Non-Executive Directors at Early-Stage Startups

Abstract

We document substantial variation across startups in whether and when they appoint non-executive directors, and the type of directors they appoint. The startup-director match depends on professional connections and individual experience profiles. Early-stage investors are more likely to serve as non-executive directors when there is a local scarcity of directors. Non-executive directors leverage their professional connections to attract new investors, directors, top executives, and potential acquirers for startups. Overall, presence of an early-stage non-executive director is associated with better funding outcomes and higher probability of exit through IPO, although presence of an investor-director makes exit via acquisition more likely.

Introduction

Board of directors are considered critical to the proper oversight of companies, because of their role in monitoring and advising top managers.[1] Apart from executive directors, boards also include non-executive directors, such as representatives of major shareholders and banks, as well as independent directors who do not have a direct material relationship with the company. The extant literature on corporate boards has mostly focused on public corporations, which have established boards in place and are subject to regulatory mandates to have adequate representation of non-executive directors who can be classified as independent. However, we have a limited understanding of the boards of directors of companies at an early stage of development when they are still private, and may have just started professionalizing their boards. In this paper we focus on the role of non-executive directors at such companies, namely, startup firms at the series A stage ("early-stage" startups). Unlike public corporations, startups do not have to hire non-executive directors to satisfy regulatory mandates, and will do so only in response to specific governance needs. We seek to understand why and when early-stage startups appoint non-executive directors, the skill sets they seek in them, and the specific channels through which they may benefit from the non-executive directors.

Startups at the series A stage focus on establishing a viable business model to scale up their operations and drive future growth, and this may also involve professionalizing the company's board of directors. A key advantage of focusing on early-stage startups is that we observe the timeline of key organizational changes: appointment of directors and executives, financing rounds and the investors that participate in them, and transition to new life-cycle stages. This allows us to understand not only the endogenous matching between startups

[1] See Adams, Hermalin, and Weisbach (2010) and Hermalin and Weisbach (2003) for surveys of the theoretical and empirical literature on boards of directors.

and directors, but also how directors use their social connections to attract new stakeholders to the startup. Moreover, although causal inference is challenging, we can exploit the cross-sectional heterogeneity in our sample to examine how the choice of early-stage non-executive directors correlates with future performance of the startups, in terms of fund-raising activity and exit strategies.

We obtain information on startups and their investors from CrunchBase (www.crunchbase.com), which is the largest crowd-sourced database on startups, and AngelList (angel.co), which is the leading on-line fund-raising platform for startups. Among other things, these two databases also provide information on directors appointed to the boards of startups. We collect additional biographical information on directors from LinkedIn (linkedin.com) and the BoardEx database. By combining these databases, we are able to identify the year of appointment for each director-startup combination. The data also allow us to differentiate between non-executive directors who have invested in the startup ("investor directors") and those who do not have a stake in the startup prior to their appointment as directors ("non-investor directors").[2] Our sample comprises 44,815 startups at the series A stage, whose future progress we are able to track. Only 31% of the startups in our sample appoint a non-executive director at the series A stage: among these, 35% appoint an investor-director whereas the rest appoint a non-investor director to this role. Please see section 1 below for more details.

Theory highlights two primary roles for non-executive directors in case of public corporations: ameliorating manager-shareholder agency conflicts by monitoring managers (e.g., see Hermalin and Weisbach (1998) and Raheja (2005)), and advising managers (Adams and

[2]Investor directors may be either individual investors or executives/partners at institutional investors (e.g., VC funds) that have invested in the startup. In practice, non-investor directors often receive an equity stake in the startup as part of their compensation, but the crucial distinction is that they have not invested in the startup prior to their appointment as directors. Unlike public corporations, startups are not subject to regulatory mandates to appoint independent or unaffiliated directors. In fact, as we show below, the non-investor directors may be affiliated with the founders or early-stage investors through their professional or educational connections.

Ferreira (2007) and Harris and Raviv (2008)).[3] Of course, the governance challenges at startups are likely to be very different from those at public corporations. Because startups have highly concentrated ownership structures with high levels of managerial ownership, expropriation of minority shareholders by management is not a serious concern. Moreover, investors have other governance tools at their disposal, such as staging of financing rounds (Gompers (1995)) and syndication (Lerner (1994)), to discipline entrepreneurs. Hence, it is likely that the advisory role of non-executive directors dominates the monitoring role in case of startups. Another potential channel through which non-executive directors may benefit early-stage startups is by leveraging their network connections to attract new investors in growth-stage and late-stage funding rounds, outside executives to serve in the startup, and potential acquirers in case of M&A exits.

We find that early-stage startups that raised more funds in the seed and series A stages, especially from venture capital (VC) firms, and those in which the founder shares a past professional or educational connection with one of the early-stage investors are both more likely to appoint non-executive directors, and to have one of their early-stage investors serve as a director.[4] Early-stage startups are also more likely to appoint non-executive directors when the local supply of (demand for) directors is high (low), where local supply and demand are measured at the level of the city. Interestingly, early-stage investors of startups are more likely to serve as directors when the local supply of (demand for) directors is low (high). Thus, the local ecosystem of the startup affects the appointment of non-executive directors, and early-stage investors are more likely to serve as directors when there is a local scarcity of directors. This result is also reminiscent of the finding in Knyazeva, Knyazeva, and Masulis

[3] On a related note, the extant literature on venture capital contracting also highlights the importance of agency conflicts in determining the allocation of control rights between entrepreneurs and venture capitalists (e.g., see Cumming (2008), Kaplan and Stromberg (2003) and Kaplan and Stromberg (2004)).

[4] We define as a past professional connection to exist between the founder and the investor if they worked for the same employer during an overlapping period, or if the investor either invested in or served as director on the founder's previous startup.

(2013) that the local supply of directors affects the proportion of outside directors at public corporations.

Next, we investigate the factors that determine the matching between startups and non-executive directors. Our analysis aims to uncover why startups match with specific directors from a larger pool of potential directors, and vice versa. Our results point to the importance of social connections and individual expertise in determining the matching between startups and non-executive directors.

First, all else equal, an individual is more likely to be appointed as non-executive director if he has a social connection with the startup's founder or investors. The effect of social connections is mostly driven by past professional connections rather than educational connections. Interestingly, the appointment of growth-stage directors and late-stage directors also seem to depend on their past professional connections with the early-stage directors, even after controlling for the connections with the founder and early-stage investors. This suggests that early-stage directors play an important role in attracting future directors.

Second, we shed light on the expertise that startups seek in their non-executive directors. Formally, we measure the expertise of individuals along seven dimensions that seem important for startup firms: past entrepreneurial experience in having founded a startup, past board experience at either a public or a private firm, past professional experience as a C-suite executive at a public or private firm, past professional experience in finance or law in a non-C-suite role, past patenting experience, IPO experience, and M&A experience. We find that board experience and entrepreneurial experience matter the most for non-executive director appointments at all stages, and to a lesser extent, so do IPO experience and M&A experience. Public board experience is much more important for the choice of later-stage directors, whereas private board experience is marginally more important for the choice of early-stage outside directors. Patenting experience matters only for the choice of early-stage directors, whereas C-suite experience matters only for the choice of late-stage

directors. These findings are intuitive because later-stage startups have more diffuse ownership structures compared to early-stage startups, and may be contemplating exit via an IPO or acquisition, which makes it important for them to appoint directors who have prior experience in overseeing or managing public corporations.

Third, all else equal, an individual is more likely to be hired as an early-stage or growth-stage director when the *vector difference* (along the seven dimensions noted above) between his expertise and that of the startup's founders is high. That is, early-stage and growth-stage startups are more likely to hire non-executive directors who possess expertise that the founders lack, which hints at the importance of the advisory role of these directors. When we decompose the vector difference into its individual components, we find that the effect for early-stage directors is mostly driven by difference in board experience, entrepreneurial experience, and professional experience. In other words, early-stage startups are more likely to seek a non-executive director with board experience if the founder lacks this experience, and similarly with entrepreneurial and professional experience. In sharp contrast, when it comes to patenting experience, founders seek early-stage directors who are actually similar to them.

Next, we examine the role that non-executive directors play in attracting key stakeholders to the startup, such as new investors in growth-stage and late-stage funding rounds, outside executives to serve in the startup, and potential acquirers in case of M&A exits. To do this, we analyze the matching between startups and later-stage investors (and outside executives and acquirers, respectively), and how it varies with the presence and characteristics of early-stage non-executive directors. We find that, all else equal, an investor is more likely to participate in later-stage funding rounds of a startup if the startup has an early-stage non-executive director and if the investor shares a social connection with the director, especially if the connections were formed by working together on a previous startup (e.g., as co-investors, co-directors, or as investor and director). These results are robust to con-

trolling for any connections that later-stage investors may have with startups' founders and early-stage investors.

Similarly, an outside executive is more likely to be appointed as CEO or C-suite executive at a startup if he shares a social connection with the early-stage non-executive director, and this effect is mainly driven by professional connections rather than educational connections. Interestingly, social connections between the outside executive and the startup's founder or investors make it less likely that he will be appointed CEO (and do not have any effect on the likelihood of C-suite executive appointments), which suggests that founders and investors go beyond their social networks when they choose to appoint an outside CEO. Also, an acquirer is more likely to bid for a startup if C-suite executives at the acquiring firm share a social connection with the early-stage non-executive director, even after controlling for connections with the founder and investors. These results suggest that non-executive directors leverage their network connections to attract new stakeholders to the startup. While past literature highlights that startups benefit by raising financing from well-connected investors (see Hochberg, Ljungqvist, and Lu (2007)), our results suggest that they may also benefit from having well-connected directors serve on their boards. Hellmann and Puri (2002) highlight the role played by VCs in professionalizing startups, and our results suggest that early-stage non-executive directors play a similar role.

Identifying the causal effect of early-stage non-executive directors on the startup's future performance and exit strategies is challenging because, as we have shown, the choice of whether and who to appoint as non-executive director is endogenous, and may depend on a host of unobserved factors that we cannot control for. Although there is substantial uncertainty about the future prospects of startups at the series A stage, it may be that startups with brighter prospects are more likely to want to, and be able to appoint, qualified non-executive directors. Therefore, absent an instrument to capture an exogenous shock to the supply or demand for non-executive directors, one cannot convincingly identify the

causal effect of directors on startup performance.[5] Despite these challenges, it is instructive to look at the correlation between characteristics of early-stage non-executive directors and startups' future performance and exit strategies in a two-stage analysis that controls for the effect of observable characteristics, and includes fixed effects for the startups' city, product market category, and year of founding.

