Do VCs benefit as board of directors in mature public companies?

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Abstract

This paper examines the benefits to Venture Capital firms through their directorships in mature public companies. We investigate the benefits to Venture Capital firms in terms of fundraising and investment performance. Our empirical results show that Venture Capital firms raise more funds, set higher fund-raising target, and are more likely to exit successfully their investments post appointment as a board of director in the S&P 1500 companies. Directorships status in mature public firms provides Venture Capital firms with enhanced network, visibility, and credibility, which facilitate their fundraising activities. In addition, knowledge and experience acquired through being a director in mature public firms not only benefit the Venture Capital firms, but also their portfolio companies as measured by the successful exits.

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1. INTRODUCTION

The role of Venture Capitalists (VCs) has long been recognized as capital providers, monitors of small and young business. It is only until recent when VC’s role in mature public firms has been brought to the attentions of academics and professionals alike. In a recent study by Celikyurt, Sevilir and Shivdasani (2012), they examine the role of VC directors in mature public companies. They have documented that 30.5% of S&P 1500 companies have directors with a VC background prior to their appointment on the board. They find that the presence of VC directors on the board is strongly associated with greater innovation activity by mature firms. In addition, the presence of VC directors also increase the likelihood that the firm acquires a VC-backed firm, establishes strategic alliances with other VC-backed firms, and undertakes corporate venture capital investments in start-up companies. However, the focus of their study is on the benefits to mature firms having VC directors on the board. The question of whether VC firms benefit by being on the board of mature public companies remained unexplored. In this paper, we aim to fill this gap by examining whether VC firms benefit from being on the board of mature public companies. We investigate the potential, but crucial benefits to VC firms mainly: fundraising and investment performance.

We follow Celikyurt, et al. (2012) to construct our VC director sample, which covers the period from 1998 to 2011. Our final sample consists of 1,359 unique VC directors working in 700 different VC firms. We collect VC fundraising, VC investments, VC firms, and exits data from VentureXpert, which has been used extensively by previous studies (Nahata, 2008; Cumming and Dai, 2010).
The first benefit we examine is VC fundraising, which has been examined by a number of previous studies (Gompers and Lerner, 1998; Gompers, 1996; Jeng and Wells, 2000; Mayer et al., 2004). In general, these studies find that reputation increases VC firms’ ability to raise new capital. And reputation is achieved through taking portfolio companies public quickly (i.e. VC grandstanding). In our study, we postulate that directorships in mature public companies also increase reputation and improve fundraising performance. This is due to the fact that being on board of S&P 1500 companies provides VC firms visibility, credibility and enhanced network. (Celikyurt et al., 2012). Our analysis indicate that there is a significant difference between VC firms with directorships and VC firms without directorships. However, this difference could be due to either selection effect or treatment effect. We address this concern by comparing fundraising performance in pre and post director-appointment and find that better performance is due to directorship. Furthermore, we use the difference in difference method to address the concern that the difference could be due to industry effect (i.e. VC firms raise more fund when the industry is booming) and yet the results remained quantitatively the same. Overall, our results show that directorships in mature public companies benefit VC firms in terms of fundraising performance.

The second benefit we examine is VC investment performance. A number of recent studies have examined VCs’ role as knowledge intermediaries (Gonzalez-Uribe, 2013; Dessi and Yin, 2014). These studies show that that VC investors can communicate valuable knowledge to an entrepreneur, and to other portfolio companies, facilitating innovation. Based on their findings, we question whether VC firms can also transfer knowledge and experience gained in mature public companies to their small non-public portfolio companies and improve their investment performance as measured by the likelihood of a successful exit (Cumming and Dai,
2010; Dai et al., 2012; Nahata, 2008). Our empirical results show that VC firms improve their investment performance post becoming a director in mature public companies and better investment performance is due to their status as board of director and not due to their reputation in pre-appointment.

Overall, our results show that VC firms do benefit from their directorships in S&P 1500 companies in terms of fundraising and investment performance. Specifically, VC firms raise more fund, set higher fundraising target, and have a higher likelihood of successful exits post being a board of director in mature public companies. These results are consistent controlling for matched sample of VC firms with similar reputation, but without directorship in mature public companies.

The rest of the paper is organised as follows. Section 2 highlights related studies and raises testable hypotheses; section 3 outlines and data and methodology; section 4 analyses the empirical results; and section 5 concludes the paper.

2. HYPOTHESES DEVELOPMENT

VC characteristics and directorships

Prior to analysis of potential benefits of directorship in S&P 1500 accrued to VC firms; we focus on characteristics of VC firms that make them more likely to build connections with public companies. As suggested by Celikyurt et al., (2012), mature public companies select directors with VC background based on the anticipated experience and expertise that could be brought by these VC directors. Therefore VC firm’s experience and/or reputation within the VC industry are likely to influence public companies’ choices and decisions. We use IPO market share and VC investment share to measure VC firm’s reputation similar measure to Nahata, (2008)
and Krishnan et al., (2011). We postulate that reputable VC firms, which have higher IPO market share and VC investment shares, are more visible and potentially more valuable to mature public companies and hence they are likely to obtain board seats.

In addition to reputation, we also examine other characteristics of VC firms. Specifically, we examine VC firm’s age, size, location, and type. We use the total number of years a firm has experience as VC investor (Cumming et al., 2006) as a measure of VC firm’s experience. We posit that older VC firms are more experienced, knowledge-abundant, and credible, therefore are likely to be selected as directors by S&P 1500 companies. We classify all VC firms into two categories: independent VC and others. Independent VC firms are traditional VC firms that are not affiliated to any corporations, banks or government while those with affiliations are defined as others. Given that S&P 1500 companies invite VCs to join the board to add value, it is unlikely that they invite non-independent VC firms to join the board of directors. Therefore, captive VC firms, especially corporate VC firms are far less likely to become directors as compared to independent VC firms. Finally, we examine whether the location of VC firms influence the likelihood of obtaining directorships. VC firms based in US venture hubs (California and New York State) are exposed to more entrepreneurial activities than those based in other states (Gompers et al., 2005). These VC firms might be more experienced in evaluating and cultivating young firms than other VC firms, which are potentially valuable for S&P 1500 companies. Therefore, we posit that VC firms based in venture hubs are more likely to obtain directorships. Based on the above discussion, we therefore develop the following hypothesis:
**Hypothesis 1:** More reputable, older, larger, independent VC firms and those based in venture hubs are more likely to become board of director.

**Directorship and VC fundraising**

Gompers and Lerner (1998) examine fundraising process within the context of US VC market and find that economic growth, R&D expenditures, and firm specific reputation and performance influence fundraising. Further, they find that VC firms tend to hold larger equity stakes in firms that have recently gone public in order to raise larger funds. In a related study by Gompers (1996), it is shown that young VC firms tend to rush to IPO in to facilitate their future fundraising. Non-US evidence also show similar findings. Jeng and Wells (2000) and Mayer et al. (2004) examine the impact of a series factors such as IPOs, accounting standards, labour market, and economic growth etc. on the ability to raise new capital. They show that the ability to take company public determines raising new capital.

Our analysis extends prior studies by incorporating another potential important determinant of VC fundraising. Previous studies find that a good reputation increase VC firms’ ability to raise new capital. The reputation of VC firms is achieved through bringing their portfolio companies to IPOs as early as possible, i.e. VC groundstanding (Gompers, 1996). However, we postulate that VC firms can gain reputation through the directorships in mature public companies. A board seat in S&P 1500 companies provides visibility, credibility and enhanced network for VC professionals, which may in turn improve VC’s ability to raise new capital. The measures we use are total amount raised and target amount. The total mount equals to the sum of all funds raised by a particular VC firm during the sampling period.
(1980-2013), target amount is the sum of all target fund size of VC firm during the sampling period. The total amount raised measures the objective result of fundraising, while the target amount captures VC firm’s subjective perception. We posit that VC firms, after obtaining directorships, are not only more able to raise new funds, but also become more confident in their ability to raise funds. Therefore, we hypothesize that directorships in S&P 1500 companies will increase the total amount a VC firm raise and the target amount a VC firm set:

**Hypothesis 2a:** Directorships in S&P 1500 companies would increase the total amount a VC firm raise.

**Hypothesis 2b:** Directorships in S&P 1500 companies would increase the target amount a VC firm set as compared to pre-directorship appointment.

