464134	-0.7245992	-1.394
CONSTANT	NA	0.3248034	0.310
Number of firms = 99		Pseudo $R^2 = 0.0578$	Model p-value=0.3211

Dependent Variable: RECRUIT(AM)

Independent Variables	Marginal increase in probability	Coefficients	T-ratio
VC	0.4366999***	1.217822***	3.628
LNAGE	0.1830012	0.5588965	1.340
COMPUTER	-0.0033167	-0.010125	-0.023
TELECOM	-0.2692377	-0.7508911	-1.476
MEDICAL	-0.073619	-0.2160782	-0.395
CONSTANT	NA	-1.360384	-1.324
Number of firms = 100		Pseudo $R^2 = 0.1409$	Model p-value=0.0073

Dependent Variable: RECRUIT(SM)

Independent Variables	Marginal increase in probability	Coefficients	T-ratio
VC	0.1470161	0.4673383	1.475
LNAGE	-0.2855742**	-0.9850359**	-2.241
COMPUTER	-0.0243882	-0.08374	-0.217
TELECOM	0.122029	0.4725722	0.933
MEDICAL	0.1560752	0.6494414	1.235
CONSTANT	NA	2.526699**	2.469
Number of firms = 100		Pseudo $R^2 = 0.1103$	Model p-value=0.0501

Table 3

These tables present results from probit regressions. The dependent variable is HRPOLICY, which is a dummy variable that takes the value 1 if a firm reported their venture capitalists or other financiers influential in shaping human resource management; 0 otherwise. The independent variables are VC, which is a dummy variable that takes the value 1 if a firm has received venture capital; 0 otherwise; LNAGE which is the natural logarithm of the company's age; and COMPUTER, TELECOM, and MEDICAL which are dummy variables which take the value 1 if the firm is in the computer, telecommunication or medical industry respectively; 0 otherwise. Marginal increase measures the change in probability of the dependent variable to a change in the independent variable implied by the probit coefficients evaluated at the sample mean. T-ratios are computed using White's heteroskedasticity-adjusted standard errors. Model p-value reports the joint significance of the coefficients of the independent variables. Pseudo $R^2 = 1 - \log L / \log L_0$ where $\log L$ is the maximized value of the log-likelihood function, $\log L_0$ is the log-likelihood computed only with a constant term. *, ** or *** mean that the coefficient is significant at 10%, 5% or 1% level respectively.

Dependent Variable: HRPOLICY

Independent Variables	Marginal increase in probability	Coefficients	T-ratio
VC	0.4770777***	1.533646***	3.749
LNAGE	-0.2894254	-0.7450183	-1.608
COMPUTER	-0.1444156	-0.3752523	-0.834
TELECOM	-0.3212045*	-0.9405605*	-1.803
MEDICAL	-0.3175812*	-0.9387685*	-1.758
CONSTANT	NA	0.8677364	0.790
Number of firms = 92	Pseudo $R^2 = 0.1703$		Model p-value=0.0007

Table 4

Table 4 presents the results from a Cox regression with time-varying co-variates. The dependent variable is TIME-TO-OPTION-PLAN, which measures the time from the birth of a company to the date of implementing a stock option plan. The independent variables are VC(t), which is a time-dependent dummy variable that takes the value 0 as long as a firm has not received venture capital and 1 thereafter; and COMPUTER, TELECOM, and MEDICAL which are dummy variables which take the value 1 if the firm is in the computer, telecommunication or medical industry respectively; 0 otherwise. If the dependent variable is observed without any realization, it is treated as a censored event. Model p-value reports the joint significance of the coefficients of the independent variables. *, ** or *** mean that the coefficient is significant at 10%, 5% or 1% level respectively.

