Non-Executive Directors at Early-Stage Startups*

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Abstract

Most non-executive directors appointed by early-stage startups are not investors in the startup, and only a small fraction are venture capital (VC) directors. Non-investor and angel directors are more likely to be appointed when they possess experiences that founders lack; and leverage their professional connections to attract new investors, directors, top executives, and potential acquirers for startups. Among early-stage startups that appoint non-executive directors, those with investor-directors experience better later-stage funding outcomes and a higher likelihood of exit, but also file fewer patents and are more likely to exit via acquisitions rather than IPOs compared to similar startups with non-investor-directors.

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Introduction

Non-executive ("NE") directors are considered critical to the proper oversight of companies because of their role in monitoring and advising top managers.[1] While there is a large literature on the role of NE directors at public corporations, we know relatively little about their role at startup companies. Due to data limitations, the existing literature on startup boards has mostly focused on venture capital (VC) backed startups, and has highlighted the role played by VC directors in professionalizing their portfolio companies in preparation for exit (e.g, Lerner (1995); Baker and Gompers (2003); Amornsiripanitch, Gompers, and Xuan (2019)). However, as we show below, startups begin appointing NE directors at a much earlier stage of development – typically at the series A stage – and the vast majority of these directors are not investors in their startups. These early-stage startups are more likely to be funded by angel investors rather than VCs, face considerable uncertainty about survival till the series B stage and beyond, and are years away from exit assuming they survive till then. Their governance needs are likely very different from those of later-stage startups as they are more focused on establishing viable business models and managing growth, rather than preparing for an exit. Yet, we know little about the role played by NE directors at early-stage startups, especially the role of unaffiliated directors who are not investors in the startup and how they compare with investor-directors, such as angel directors and VC directors. Our paper fills this gap in the literature.

We document substantial heterogeneity across early-stage startups (defined as startups at the series A stage) both in terms of whether they appoint NE directors and the type of directors appointed. Only 34% of the startups in our sample appoint a NE director at

[1] See Adams, Hermalin, and Weisbach (2010) and Hermalin and Weisbach (2003) for surveys of the theoretical and empirical literature on boards of directors. NE directors may be either representatives of major shareholders and banks or independent directors who do not have a direct material relationship with the company.

the series A stage; and among these, only 37% appoint a director who is also an investor in the startup ("investor-director"), whereas the rest appoint unaffiliated directors who are not investors in the startup ("non-investor directors").[2] Thus, unlike in the past papers on startup boards, the vast majority of NE directors in our sample are non-investor directors, 23% are angel directors, and only 13% are VC directors.

Our analysis highlights two key factors that affect the matching between early-stage startups and NE directors: experience complementarity and network connections. First, an individual is more likely to be appointed NE director to an early-stage startup when he possesses experiences that the founders lack; and this effect is stronger in the case of non-investor directors compared to investor-directors. Non-investor directors and investor-directors also differ substantially in their past experience profiles, which suggests that they meet different governance needs: non-investor directors are more likely than investor-directors to possess entrepreneurial experience, board experience, C-suite experience, and patenting experience, whereas investor-directors are more likely than non-investor directors to possess IPO experience and M&A experience. Second, an individual is more likely to be appointed NE director to an early-stage startup if he has a past professional connection with the startup's founder or early-stage investors; and this effect is also stronger in the case of non-investor directors compared to investor-directors. Taken together, these findings suggest that NE directors play an important role in advising and guiding the founders of early-stage startups, and this is especially true for non-investor directors compared to investor-directors.

Next, we show that early NE directors use their network connections to attract key future stakeholders to the startup: new later-stage (i.e., series B and beyond) investors, outside

[2]The investor-directors could be either individual investors or executives of institutional investors, such as a VC fund or angel group. To account for the possibility that some investors simultaneously negotiate investment terms and board seats and take up a board seat prior to the investment date, we classify a director as an investor-director if the time between his appointment date and a future investment round is less than or equal to 180 days. Anecdotal evidence suggests that some non-investor directors receive sweat equity from the startup as part of their compensation, but the crucial distinction is that they have not invested in the startup either prior to or in conjunction with their appointment as directors.

CEOs and C-suite executives to serve in the startup, later-stage directors, and potential acquirers in case of M&A exits. Specifically, for each category of stakeholders, we show that the startup-stakeholder match is more likely when the stakeholder shares a past professional connection with the startup's early NE directors which was formed either by collaborating on a previous startup or by working together for the same employer; and this effect holds after controlling for the stakeholder's connections with the startup's founders and early-stage investors. On the other hand, educational connections between the stakeholder and early NE directors have no effect on the startup-stakeholder match, which contrasts with the importance of educational connections documented in other studies (e.g., Bhagwat (2013); Gompers, Mukharlyamov, and Xuan (2016)). We also show that the startups' ability to attract key future stakeholders is positively related to the complementary experiences of early NE directors (i.e., experience gaps of founders that are filled by early NE directors). While the past literature has highlighted the role of VCs and VC directors in professionalizing startups (e.g., Amornsiripanitch et al. (2019); Bottazzi, Da Rin, and Hellmann (2008); Hellmann and Puri (2002)), we show that early-stage non-investor directors and angel directors play an equally important role.