**Directorship and investment performance**

Various studies including Cumming and Johan (2008), Giot and Schwienbacher (2007), Isaksson (2007), examine VC exits in different contexts. A large body of literature concludes that exits are influenced by various factors. These studies report that the characteristics of VC firms and investee companies affect the likelihood of exits (Cumming and Johan, 2008 and Elisabete, Cesaltina and Mohamed, 2008). Others (Cumming, et al., 2006; and Cumming and MacIntosh 2003) find that better economic condition and legal environment increase the likelihood of exits. In addition, VC syndication (Megginson and Weiss, 1991; Lerner, 1994; Giot and Schwienbacher, 2007) geographical distance and cultural disparity (Cumming and Dai, 2010) also influence the VC’ exit within the context of cross-border VC investments.
It is only until recent when VC’s role in mature public firms has been brought to attention. Celikyurt et al. (2012)’s study find that VC directors in mature public companies significantly improve public companies’ innovation activities. Following Celikyurt et al. (2012), Gonzalez-Uribe (2013), Dessi and Yin (2014) further examine VCs’ role as knowledge intermediaries. For instance, Dessi and Yin (2014) find that VC investors can communicate valuable knowledge to an entrepreneur, and to other portfolio companies, facilitating innovation.

We measure investment performance by the likelihood of a successful exit, which has been used extensively by previous studies (Cumming and Dai, 2010; Dai et al., 2012; Nahata, 2008). We postulate that being on the board of mature public companies provide VC professionals access to better knowledge and experience of the product, market, and industry, which could be transferred to their portfolio companies and therefore improve performance. In other words, VC firms benefit from their directorships in mature public companies in the form of ability to take their portfolio companies to successful exits. Therefore we hypothesize that directorships in S&P 1500 companies could increase the likelihood of a successful exit:

**Hypothesis 3**: Directorships in S&P 1500 companies would increase the likelihood of a successful exit.

### 3. DATA AND METHODOLOGY

#### 3.1 Data and sample
We follow the method used by Celikyurt, et al., (2012) to construct our initial sample. We collect director data from the RiskMetrics\textsuperscript{1} database, which provides information on directors of S&P 1500 firms from 1996 onwards. The RiskMetrics database reports each director’s primary employment, committees they serve on, their board affiliations, share held, and total voting power etc. Our sample covers U.S. companies from 1998 to 2011 and extend the sample studied by Celikyurt et al (2012).\textsuperscript{2} To identify VC directors, we adopt a two-step method. In the first step, we search for keywords that might define a VC firm in four different employment-related data items provided by RiskMetrics for each individual director\textsuperscript{3}. The employment-related data items that we search are the primary company name, employment category, other employment title, and type of services for each director. If at least one of the keywords we searched is available in any of these data items, we consider the director as a potential VC director. In the second step, we hand-collect information of VC director candidates from VentureXpert database in the Securities Data Company (SDC) database. We only record candidates as VC directors if they are from VC firms that are in the VentureXpert database. This is to avoid including directors that may self-describe themselves as a VC based on their experience as a private investor, but lack the skills and network associated with working at a VC firm. After these two steps, we identify 1,359 unique VC directors working in 700 different VC firms. In addition we collect information on VC directors’ year of joining in order to more accurately measure the starting point of potential benefits.\textsuperscript{4} For instance, if VC become a director of Company C in 2006 but joins VC firm B in 2009, we consider

\textsuperscript{1} Formerly known as Investor Responsibility Research Centre (IRRC).

\textsuperscript{2} Our sample starts in 1998 because this is the first year that the IRRC database collects primary employment data on directors, which is one of the main data items we need for our analysis.

\textsuperscript{3} The keywords are: venture, capital, partner, fund, investor, angel, finance, financial, and management

\textsuperscript{4} We also collect the job title of each VC director in the VC firm. But we only record the title of the VC director if he/she is a founder of the VC firm because other titles are time-varying.
2009 as the starting point rather than 2006. We collect this information primarily from VC firms’ websites with supplementary sources such as Bloomberg and Forbes. We collect fundraising, VC investments, VC firms, and exits data from VentureXpert (SDC Platinum), which is the official database used by National Venture Capital Association (NVCA) and has been used extensively by previous studies.

Table 2 presents a summary statistics of our sample. Panel A shows VC firms’ directorship in S&P 1500 companies. As shown, on average, each VC firm is associated with around two S&P 1500 companies, while the maximum number range up to 25. It is common for VC firms to send multiple partners to sit on the board as suggested by the number of directors per VC firm on the board of S&P 1500 companies. Similarly, S&P 1500 usually invite more than one VC directors to sit on the board. Panel B presents the descriptives of VC director’s experience. As shown in the table, most VC joint the S&P 1500 board around the 1999, and most VC joined/started the VC firm around the same time. As discussed above, there are two types of VC directors in our sample: those who joined the S&P 1500 board first then joint/started the VC firm (15%); the ones who started their career as venture capitalists then become a director of S&P 1500 companies (85%). For the former, they stay on the board for around 6 years before they join/start the VC firm. The latter spend on average 7 years in a VC firm before starting their directorships in S&P 1500. Panel C descripts VC directors’ role within the VC firm and S&P 1500. We find that 37% of our VC directors are the founder/co-founder of the VC firms they are associated with, suggesting that S&P 1500 tend to favour the most experienced and reputable VCs in the industry. In terms of VC directors’ role within the S&P 1500 companies, 7% hold the Chairman/Vice-Chairman positions, 8% hold CEO,CFO, and/or COO positions, and 9% hold President/Vice-President positions. The majority
(82%), however, do not hold the above positions. This is also shown by the classification of directorship, 77% of the VC directors are independent directors, while only 22% are employees or linked to the S&P 1500 companies.

Overall, our results show that VC firms tend to send multiple partners to sit on the board of S&P 1500 companies; the majority of VC directors started their career as venture capitalists then joined the S&P 1500 board; only a small proportion of VC directors hold positions such as Chairman, CEO, and CFO within the S&P 1500 companies while the majority are independent directors.

[INSERT TABLE 2 HERE]

3.2 Dependent variables

The dependent variable across all models in Table 4 is a dummy variable, which takes the value of one if a specific VC firm obtained at least one directorship of S&P 1500 companies in that particular year and zero otherwise. The dependent variables in Table 6 are either the natural logarithm of total amount raised or target amount. The dependent variable in model 1-3 of Table 8 is a dummy that takes the value of one if the investee company is exited through and IPO and/or M&A by the end of 2012 and zero otherwise. We consider both IPO and M&A are successful exits (Cumming and Dai, 2010; Dai et al., 2012; Nahata, 2008). In model 4-6 of Table 8, the dependent variable is the time to exits, calculated by taking the difference between the year in which the portfolio company received its initial funding and the observation year or the end of 2012.
3.3 Determinants of VC directorship

Directorship

This is a dummy variable which takes the value of one if the VC firm has at least one partner sitting on the board of S&P 1500 companies and zero if the VC firm has never obtained any directorships during the sampling period.

Post-directorship

This variable is only for VC firms appointed as director during the sampling period. It is a dummy variable which takes the value of one if the VC firm has existing directorships in S&P 1500 companies and zero if the VC firm has not yet obtained directorships.

Directorship length

This variable is only for VC firms that have obtained directorships during the sampling period. It is measured as the number of years between the year in which VC firm became a director and the observation year.

In our analysis of directorship and VC fundraising, we follow Gompers and Lerner (1998) by including various variables to control for VC firm characteristics. For instance, Gompers and Lerner (1998) find that older and larger VC firms are more likely to raise larger funds than younger and smaller ones. A better economic environment as measured by GDP growth in the previous year also facilitates VC firm’s fund-raising. In addition to VC firm age, size, and GDP growth, we also
include VC firm type, location, and year dummies to control for other VC firm characteristics and year fixed effects in our models.