Cox Regression

Dependent Variable: TIME-TO-OPTION-PLAN

Independent Variable	Hazard ratio	Coefficient	T-ratio
VC(t)	2.060956**	0.72317**	2.468
COMPUTER	1.796011	0.5855683	1.515
TELECOM	2.264658*	0.8174239*	1.878
MEDICAL	1.264736	0.2348633	0.515
Number of firms = 95		Model p-value=0.0318	

Table 5

Table 5 presents the results from a Cox regression with time-varying co-variates. The dependent variable is TIME-TO-SALES-VP, which measures the time from the birth of a company to the first date of appointing a Vice President of Sales and Marketing. The independent variables are VC(t), which is a time-dependent dummy variable that takes the value 0 as long as a firm has not received venture capital and 1 thereafter; and COMPUTER, TELECOM, and MEDICAL which are dummy variables which take the value 1 if the firm is in the computer, telecommunication or medical industry respectively; 0 otherwise. If the dependent variable is observed without any realization, it is treated as a censored event. Model p-value reports the joint significance of the coefficients of the independent variables. *, ** or *** mean that the coefficient is significant at 10%, 5% or 1% level respectively.

Cox Regression

Dependent Variable: TIME-TO-SALES-VP

Independent Variable	Hazard ratio	Coefficient	T-ratio
VC(t)	1.793032**	0.5839081**	2.399
COMPUTER	1.167236	0.1546387	0.489
TELECOM	1.167798	0.1551197	0.401
MEDICAL	1.175999	0.1621181	0.446
Number of firms = 99		Model p-value=0.1530	

Table 6

Table 6a presents the results from a Probit regression. The dependent variable is TURNOVER, which is a dummy variable that takes the value 1 if a firm hired an outside CEO; 0 otherwise. The independent variables are VC, which is a dummy variable that takes the value 1 if a firm has received venture capital; 0 otherwise; LNAGE which is the natural logarithm of the company's age; and COMPUTER, TELECOM, and MEDICAL which are dummy variables which take the value 1 if the firm is in the computer, telecommunication or medical industry respectively; 0 otherwise. Marginal increase measures the change in probability of the dependent variable to a change in the independent variable implied by the probit coefficients evaluated at the sample mean. T-ratios are computed using White's heteroskedasticity-adjusted standard errors. Model p-value reports the joint significance of the coefficients of the independent variables. Pseudo $R^2 = 1 - \log L / \log L_0$ where $\log L$ is the maximized value of the log-likelihood function, $\log L_0$ is the log-likelihood computed only with a constant term. *, ** or *** mean that the coefficient is significant at 10%, 5% or 1% level respectively.

Table 6a: Probit Regression
Dependent Variable: TURNOVER

Independent Variables	Marginal increase in probability	Coefficients	T-ratio
VC(T)	0.1503328*	0.3793667*	1.780
LNAGE	0.3336875***	0.8401538***	2.770
COMPUTER	0.0464849	0.1171207	0.421
TELECOM	0.0565826	0.1432936	0.439
MEDICAL	0.2057749	0.5439469	1.467
Number of firms = 170		Pseudo $R^2 = 0.0623$	Model p-value=0.0157

Table 6b presents the results from a Cox regression with time-varying co-variates. The dependent variable is TIME-TO-TURNOVER, which measures the time from the birth of the company to the date of arrival of the first outside CEO. The independent variables are VC(t), which is a time-dependent dummy variable that takes the value 0 as long as a firm has not received venture capital and 1 thereafter; and COMPUTER, TELECOM, and MEDICAL which are dummy variables which take the value 1 if the firm is in the computer, telecommunication or medical industry respectively; 0 otherwise. If the dependent variable is observed without any realization, it is treated as a censored event. Model p-value reports the joint significance of the coefficients of the independent variables. *, ** or *** mean that the coefficient is significant at 10%, 5% or 1% level respectively.

Table 6b: Cox Regression
Dependent Variable: TIME-TO-TURNOVER

Independent Variable	Hazard ratio	Coefficient	t-ratio
VC(t)	2.317916***	0.8406685***	3.395
COMPUTER	1.164512	0.152302	0.495
TELECOM	1.099037	0.094434	0.284
MEDICAL	1.488202	0.3975686	1.105
Number of firms = 170		Model p-value=0.0047	

Table 7 (a-b)