We find that early-stage startups that appoint non-executive directors raise larger amounts in later stages, are more likely to attract VC funding, have higher patenting activity, and are more likely to exit, especially through IPOs, compared with otherwise similar early-stage startups that did not appoint early-stage directors. Among the subset of early-stage startups that appointed non-executive directors, those with investor-directors obtain larger amounts in later stages, are more more likely to attract VC funding, and more likely to exit compared with otherwise similar startups with non-investor directors. Interestingly, however, startups whose early-stage investors serve as directors file fewer patents and are more likely to exit via acquisitions rather than IPOs compared to similar startups with non-investor-directors. This is reminiscent of the result in Cumming (2008) that stronger VC control rights increase the likelihood of exit by an acquisition. Although these results do not reflect the causal effect of early-stage non-executive directors, we note that they cannot be explained by differences in startups' observable characteristics, or the city, product market category, and year of founding.

Our paper contributes to the small but growing literature on the boards of startups, although most of this literature examines boards of later-stage startups that are financed by VCs. In a recent paper, Ewens and Malenko (2020) examine how board size and composition of VC-backed startups vary over the startup's life cycle. They suggest that directors play a

[5] Although the literature on public boards has used the local supply of directors as an instrument for the fraction of outside directors (see Knyazeva et al. (2013)), we are not confident that this instrument satisfies the exclusion restriction in our setting because startup activity is highly clustered in a few cities, and startup location is itself endogenous.

mediation role between VCs and entrepreneurs in VC-backed startups. Larcker and Tayan (2018) seek to understand the evolution of corporate governance in pre-IPO companies using data collected from 47 companies that undertook an IPO in the U.S. between 2010 and 2018. Baker and Gompers (2003) examine board characteristics of firms at the time of their IPO, and show that VC-backed firms have more outside directors (also see Hochberg (2012)). Cumming (2008) finds that strong VC control rights– i.e., VC board control combined with the right to replace the founding entrepreneur as CEO– are associated with a higher probability of acquisitions and a lower probability of IPOs. Kaplan and Stromberg (2003) examine how the allocation of control rights, which include board seats and voting rights, between the entrepreneur and the VC vary with startup characteristics.

The extant literature on the determinants of board structure has mostly focused on the boards of public corporations. One significant drawback with public corporations is that their boards are sticky and reflect the cumulative effects of decisions made over long periods of time, some of which were made to satisfy regulatory mandates, which makes it hard to understand how the board structures evolved endogenously in response to specific governance needs.[6] Moreover, the literature has little to say about which director skill sets matter (see Adams, Akyol, and Verwijmeren (2018)). We contribute to the extant literature by highlighting the role played by non-executive directors at an important category of private companies, namely, early-stage startups. Our strategy of focusing on de novo board

[6]Because public corporations are required by law to have non-executive and independent directors, the literature has examined either aggregate measures of board composition, such as size and the fraction of independent directors (e.g., see Lehn, Patro, and Zhao (2009), Coles, Daniel, and Naveen (2008), Linck, Netter, and Yang (2008), and Boone, Field, Karpoff, and Raheja (2007)), or specific director attributes, such as industry expertise (Dass, Kini, Nanda, Onal, and Wang (2013)), venture capital expertise (Field, Lowry, and Mkrtchyan (2013)), executive experience (Fich (2005) and Fahlenbrach, Low, and Stulz (2010)), acquisition experience (Harford and Schonlau (2013) and Field and Mkrtchyan (2017)), financial expertise (Guner, Malmendier, and Tate (2008)), network size (Fracassi and Tate (2012) and Denis, Lee, and Lee (2014)), and political connections (Agrawal and Knoeber (2001) and Goldman, Rocholl, and So (2009)). The effect of director independence on performance of public corporations are also hotly debated in the literature (e.g., see Bhagat and Black (2002), Hermalin and Weisbach (2003), Duchin, Matsusaka, and Ozbas (2010), Nguyen and Nielsen (2010), Bhagat and Bolton (2013), Knyazeva et al. (2013), and a survey of the literature in Coles et al. (2008)).

formation at early-stage startups is similar to that used by Denis, Denis, and Walker (2015) who examine the formation of de novo boards following corporate spinoffs, Cornelli and Karakas (2012) who examine changes in board composition when a public company is taken private in an LBO, and Boone et al. (2007) who track corporate board development from a firm's IPO through 10 years later.

1. Data and Sample Collection

1.1. Data Sources

Startups and Investors: We obtain detailed information on startups and their fund-raising activity from CrunchBase (www.crunchbase.com)[7], which is the largest crowd-sourced database on startups, and AngelList (angel.co)[8], which is the leading on-line fund-raising platform for startups.

CrunchBase (henceforth "CB") is a graph database organized around several collection endpoints. We use the "Organization" endpoint to extract detailed information on startups' founders, founding date, website domain address, location, fund-raising dates, stage information on fund-raising rounds (i.e., seed, series A, etc.), amount of funds raised, identity of investors who participated in various financing rounds, and board members.[9] A representative snapshot of the information available for Uber is available at https://www.crunchbase.com/organization/uber.

[7] CrunchBase collects data through crowd-sourcing from more than 80,000 contributors (Freytag (2014)); partnerships with more than 3,600 VCs, accelerators and incubators (CrunchBase VC Program (2018)); and by capturing information from Form-D filings, news articles, and industry announcements. The data are authenticated manually and algorithmically (Crunchbase (2017)).

[8] AngelList collects data from startups that register on its platform to raise funds and investors looking for potential investment opportunities.

[9] In entrepreneurial finance, startups are generally classified into the following life-cycle stages: seed, series A, series B, series C, series D, etc. Please see the Appendix for the generally accepted definitions of these stage classifications in the industry. The academic literature (e.g., see Gompers (1995)) refers to seed and series A as "early stage," series B as "expansion stage," and series C and D as "late stage."

Similar to CB, AngelList (henceforth "AL") also provides data on fund-raising activity of startups and biographical information of founders, investors and directors. We use a vectorial decomposition algorithm on startup names and website domain addresses followed by a manual check to eliminate duplications between CB and AL.[10] We find an overlap in coverage of around 75% between the two datasets. In general, CB has better coverage on fund-raising dates and amounts raised by startups, whereas AL provides more details on the investors who participated in each round and the founding teams of startups.

Board of Directors: CB and AL identify the individuals who serve on the boards of startups, and also provide the LinkedIn profile links of all individuals that they cover. There are a total of 59,016 individuals that are appointed as directors to the startups in our sample at various life-cycle stages. We use the combination of CB, AL and LinkedIn to obtain the year of appointment for each director-startup combination, and detailed biographical information for the directors, which includes their past work experience, past director appointments at both public and private companies, and educational profile.

We are able to match a subset of the directors in our sample (2,382 individuals) with the BoardEx North America file. BoardEx is more likely to cover directors at large public and private companies, which explains why not all directors in our sample match with BoardEx. For those that match with BoardEx, we are able to verify that in most cases the combination of CB, AL and LinkedIn provides all the information that is available on BoardEx. However, in a few cases, BoardEx provides additional information on past appointments that is not

[10] A 3-gram vectorial decomposition algorithm to match names works as follows: Suppose we have two strings – "Mathew" and "Matthew" – to match. The algorithm creates vectors by breaking each string into rolling substrings of 3 characters each; i.e., A={"mat", "ath", "the", "hew"} and B={"mat", "att", "tth", "the", "hew"}. We then compute a similarity score between the two vectors defined as $s \equiv \frac{|A \cap B|}{|A \cup B|}$, where $s \in [0, 1]$. We apply this algorithm separately to match startup names and website domain addresses (after removing domain suffixes such has .com, .net, etc.) to compute two similarity scores. If either of the similarity scores exceeds 0.8, we manually check the matches to verify if it is the same company in both databases.

available in CB, AL and LinkedIn.

Patenting Activity: We collect information on patenting activity of all individuals in our sample (i.e., founders, directors, and investors) from USPTO's PatentView database. We employ the vectorial decomposition method described above to match company, founder, investor and director names in our dataset with the names of assignees, inventors and lawyers in the patent database. We also verify whether the individual was located in the same state during the same year according to both datasets in order to increase the accuracy of matches.

1.2. Sample Selection

Startups at the pre-seed or seed stages do not have any real need to appoint non-executive directors to their boards, and just under 25% of seed-stage startups manage to survive till the series A stage (see Venugopal and Yerramilli (2020)). However, startups that survive till the Series A stage begin focusing on establishing a viable business model to scale up their operations, which may also involve professionalizing the company's board of directors by hiring non-executive directors. Therefore, given the main focus of our study, it is sensible to focus attention only on startups that have survived till series A. Indeed, most startups in our sample that appoint non-executive directors do so at series A stage or after. After imposing this restriction, we are left with a sample of 44,815 startups that have reached series A stage, for which we have information on future fund-raising rounds, investors, and identities of directors.

In Table 1, we provide a breakdown of our sample by "product-market" category (using the definitions provided by CrunchBase) and city for the top 10 product market categories and cities, respectively. As expected, many cities in the San Francisco Bay Area feature in the top 10 cities list, which altogether account of around 32% of all startups.

2. Key Variables and Descriptive Statistics

2.1. Non-Executive Directors

Our main variable of interest is *Early NE Director*, which is a dummy variable that identifies startups that appointed a non-executive ("NE") director at the series A stage. To create this variable, we match the name of each director with the names of founders and all employees of the startup to identify directors whose primary employment is not with the startup. Similarly, we define dummy variables *Growth-Stage NE Director* and *Late-Stage NE Director* to identify startups that appoint non-executive directors during the growth stage (i.e., series B and C) and late stage (i.e., series D and beyond), respectively.

Non-executive directors could be either investors that have invested in the startup ("investor directors") or other individuals that are not directly affiliated with the startup ("non-investor directors"). We define the dummy variable *Investor as NE Director* to identify startups that appoint one of their existing investors as non-executive director.[11] Similarly, we define *Investor as Early NE Director* to identify startups that appoint one of their early-stage investors as an early-stage non-executive director. To create these variables, we name-match each non-executive director with the list of individual investors as well as with the list of senior executives (e.g., fund manager and general partner) at institutional investors that may have invested in the startup, such as VC funds or angel groups.

[11] Large investors could simultaneously negotiate with startups investment terms and a board seat. There is a possibility that CB and AL record the board appointment before the investment date in these cases. To avoid misclassifying such investors as non-investor directors we check if the board appointment and investment dates are within 180 days of each other. If it is less than or equal to 180 days we classify these board appointments as *Investor as NE Director*.