In our analysis of investment performance, we follow Nahata (2008) by including variables to control for characteristics of VC firms, portfolio companies and deal characteristics. We include VC firm age, IPO market share to control for VC firm’s experience and reputation (Nahata, 2008). We also control for venture-related characteristics. We include Seed/start-up stage, early stage, expansion stage, and later stage dummies in our analysis. We include these variables because previous studies suggest that early-stage ventures are risky and have a high failure risk (Cochrane, 2005). The level of information asymmetry and uncertainty are high at early stage than the later stage (Dai et al., 2012). VC syndication is also important and can systematically reduce the level of uncertainty. Megginson and Weiss (1991) and Lerner (1994) find that VC syndication is positively related to the likelihood of IPO exits. Giot and Schwienbacher (2007) find that the larger the size of VC syndication the shorter the time to exit a portfolio company. Therefore, we include Syndicate size, which is the total number of VC firms invested in a particular portfolio company. To control for other characteristics of VC firms, we include VC type dummies to indicate difference types of VC firms. In addition, we also account for venture industry and year-specific fixed effects by including industry dummies and year dummies in our estimations. We also include total funding received to control for investment size.

3.4 Estimation models

a. Logit model
We use logit model to estimate likelihood of becoming directors and investment performance (company level). Since the dependent variables in both analyses are binary in nature, we apply logit model. The basic function of the non-linear model is described as:

\[ \hat{Y}_i = \frac{e^u}{1 + e^u} \quad \hat{Y}_i = \frac{e^u}{1 + e^u} \]  

(1)

In table 4, \( \hat{Y}_i \) is the probability of having at least one partners sitting on the board of S&P 1500 companies for the \( i \)th investment, \( \hat{Y}_i \) equals 1 if the VC firm has at least one directorship in S&P 1500 and 0 otherwise. In table 8, \( \hat{Y}_i \) is the estimated probability of a successful exit for the \( i \)th investment, \( \hat{Y}_i \) equals 1 if the company is successfully exited by the end of 2012 and equals 0 otherwise. \( \hat{Y}_i \) is the normal linear regression model, which is:

\[ u = a + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_r X_r \]  

(2)

Where \( \alpha \) is the constant and \( \beta_1 \) to \( \beta_r \) are coefficients of independent variables \( X_1 \) to \( X_r \). The log transformation of the logistic model is given by:

\[ \ln \left[ \frac{\hat{Y}_i}{1 - \hat{Y}_i} \right] = a + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_r X_r \]  

(3)

The parameters are estimated through maximum likelihood method. To test the statistical significance of the predictor variable, Wald test is used. Pseudo \( R^2 \) is used to measure the goodness fit of the model. Pseudo \( R^2 \) is similar to \( R^2 \) in the OLS, the larger the pseudo\( R^2 \), the better the goodness of fit.

\textit{b. Heckman two-stage model}

In our analysis of directorship and VC fund-raising, we estimated a Heckman two-stage model, which estimates two equations. The first equation is the probability
of raising a fund in a particular year. And the second is the amount raised given that the fund was raised in that year.

c. Cox proportional hazard model

We examine the “time-to-exit”/exit rate using Cox proportional hazard model. The model is used in our deal company level analysis. The dependent variable is the hazard rate, which is the probability of exiting an investment given that the exits have not occurred. The following is the hazard model:

\[ h_j(t|X_j) = h_0(t) \exp(\beta_0 + X_j\beta_x) \] (4)

where, \( h_j(t|X_j) \) is the proportional hazard rate, \( h_0(t) \) is the baseline hazard rate at time \( t \), \( j \) is the index for individual firm, \( X_j \) is a vector of independent variables, which includes VC firm-related factors, portfolio company-related factors, and venture nation-related factors. \( \beta_x \) are coefficients to be estimated through maximum likelihood. The Cox model makes no assumption about the distribution of the hazard rate and can take any shape (i.e. could be increasing or decreasing functions).

In our analysis of investment performance, we use the computed time to exit as the dependent variables. The “survival” time in years is either the time between the first investment date the exit date or difference between investment date and 31/03/2012. We do not consider the not-yet-exited deals as unsuccessful but treat them as right-censored.

4. ANALYSIS

4.1. Directorship and VC firm characteristics
4.1.1 Univariate analysis

Before moving on to the analysis of potential benefits of directorship in S&P 1500 accrued to VC firms, we are interested in the initiation of the process, i.e. what characteristics of VC firms make them more likely to build such connections with large public companies. We first examine if there is a difference between VC firms with directorship and VC firms without in terms of their characteristics. Table 3 shows a comparison between these two groups. As shown in the table, VC firms with directorships are in general more reputable and larger than those without as measured by IPO market share, VC investment share, and firm size. In terms of firm type, VC firms with directorships are mainly independent while VC firms without directorships have higher proportions of captive VC firms (affiliated to corporations, banks, government). This is not surprising because having directors from independent VC firms sitting on the board will lead to less conflict of interest than having directors from captive VC firms, especially corporate VC firms, which are probably subsidiaries of their competitors. This explains why there is only 3% directors from CVCs are found on the board of S&P 1500 companies. VC firms with directorships are more concentrated in the two venture hubs of the U.S. (California and New York). Nearly 50% of these VC firms are headquartered in these two states. VC firms without directorships, on the other hand, are relatively more scattered across the country.

Overall, our results suggest that VC firms with directorships are more reputable, larger, mostly not affiliated to corporations or banks, and based mainly in California and New York states. But the results so far do not necessarily imply that such VC characteristics lead to directorships in the S&P 1500 companies. Therefore, in the
next section we test whether these characteristics cause VC firms to obtain directorships controlling for other determinants.

[INSERT TABLE 3 HERE]

4.1.2 Multivariate analysis

In this section, we test whether certain characteristics of VC firms lead to directorships in S&P 1500 companies controlling for other variables in Table 3. The dependent variable in these models is a dummy variable which takes the value of one if a specific VC firm obtain at least one directorship in S&P 1500 companies and zero otherwise. These regressions control for size effect, firm location, firm types, and year-fixed effects. The main explanatory variables we are interested is VC firm’s reputation (Nahata, 2008). We use IPO market share and VC investment share as two measures of VC firm’s reputation. IPO market share is the dollar market value of all companies taken public by the VC firm from the beginning of calendar year 1980 until a given calendar year and normalized by the aggregate market value of all VC-backed companies that went public from the beginning of 1980 up until the same calendar year. VC investment share is the dollar investment from the beginning of year 1980 up until a given calendar year and normalized by the overall aggregate investment in the VC industry in those years. We also examine whether older, larger, independent, and those based in venture hubs are more likely to obtain directorships.

Model (1) presents regression estimates with VC reputation as measured by IPO market share. The coefficient of IPO market share is positive and significant at 1%, indicating that more reputable VC firms are more likely to become directors in S&P
1500 companies. Model (2) examines an alternative measure of VC reputation. The coefficient of the VC investment share is positive and significant at 1%, which is consistent with the results in Model (1). In Model (3), we include both measures of reputation and the results are consistent with our Hypothesis 1. In all three models we include VC firm’s age, size, type, and location to examine whether these characteristics also influence the likelihood. The results indicate that larger, independent VC firms and those based in venture hubs are more likely to obtain directorships which are consistent with Hypothesis 1. However, the results indicate that younger VC firms are more likely to obtain directorships in S&P 1500 companies, which is inconsistent with our hypothesis. Our explanation is that younger VC firms are more motivated to build up their reputation through directorships in large public companies while older and established VC firms have less incentive to do so. This is similar to the “VC groundstanding” theory by Gompers (1996), which suggests that young VC firms take companies public earlier than older VC firms in order to establish a reputation.

Overall, our results show that more reputable and larger VC firms are more likely to obtain board seats in S&P 1500 companies. And independent VC firms, based in venture capital hubs are more likely to become directors than captive VC firms and those based in other states.

[INSERT TABLE 3 HERE]

4.2 Directorship and fundraising
In the previous section, we examine the initiation, i.e. what characteristics determine the likelihood of becoming directors in S&P 1500 companies. Now we move on to the potential benefits accrued to VC firms, given that they already have directorships in S&P 1500 companies. We conduct our analysis in two steps. Firstly, we compare VC firms with directorship with VC firms without to see if there is a significant difference between these two groups. However, the differences found in the first step can be due to a treatment effect, a selection effect, or both. Under the treatment effect, VC firms do benefit from their directorships in large public companies in terms of knowledge, experience, credibility, and visibility, which may lead to better fundraising and investment performance. Under the selection effect, S&P 1500 companies only recruit people from reputable, experienced VC firms with a good tracking record to sit on the board in order to add value to the corporation. In other words, VC firms with directorships are essentially good VC firms in the first place and the difference is not due to directorships. It is also possible that both effects exist since they are not mutually exclusive. That is to say, good VC firms are more likely to become directors in large public companies, and such directorships in return benefit them and make these VC firms even better. In order to test if there is a treatment effect, in the second step we focus only on VC firms with directorships and test if there is a significant difference between pre-directorship and post-directorship periods in terms of fundraising and investment performance. Overall, our first step tries to identify if there is a potential treatment effect and step two aims to confirm its existence.