Table 7a presents the results from a Probit regression for separating turnovers, i.e., the subsample of firms where the founder does not remain with the company after the hiring of the new CEO. The dependent variable is TURNOVER, which is a dummy variable that takes the value 1 if a firm hired an outside CEO; 0 otherwise. The independent variables are VC, which is a dummy variable that takes the value 1 if a firm has received venture capital; 0 otherwise; LNAGE which is the natural logarithm of the company's age; and COMPUTER, TELECOM, and MEDICAL which are dummy variables which take the value 1 if the firm is in the computer, telecommunication or medical industry respectively; 0 otherwise. Marginal increase measures the change in probability of the dependent variable to a change in the independent variable implied by the probit coefficients evaluated at the sample mean. T-ratios are computed using White's heteroskedasticity-adjusted standard errors. Model p-value reports the joint significance of the coefficients of the independent variables. Pseudo $R^2 = 1 - \log L / \log L_0$ where $\log L$ is the maximized value of the log-likelihood function, $\log L_0$ is the log-likelihood computed only with a constant term. *, ** or *** mean that the coefficient is significant at 10%, 5% or 1% level respectively.

Table 7a: Probit Regression
Dependent Variable: TURNOVER

Independent Variables	Marginal increase in probability	Coefficients	T-ratio
VC(T)	0.1417989	0.3755078	1.529
LNAGE	0.3678022	0.956066***	2.728
COMPUTER	-0.0360922	-0.093886	-0.304
TELECOM	0.0070556	0.018314	0.051
MEDICAL	0.110693	0.2819777	0.646
Number of firms = 132	Pseudo $R^2 = 0.0621$		Model p-value=0.0524

Table 7b presents the results from a Cox regression with time-varying co-variables for separating turnovers. The dependent variable is TIME-TO-TURNOVER, which measures the time from the birth of the company to the date of arrival of the first outside CEO. The independent variables are VC(t), which is a time-dependent dummy variable that takes the value 0 as long as a firm has not received venture capital and 1 thereafter; and COMPUTER, TELECOM, and MEDICAL which are dummy variables which take the value 1 if the firm is in the computer, telecommunication or medical industry respectively; 0 otherwise. If the dependent variable is observed without any realization, it is treated as a censored event. Model p-value reports the joint significance of the coefficients of the independent variables. *, ** or *** mean that the coefficient is significant at 10%, 5% or 1% level respectively.

Table 7b: Cox Regression
Dependent Variable: TIME-TO-TURNOVER

Independent Variable	Hazard ratio	Coefficient	t-ratio
VC(t)	2.421437***	0.8843611***	2.789
COMPUTER	0.8456732	-0.1676223	-0.450
TELECOM	0.9173724	-0.0862418	-0.214
MEDICAL	1.050463	0.0492313	0.110
Number of firms = 132	Model p-value=0.0748		

Table 7 (c-d)

Table 7c presents the results from a Probit regression for accommodating turnovers, i.e., the subsample of firms where the founder remains with the company after the hiring of the new CEO. The dependent variable is TURNOVER, which is a dummy variable that takes the value 1 if a firm hired an outside CEO; 0 otherwise. The independent variables are VC, which is a dummy variable that takes the value 1 if a firm has received venture capital; 0 otherwise; LNAGE which is the natural logarithm of the company's age; and COMPUTER, TELECOM, and MEDICAL which are dummy variables which take the value 1 if the firm is in the computer, telecommunication or medical industry respectively; 0 otherwise. Marginal increase measures the change in probability of the dependent variable to a change in the independent variable implied by the probit coefficients evaluated at the sample mean. T-ratios are computed using White's heteroskedasticity-adjusted standard errors. Model p-value reports the joint significance of the coefficients of the independent variables. Pseudo $R^2 = 1 - \log L / \log L_0$ where $\log L$ is the maximized value of the log-likelihood function, $\log L_0$ is the log-likelihood computed only with a constant term. *, ** or *** mean that the coefficient is significant at 10%, 5% or 1% level respectively.

Table 7c: Probit Regression
Dependent Variable: TURNOVER

Independent Variables	Marginal increase in probability	Coefficients	T-ratio
VC(T)	0.1375467	0.4015431	1.464
LNAGE	0.2161565	0.6120532	1.536
COMPUTER	0.1661263	0.4751503	1.186
TELECOM	0.144969	0.3915009	0.830
MEDICAL	0.3756906**	0.9884206**	2.033
Number of firms = 117		Pseudo $R^2 = 0.0759$	Model p-value=0.0453

Table 7d presents the results from a Cox regression with time-varying co-variables for accommodating turnovers. The dependent variable is TIME-TO-TURNOVER, which measures the time from the birth of the company to the date of arrival of the first outside CEO. The independent variables are VC(t), which is a time-dependent dummy variable that takes the value 0 as long as a firm has not received venture capital and 1 thereafter; and COMPUTER, TELECOM, and MEDICAL which are dummy variables which take the value 1 if the firm is in the computer, telecommunication or medical industry respectively; 0 otherwise. If the dependent variable is observed without any realization, it is treated as a censored event. Model p-value reports the joint significance of the coefficients of the independent variables. *, ** or *** mean that the coefficient is significant at 10%, 5% or 1% level respectively.