2.2. Network Measures

Network connections may play an important role in startups' ability to attract non-executive directors and investors. We use the procedure in Venugopal (2018) to map the network connections among founders, investors, and directors. Specifically, we construct a panel containing every pair of individuals (e.g., Founder-Investor, Founder-Director, Investor-Investor, etc.) in each year from the year they first appeared in the sample. We define a pair of individuals as connected if either of the following conditions is met: (a) the pair attended the same college or university during an overlapping time period ("Education Channel"); or (b) the pair either worked for the same employer during an overlapping time period or worked together on a previous startup venture ("Work Channel").

We use the definition above to define dummy variables to identify the presence of a connection between non-executive directors and founders, non-executive directors and investors, investors and founders, late-stage non-executive directors and early-stage non-executive directors, and late-stage investors and early-stage investors. Moreover, we decompose each of these dummy variables into two separate dummies to identify whether the connection, if any, is through an education channel or a work channel.

We also map the co-investment networks of investors using the procedure in Venugopal and Yerramilli (2020). Formally, we define a co-investment connection as being formed between two investors when they invest together for the first time in the same funding round of a startup. At any given point, the co-investment network reflects all the past interactions between investors since they first appear in our data, which in some cases, goes as far back as 1998. To measure the importance of an investor to the network, we define *Degree Centrality* of an investor as the number of co-investment connections an investor has with other investors as of year 't' (see Chapter 2 of Jackson (2008)).

2.3. Experience Measures

We track the past experience or expertise of founders and directors across seven dimensions: entrepreneurial experience in having founded a startup, board experience at either a public or a private firm, executive experience as a C-suite executive at a public or private firm[12], professional experience in finance or law in a non-C-suite role, patenting experience, M&A experience and IPO experience. We consider an individual to have professional experience in finance if he has either served in a finance or accounting role, or holds a bachelors degree or higher in finance or accounting. Similarly, we consider an individual to have professional experience in law if he has either served in a legal role (e.g., General Counsel, Lawyer, IP Lawyer, etc.) or has a degree in law. We consider an individual to possess M&A experience if he served as director or top executive at either the acquirer or target company in an M&A transaction; IPO experience is defined along similar lines. For each of these experience dimensions, we create a dummy variable to proxy for the individual's experience along that dimension, as well as numerical measures – e.g., no. of startups founded, no. of directorships held, no. of patents filed, etc. – to measure the extent of the individual's experience.

For each individual, we define *Experience Index* as an aggregate measure of experience that is obtained by adding the seven experience dummies listed above. Thus, *Experience Index* is a category variable that takes values from 0 to 7, where 0 denotes lack of any experience and 7 denotes experience in all dimensions.

To compare and contrast the experiences of a founder-director pair, we create a variable called *Experience Distance*, which is the normalized Euclidean vector distance between the experience vectors of the director and founder. If F and D denote the experience vectors of the founder and the director, respectively, the *Experience Distance* between the founder and director is defined as $d(F, D) = \sqrt{\sum_{i=1}^{7}(F_i - D_i)^2}/\sqrt{7}$. Thus, *Experience Distance* takes

[12]To avoid double-counting, we exclude founder-CEOs of startups while constructing the C-suite experience dummy because their experience already counts under entrepreneurial experience.

values between 0 and 1, where 0 denotes that the two individuals have identical experience, and 1 denotes that their experiences are perfectly complementary.[13] In general, a higher value of *Experience Distance* denotes greater *complementarity* between the skill sets of the founder and director.

2.4. Startup Performance

We measure the performance of startups using their fund-raising activity in later-stage rounds (i.e., series B stage and beyond), patenting activity, and the likelihood of a exit via IPO or acquisition. We define the dummy variable *Survived till Series B* to identify startups that successfully progress to series B, and the following additional variables to measure the fund-raising performance in later-stage rounds of startups that do manage to survive till series B: *Later-stage Funds* is the total funds raised by the startup in all later-stage rounds; and *VC in Later-Stages* is a dummy variable which indicates whether the startup was able to attract venture capital funding in later-stage funding rounds.

Similarly, we define the dummy variable *Exit* to identify startups that exit via an IPO or acquisition. Conditional on exit, the dummy variables *IPO* and *Acquisition* identify the mode of exit.

2.5. Descriptive Statistics

We provide descriptive statistics for our sample of early-stage startups in Panel A of Table 2. There is substantial cross-sectional variation and skewness in the total amount of early-stage funding: whereas the average startup raised $7.98 million, the median startup raised only

[13]For example, suppose founder has entrepreneurial experience, professional experience and patenting experience, but no board, C-suite experience, M&A or IPO experience so that his experience vector is $F = [1, 0, 0, 1, 1, 0, 0]$. Suppose the director has board, C-suite, professional, M&A and IPO experience, but lacks entrepreneurial experience and patenting experience, so that his experience vector is $D = [0, 1, 1, 1, 0, 1, 1]$. Then, the *Experience Distance* between the founder and director is given by $d(F, D) = \sqrt{\sum_{i=1}^{7}(F_i - D_i)^2}/\sqrt{7} \simeq 0.926$.

$2.2 million. The median age of the startup at the first series A round is 4.33 years, and 54% obtained some VC funding in the early stages (mostly at the series A stage). In 22% of startups, one of the founders has a past educational or professional connection with one of the early-stage investors.

Examining board characteristics, we find that 13,673 startups (31% of the sample) appointed a non-executive director at the early stage, and out of these, 35% appointed one of their early-stage investors to this role. Among the startups that appointed an early-stage non-executive director, the median number of non-executive directors is 2. The early-stage director has a past professional or educational connection with the startup's founder in 36% of startups, and has a past professional or educational connection to the early-stage investor in 28% of startups.

Among the startups that appoint early-stage non-executive directors, the most common experience possessed by the directors are board experience (58% of cases) and M&A experience (59% of cases), followed by IPO experience (31% of cases) and patenting experience (21% of cases). The median experience distance between the founder and early-stage director is 0.48, which suggests that their experience vectors differ on 1.152 dimensions.

In terms of later-stage outcomes, only 14,748 startups (33% of the sample) successfully progress from series A to series B, which is considered to be the beginning of the growth stage. Among this subsample, 70% obtain VC funding in later stages. Only 7,944 startups (18% of the sample) eventually exit via an IPO or acquisition: of these, 79% exit via an acquisition and 21% via an IPO.

In Panel B of Table 2, we describe the stages at which startups appoint their first non-executive director. Recall that early stage refers to series A, growth stage refers to series B and C, and late stage refers to series D and beyond. The first column shows the number of startups, and the corresponding fraction in parentheses, in our sample that survive till each stage. As can be seen, only 33% of the sample survives till the growth stage, and only 23.7%

of the sample survives till the late stage. Most of the startups that appoint a non-executive director do so at the early stage: 31% appoint their first non-executive director at the early stage, 8.4% do so during the growth stage, and 6.8% do so at the late stage. The same patterns hold for startups that appoint their investors as non-executive directors.

Panel C provides the cumulative numbers of startups at each stage that have appointed any non-executive director (*NE Director* = 1) and an investor-director (*Investor as NE Director* = 1), regardless of the stage at which they were appointed. As can be seen, 67.1% of startups that survive till the late stage have a non-executive director, and 39.1% of these have an investor-director. Put differently, almost 33% of startups that survive till the late stage do not have a single non-executive director on their board.

3. Appointment of Non-Executive Directors

3.1. Propensity to appoint non-executive directors

We estimate variants of the following linear probability model to examine how the propensity to appoint non-executive directors varies with startup and founder characteristics:[14]

$$\text{Early NE Director}_i = \alpha + \beta * X + \mu_t + \mu_{mkt} + \mu_{city} + \epsilon_i \tag{1}$$

We control for the following startup characteristics: age at the first series A round (*Age at Series A*); total funds raised at the seed and series A stage (*Early-Stage Funds*); a dummy variable for whether the startup obtained VC funding in either the seed or series A stage (*VC in Early Stage*); and a dummy variable to identify whether the startup's founder and any

[14]In unreported tests, which are available upon request, we verify that all our results are robust to a Logit specification. However, inclusion of so many fixed effects (which we explain below) in a nonlinear specification may give rise to concerns about the incidental parameter problem. To alleviate these concerns, we report the results of the linear probability model in the main body of the paper.

of the early-stage investors share a past professional or educational connection (*Connected Founder & Early Investor*). We include fixed effects for the startup's founding year (μ_t), product market category (μ_{mkt}), and city (μ_{city}) in all specifications. The results of our estimation are presented in Table 3.

The dependent variable in columns (1) and (2) is *Early NE Director*, which is a dummy variable that identifies startups that appointed a non-executive director at the early stage. The coefficients in column (1) indicate that startups that appoint early-stage non-executive directors tend to be older and of higher quality on average, as proxied by the total amount raised and the participation by VCs in their early-stage financing rounds. Moreover, startups in which founder and early-stage investors share a past professional or educational connection are also more likely to appoint non-executive directors at the series A stage.

In column (2) we also control for the local supply of and demand for directors. We define *Director Supply* as the number of "potential directors" that the startup may tap into, where potential directors include all individuals who have served as directors or C-suite executives at either public or private companies in the same city as the startup over the past 3 years. On the other hand, *Director Demand* denotes the number of startups at the series A stage or above in the same city that have not yet appointed a non-executive director.

The positive coefficient on *Ln(1+Director Supply)* indicates that an early-stage startup is more likely to appoint a non-executive director if there is a larger supply of potential directors in its city. This is in line with the finding in Knyazeva et al. (2013) that the local supply of directors affects the proportion of non-executive directors at public corporations. The negative coefficient on *Ln(1+Director Demand)* indicates that an early-stage startup is less likely to appoint a non-executive director if there are a large number of startups in the same city without non-executive directors.

The dependent variable in columns (3) and (4) is *Investor as NE Early Director*, which is a dummy variable that identifies startups that appoint one of their early-stage investors as

non-executive director. We estimate this regression on the subsample of early-stage startups that appointed a non-executive director. Hence, for this subsample, *Investor as NE Early Director*= 0 indicates that the startup appointed a non-investor as non-executive director. The coefficients on startup characteristics are broadly similar in sign to those in columns (1) and (2), except that the propensity to appoint an investor-director is negatively related to the startup's age.

Interestingly, the coefficients on *Ln(1+Director Supply)* and *Ln(1+Director Demand)* in column (4) have the opposite signs compared to column (2), and indicate that, early-stage investors are more likely to serve as non-executive directors when the local demand for directors is high and when the local supply of directors is low. These findings suggest that the local ecosystem of the startup affects the appointment of non-executive directors, and early-stage investors are more likely to serve as directors when there is a local scarcity of directors.