Celikyurt, Sevilir and Shivdasani (2012)’s study suggested a few potential benefits of directorship in large public companies that may be accrued to VC firms such as enhanced network and reputation, greater visibility, and access to detailed
knowledge of R&D efforts. In this study, we focus on two primary functions of VC firms: fundraising and funding portfolio companies. In the following sections, we examine whether being on the board of S&P 1500 companies facilitate VC firms to raise more funds and improve their investment performance.

4.2.1 Univariate analysis

Table 5 provides a univariate analysis of directorship and VC firm’s fundraising. Panel A compares VC firms with directorships with VC firms without. The measures we use are fund size and target size. Fund size equals to the average size of all funds a VC firm raised during the sampling period, which is 1980 to 2013. Target amount is the average of all target amount set by a VC firm during the sampling period. Fund size measures the objective result of fundraising, while the target size captures VC firm’s subjective perception. Panel A tests whether there is a difference between VC firms with directorships and VC firms without. The results show that the fund size raised by VC firms with directorships is three times than that of VC firms without directorships. Similarly, target size of VC firms with directorships doubles the target amount as compared to VC firms without directorship. The t-tests for these three measures are all significant at 1%. The results indicate that not only VC firms with directorships are more confident (higher target) but also they are more able to achieve their target (larger fund size), compared to VC firms without directorships. However, the difference between VC firms with directorships and VC firms without directorships cannot suggest there is a treatment effect. This difference could be due to the fact that VC firms with directorships are essentially high-quality VC firms and are able to raise a higher amount of funds even without directorships. Panel B aims to test if there is a
treatment effect by comparing the pre-directorship fundraising and post-directorships fundraising. The results show that VC firms are able to raise more funds after after becoming board of director of S&P 1500 companies. Similarly, the post-directorship target size is also higher compared to pre-directorship. Panel C uses the difference in difference method to account for the potential industry effect. The results show that on average VC firms raise $205 million, more than industry average in post-directorship period but only raise $23 million above industry average in the pre-directorship period. And the difference is significant at 1%. The results are similar for target size. Our results suggest that VC firms set higher target and are able to raise larger fund in the post-directorship period even controlling for the industry.

Overall, our results indicate that VC firms with directorships perform better than VC firms without directorships in terms of fundraising and this is due to their involvement in large public companies. The reason might be that siting on the board of large public companies provides network, visibility, and creditability to VC professionals, which in turn improve their ability to raise further and larger funds.

[INSERT TABLE 5 HERE]

4.2.2 Multivariate analysis

In this section we test whether being on the board of S&P 1500 companies lead to better fundraising performance. We use Heckman two-stage model to estimate two equations. The first equation is the probability of raising a fund in a given year. The second is the amount raised given that the fund was raised in that particular year. Model 1 and 3 include all VC firms, i.e. VC firms with directorships and VC firms
without directorships. The main independent variable we are interested in is *Directorship*, a dummy which takes the value of one if the particular VC firm has directors on S&P 1500 and zero otherwise. We also control for other VC characteristics such as VC firm age, VC firm size, VC type, VC location, and year fixed effects. The results indicate that having directors sitting on the board of mature public companies lead to a higher amount of funds raised as well as a higher target. The multivariate analysis results are consistent with the findings in univariate analysis. In term of other VC characteristics, we find that older and larger VC firms are more likely to raise a larger amount and to set a higher target. The results indicate that there is a significant difference in terms of fundraising between VC firms with directorships and VC firms without. However, as discussed above, the difference may be attributed to a selection effect. We run additional tests to address this concern.

Model 2 and 4 focus only on VC firms with directorships to test whether being on the board of large public companies improve these VC firm’s fundraising performance. The main independent variable we are interested in is *Post-directorship*, a dummy variable which takes the value of one if a particular firm-year is during the post-directorship period and zero otherwise. As shown in the table, post-directorship is positively significantly related to both fund size and target size suggesting that VC firms do perform better in terms of fundraising after their partners becoming directors of S&P 1500 companies. Other VC characteristics are similar to model 1 and 3’s results, i.e. larger and older VC firms are more likely to raise a larger amount and to set a higher target.

Overall, the multivariate results show that directorships in S&P 1500 companies lead to a better performance in terms of fundraising. VC firms are able to raise a larger amount and set higher target after having partners sitting on the board of S&P
1500 companies. The network and visibility provided by the directorships do add value to VC firm’s following-up fundraising.

4.3. Directorship and investment performance

As discussed, we aim to examine whether being on the board of mature public companies benefit VC firms in terms of two main functions of VC firms: raising funds and making investments. In this section we test whether directorships lead to better investment performance as measured by likelihood of successful (IPO and M&A) exits (Nahata, 2008; Cumming and Dai, 2010; Zarutskie, 2010; Dai et al., 2012)

4.3.1 Univariate analysis

Table 7 presents the univariate analysis of directorship and VC investment performance. Panel A compares the investment performance of VC firms with directorships with VC firms without directorships. As shown in the table, 11% of the investments made by VC firms with directorships went public while only 7% made by VC firms without directorships went public. In terms of M&A, 27.7% of the investments made by VC firms with directorships were exited through M&A while only 19.7% made by VC firms without directorships. Therefore, the percentage of all successful exits of VC firms with directorships is nearly 12% more than that of VC firms without directorships. However this result alone does not suggest that
directorships improve VC firm’s investment performance. The difference could also due to the fact that VC firms with directorships are able to take portfolio companies to successful exits even without directorships. Therefore in Panel B we compare the pre-directorship period with the post-directorship period by only focusing on VC firms with directorships. The results indicate that 40% of investments made during the post-directorship period were exited successfully compared to 37% of investments made during the pre-directorship periods. The difference is significant at 5%.

Overall, our results suggest that investments made by VC firms with directorships have higher success rate compared to VC firms without directorships. And the better investment performance is due to (at least partially) the directorship in S&P 1500 companies. The reason might be that detailed knowledge of product and market at large public companies may be valuable in assessing and coaching the portfolio companies, in which the VC firms invest and therefore improve their investment performance.

[INSERT TABLE 7 HERE]

4.3.2 Multivariate analysis

In this section, we test whether being on the board of S&P 1500 companies lead to better investment performance. Our analysis is at company level, i.e. there is only one observation for each portfolio company. We use two measures to estimate investment performance: likelihood of successful exits and time to exits. The dependent variables in Model 1-3 is a dummy variable which takes the value of one if the portfolio company ultimately went public or was acquired by the end of 2012.
And the dependent variable is model 4-6 is the time to exits, calculated by taking the difference between the year in which the portfolio company received its initial funding and the observation year or the end of 2012. Model 1 and 4 include all VC firms while model 2, 3, 5 and 6 only include VC firms with directorships. The main independent variables we are interested in are Directorship, Post-directorship, and Directorship length. Directorship is a dummy variable which takes the value of one if a particular portfolio company is backed by at least one VC firms with directorships in S&P 1500 companies and zero otherwise. Post-directorship is a dummy variable which takes the value of one if the year in which the portfolio company received its initial funding is during the post-directorship period and zero otherwise. Directorship length is the number of years of directorships in S&P 1500 companies at the time of investment. In the case of multiple investors, we take the average of their directorship length. Since the issue of VC exits has been studied extensively by previous studies, we include most of the control variables used in previous studies such as characteristics of VC firms and investee companies (Cumming and Johan 2007 and Elisabete, Cesaltina and Mohamed 2008), venture stages (Cumming, Fleming and Schwienbacher 2006; and Cumming and MacIntosh 2003), and VC syndication (Meggison and Weiss, 1991; Lerner, 1994; Giot and Schwienbacher, 2007). We also include year fixed effects and industry fixed effects.