Table 7d: Cox Regression
Dependent Variable: TIME-TO-TURNOVER

Independent Variable	Hazard ratio	Coefficient	t-ratio
VC(t)	2.670197***	0.9821523***	2.528
COMPUTER	2.007404	0.6968424	1.137
TELECOM	1.756776	0.5634801	0.834
MEDICAL	3.749152**	1.32153**	1.987
Number of firms = 117		Model p-value=0.0026	

Table 8 (a-c)

These tables report regressions that are identical to those presented in table 2 (a-c), except that the regressions are run in two subsamples: the sample of companies that experienced a turnover, and those that did not experience a turnover.

Table 8a: Probit Regression
Dependent Variable: RECRUIT(SA)

Independent Variable	If TURNOVER = 1		If TURNOVER = 0	
	Coefficient	T-ratio	Coefficient	T-ratio
VC(T)	0.3449867	0.749	1.126228**	2.040
LNAGE	0.3387789	0.609	-0.2494935	-0.353
COMPUTER	-0.0510635	-0.091	-0.6133305	-0.854
TELECOM	0.0658443	0.107	-1.633219*	-1.916
MEDICAL	-0.3381352	-0.546	-0.8711714	-1.047
CONSTANT	-0.3277766	-0.226	1.560968	0.823
Number of firms	58		41	
Pseudo R ²	0.0217		0.1862	
Model p-value	0.8927		0.2309	

Table 8b: Probit Regression
Dependent Variable: RECRUIT(AM)

Independent Variable	If TURNOVER = 1		If TURNOVER = 0	
	Coefficient	T-ratio	Coefficient	T-ratio
VC(T)	0.6309274	1.441	1.928223***	3.266
LNAGE	0.6747368	1.225	0.6991546	1.046
COMPUTER	0.4970228	0.889	-0.9699655	-1.255
TELECOM	-0.2498728	-0.418	-1.530711*	-1.691
MEDICAL	0.3155907	0.494	-0.8229691	-0.980
CONSTANT	-1.665827	-1.178	-1.262842	-0.707
Number of firms	59		41	
Pseudo R ²	0.0698		0.3057	
Model p-value	0.4312		0.0111	

Table 8c: Probit Regression
Dependent Variable: RECRUIT(SM)

Independent Variable	If TURNOVER = 1		If TURNOVER = 0	
	Coefficient	T-ratio	Coefficient	T-ratio
VC(T)	0.2515635	0.545	1.117654**	2.160
LNAGE	-0.4411297	-0.868	-1.762467**	-2.190
COMPUTER	-0.0831746	-0.147	-0.9243682**	-1.740
TELECOM	0.1574175	0.244	°	°
MEDICAL	0.7864689	1.133	-0.1568579	-0.223
CONSTANT	1.488322	1.141	4.567973	2.484
Number of firms	59		41	
Pseudo R ²	0.0606		0.2577	
Model p-value	0.3902		0.0092	

° To run the probit, we had to drop the TELECOM dummy variable, since it predicted success perfectly. We also reran the regression dropping all the TELECOM observation and obtained similar results.

Table 8 (d-f)

This table reports regressions that are identical to the one presented in table 3, except that the regressions are run in two subsamples: the sample of companies that experienced a turnover, and those that did not experience a turnover.