3.2. Matching between startups and non-executive directors

Next, we use a conditional linear probability model to investigate the factors that determine the endogenous matching between startups and non-executive directors.[15] Formally, for each actual startup-director combination, we create eight *control* pairs of startup-director combinations that are very similar but did not result in an actual match: four control pairs in which the actual startup is paired with another individual who could have potentially served as a director on the startup's board but did not, and four control pairs in which the actual director is paired with another startup in which he could have potentially served but did not. We define the set of potential directors for the startup as individuals who were appointed

[15]This is similar to the conditional logit regression proposed by McFadden (1974); see Bena and Li (2014) and Kuhnen (2009) for recent applications in finance. As noted above, we use the linear probability model specification instead of the logit specification to avoid the incidental parameter problem, although all our results are robust to the logit specification.

as directors to another startup in the same product market category or city over the past five years, and randomly pick four control directors from this set. Similarly, we define the set of potential startups for each director as all other startups in the same product market category or city.

We then estimate linear probability regressions to understand the startup and director characteristics that explain why startups chose their specific directors from a larger pool of potential directors, and vice versa. We estimate these regressions on a sample that includes all actual startup-director pairs and their corresponding control pairs (as described above), where the dependent variable is a dummy that identifies the actual startup-director pairs.[16] The regression includes fixed effects for each actual startup-director pair and its corresponding control pairs ("group fixed effect"). We repeat this analysis separately for non-executive director appointments at the early, growth and late stages of startups. We control for all the startup characteristics from Table 3 but suppress these coefficients to conserve space. The results of our analysis are summarized in Table 4.

In Panel A we focus on the effect of educational and professional connections in determining the match between startups and non-executive directors. We examine early-stage appointments in column (1), growth-stage appointments in column (2), and late-stage appointments in column (3). As expected, the positive and significant coefficients on *Investor* in all columns indicate that an individual is more likely to be appointed as non-executive director if he is an investor in that startup. The results in column (1) also indicate that an individual is significantly more likely to be appointed as non-executive director if he shares a professional connection with the startup's founder or investors. On the other hand, an educational connection with the startup's founder seems to have no significant effect on the

[16]Our results hold regardless of the number of control pairs used, or even if we treat all individuals (startups) other than the actual director (startup) as controls. However, using a large set of controls may lead to concerns that the standard errors on coefficients are artificially low because of the large regression sample. We use a small set of tighter controls to ameliorate this concern.

startup-director match, whereas an educational connection with the startup's investor only has a small effect.

The results relating to growth-stage director appointments (column (2)) and late-stage director appointments (column (3)) are qualitatively similar to those relating to early-stage director appointments, except that professional connections with the startup's founder matter significantly more than professional connections with the startup's investors in determining the startup-director match at the growth and late stages. Interestingly, the appointment of growth-stage non-executive directors and late-stage non-executive directors also seem to depend on their professional connections with the early-stage non-executive directors, even after controlling for the connections with the founder and early-stage investors, and this effect is significantly stronger than that of professional connections with investors. These results suggests that early-stage non-executive directors play an important role in professionalizing startups' boards by attracting future non-executive directors to serve on them.

In Panel B we focus on the effect of the past experience or expertise in the appointment of directors, after controlling for all the variables from Panel A whose coefficients we suppress to conserve space. Recall that we measure experience of individuals along seven dimensions: entrepreneurial experience, board experience, C-suite executive experience, professional experience in finance or law in a non-C-suite role, patenting experience, M&A experience, and IPO experience. The results in column (1) indicate that board experience, entrepreneurial experience and patenting experience are significantly more important for early-stage non-executive director appointments than M&A, IPO, or other professional experience, whereas C-suite experience seems irrelevant at this stage. The results in column (2) indicate that board experience at a private firm matters significantly more for early-stage director appointments than board experience at public firms.

Although entrepreneurial experience and board experience are also important for appointments of growth-stage directors (column (3)) and late-stage directors (column (4)),

there are a few notable differences worth emphasizing. First, unlike with early-stage appointments, board experience at public firms is significantly more important than board experience at private firms for non-executive director appointments at the growth and late stages. Second, C-suite executive experience is very important for late-stage non-executive director appointments, although it has no effect for director appointments at early stage and growth stage. Third, unlike with early-stage appointments, patenting experience has no effect on non-executive director appointments at the growth stage and late stage. These findings are intuitive because later-stage startups have more diffuse ownership structures compared to early-stage startups, and may be contemplating exit via an IPO or acquisition, which makes it important for them to appoint directors who have prior experience in overseeing or managing public corporations.

In Panel C we examine the effect of *Experience Vector Difference* on the startup-director matching, after controlling for all the variables from panels A and B although we suppress these coefficients to conserve space. The positive and significant coefficient on *Experience Vector Difference* in column (1) indicates that startups seek to appoint early-stage non-executive directors whose experiences *complement* (i.e., are different from) those of the founder, which hints at the importance of the advisory role of non-executive directors. When we decompose the vector difference into its individual components, we find that the effect for early-stage non-executive directors is mostly driven by difference in board experience, entrepreneurial experience, and professional experience. In other words, early-stage startups are more likely to seek non-executive directors with board experience if their founders lacks this experience, and similarly with entrepreneurial and professional experience. On the other hand, when it comes to patenting experience, founders seek early-stage non-executive directors who are actually similar to them.

We find similar broadly similar results with growth-stage and late-stage non-executive directors in columns (3) and (4), except that complementarity in IPO experience and M&A

experience are important for late-stage director appointments. These results are intuitive and highlight the changing governance needs of the startup as it matures. In particular, late-stage startups which may be eyeing exit through an IPO or acquisition seek non-executive directors with IPO and M&A experience if the founders lack this experience.

4. Benefits of Non-Executive Directors for Startups

Theory highlights two primary roles for non-executive directors at public corporations: ameliorating shareholder-manager agency conflicts by monitoring managers (Hermalin and Weisbach (1998)) and providing strategic advice to top managers (Adams and Ferreira (2007) and Harris and Raviv (2008)). However, another potential channel through which non-executive directors may benefit early-stage startups is by leveraging their network connections to attract new investors in growth-stage and late-stage funding rounds, outside executives to serve in the startup, and potential acquirers in case of M&A exits. We test this hypothesis in this section. Recall that we already showed in Panel A of Table 4 that early-stage non-executive directors play a role in attracting later-stage non-executive directors to serve on the startup's board.

4.1. Early-stage non-executive directors and later-stage investors

Do early-stage non-executive directors leverage their network connections to attract new investors to invest in the growth-stage and late-stage funding rounds (jointly referred to as "later-stage" rounds) of the startup? To investigate this possibility, we need to understand the factors that determine the matching between startups and investors in later-stage rounds. We use a conditional linear probability model similar to that we used to examine the matching between startups and non-executive directors. For each actual startup-investor combination, we create eight *control* pairs of startup-investor combinations that are very similar but did

not result in an actual match; four pairs in which the actual startup is paired with a potential investor, and four pairs in which the actual investor is paired with a potential startup. We define the set of potential investors for the startup as those who invested in another growth-stage startup or late-stage startup in the same product market category or city over the past five years, and randomly pick four control investors from this set if we have more than four matches. Similarly, we define the set of potential startups for each investor as all other growth-stage or late-stage startups in the same product category or city, and randomly pick four startups from this set if we have more than four matches.

We then estimate linear probability regressions to understand the determinants of the matching between startups and investors in later-stage funding rounds, and how it varies with the presence and characteristics of early-stage non-executive directors. We estimate these regressions on a sample that includes all the actual startup-investor pairs and their corresponding control pairs (as described above), where the dependent variable is a dummy that identifies the actual startup-investor pairs. The regression includes fixed effects for each actual startup-investor pair and its corresponding control pairs ("group fixed effect"). We control for all the startup characteristics and director experience variables but suppress these coefficients to conserve space. The results of these regressions are presented in Table 5.

The results in column (1) indicate that investors are more likely to participate in later-stage funding rounds of startups that hired early-stage non-executive directors. The coefficients on the social connections variables indicate that investors are more likely to participate in later-stage funding rounds of startups when they share a social connection with the startup's founder and early-stage investors.

In column (2) we examine the subset of startups that appointed early-stage non-executive directors, and find that investors are more likely to participate in later-stage funding rounds of startups in which an early-stage investor serves on the board. A key finding is that an investor's participation is also more likely if he shares a social connection with an early-stage

non-executive director. These results are robust to controlling for any connections that later-stage investors may have with startups' founders and early-stage investors. While past literature highlights that startups benefit by raising financing from well-connected investors (see Hochberg et al. (2007)), our results suggest that they may also benefit from having well-connected directors serve on their boards.

In column (3), we try to understand the effects of different types of social connections between investors and early-stage directors on the investors' propensity to invest in later-stage funding rounds of the startup. We find that the most important connections are those that were formed by the investor and early-stage director having worked together on a previous startup as co-investors, co-directors, or as investor and director.

In column (4), we repeat the analysis in column (3) after restricting attention to the sub-sample of startups that appointed a non-investor as early-stage non-executive director (i.e., startups with *Early NE Director*= 1 and *Investor as Early NE Director*= 0). We do this to allay concerns that the results in column (3) may be driven solely by investor-directors. The results are qualitatively similar to those in column (3), with some minor differences, and show that an investor is more likely to participate in a startup's later-stage rounds if he shares a social connection with non-investor early-stage directors. The most important connections are those that were formed by the investor and early-stage non-investor director having worked together on a previous startup as co-directors, co-founders, or as investor and director.

4.2. Early-stage non-executive directors and appointment of outside executives

Next, we examine whether early-stage non-executive directors play a role in professionalizing the startup by attracting outside talent to serve as CEOs or C-suite executives in the

startup (similar to the role of VCs highlighted by Hellmann and Puri (2002)). To investigate this possibility, we use a similar empirical strategy as in Section 4.1 to understand the factors that determine the matching between outside executive talent and startups, and how this matching is affected by social connections between outside executives and early-stage non-executive directors. We examine outside CEO appointments and C-suite appointments separately.

We begin with the subset of startups that appointed an outside CEO (in our sample, these appointments happen only at Series B or beyond). For each actual startup-outside CEO combination, we create eight *control* pairs of startup-CEO combinations that are very similar but did not result in an actual match; four pairs in which the actual startup is paired with a potential CEO, and four pairs in which the actual CEO is paired with a potential startup. We define the set of potential CEOs for a startup as all unaffiliated CEOs, founders, directors and executives from same industry as the actual CEO and who have a similar experience profile as the actual CEO (i.e., have a low *Experience Vector Distance* to the actual CEO), and randomly pick four individuals from this set if we have more than four matches. Similarly, we define the set of potential startups for each CEO as startups in the same product category or city as the actual startup and that are also at the same life-cycle stage (i.e., series B, series C, and so on) as the actual startup; we randomly pick four startups if we have more than four matches.