As shown in the Table 8, Directorship in model 1 and 4 is positively related to the likelihood of successful exits and time to exits and is significant at 1% level. The results indicate that being on the board of large public companies lead to improved investment performance. The control variables are mostly consistent with previous studies. For instance, early and seed stage ventures are less likely to be exited; a large syndicate size lead to better performance; and a larger investment size contribute...
positively to the likelihood of a successful exit. However, this difference may be attributed to a selection effect, i.e. VC firms with directorships are high-quality and are able to bring portfolio companies to successful exits even without directorships. Therefore, we conduct additional analysis to test if there is a treatment effect. In model 2, 3, 5 and 6, we focus only on VC firms with directorships. As shown in the table, both Post-directorship and Directorship length are positively related to the likelihood of successful exits and time to exits and are significant at 5% level. The results indicate that VC firms do benefit from their directorships in large public companies, their investment performance is improved as a result (at least partially) of their directorships.

Overall, our results show that not only VC firms with directorships tend to performance better than VC firms without directorships in terms of successful exits but also the directorships in large public companies improve VC firms’ ability to take portfolio companies to successful exits.

[INSERT TABLE 8 HERE]

5. CONCLUSION

In this paper, we aim to examine whether being on the board of mature public companies benefit VC firms. We investigate potential benefits mainly from the prospect of: fundraising and investment performance. Firstly, we posit that being on the board of mature public companies provide enhanced network, visibility, and credibility to VC firms and therefore increase their ability to raise more funds. The second issue we examine is investment performance. We postulate that being on the board of mature public companies provide VC professionals access to better
knowledge and experience of the product, market, and industry, which could be transferred to their other portfolio companies and therefore improve performance.

We follow the method used by Celikyurt, et al. (2012) to construct our initial sample and extend Celikyurt, et al (2012)’s sample to 2011. Our final sample of VC directors consists of 1,359 unique VC directors working in 700 different VC firms.

Our empirical results show that VCs from reputable VC firms are more likely to become directors in S&P 1500 companies. And being on the board of mature public companies do benefit VC firms in terms of fundraising and investment performance controlling for a matched sample of VC firms without directorship. We find that VC firms not only raise more funds but also set higher target after becoming board of director suggesting that directorships provide visibility, network, and credibility to VC firms. We also find that being on the board increase the likelihood of successful exits of VC firms’ other portfolio companies indicating that directorships provide VC firms access to knowledge and more learning opportunities.
REFERENCE


Mayer, C., Schoors, K., Yafeh, Y., 2004. Sources of funds and investment activities of venture capital funds: Evidence from Germany, Israel, Japan and the UK. Journal of Corporate Finance


Table 1: Definition of variables

<table>
<thead>
<tr>
<th>Variable name</th>
<th>Definition of variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Directorship (Indicator)</td>
<td>A dummy variable which takes the value of one if the VC firm has partners sitting on the board of S&amp;P 1500 companies and zero if the VC firm has never obtained any directorships during the sampling period.</td>
</tr>
<tr>
<td>Post-directorship (Indicator)</td>
<td>Only for VC firms that have obtained directorships during its lifetime. A dummy variable which takes the value of one if the VC firm has existing directorships in S&amp;P 1500 companies and zero if the VC firm has not yet obtained directorships.</td>
</tr>
<tr>
<td>Directorship length (years)</td>
<td>Only for VC firms that have directorships during its lifetime. The number of years between the year in which VC firm obtained its directorships and the observation year.</td>
</tr>
<tr>
<td>IPO market share</td>
<td>It is measured as the dollar market value of all companies taken public by the VC firm from the beginning of calendar year 1980 up until a given calendar year and normalized by the aggregate market value of all VC-backed companies that went public during those years.</td>
</tr>
<tr>
<td>VC investment share</td>
<td>It is the dollar investment made by a VC firm from the beginning of year 1980 up until a given calendar year and normalized by the overall aggregate investment in the VC industry in those years.</td>
</tr>
<tr>
<td>VC firm age (years)</td>
<td>This is measured by the period between VC firm's year of incorporation and the observation year.</td>
</tr>
<tr>
<td>VC firm size ($ millions)</td>
<td>It is the VC’s capital under management in a particular year, calculated by taking the sum of all previous funds raised by the VC firm.</td>
</tr>
<tr>
<td>Independent VC (I)</td>
<td>A dummy variable which takes the value of one of the VC firm is not affiliated to any other entities and zero otherwise.</td>
</tr>
<tr>
<td>VC based in venture hubs (I)</td>
<td>A dummy variable which takes the value of one if the VC firm is based in either California or New York state.</td>
</tr>
<tr>
<td>Seed/Start-up venture</td>
<td>A dummy variable which takes the value of 1 if the venture is in seed/start-up stage when it receives its initial founding, and 0 otherwise.</td>
</tr>
<tr>
<td>Early stage venture</td>
<td>A dummy variable which takes the value of 1 if the venture is in early stage when it receives its initial founding, and 0 otherwise.</td>
</tr>
<tr>
<td>Expansion stage venture</td>
<td>A dummy variable which takes the value of 1 if the venture is in expansion-stage when it receives its initial founding, and 0 otherwise.</td>
</tr>
<tr>
<td>Syndicate size</td>
<td>The total number of VC firms invested in the portfolio company.</td>
</tr>
<tr>
<td>Total funding received</td>
<td>The total amount of funding received by a portfolio company across all rounds.</td>
</tr>
<tr>
<td>GDP growth in the previous year</td>
<td>The GDP growth of the United States in the previous year.</td>
</tr>
</tbody>
</table>
Table 2: Summary statistics

This table presents the descriptive statistics of VC firms’ directorships in S&P 1500 companies. Panel A describes VC firms and VC director’s association with S&P 1500 companies. Panel B describes VC directors’ experience in VC firms and S&P 1500 companies. Panel C describes VC director’s roles within the VC firms or S&P 1500 companies. †VC directors who started as directors and then joint/started the VC firms constitute less than 15% of our sample and therefore our main focus is the VC directors who started as VC then became a director in S&P 1500 companies

<table>
<thead>
<tr>
<th>Panel A: VC firms and S&amp;P 1500</th>
<th>Mean</th>
<th>Median</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of S&amp;P 1500 companies per VC firm is associated with</td>
<td>2.539</td>
<td>1.000</td>
<td>25.000</td>
</tr>
<tr>
<td>No. of S&amp;P1500 companies per director is associated with</td>
<td>0.893</td>
<td>1.000</td>
<td>6.000</td>
</tr>
<tr>
<td>No. of directors per VC firm has that sit on the board of S&amp;P 1500</td>
<td>1.941</td>
<td>1.000</td>
<td>18.000</td>
</tr>
<tr>
<td>No. of directors per S&amp;P 1500 company has on board</td>
<td>1.329</td>
<td>1.000</td>
<td>5.000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel B: VC directors’ experience</th>
<th>Mean</th>
<th>Median</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year in which the VC became a director in S&amp;P 1500</td>
<td>1999</td>
<td>1999</td>
<td>2011</td>
</tr>
<tr>
<td>Year in which the VC joined/started the VC firm</td>
<td>1997</td>
<td>1998</td>
<td>2012</td>
</tr>
<tr>
<td>No. of years of experience in S&amp;P 1500 before joining the VC firm†</td>
<td>5.988</td>
<td>4.500</td>
<td>30.000</td>
</tr>
<tr>
<td>No. of years of experience in VC firm before joining the S&amp;P 1500</td>
<td>7.396</td>
<td>5.000</td>
<td>36.000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel C: VC directors’ role</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>VC directors' role in the VC firm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Founder, Co-Founder</td>
<td>491</td>
<td>37.20%</td>
</tr>
<tr>
<td>Other job titles</td>
<td>829</td>
<td>62.80%</td>
</tr>
<tr>
<td>VC directors' role in S&amp;P 1500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chairman, Vice Chairman</td>
<td>94</td>
<td>7.12%</td>
</tr>
<tr>
<td>Chief officers (CEO,CFO,COO)</td>
<td>110</td>
<td>8.33%</td>
</tr>
<tr>
<td>President, Vice President</td>
<td>127</td>
<td>9.62%</td>
</tr>
<tr>
<td>Other job titles</td>
<td>1083</td>
<td>82.05%</td>
</tr>
<tr>
<td>Directorship classification</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employee</td>
<td>74</td>
<td>5.66%</td>
</tr>
<tr>
<td>Linked</td>
<td>215</td>
<td>16.45%</td>
</tr>
<tr>
<td>Independent</td>
<td>1017</td>
<td>77.81%</td>
</tr>
</tbody>
</table>
Table 3: Directorships and VC firm's characteristics