Table 8d: Probit Regression. Dependent Variable: HRPOLICY

Independent Variable	If TURNOVER = 1		If TURNOVER = 0	
	Coefficient	T-ratio	Coefficient	T-ratio
VC(T)	0.8290523	1.529	1.544036***	2.877
LNAGE	-1.178108*	-1.957	-0.40047	-0.612
COMPUTER	-1.314339*	-1.941	0.1366377	0.222
TELECOM	-1.464785**	-1.991	-0.8016821	-1.060
MEDICAL	-1.30412*	-1.737	-1.155917	-1.293
CONSTANT	3.177674*	1.943	-0.1776248	-0.106
Number of firms	50		42	
Pseudo R ²	0.1280		0.2490	
Model p-value	0.0772		0.0308	

This table reports regressions that are identical to the one presented in table 4, except that the regressions are run in two subsamples: the sample of companies that experienced a turnover, and those that did not experience a turnover.

Table 8e: Cox Regression. Dependent Variable: TIME-TO-OPTION-PLAN

Independent Variable	If TURNOVER = 1		If TURNOVER = 0	
	Coefficient	T-ratio	Coefficient	T-ratio
VC(T)	0.5558378	1.429	1.069102**	2.230
COMPUTER	-0.2730287	-0.589	1.646073**	2.360
TELECOM	-0.2024297	-0.399	2.756569***	3.717
MEDICAL	-0.3692889	-0.682	0.7241106	0.816
Number of firms	57		38	
Model p-value	0.5246		0.0001	

This table reports regressions that are identical to the one presented in table 5, except that the regressions are run in two subsamples: the sample of companies that experienced a turnover, and those that did not experience a turnover.

Table 8f: Cox Regression. Dependent Variable: TIME-TO-SALES-VP

Independent Variable	If TURNOVER = 1		If TURNOVER = 0	
	Coefficient	T-ratio	Coefficient	T-ratio
VC(T)	0.6608867**	2.302	0.6812879	1.545
COMPUTER	0.4171708	1.087	-0.3671893	-1.064
TELECOM	0.3453134	0.796	-0.4343757	-0.591
MEDICAL	0.2986724	0.723	-0.3646467	-1.073
Number of firms	66		33	
Model p-value	0.1937		0.4089	

Table 9

This table reports regressions that are identical to the one presented in table 6a, except that the regressions are run in three subsamples: the sample of companies that experienced clear sign of success, such as an IPO, the sample of firms that have some sign of progress, such as a product on the market, and those who have no concrete evidence of progress, i.e., neither IPO nor product

Table 9a: Probit Regression
Dependent Variable: TURNOVER

Independent Variable	IPO STATE		PRODUCT STATE		NOTHING TO SHOW STATE	
	Coefficient	t-ratio	Coefficient	t-ratio	Coefficient	t-ratio
VC(T)	-0.459174	-0.579	0.5471696**	1.923	2.308881***	3.362
LNAGE	1.051509	1.475	1.430092***	3.329	1.338967	1.513
COMPUTER	-0.939615	-1.164	0.4613404	1.284	0.9386687	1.199
TELECOM	-0.4654517	-0.598	0.824938*	1.697	-1.54289*	-1.740
MEDICAL	-0.0422916	-0.050	0.6905522	1.157	1.318186	1.386
CONSTANT	-1.661827	-0.831	-3.801519***	-3.568	-3.891526*	-1.820
Number of firms	45		96		29	
Pseudo R ²	0.2433		0.1464		0.3877	
Model p-value	0.1136		0.0038		0.0040	

This table reports regressions that are identical to the one presented in table 6B, except that the regressions are run in three subsamples: the sample of companies that experienced clear sign of success, such as an IPO, the sample of firms that have some sign of progress, such as a product on the market, and those who have no concrete evidence of progress, i.e., neither IPO nor product

Table 9b: Cox Regression
Dependent Variable: TIME-TO-TURNOVER

Independent Variable	IPO STATE		PRODUCT STATE		NOTHING TO SHOW STATE	
	Coefficient	t-ratio	Coefficient	t-ratio	Coefficient	t-ratio
VC(T)	0.3406719	0.416	1.064003	3.448***	2.588803***	4.095
COMPUTER	-0.8007438	-1.095	0.4468177	1.191	1.319213*	1.831
TELECOM	-0.0765131	-0.096	0.7163346	1.587	-0.9661981	-0.779
MEDICAL	0.0294689	0.045	0.5817608	1.063	2.651634***	2.983
Number of firms	45		96		29	
Model p-value	0.6481		0.0022		0.0003	