We then estimate linear probability regressions to understand the determinants of the matching between startups and outside CEOs, and how it varies with the presence and characteristics of early-stage non-executive directors. We estimate these regressions on a sample that includes all the actual startup-outside CEO pairs and their corresponding control pairs (as described above), where the dependent variable is a dummy that identifies the actual startup-outside CEO pairs. The regression includes fixed effects for each actual startup-outside CEO pair and its corresponding control pairs ("group fixed effect"). We control for

all the startup characteristics and director experience variables but suppress these coefficients to conserve space. The results of these regressions are presented in column (1) through (4) of Table 6.

The results in column (1) indicate that an individual is more likely to join a startup as an outside CEO if the startup has an early-stage non-executive director. The coefficients on the social connections variables indicate that outside CEO appointment are not driven by social connections that the outside CEO shares with either the startup's founder or early-stage investors.

In column (2) we examine the subset of startups that appointed early-stage non-executive directors, and find that new CEO appointments are more likely when an early-stage investor serves on the startup's board. Moreover, an individual is more likely to serve as outside CEO if he shares a social connection with the early-stage non-executive director. On the other hand, the negative coefficients on *Founder* and *Early Investor* indicate that an individual is less likely to serve as outside CEO if he shares a social connection with either the startup's founder or early-stage investor, which suggests that founders and early-stage investors go beyond their social networks when they choose to appoint an outside CEO. Overall, it appears that the early-stage non-executive director's social connections are particularly important in attracting outside CEOs.

In column (3), we try to understand the effects of different types of social connections between potential outside CEOs and early-stage directors on the individual's propensity to serve as outside CEO on the startup. We find that the most important connections are professional connections that were formed by the potential outside CEO and the early-stage non-executive director having worked together for the same employer or for a same startup in the past as co-directors. In column (4), we restrict the analysis to startups that appointed a non-investor as early-stage non-executive director. We find that connections formed by potential outside CEO and the non-investor early-stage director while working together on

a previous startup as co-founders, or as investor and director also increase the individual's propensity to serve as outside CEO on the startup.

In columns (5) through (8) we use a similar approach to understand the determinants of the matching between startups and outside C-suite executives, and find very similar results. In particular, the results in column (6) indicate that an outside executive is more likely to accept a C-suite executive role at the startup if he shares a social connection with the early-stage non-executive director, whereas social connections with either the founder or early-stage investors do not play a role. In column (7) we find that the most important connections are those that were formed by the potential outside executive and the early-stage non-executive director having worked together for the same employer or for a same startup in the past as co-directors or co-founders. We find that the same types of connections are important in startups that appointed non-investors as early non-executive directors (column (8)).

4.3. Early-stage non-executive directors and potential acquirers

Next, we examine whether early-stage non-executive directors play a role in attracting potential acquirers for the startup. We focus on the subsample of startups that exited via M&A and seek to understand the factors that determine the matching between acquirers and startups, and how this matching is affected by social connections between the top management of the acquiring firm and the early-stage non-executive director.

We follow a similar empirical strategy as in Sections 4.1 and 4.2. For each actual startup-acquirer pair in our sample, we create eight *control* pairs that are very similar but did not result in a match; four control pairs in which the actual startup is paired with another potential acquirer, and four control pairs in where the actual acquirer is paired with another potential startup. We define the set of potential acquirers for a startup as companies that

are in the same industry and are of similar size as the actual acquirer. Similarly, we define the potential targets for an acquirer as startups that are in the same industry and have raised similar amount of funding as the actual startup.

We then estimate linear probability regressions to understand the determinants of the matching between startups and acquirers, and how it varies with the presence and characteristics of early-stage non-executive directors. We estimate these regressions on a sample that includes all the actual startup-acquirer pairs and their corresponding control pairs (as described above), where the dependent variable is a dummy that identifies the actual startup-acquirer pairs. The regression includes fixed effects for each actual startup-acquirer pair and its corresponding control pairs ("deal fixed effect"), and fixed effects for the city and year. We control for all the startup characteristics and director experience variables but suppress these coefficients to conserve space. The results of these regressions are presented in Table 7.

The insignificant coefficient on *Early NE Director* in column (1) indicates that the propensity of an acquirer to acquire a startup does not depend on whether the startup has an early-stage director. On the other hand, the positive coefficients on *Founder* and *Early Investor* indicate that an acquirer is more likely to bid for a startup if the C-suite executives at the acquirer share social connections with either the startup's founder or early-stage investors.

In column (2) we examine the subset of startups that appointed early-stage non-executive directors, and find that acquirers are more likely to bid for startups which have an early-stage investor serving on the startup's board. Moreover, an acquirer is more likely to bid for a startup if the C-suite executives of the acquirer share social connections with the early-stage non-executive director, and this effect holds even after controlling for the acquirer's social connections with the startup's founder and early-stage investors.

In column (3), we try to understand the effects of different types of social connections between potential acquirers and early-stage directors on the acquirer's propensity to bid for

the startup. We differentiate between the following types of connections: *Worked at Acquirer* is a dummy to identify whether the early-stage director was employed by the acquirer in past; *Past Founder/Investor/Director* is a dummy to identify whether the early-stage non-executive director and the C-suite executives of the acquirer worked together on a startup as founders, directors, or investors; *Employment* and *Education* are dummies to identify whether the early-stage non-executive director and acquirer's C-suite executives share a past employment connection and educational connection, respectively. The significant coefficients on all these dummies indicate that all these connection channels play a role in attracting potential acquirers to bid for the startup. In column (4), we repeat the analysis in column (3) after restricting attention to a subsample of startups that appointed non-investors as early-stage non-executive directors, and find very similar results.

4.4. Early-stage non-executive directors and future performance of the startup

Thus far, we have shown that early-stage non-executive directors leverage their network connections to attract later-stage investors, top outside executives, and potential acquirers for the startup. These findings suggest that early-stage non-executive directors affect the future performance of the startup. Identifying the causal effect of early-stage directors on the startup's future performance and exit strategies is challenging because, as we have shown, the choice of whether and who to hire as non-executive director is endogenous, and may depend on a host of unobserved factors that we cannot control for. Thus, there is selection bias in both *Early NE Director* and *Investor as Early NE Director*. In particular, although there is substantial uncertainty about the future prospects of startups at the series A stage, it may be that startups with brighter prospects are more likely to want to, and be able to appoint, qualified non-executive directors.

Therefore, absent an instrument to capture an exogenous shock to the supply or demand for non-executive directors, one cannot convincingly identify the causal effect of directors on startup performance. Although the literature on public boards has used the local supply of directors as an instrument for the fraction of outside directors (see Knyazeva et al. (2013)), we are not confident that this instrument satisfies the exclusion restriction in our setting because startup activity is highly clustered in a few cities, and startup location is itself endogenous. Despite these challenges, it is instructive to look at the correlation between characteristics of early-stage non-executive directors and startups' future performance and exit strategies in a two-stage analysis that controls for the effect of observable characteristics on the propensity to appoint non-executive directors, and includes fixed effects for the startups' city, product market category, and year of founding.

We estimate an endogenous treatment regression model (Heckman (1978); Maddala (1983)) to examine how future performance and exit strategies vary with the presence of an early-stage non-executive director (the "treatment"), after adjusting for the effect of observable startup characteristics on the appointment of an early-stage non-executive director. Similarly, for the subsample of startups that appoint an early-stage non-executive director, we use the model to examine how outcomes vary between startups that appoint an investor-director versus those that appoint non-investor directors. Accordingly, the first-stage Probit regression models *Early NE Director* (or *Investor as Early NE Director*) as a function of observable characteristics that influence the propensity to appoint non-executive directors, and fixed effects for the startup's product market category, city and year of founding. Second-stage OLS regressions are used to examine how future performance and exit strategy vary with *Early NE Director* (or *Investor as Early NE Director*), after augmenting these regressions with the Inverse Mill's Ratio (*IMR*) to correct for self-selection.

Panel A of Table 8 presents the second-stage of endogenous treatment regressions aimed at examining how startups' future performance and exit strategies vary with *Early NE Director*.

We only present the results of the second-stage regression to conserve space. The results in Panel A indicate that early-stage startups which appoint non-executive directors raise larger amounts in later stages (column (1)), are more likely to attract VC funding in later stages (column (2)), are more likely to exit (column (3)) especially through IPOs (column (4)), and develop more patents (column (5)) compared with otherwise similar early-stage startups that did not appoint non-executive directors.[17] Note that *IMR* captures the effect of omitted characteristics (e.g., unobservable quality) that cause a startup to choose to appoint an early-stage non-executive director. The positive and significant coefficient on *IMR* in all columns indicate that these omitted characteristics also predict stronger future performance for the startup.

In Panel B we estimate the endogenous treatment regression model over the subsample of early-stage startups that appointed a non-executive director, and seek to understand how the future performance and exit strategies vary with the presence of an investor-director and other director characteristics. The results indicate that, among the startups that appoint an early-stage non-executive director, those that appoint investor-directors raise larger amounts in later stages (column (1)), are more likely to attract VC funding in later stages (column (2)), and are more likely to exit (column (3)) compared to similar startups that chose to appoint non-investors as early-stage non-executive directors. Interestingly, however, startups which appoint early-stage investor-directors are less likely to exit via IPO (column (4)) and develop fewer patents (column (5)) compared to similar startups that chose to appoint non-investors as early-stage non-executive directors. Once again, the positive and significant coefficients on *IMR* suggest that omitted characteristics that predict the appointment of an investor-director are positively correlated with future performance.

[17]For the regression in columns (1) and (2), we code the dependent variable as zero for startups that do not progress beyond series A. In unreported tests, we verify that early-stage startups which appoint non-executive directors are more likely to progress to series B, and that, conditional on surviving till series B, raise larger amounts and are more likely to attract VC funding in later stages. The sample size in column (4) is smaller because it only includes startups that eventually exit.

The coefficients on the director experience variables indicate that board experience has the the strongest correlation with later-stage funding outcomes and ability to attract VCs in later stages, and also correlates strongly with propensity to exit and patenting activity. M&A experience and IPO experience are also strongly correlated with the propensity to exit and the manner of exit: exit through IPO is more likely when the early-stage non-executive director has IPO experience but is less likely when the early-stage director has M&A experience. A possible explanation for this result is that startups strategically choose their early-stage non-executive directors depending on the intended type of exit, although this seems implausible because the average time taken for a Series A firm to exit via an IPO or M&A is 7.6 years and it would be difficult for startups to anticipate exit choices so far ahead. Finally, we find that patenting experience and IPO experience of early-stage non-executive directors are also associated with more patenting activity for the startup.