This table presents an analysis of VC firms' characteristics based on two groups: VC firms with directorships and VC firms without directorships. Column 1 is on VC firms with directorships, column 2 is on VC firms without directorships, column 3 is the difference between column 1 and 2, column 4 is t-statistics, and column 5 is the p-value. **IPO market share** is the dollar market value of all companies taken public by the VC firm from the beginning of calendar year 1980 up until a given calendar year and normalized by the aggregate market value of all VC-backed companies that went public from the beginning of 1980 up until the same calendar year. **VC investment share** is the dollar investment from the beginning of year 1980 up until a given calendar year and normalized by the overall aggregate investment in the VC industry in those years. **VC firm age** is measured by the period between VC firm's year of incorporation and the observation year. **VC firm size** is the VC's capital under management in a particular year, calculated by taking the sum of all previous funds raised by the VC firm. **Independent VC firm** is a dummy variable which takes the value of one of the VC firm is not affiliated to any other entities and zero otherwise. **VC based in venture hubs** is a dummy variable which takes the value of one if the VC firm is based in either California or New York state. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

<table>
<thead>
<tr>
<th>VC reputation</th>
<th>VC firms with directorships (1)</th>
<th>VC firms without directorships (2)</th>
<th>Difference (3)=(2)-(1)</th>
<th>t-statistics</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPO market share</td>
<td>0.062%</td>
<td>0.010%</td>
<td>-0.052%</td>
<td>-41.127</td>
<td>0.000***</td>
</tr>
<tr>
<td>VC investment share</td>
<td>0.328%</td>
<td>0.052%</td>
<td>-0.275%</td>
<td>-92.435</td>
<td>0.000***</td>
</tr>
<tr>
<td>VC characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VC firm age (no. of years)</td>
<td>12.511</td>
<td>15.694</td>
<td>3.182</td>
<td>6.724</td>
<td>0.000***</td>
</tr>
<tr>
<td>VC firm size ($ millions)</td>
<td>1566.662</td>
<td>233.051</td>
<td>-1333.611</td>
<td>-53.600</td>
<td>0.000***</td>
</tr>
<tr>
<td>Firm type</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Independent VC firm (Indicator)</td>
<td>99.129%</td>
<td>52.582%</td>
<td>-46.548%</td>
<td>-120.000</td>
<td>0.000***</td>
</tr>
<tr>
<td>Other types of VC firm (Indicator)</td>
<td>0.871%</td>
<td>47.418%</td>
<td>146.548%</td>
<td>120.000</td>
<td>0.000***</td>
</tr>
<tr>
<td>Firm location</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VC firms based in venture hubs (Indicator)</td>
<td>48.046%</td>
<td>36.224%</td>
<td>-11.821%</td>
<td>-29.785</td>
<td>0.000***</td>
</tr>
<tr>
<td>VC firms based in other states (Indicator)</td>
<td>51.954%</td>
<td>63.776%</td>
<td>111.821%</td>
<td>29.785</td>
<td>0.000***</td>
</tr>
</tbody>
</table>
Table 4: Likelihood of becoming directors

This table presents the regression analysis of likelihood of VC firms obtaining directorships in S&P 1500 companies. All models are estimated using logistic regression. The dependent variable in all models is a dummy variable which takes the value of one if the VC firm obtained directorship in that particular year and zero otherwise. Model (1) and (2) examines each reputation measure separately and Model (3) aggregates two measures in one model. *IPO market share* is the dollar market value of all companies taken public by the VC firm from the beginning of calendar year 1980 up until a given calendar year and normalized by the aggregate market value of all VC-backed companies that went public from the beginning of 1980 up until the same calendar year. *VC investment share* is the dollar investment from the beginning of year 1980 up until a given calendar year and normalized by the overall aggregate investment in the VC industry in those years. *VC firm age* is measured by the period between VC firm's year of incorporation and the observation year. *VC firm size* is the VC's capital under management in a particular year, calculated by taking the sum of all previous funds raised by the VC firm. *Independent VC firm* is a dummy variable which takes the value of one if the VC firm is not affiliated to any other entities and zero otherwise. *VC based in venture hubs* is a dummy variable which takes the value of one if the VC firm is based in either California or New York state. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

<table>
<thead>
<tr>
<th>Likelihood of becoming directors</th>
<th>Model (1)</th>
<th>Model (2)</th>
<th>Model (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VC reputation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IPO market share</td>
<td>47.310***</td>
<td>(0.000)</td>
<td>-</td>
</tr>
<tr>
<td>VC investment share</td>
<td>-</td>
<td>-</td>
<td>30.000***</td>
</tr>
<tr>
<td><strong>VC characteristics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VC firm age (years)</td>
<td>-0.073***</td>
<td>(0.000)</td>
<td>-0.077***</td>
</tr>
<tr>
<td>VC firm size ($ millions)</td>
<td>0.001***</td>
<td>(0.000)</td>
<td>0.001***</td>
</tr>
<tr>
<td>Independent VC firm (Indicator)</td>
<td>5.398***</td>
<td>(0.000)</td>
<td>5.399***</td>
</tr>
<tr>
<td>VC based in venture hubs (Indicator)</td>
<td>0.431***</td>
<td>(0.000)</td>
<td>0.398***</td>
</tr>
<tr>
<td><strong>Year fixed effects</strong></td>
<td>Present</td>
<td>Present</td>
<td>Present</td>
</tr>
<tr>
<td>Log likelihood</td>
<td>-2369.6</td>
<td>-2401.1</td>
<td>-2357.8</td>
</tr>
<tr>
<td>Pseudo R squared</td>
<td>0.128</td>
<td>0.131</td>
<td>0.133</td>
</tr>
<tr>
<td>Number of observations</td>
<td>63949</td>
<td>63949</td>
<td>63949</td>
</tr>
</tbody>
</table>
### Table 5: Directorship and VC fundraising - Univariate analysis

This table presents a univariate analysis of directorship and VC fundraising. Panel A compares VC firms with directorships with those VC firms without directorships. Panel B focus only on VC firms with directorships and compares pre-directorship fundraising with post-directorship fundraising. Panel C addresses the industry effect concern by using the difference in difference method. Fund size is the average size of all funds a VC firm raised during the sampling period, which is 1980 to 2013. Target size is the average of all target amount set by a VC firm during the sampling period. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

**Panel A: VC firms with directorship vs. VC firms without directorships**

<table>
<thead>
<tr>
<th></th>
<th>All VC firms</th>
<th>VC firms with Directorships</th>
<th>VC firms without directorships</th>
<th>Comparison between with-and without-directorship VCFs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
<td>N</td>
<td>Mean</td>
</tr>
<tr>
<td>Fund size</td>
<td>4693</td>
<td>105.956</td>
<td>527</td>
<td>256.042</td>
</tr>
<tr>
<td></td>
<td>2691</td>
<td>150.216</td>
<td>446</td>
<td>258.649</td>
</tr>
</tbody>
</table>

**Panel B: Pre-directorship vs. Post-directorship**

<table>
<thead>
<tr>
<th></th>
<th>VC firms with directorships</th>
<th>Post-directorship</th>
<th>Pre-directorship</th>
<th>Comparison between Pre-and Post-directorship VCFs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>t-statistics</td>
</tr>
<tr>
<td>Fund size</td>
<td>527</td>
<td>527</td>
<td>527</td>
<td>-6.757</td>
</tr>
<tr>
<td></td>
<td>446</td>
<td>446</td>
<td>446</td>
<td>-5.921</td>
</tr>
</tbody>
</table>

**Panel C: Pre-directorship vs. Post-directorship (difference in difference)**

<table>
<thead>
<tr>
<th></th>
<th>VC firms with directorships</th>
<th>Post-directorship</th>
<th>Pre-directorship</th>
<th>Comparison between Pre-and Post-directorship VCFs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>t-statistics</td>
</tr>
<tr>
<td>Fund size</td>
<td>527</td>
<td>527</td>
<td>527</td>
<td>-4.018</td>
</tr>
<tr>
<td></td>
<td>446</td>
<td>446</td>
<td>446</td>
<td>-2.417</td>
</tr>
<tr>
<td>Target size</td>
<td>446</td>
<td>446</td>
<td>446</td>
<td>-2.417</td>
</tr>
</tbody>
</table>
This table presents regression analysis of directorship and VC fundraising. All models are estimated using Heckman two-stage model, where the first stage is the probability that a fund was raised in a given year and the second stage is the amount raised/target set given that fund was raised in a particular year. All VC firms are included in each model. The dependent variable is either the natural logarithm of the size of raised fund (Fund size) or the natural logarithm of the target size set by the VC firm (Target size). Model 1 and 3 include all VC firms while model 2 and 4 only include VC firms with directorships. Directorship is a dummy variable which takes the value of one if the VC firm has at least one partner sitting on the board of S&P 1500 companies and zero otherwise. Post-directorship is a dummy variable which takes the value of one if the observation year is during the post-directorship periods. VC firm age is measured by the period between VC firm's year of incorporation and the observation year. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

<table>
<thead>
<tr>
<th></th>
<th>Fund size (Ln)</th>
<th>Target size (Ln)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td><strong>Second stage: size of funds raised / target size</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VC firm's directorship</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Directorship (Indicator)</td>
<td>0.338***</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Post-directorship (Indicator)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>VC characteristics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VC firm age (years)</td>
<td>0.142***</td>
<td>(0.000)</td>
</tr>
<tr>
<td>VC firm size ($ millions)</td>
<td>0.001**</td>
<td>(0.012)</td>
</tr>
<tr>
<td>Independent VC (Indicator)</td>
<td>0.089**</td>
<td>(0.004)</td>
</tr>
<tr>
<td>VC based in venture hubs (Indicator)</td>
<td>-0.075</td>
<td>(0.110)</td>
</tr>
<tr>
<td><strong>First stage: likelihood of raising funds</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VC firm age (years)</td>
<td>-0.041***</td>
<td>(0.000)</td>
</tr>
<tr>
<td>VC firm size ($ millions)</td>
<td>0.001***</td>
<td>(0.000)</td>
</tr>
<tr>
<td>VC based in venture hubs (Indicator)</td>
<td>0.097***</td>
<td>(0.000)</td>
</tr>
<tr>
<td>GDP growth in the previous year</td>
<td>0.015***</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Year fixed effects</td>
<td>Present</td>
<td>Present</td>
</tr>
<tr>
<td>p-value of Chi-squared test</td>
<td>(0.000)</td>
<td>(0.000)</td>
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<tr>
<td>Number of observations</td>
<td>70343</td>
<td>10121</td>
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</table>
Table 7: Directorship and VC investment performance—Univariate analysis

This table presents a univariate analysis of directorship and VC investment performance. Panel A compares VC firms with directorships with those VC firms without directorships. Panel B focuses only on VC firms with directorships and compares pre-directorship investment performance with post-directorship investment performance. All investments were made during 1980-2009 and we track the outcome of each investment until the end of 2012, allowing at least three years for each investment to be exited. Successful exits (%) is the percentage of all investments that were exited through either IPO or M&A, we consider both IPO and M&A as successful exits. Time to successful exits is calculated by taking the difference between the year a portfolio company received its first funding and the exit year or the end of 2012. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

### Panel A: VC firms with directorship vs. VC firms without directorships

<table>
<thead>
<tr>
<th></th>
<th>All VC firms</th>
<th>VC firms with Directorships</th>
<th>VC firms without directorships</th>
<th>Comparison between with-and without-directorship</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
<td>N</td>
<td>Mean</td>
</tr>
<tr>
<td>All successful exits</td>
<td>23434</td>
<td>0.321</td>
<td>9939</td>
<td>0.390</td>
</tr>
<tr>
<td>IPO exits</td>
<td>23434</td>
<td>0.090</td>
<td>9939</td>
<td>0.113</td>
</tr>
<tr>
<td>M&amp;A exits</td>
<td>23434</td>
<td>0.231</td>
<td>9939</td>
<td>0.277</td>
</tr>
</tbody>
</table>

### Panel B: Pre-directorship vs. Post-directorship

<table>
<thead>
<tr>
<th></th>
<th>All VC firms with directorships</th>
<th>Post-directorship</th>
<th>Pre-directorship</th>
<th>Comparison between Pre-and Post-directorship</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
<td>N</td>
<td>Mean</td>
</tr>
<tr>
<td>All successful exits</td>
<td>9939</td>
<td>0.390</td>
<td>7336</td>
<td>0.396</td>
</tr>
<tr>
<td>IPO exits</td>
<td>9939</td>
<td>0.113</td>
<td>7336</td>
<td>0.092</td>
</tr>
<tr>
<td>M&amp;A exits</td>
<td>9939</td>
<td>0.277</td>
<td>7336</td>
<td>0.304</td>
</tr>
</tbody>
</table>
Table 8: Directorship and investment performance

This table presents the regression analysis of directorship and investment performance as measured by the likelihood of successful exits or time to exits. All VC firms are included in model 1 and 4. Model 2, 3, 5, 6 only include VC firms with directorships. This is a company-level analysis, i.e. there is one observation for each portfolio company. Model 1, 2 and 3 are estimated using logit regression while Model 3, 4 and 5 are estimated using Cox hazard model. The dependent variable in Model 1-3 is a dummy variable which takes the value of one if the company is exited through either IPO or M&A by the end of 2012 and zero otherwise. The dependent variable in Model 3-6 is the time to exits, calculated by taking the difference between the year in which the portfolio company received its initial funding and the observation year or the end of 2012. Companies that are not yet exited are treated as right-censored. Directorship is a dummy variable which takes the value of one if the portfolio company received funding from at least one VC firms with directorships and zero otherwise. Post-directorship is a dummy variable which takes the value of one if the year in which a portfolio company received its initial funding is during the post-directorship period and zero otherwise. Directorship length is the number of years between the year in which a VC firm obtained directorships and the observation year. The definitions of control variables are provided in Table 1. Year and industry dummies are included to control for year and industry fixed effects. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

<table>
<thead>
<tr>
<th>VC firm's directorship</th>
<th>Likelihood of successful exits</th>
<th>Time to exits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Directorship</td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Directorship</td>
<td>0.158*** (0.000)</td>
<td></td>
</tr>
<tr>
<td>Post-directorship</td>
<td>0.132** (0.034)</td>
<td>0.088* (0.057)</td>
</tr>
<tr>
<td>Directorship length</td>
<td>0.011** (0.019)</td>
<td></td>
</tr>
<tr>
<td>VC firm characteristics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VC firm age (logged)</td>
<td>0.012 (0.530)</td>
<td></td>
</tr>
<tr>
<td>VC firm reputation</td>
<td>4.669 (0.154)</td>
<td></td>
</tr>
<tr>
<td>VC based in venture hubs</td>
<td>0.136*** (0.000)</td>
<td></td>
</tr>
<tr>
<td>Venture stage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seed/Start-up venture</td>
<td>-0.385*** (0.000)</td>
<td></td>
</tr>
<tr>
<td>Early stage venture</td>
<td>-0.247*** (0.000)</td>
<td></td>
</tr>
<tr>
<td>Expansion stage venture</td>
<td>-0.239** (0.001)</td>
<td></td>
</tr>
<tr>
<td>Other control variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VC Syndicate size</td>
<td>0.068*** (0.000)</td>
<td></td>
</tr>
<tr>
<td>Corporate investor</td>
<td>0.065 (0.211)</td>
<td></td>
</tr>
<tr>
<td>Investment bank investor</td>
<td>-0.177*** (0.001)</td>
<td></td>
</tr>
<tr>
<td>Total funding received</td>
<td>0.001*** (0.000)</td>
<td></td>
</tr>
<tr>
<td>Industry and year fixed effects</td>
<td>Present</td>
<td>Present</td>
</tr>
<tr>
<td>Log-likelihood</td>
<td>-11985.969</td>
<td>-5882.719</td>
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<tr>
<td>Pseudo R squared</td>
<td>0.085</td>
<td>0.074</td>
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<tr>
<td>Number of observations</td>
<td>20458</td>
<td>9450</td>
</tr>
</tbody>
</table>
Table 9: Correlation matrix

This table shows the pairwise correlations matrix of the independent variables that used in the logit and cox models in table 4, table 6, and table 8.