As we noted above, the results in Table 8 do not prove causality, and should only be seen as multivariate correlations between characteristics of early-stage non-executive directors and startups' future performance and exit strategies. However, it is important to emphasize that these results cannot be explained by differences in startups' observable characteristics, or the city, product market category, and year of founding, because our selection equation controls for these characteristics.

5. Conclusion

The extant literature on boards of directors highlights that non-executive directors are critical to the proper oversight of public corporations. However, we have a limited understanding of the boards of directors of companies at an early stage of development when they are still private, and may have just started professionalizing their boards. In this paper we focus on the role of non-executive directors at such companies, namely, early-stage startups.

Unlike public corporations, startups do not have to hire non-executive directors to satisfy regulatory mandates, and will do so only in response to specific governance needs. We seek to understand why and when early-stage startups hire non-executive directors, the skill sets they seek in their directors, and the specific channels through which they may benefit by hiring non-executive directors.

We use CrunchBase and AngelList to obtain information on startups, and combine these with LinkedIn and BoardEx to obtain information on non-executive director appointments and biographical information of directors. A key advantage of the data is that we can observe the timeline of key organizational changes: appointment of non-executive directors and executives, financing rounds and the investors that participate in them, and transition to new life-cycle stages. This allows us to understand not only the endogenous matching between startups and non-executive directors, but also how non-executive directors use their social connections to attract new stakeholders to the startup.

We find that startups mainly seek non-executive directors with entrepreneurial experience, board experience, IPO and M&A experience, especially when the founder lacks these experiences. Founders and early-stage investors leverage their professional connections to attract non-executive directors, who are a scarce resource. In turn, early-stage non-executive directors benefit startups by leveraging their professional connections to attract new investors, new directors, outside top executives, and potential acquirers. Overall, early-stage startups with non-executive directors raise larger amounts in later-stage rounds, are more likely to attract VC funding, file more patents, and are more likely to exit successfully, especially through IPOs than similar startups without non-executive directors. Interestingly, however, startups whose early-stage investors serve as directors are more likely to exit via acquisition rather than IPO, and file fewer patents than similar startups with non-investor directors.

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Table 1 Distribution of Startups

This table provides a breakdown of our sample by product-market category (using the definitions provided by CrunchBase) and city for the top 10 product market categories and cities, respectively. The sample includes 44,815 startups that were founded between 1990 to 2015 and have survived till the series A stage.

Product Market Category	Startups	% of Total Sample	City	Startups	% of Total Sample
Biotechnology	4392	9.80	San Francisco	3993	8.91
Health Care	2926	6.53	New York	3602	8.04
Hardware	2675	5.97	Austin	998	2.23
Commerce and Shopping	2653	5.92	Seattle	916	2.04
Software	2535	5.66	Boston	913	2.04
Data and Analytics	2257	5.04	San Diego	865	1.93
Internet Services	2134	4.76	San Jose	780	1.74
Information Technology	1968	4.39	Palo Alto	760	1.70
Financial Services	1799	4.01	Mountain View	746	1.66
Advertising	1609	3.59	Chicago	742	1.66
Total	24948	55.67		14315	31.94

Table 2 Descriptive Statistics and Director Appointment Stages

Panel A of this table presents the summary statistics for the key variables used in our analysis. Each observation corresponds to a startup. The sample includes 44,815 startups that were founded between 1990 to 2015 and have survived till the series A stage. All variables are defined in the Appendix.

Panel B reports the number of startups that appoint their first non-executive director at each financing stage (column (2)), and whether the non-executive director is also an investor (column (3)). We scale the number in each cell by the total number of startups in the sample (44,815) and report the percentage in parentheses.

Panel C reports the cumulative number of startups at each stage that have appointed non-executive director, regardless of the stage at which the non-executive director is appointed. The numbers in parentheses denote the fraction of surviving firms at that stage that have a non-executive director (column (2)) and an investor as director (column (3)).

Variable	Mean	SD	p25	p50	p75	N
Early-stage Startup Characteristics						
Serial Entrepreneur	0.06	0.24	0.00	0.00	0.00	44815
Connected Founder & Early Investor	0.22	0.41	0.00	0.00	0.00	44815
Early-stage Funds	7.98	18.01	0.05	2.20	7.50	44815
VC in Early-stages	0.54	0.50	0.00	1.00	1.00	44815
Age at Series A	5.66	5.32	1.44	4.33	9.50	44815
Later-stage Outcomes						
Survived till Series B	0.33	0.47	0.00	0.00	1.00	44815
Later-stage Funds	31.63	52.43	4.25	14.00	35.65	14748
VC in Later-stages	0.70	0.46	0.00	1.00	1.00	14748
Exit	0.18	0.38	0.00	0.00	0.00	44815
Acquired	0.79	0.41	1.00	1.00	1.00	7944
IPO	0.21	0.41	0.00	0.00	0.00	7944
NE Director Characteristics						
Early NE Director	0.31	0.46	0.00	0.00	1.00	44815
Investor as Early NE Director	0.35	0.48	0.00	0.00	1.00	13673
No. of NE Directors	3.27	3.97	1.00	2.00	4.00	13673
Connected Founder & Early NE Director	0.36	0.46	0.00	0.00	1.00	13673
Connected Early Investor & Early NE Director	0.28	0.38	0.00	0.00	0.50	13673
Early NE Director Expertise						
Entrepreneurial Experience	0.15	0.28	0.00	0.00	0.20	13673
Board Experience	0.58	0.41	0.14	0.60	1.00	13673
C-suite Experience	0.07	0.20	0.00	0.00	0.00	13673
Other Professional Experience	0.06	0.19	0.00	0.00	0.00	13673
Patent Experience	0.21	0.32	0.00	0.00	0.33	13673
IPO Experience	0.31	0.46	0.00	0.00	1.00	13673
M&A Experience	0.59	0.49	0.00	1.00	1.00	13673
Director Experience Index	1.20	0.69	1.00	1.00	1.67	13673
Experience Distance	0.44	0.22	0.33	0.48	0.58	13673

Panel B: Stage at which first non-executive director is appointed

Stage	Startups surviving	NE Director=1	Investor as NE Director=1
Early	44815 (1.000)	13673 (0.305)	4826 (0.108)
Growth	14748 (0.329)	3777 (0.084)	2011 (0.045)
Late	10624 (0.237)	3043 (0.068)	1752 (0.039)

Panel C: Stage-wise breakup of startups with non-executive directors

Stage	Startups surviving	NE Director=1	Investor as NE Director=1
Early	44815	13673 (0.305)	4826 (0.108)
Growth	14748	8304 (0.563)	4513 (0.306)
Late	10624	7163 (0.674)	4151 (0.391)

Table 3 Propensity to Appoint Early Non-executive Directors

This table reports results of linear probability regressions aimed at understanding how the propensity to appoint non-executive directors varies with startup characteristics. The dependent variable in columns (1) and (2) is *Early NE Director*, which is a dummy variable that identifies startups that appointed a non-executive director in early-stages. The dependent variable in columns (3) and (4) is *Investor as Early NE Director*, which is a dummy variable that identifies startups that appoint one of their early-stage investors as early non-executive director. The sample in columns (3) and (4) only includes startups that appointed an early-stage non-executive director. All regressions include fixed effects for the startups' founding year, product market and city. The standard errors (reported in parentheses) are heteroskedasticity robust. All variable are defined in the Appendix.

	Early NE Director		Investor as Early NE Director	
	(1)	(2)	(3)	(4)
Ln(1+Director Demand)		-0.095***		0.043***
		(0.007)		(0.009)
Ln(1+Director Supply)		0.043***		-0.019***
		(0.003)		(0.004)
Connected Founder & Early Investor	0.354***	0.330***	0.364***	0.369***
	(0.020)	(0.020)	(0.013)	(0.012)
Startup Characteristics				
Ln(1+Age at Series A)	0.031***	0.031***	-0.061***	-0.061***
	(0.003)	(0.004)	(0.007)	(0.006)
Ln(1+Early-stage Funds)	0.060***	0.060***	0.021***	0.021***
	(0.005)	(0.005)	(0.007)	(0.006)
VC in Early-stages	0.134***	0.132***	0.061***	0.062***
	(0.007)	(0.007)	(0.013)	(0.013)
Obs.	44815	44815	13673	13673
Adj. R^2	0.262	0.278	0.231	0.234
Sample	Full	Full	Full	Full
Founded Yr, Prod. Market, City F.E.	Yes	Yes	Yes	Yes
Sample	Full		Early Director=1	

Table 4 Matching between Startups and non-executive directors

This table reports the results of regressions aimed at understanding the factors that determine the two-sided matching between startups and non-executive directors. The unit of observation is a startup-director pair. The sample used in these regressions contain the observed startup-director pair and control pairs created using the process outlined in section 3.2. Note that we create matched samples for non-executive director appointments at the early, growth, and late stages.
We examine the effect of social connections in Panel A, the effect of director experience in Panel B, and the effect of the matching of director experience and founder experience in Panel C. The regressions in each panel control for variables presented in the previous panel and startup characteristics from Table 3, although we suppress these coefficients to conserve space. We include fixed effects for the actual startup-director pair in all regressions. Standard errors (reported in parentheses) are robust to heteroskedasticity and clustered at product market level. We use ***, **, and * to denote statistical significance at 1%, 5% and 10% levels, respectively. All variable are defined in the Appendix.

Panel A: Effect of social connections

	Early-stage NE Director	Growth-stage NE Director	Late-stage NE Director
	(1)	(2)	(3)
Investor	0.076***	0.118***	0.144***
	(0.004)	(0.003)	(0.005)
Network Connections			
Connected to Founder			
Education Channel	-0.007	-0.005	-0.022
	(0.006)	(0.004)	(0.019)
Work Channel	0.089***	0.093***	0.104***
	(0.002)	(0.003)	(0.005)
Connected to Investor			
Education Channel	0.007***	0.005**	0.005
	(0.002)	(0.002)	(0.003)
Work Channel	0.081***	0.040***	0.041***
	(0.004)	(0.005)	(0.006)
Connected to Early NE Director			
Education Channel		0.016**	0.002
		(0.007)	(0.005)
Work Channel		0.081***	0.128***
		(0.005)	(0.006)
Obs.	319493	39761	14083
Adj. R^2	0.467	0.581	0.468
Startup Controls	Yes	Yes	Yes
Group F.E.	Yes	Yes	Yes

Panel B: Effect of director experience

	Early-stage NE Director		Growth-stage NE Director	Late-stage NE Director
	(1)	(2)	(3)	(4)
Experience				
Entrepreneurial Exp.	0.027***	0.025***	0.044***	0.028***
	(0.002)	(0.002)	(0.004)	(0.003)
Board Exp.	0.041***			
	(0.001)			
Public		0.022***	0.066***	0.085***
		(0.002)	(0.009)	(0.008)
Private		0.056***	0.036***	-0.028
		(0.001)	(0.005)	(0.021)
C-suite Exp.	-0.000			
	(0.002)			
Public		-0.001	0.041	0.162*
		(0.002)	(0.149)	(0.084)
Private		0.004	0.020	0.081
		(0.010)	(0.040)	(0.170)
Other Professional Exp.	0.010***			
	(0.002)			
Public		0.013***	0.018*	0.029***
		(0.003)	(0.010)	(0.006)
Private		0.004*	0.007	0.011
		(0.002)	(0.006)	(0.008)
Patent Exp.	0.028**	0.031**	-0.002	0.004
	(0.014)	(0.014)	(0.003)	(0.005)
M&A Exp.	0.015***	0.013***	0.017***	0.010***
	(0.001)	(0.001)	(0.002)	(0.002)
IPO Exp.	0.016***	0.014***	0.010***	0.020***
	(0.001)	(0.002)	(0.002)	(0.004)
Obs.	319493	319493	39761	14083
Adj. R^2	0.512	0.512	0.606	0.518
Startup F.E.	Yes	Yes	Yes	Yes
Group F.E.	Yes	Yes	Yes	Yes
Connection Controls	Yes	Yes	Yes	Yes

Panel C: Effect of experience distance between founders and directors

	Early-stage NE Director		Growth-stage NE Director	Late-stage NE Director
	(1)	(2)	(3)	(4)
Experience Vector Distance				
Experience Distance	0.103***			
	(0.028)			
Entrepreneurial Exp. Distance		0.053***	0.019***	0.002*
		(0.006)	(0.003)	(0.001)
Board Exp. Distance		0.060***	0.088***	0.128***
		(0.007)	(0.030)	(0.035)
C-suite Exp. Distance		-0.010	0.009***	0.026**
		(0.008)	(0.001)	(0.011)
Other Prof. Exp. Distance		0.085**	0.018***	0.091
		(0.037)	(0.003)	(0.111)
Patent Exp. Distance		-0.018***	-0.002	-0.003
		(0.003)	(0.004)	(0.004)
M&A Exp. Distance		0.002	0.004	0.085***
		(0.002)	(0.018)	(0.031)
IPO Exp. Distance		0.000	0.013	0.137***
		(0.002)	(0.014)	(0.022)
Obs.	319493	319493	39761	14083
Adj. R^2	0.577	0.578	0.631	0.552
Startup F.E.	Yes	Yes	Yes	Yes
Group F.E.	Yes	Yes	Yes	Yes
Connection Controls	Yes	Yes	Yes	Yes
Experience Controls	Yes	Yes	Yes	Yes

Table 5 Early-Stage Non-executive Directors and Later-Stage Investors

This table reports results of regressions aimed at understanding how two-sided matching between startups and later-stage investors is affected by early-stage directors. The unit of observation is a startup-investor pair. The sample used in these regressions contain the observed startup-investor pair and control pairs created using the process outlined in section 4.1. We then estimate linear probability regressions on the matched sample, where the dependent variable is a dummy variable that identifies the actual startup-investor pair.
The dummy variables under *'Later-stage Investor is connected to'* indicate whether a (potential) later-stage investor is connected to a startup's early non-executive directors, founders or early-stage investors. We control for startup characteristics from Table 3 in all specifications (but suppress the coefficients to conserve space), and include fixed effects for the actual startup-director pair. Standard errors (reported in parentheses) are heteroskedasticity robust and clustered at product market level. We use ***, **, and * to denote statistical significance at 1%, 5% and 10% levels, respectively. All variable are defined in the Appendix.

	Later-stage Investment			
	(1)	(2)	(3)	(4)
Early NE Director	0.115***			
	(0.020)			
Investor as Early NE Director		0.079***	0.072***	
		(0.020)	(0.020)	
Later-stage Investor is connected to:				
Early NE Director		0.074***		
		(0.010)		
Early NE Director Connection Channels				
Co-Investor			0.069***	0.031
			(0.023)	(0.020)
Co-Director			0.048**	0.076***
			(0.022)	(0.019)
Co-Founder			0.058	0.061***
			(0.049)	(0.022)
Past Investor/Director			0.082***	0.069***
			(0.023)	(0.021)
Employment			0.037***	0.042**
			(0.015)	(0.019)
Education			0.032	0.031
			(0.020)	(0.019)
Founder	0.027***	0.037***	0.035***	0.041***
	(0.004)	(0.007)	(0.008)	(0.016)
Early Investor	0.099***	0.094***	0.094***	0.032*
	(0.011)	(0.011)	(0.011)	(0.018)
Obs.	121371	57916	57916	38225
Adj. R^2	0.411	0.435	0.435	0.451
Startup & Director Exp. Controls	Yes	Yes	Yes	Yes
Group F.E.	Yes	Yes	Yes	Yes
Matched Sample		Early NE Director=1		Early NE Director=1 & Investor as Early NE Director=0

Table 6 Early-Stage Non-executive Directors and Outside CEO/C-suite Executive Appointments

This table reports the results of regressions aimed at understanding the impact of early director's connections on attracting outside CEOs/Executives. The unit of observation is a startup-(Potential) CEO/Executive pair. We estimate linear probability regressions on a sample that contains the observed startup-CEO/Executive pair and control pairs created using the process outlined in section 4.2. The dependent variable is a dummy variable that identifies the actual startup-CEO pair in columns (1)-(4). In columns (5)-(8), the dependent variable identifies outside C-suite executive appointments.
The dummy variables under *'Outside CEO/Exec. is connected to'* indicate whether a (potential) outside CEO/Executive is connected to a startup's early non-executive directors, founders or early-stage investors. We control for the startup characteristics from Table 3 in all specifications (but suppress the coefficients to conserve space), and also include fixed effects for the actual startup-director pair. Standard errors (reported in parentheses) are robust to heteroskedasticity and clustered at product market level. We use ***, **, and * to denote statistical significance at 1%, 5% and 10% levels, respectively. All variable are defined in the Appendix.

	Outside CEO				Outside C-suite Executive			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Early NE Director	0.052**				0.046**			
	(0.023)				(0.020)			
Investor as Early NE Director		0.038**	0.036***			0.024**	0.024**	
		(0.017)	(0.015)			(0.011)	(0.010)	
Outside CEO/Exec. is connected to:								
Early NE Director		0.023**				0.037**		
		(0.011)				(0.017)		
Early NE Director Connection Channels								
Co-Founders			0.008	0.042**			0.019*	0.032**
			(0.017)	(0.020)			(0.010)	(0.015)
Co-Directors			0.024**	0.051***			0.028***	0.043***
			(0.011)	(0.018)			(0.011)	(0.017)
Co-Investors			0.022	0.022			0.010	0.006
			(0.024)	(0.016)			(0.012)	(0.018)
Past Investor/Director			0.026	0.031*			0.016	0.021
			(0.019)	(0.017)			(0.015)	(0.016)
Employment			0.047***	0.068***			0.042**	0.057***
			(0.018)	(0.022)			(0.020)	(0.020)
Education			0.009*	0.017			0.020	0.029
			(0.004)	(0.021)			(0.018)	(0.018)
Founder	-0.011	-0.003*	-0.004*	-0.010	-0.009	-0.006	-0.009	-0.015
	(0.009)	(0.002)	(0.002)	(0.019)	(0.008)	(0.009)	(0.011)	(0.017)
Early Investor	-0.016	-0.011*	-0.011*	-0.017	-0.014	-0.020	-0.020	-0.025
	(0.012)	(0.006)	(0.006)	(0.018)	(0.013)	(0.016)	(0.015)	(0.019)
Obs.	25295	19689	19689	12402	21945	13536	13536	8388
Adj. R^2	0.094	0.124	0.122	0.138	0.096	0.138	0.138	0.145
Startup & Dir. Exp. Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Group F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Matched Sample		Early NE Director=1		Early NE Director=1 Investor as Early NE Director=0		Early NE Director=1		Early NE Director=1 Investor as Early NE Director=0

Table 7 Early-Stage Non-executive Director and Potential Acquirers

This table reports the results of regressions aimed at understanding the impact of early directors' connections on attracting potential acquirers. The unit of observation is Target-(Potential) Acquirer. We estimate linear probability regressions on a sample that contains the observed Target-Acquirer pair and control pairs created using the process outlined in section 4.3. The dependent variable *Acquired* is a dummy variable that identifies the actual startup-acquirer pair.
The dummy variables under *'Acquirer is connected to'* indicate whether an (potential) acquirer is connected to a startup's early non-executive directors, founders or early-stage investors. We control for the startup characteristics from Table 3 in all specifications (but suppress the coefficients to conserve space), and also include fixed effects for the actual target-acquirer pair. Standard errors (reported in parentheses) are robust to heteroskedasticity and clustered at product market level. We use ***, **, and * to denote statistical significance at 1%, 5% and 10% levels, respectively. All variable are defined in the Appendix.

	Acquired			
	(1)	(2)	(3)	(4)
Early NE Director	0.003			
	(0.009)			
Investor as Early NE Director		0.051***	0.052***	
		(0.017)	(0.017)	
Acquirer is connected to:				
Early NE Director		0.095***		
		(0.016)		
Early NE Director Connection Channels				
Worked at Acquirer			0.129***	0.138***
			(0.022)	(0.023)
Past Founder/Investor/Director			0.054***	0.037*
			(0.019)	(0.021)
Employment			0.085***	0.101***
			(0.018)	(0.022)
Education			0.034*	0.039*
			(0.019)	(0.020)
Founder	0.313***	0.319***	0.282***	0.201***
	(0.013)	(0.020)	(0.020)	(0.023)
Early Investor	0.046***	-0.003	-0.012	0.010
	(0.008)	(0.015)	(0.015)	(0.021)
Obs.	30404	12303	12303	7829
Adj. R^2	0.055	0.072	0.037	0.065
Startup & Director Exp. Controls	Yes	Yes	Yes	Yes
Founded Yr, City and Deal F.E.	Yes	Yes	Yes	Yes
Matched Sample		Early NE Director=1		Early NE Director=1 Investor as Early NE Director=0

Table 8 Early-Stage Non-executive Director and Startup Performance: Endogenous Treatment Regressions

Panel A reports the results of 2-stage endogenous treatment regressions, discussed in section 4.4, aimed at understanding the effect of early-stage non-executive directors on startups' future performance and exit strategies. Panel B reports the results of 2-stage endogenous treatment regressions aimed at understanding the effect of non-executive investor-directors on startups' future performance and exit strategies, for the subset of startups that appointed an early-stage non-executive director (i.e., startups with *Early NE Director*= 1).
We suppress the results of the first-stage probit regressions to conserve space and only report the results of second-stage regressions for the various outcome variables. We control for startup characteristics from Table 3 in all specifications (but suppress the coefficients to conserve space), and include fixed effects for startups' founding year, product market, and city. Standard errors (reported in parentheses) are robust to heteroskedasticity and are clustered at the product market level. We use ***, **, and * to denote statistical significance at the 1%, 5%, and 10% levels, respectively. All variable are defined in the Appendix.