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
<th>(9)</th>
<th>(10)</th>
<th>(11)</th>
<th>(12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) VC firm age (years)</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) VC firm size ($ millions)</td>
<td>0.120</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(3) Independent VC (I)</td>
<td>0.007</td>
<td>-0.043</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(4) VC based in venture hubs (I)</td>
<td>0.145</td>
<td>0.104</td>
<td>-0.044</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5) Seed/Start-up venture</td>
<td>-0.028</td>
<td>-0.031</td>
<td>0.016</td>
<td>0.023</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(6) Early stage venture</td>
<td>-0.008</td>
<td>-0.023</td>
<td>0.000</td>
<td>0.064</td>
<td>-0.552</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(7) Expansion stage venture</td>
<td>0.032</td>
<td>0.031</td>
<td>-0.017</td>
<td>-0.065</td>
<td>-0.351</td>
<td>-0.463</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(8) Syndicate size</td>
<td>0.004</td>
<td>0.035</td>
<td>-0.409</td>
<td>0.245</td>
<td>0.013</td>
<td>0.035</td>
<td>-0.043</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(9) Total funding received</td>
<td>0.131</td>
<td>0.140</td>
<td>-0.156</td>
<td>0.189</td>
<td>-0.275</td>
<td>0.123</td>
<td>0.115</td>
<td>0.351</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(10) IPO market conditions</td>
<td>0.010</td>
<td>0.049</td>
<td>0.001</td>
<td>0.031</td>
<td>0.026</td>
<td>-0.027</td>
<td>0.002</td>
<td>0.045</td>
<td>0.021</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(11) Directorship (I)</td>
<td>0.289</td>
<td>0.070</td>
<td>0.103</td>
<td>0.232</td>
<td>-0.010</td>
<td>0.083</td>
<td>-0.077</td>
<td>0.188</td>
<td>0.271</td>
<td>0.040</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>(12) Directorship length (years)</td>
<td>0.357</td>
<td>0.035</td>
<td>0.093</td>
<td>0.236</td>
<td>-0.012</td>
<td>0.081</td>
<td>-0.069</td>
<td>0.161</td>
<td>0.238</td>
<td>-0.008</td>
<td>0.744</td>
<td>1.000</td>
</tr>
</tbody>
</table>
Appendix

Table 1: VC firm's directorship by year

This table presents US VC firm's directorship in S&P 1500 companies from 1985 to 2012. Number of VC firms with directorships, Number of VC firms without directorships, percentage of VC firms with directorships, percentage of VC firms without directorships, and total number of VC firms are presented. Chart 1 is based on this table and is presented below. The line represents the percentage of VC firms with directorships, and the bars represent the number of VC firms with directorships.

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of VC firms with directorships</th>
<th>No. of VC firms without directorships</th>
<th>% of VC firms with directorships</th>
<th>% of VC firms without directorships</th>
<th>Total no. of VC firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>0</td>
<td>2489</td>
<td>0.000</td>
<td>100.000</td>
<td>2489</td>
</tr>
<tr>
<td>1986</td>
<td>5</td>
<td>2656</td>
<td>0.188</td>
<td>99.812</td>
<td>2661</td>
</tr>
<tr>
<td>1987</td>
<td>12</td>
<td>2795</td>
<td>0.428</td>
<td>99.572</td>
<td>2807</td>
</tr>
<tr>
<td>1988</td>
<td>33</td>
<td>2896</td>
<td>1.127</td>
<td>98.873</td>
<td>2929</td>
</tr>
<tr>
<td>1989</td>
<td>51</td>
<td>3061</td>
<td>1.639</td>
<td>98.361</td>
<td>3112</td>
</tr>
<tr>
<td>1990</td>
<td>67</td>
<td>3140</td>
<td>2.089</td>
<td>97.911</td>
<td>3207</td>
</tr>
<tr>
<td>1991</td>
<td>81</td>
<td>3240</td>
<td>2.439</td>
<td>97.561</td>
<td>3321</td>
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<tr>
<td>1992</td>
<td>86</td>
<td>3386</td>
<td>2.477</td>
<td>97.523</td>
<td>3472</td>
</tr>
<tr>
<td>1993</td>
<td>105</td>
<td>3506</td>
<td>2.908</td>
<td>97.092</td>
<td>3611</td>
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<tr>
<td>1994</td>
<td>131</td>
<td>3649</td>
<td>3.466</td>
<td>96.534</td>
<td>3780</td>
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<tr>
<td>1995</td>
<td>170</td>
<td>3880</td>
<td>4.198</td>
<td>95.802</td>
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<tr>
<td>1996</td>
<td>212</td>
<td>4118</td>
<td>4.896</td>
<td>95.104</td>
<td>4330</td>
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<td>1997</td>
<td>261</td>
<td>4387</td>
<td>5.615</td>
<td>94.385</td>
<td>4648</td>
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<td>1998</td>
<td>323</td>
<td>4667</td>
<td>6.473</td>
<td>93.527</td>
<td>4990</td>
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<td>1999</td>
<td>386</td>
<td>5230</td>
<td>6.873</td>
<td>93.127</td>
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<td>2000</td>
<td>434</td>
<td>5808</td>
<td>6.953</td>
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<td>2001</td>
<td>494</td>
<td>6059</td>
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<td>2002</td>
<td>547</td>
<td>6384</td>
<td>7.892</td>
<td>92.108</td>
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<td>2003</td>
<td>589</td>
<td>6540</td>
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<td>91.738</td>
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<td>2004</td>
<td>624</td>
<td>6708</td>
<td>8.511</td>
<td>91.489</td>
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<td>2005</td>
<td>676</td>
<td>6913</td>
<td>8.908</td>
<td>91.092</td>
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<td>2006</td>
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<td>7124</td>
<td>9.051</td>
<td>90.949</td>
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<td>2007</td>
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<td>7316</td>
<td>9.366</td>
<td>90.634</td>
<td>8072</td>
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<tr>
<td>2008</td>
<td>799</td>
<td>7492</td>
<td>9.637</td>
<td>90.363</td>
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<tr>
<td>2009</td>
<td>826</td>
<td>7674</td>
<td>9.718</td>
<td>90.282</td>
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<tr>
<td>2010</td>
<td>855</td>
<td>7812</td>
<td>9.865</td>
<td>90.135</td>
<td>8667</td>
</tr>
<tr>
<td>2011</td>
<td>875</td>
<td>7940</td>
<td>9.926</td>
<td>90.074</td>
<td>8815</td>
</tr>
<tr>
<td>2012</td>
<td>883</td>
<td>8056</td>
<td>9.878</td>
<td>90.122</td>
<td>8939</td>
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</table>
Table 2: VC firms and their directorships in S&P 1500 firms -Top 20

This table presents the top 20 VC firms, who has the largest number of directors on S&P 1500 firms. Number of directors on the boards of S&P 1500 firms, number of S&P 1500 firms associated with are presented.

<table>
<thead>
<tr>
<th>VC firm name</th>
<th>No. of directors on S&amp;P 1500 firms</th>
<th>No. of S&amp;P firms associated with</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warburg Pincus LLC</td>
<td>18</td>
<td>25</td>
</tr>
<tr>
<td>General Atlantic LLC</td>
<td>13</td>
<td>24</td>
</tr>
<tr>
<td>Bain Capital Inc</td>
<td>13</td>
<td>18</td>
</tr>
<tr>
<td>The Carlyle Group L.P.</td>
<td>11</td>
<td>18</td>
</tr>
<tr>
<td>Madison Dearborn Partners LLC</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>Silver Lake Partners LP</td>
<td>9</td>
<td>15</td>
</tr>
<tr>
<td>TPG Capital LP</td>
<td>15</td>
<td>14</td>
</tr>
<tr>
<td>Sequoia Capital</td>
<td>8</td>
<td>14</td>
</tr>
<tr>
<td>Thomas H Lee Partners LP</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>Oak Hill Capital Management</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>Kohlberg Kravis Roberts &amp; Co LP</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>Benchmark Capital Management</td>
<td>8</td>
<td>11</td>
</tr>
<tr>
<td>Clayton Dubilier &amp; Rice LLC</td>
<td>8</td>
<td>11</td>
</tr>
<tr>
<td>GSC Partners</td>
<td>8</td>
<td>11</td>
</tr>
<tr>
<td>AEA Investors LLC</td>
<td>9</td>
<td>10</td>
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<tr>
<td>Irving Place Capital LLC</td>
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<td>Kleiner Perkins Caufield &amp; Byers LLC</td>
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<td>Blum Capital Partners LP</td>
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