Panel A: Effect of Early NE Director

	(1) Ln(1+Later-stage Funds)	(2) VC in Later-stages	(3) Exit	(4) IPO	(5) Ln(1+# Patents)
$\widehat{Early\ NE\ Director}$	0.135***	0.051**	0.039***	0.060**	0.120*
	(0.040)	(0.020)	(0.004)	(0.027)	(0.058)
Connected Founder & Early Investor	0.301***	0.160***	-0.009***	0.055*	0.095***
	(0.077)	(0.011)	(0.002)	(0.033)	(0.031)
Inverse Mills Ratio	0.252***	0.036***	0.015***	0.083*	0.090**
	(0.082)	(0.012)	(0.002)	(0.046)	(0.036)
Obs.	44815	44815	44815	7940	44815
$(\beta = 0), \chi^2$	28954.756	26943.275	17128.548	4498.713	18567.102
$(\beta = 0), p - val$	0.000	0.000	0.000	0.000	0.000
Startup Controls	Yes	Yes	Yes	Yes	Yes
Founded Yr, Prod. Market, City F.E.	Yes	Yes	Yes	Yes	Yes
Sample	Full			Success=1	Full

Panel B: Effect of Investor as Early NE Director

	(1) Ln(1+Later-stage Funds)	(2) VC in Later-stages	(3) Exit	(4) IPO	(5) Ln(1+# Patents)
Investor as $\widehat{Early}$ NE Director	0.213***	0.058**	0.069**	-0.059***	-0.171***
	(0.067)	(0.027)	(0.031)	(0.012)	(0.052)
Connected Founder & Early NE Director	0.265***	0.039***	-0.011	0.052*	0.360***
	(0.053)	(0.015)	(0.015)	(0.027)	(0.049)
Connected Founder & Early Investor	0.101***	0.038***	-0.002	0.016***	0.018*
	(0.010)	(0.003)	(0.003)	(0.005)	(0.010)
Early NE Director Expertise					
Entrepreneurial Exp.	0.048***	0.010***	0.015***	0.017**	0.020
	(0.013)	(0.004)	(0.004)	(0.006)	(0.012)
Board Exp.	0.339***	0.105***	0.039***	-0.007	0.027*
	(0.015)	(0.004)	(0.004)	(0.007)	(0.014)
C-suite Exp.	0.019	0.008*	0.021***	0.044***	0.008
	(0.016)	(0.004)	(0.004)	(0.007)	(0.014)
Other Professional Exp.	0.055***	0.015***	0.021***	0.034***	-0.002
	(0.017)	(0.005)	(0.005)	(0.008)	(0.016)
Patent Exp.	0.016	-0.005	0.003	0.022***	0.068***
	(0.012)	(0.004)	(0.004)	(0.006)	(0.012)
M&A Experience	-0.005	0.003*	0.042***	-0.052***	0.000
	(0.006)	(0.002)	(0.002)	(0.003)	(0.006)
IPO Experience	0.121***	0.021***	0.021***	0.113***	0.079***
	(0.016)	(0.005)	(0.005)	(0.006)	(0.015)
Experience Distance	0.017	0.006	0.041***	0.012*	-0.026
	(0.019)	(0.005)	(0.005)	(0.006)	(0.017)
Inverse Mills Ratio	0.324**	0.246***	0.113**	0.296***	0.783***
	(0.159)	(0.046)	(0.045)	(0.075)	(0.150)
Obs.	13673	13673	13673	3162	13673
$(\beta = 0), \chi^2$	13120.029	11101.546	8695.227	3362.895	6924.093
$(\beta = 0), p - val$	0.000	0.000	0.000	0.000	0.000
Startup Controls	Yes	Yes	Yes	Yes	Yes
Founded Yr, Prod. Market, City F.E.	Yes	Yes	Yes	Yes	Yes
Sample	Early NE Director=1			Early NE Director=1 &Success=1	Early NE Director=1

Appendix: Variable Definitions

Description of Startup Financing Stages

Startups raise funds at various stages of their life cycle. Industry participants classify these financing stages as *Seed*, *Series A*, *Series B*, *Series C*, and so on. The academic literature (e.g., see Gompers (1995)) sometimes refers to series A as "early stage," series B as "expansion stage," and series C and beyond as "late stage." The informal definitions of the these stages are as follows:[18]

- *Seed stage:* The purpose of the series seed is for the startup to figure out the product it is building, the market it is in, and the user base. Typically, a seed round helps the company scale to a few employees past the founders and to build and launch an early product.
- *Series A:* Startups that get to this stage have figured out their product and user base, and are trying to establish a viable business model and scale up their operations.
- *Series B:* Startups that reach this stage have an established product and business model, and are trying to scale up their business model and user base.
- *Series C:* This stage is used by startups to accelerate their growth beyond the Series B stage; e.g., by going international or by making acquisitions. Firms requiring more funds raise them in stages Series D, E, etc.

The startups disclose the financing stage when they raise funds, and this information is reported by CrunchBase and AngelList. Each financing stage may itself involve multiple funding rounds.

Startup Characteristics:

- *Serial Entrepreneur* is a binary variable that indicates whether at least one of the startup's founders has founded another startup in the past.
- *Early-stage Funds* is the total funds (in $ millions) raised by a startup in seed and series A rounds.

[18] See http://blog.eladgil.com/2011/03/how-funding-rounds-differ-seed-series.html for a more detailed description of these funding stages.

- *VC in Early-stages* is a binary variable that identifies whether a venture capitalist participated in the early-stage funding rounds of the startup.
- *Age at Series A* is the number of years from the startup's founding date to its first series A round.
- *Early NE Director* is a dummy variable that identifies whether the startup has appointed a non-executive (i.e., non-employee) director at the series A stage.
- *No. of NE Directors* is the total number of non-executive directors appointed by a startup start has reached Series A stage.
- *Investor as Early NE Director* is a dummy variable that identifies whether the startup has appointed one of its early-stage investors as a non-executive director at the series A stage.
- *Director Supply* is the number of "potential directors" that the startup may tap into, where potential directors include all individuals who have served as directors or C-suite executives at either public or private companies in the same city as the startup over the past 3 years.
- *Director Demand* is the number of startups at the series A stage or above in the same city as the startup that have not yet appointed a non-executive director.

Social Connections

We define a pair of individuals as connected if either of the following conditions is met: (a) the pair attended the same college or university during an overlapping time period ("Education Channel"); or (b) the pair either worked for the same employer during an overlapping time period or worked together on a previous startup venture ("Work Channel"). We use this definition to define the following *dummy* variables:

- *Connected Founder & Early Investor* identifies a connection between an early-stage investor and a startup's founders.
- *Connected Founder & Early NE Director* identifies a connection between an early-stage non-executive director and a startup's founders.

- *Connected Early Investor & Early NE Director* identifies a connection between an early non-executive director and any of the early-stage investors of a startup.
- *Connected to Early NE Director* identifies a connection between a later-stage non-executive director and any of the early-stage non-executive directors.

We also decompose each of the above dummy variables into two separate dummies to identify whether the connection is through an education channel or a work channel. Further, we create dummy variables that indicate whether a startup's (potential) Later-stage Investor is connected to the startup's Early NE Director, Founders and Early-stage Investors. We construct similar indicator variables for connections with (potential) New Outside CEOs, New Outside C-suite executives and acquirers.

Experience Measures:

- *Entrepreneurial Experience* indicates whether an individual has ever founded a startup.
- *Board Experience* indicates whether an individual has served as a director in a public or private firm. We decompose this into two dummy variables to separately identify board experience in public and private firms.
- *C-suite Experience* indicates whether an individual has executive experience at C-suite level in a public or private firm. To avoid double-counting, we exclude founder-CEOs of startups while constructing the C-suite experience dummy because their experience is already counted under entrepreneurial experience. We decompose C-Suite Experience into two dummy variables to separately identify executive experience in public and private firms.
- *Other Professional Experience* indicates whether an individual has professional experience in finance or law in a non-C-suite role. We consider an individual to have professional experience in finance if he has either served in a finance or accounting role, or holds a bachelors degree or higher in finance or accounting. Similarly, we consider an individual to have professional experience in law if he has either served in a legal role (e.g., General Counsel, Lawyer, IP Lawyer, etc.) or has a degree in law.
- *Patent Experience* indicates whether an individual has ever applied for a patent.

- *M&A Experience* indicates whether an individual has experience (either as a founder, investor or director) with a successful M&A transaction.
- *IPO Experience* indicates whether an individual has experience (either as a founder, investor or director) with taking a company public.
- *Experience Index* is the sum of the seven experience dummies defined above. It is a category variable that takes values from 0 to 7, where 0 denotes lack of experience and 7 denotes experience across all dimensions.
- *Experience Distance* is the normalized Euclidean vector distance between the experience vectors of the director and founder of a startup. If F and D denote the experience vectors of the founder and the director, respectively. *Experience Distance* between the founder and director is defined as $d(F, D) = \sqrt{\sum_{i=1}^{7}(F_i - D_i)^2}/\sqrt{7}$. Thus, *Experience Distance* takes values between 0 and 1, where 0 denotes that the two individuals have identical experience, and 1 denotes that their experiences are perfectly complementary.

Later-stage Outcomes:

- *Survived till Series B* is a dummy variable that identifies startups that successfully reached series B stage.
- *Later-stage Funds* is the total funds (in $ millions) raised by a startup in all later-stage rounds (i.e., series B and beyond).
- *VC in Later-Stages* is a dummy variable which indicates whether the startup was able to attract venture capital funding in later-stage rounds.
- *Exit* is a dummy variable to identify startups that successfully exit via an IPO or acquisition. The dummy variables *IPO* and *Acquisition* identify the mode of exit.

Executive changes and M&A Activity:

- *Outside CEO* identifies cases where a Founder-CEO is replaced with an outside CEO
- *Outside C-suite Executive* identifies cases where a new outside C-suite executive is appointed.
- *Acquired* identifies actual M&A deals that took place between a startup-acquirer pair.