Identifying the causal effect of early NE directors on the future performance and exit strategies of their startups ideally requires an exogenous event or shock that causes random variation in the appointment of early NE directors. Because no such event exists, we follow the instrumental variables regression approach in Knyazeva, Knyazeva, and Masulis (2013) to test this relation. Specifically, we use the local supply of directors as an instrument for the likelihood of appointing early NE directors, and examine the consequent effects on the future performance and exit strategies of the startups, after accounting for unobserved heterogeneity through granular fixed effects. We show that early-stage startups that appoint NE directors experience better later-stage funding outcomes (i.e., larger amounts and a higher likelihood of 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 early-stage startups that appoint NE directors, those with investor-directors experience better later-stage funding outcomes and a higher likelihood of exit, but also file fewer patents and are more likely to exit via acquisitions rather than IPOs compared to similar startups with non-investor-directors.[3] These differences between non-investor directors and investor-directors suggest that non-investor directors may be more aligned with the interests of founders who value patenting and remaining independent through an IPO.

Our paper contributes to the small but growing literature on the role of directors at startup companies. While many papers feature small sample sizes (Lerner (1995)) or only examine boards of VC-backed startups at IPO (Baker and Gompers (2003); Hochberg (2012); Larcker and Tayan (2018)), two recent papers examine the boards of much larger samples of VC-backed startups prior to exit. Using a sample of over 20,000 domestic and international VC-backed startups, Amornsiripanitch et al. (2019) show that VC directors use their connections formed from past startup investments to help recruit managers and board members for their current startups, and help in "relationship-based acquisitions" (i.e., acquisitions in which the startup is acquired by a company that was previously funded by the same VC). Ewens and Malenko (2022) examine how the board size and composition of around 7,200 VC-backed startups vary over the startup's life cycle, and suggest that non-VC directors play a mediation role between VCs and entrepreneurs.

We contribute to this literature by examining the role of NE directors – especially non-investor directors and angel directors – in startups at a much earlier stage of development, namely the series A stage, at which startups typically begin the process of professionalizing their boards. We highlight important differences between non-investor directors, VC direc-

[3]This is reminiscent of the result in Cumming (2008) that stronger 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.

tors, and angel directors both in terms of their experience profiles and how they contribute to their startups. Given our focus on non-investor directors, we also consider a wider set of network connections than Amornsiripanitch et al. (2019): while they only examine connections formed by VCs through their past investments in startups, we separately consider the effects of educational connections, professional connections formed by collaborating on a previous startup (e.g., as co-investors, co-directors, or as investor and director), and professional connections formed by working together for the same employer.

Our startup sample is not only larger than those in prior studies but also provides a much wider coverage of early-stage startups that are not funded by VCs.[4] Our primary data source is CrunchBase (www.crunchbase.com), which is the largest crowd-sourced database on startups. We augment this using AngelList (angel.co), which is the leading online fundraising platform for startups. Apart from information on startups and their investors, 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 data sources, we obtain a sample of 30,205 startups at the series A stage, whose future progress we are able to track, and for which we are able to identify the year of appointment for each director-startup combination. Our data also allow us to develop a rich measure of director experience profiles along multiple dimensions, and to identify the professional connections and educational connections that directors share with startup founders, startup investors, and outside executives.

While there has been a great deal of empirical work on the role of directors and their effects on firm performance, there is little empirical work characterizing why firms match with specific directors.[5] Although many papers examine specific attributes of directors, with

[4] Although startups and VCs are often linked in the public eye, most early-stage startups lack access to VC financing (Ewens, Nanda, and Rhodes-Kropf (2018)). Yet, with a few notable exceptions like Puri and Zarutskie (2012), non-VC backed startups have received very limited attention in the literature.

[5] The effects of outside/independent directors on performance of public corporations are hotly debated in the literature (e.g., see Duchin, Matsusaka, and Ozbas (2010); Nguyen and Nielsen (2010); Bhagat and

the exception of Adams, Akyol, and Verwijmeren (2018), the literature has little to say about which director skill sets matter for director appointments.[6] In general, with the exception of Hochberg, Lindsey, and Westerfield (2015), there is little empirical work characterizing how economic ties are formed. We contribute to the extant literature by highlighting the factors that affect the startup-director match, and the role played by NE directors in the matching between startups and other key stakeholders.

1. Data and Sample Collection

1.1. Data Sources

Startups, Investors and Directors: We assemble a unique database of directors for a large sample of early-stage startups by combining multiple data sources. To conserve space we relegate the details of the sample construction process to Section IA.2 ("Data Appendix") of the Online Appendix, and provide a quick overview in this section.

Our primary data source is CrunchBase (www.crunchbase.com; henceforth "CB"), which is the largest crowd-sourced database on startups. 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, the identity of investors who participated in various financing rounds, and board members. A representative snapshot of the information available for Uber is available at https://www.crunchbase.com/organization/uber.

We augment information from CB using AngelList (angel.co; henceforth "AL"), which

Bolton (2013); Knyazeva et al. (2013)).

[6]The literature has examined the effects of specific director attributes, such as venture capital expertise (Iliev and Lowry (2020)), executive experience (Fich (2005); Fahlenbrach, Low, and Stulz (2010)), acquisition experience (Field and Mkrtchyan (2017)), financial expertise (Guner, Malmendier, and Tate (2008)), etc.

is the leading online fund-raising platform for startups. Similar to CB, AL also provides data on the fund-raising activity of startups and biographical information of founders, investors, and directors. Although there is significant overlap (about 75%) between CB and AL, each data set has some information that may not be available in the other. 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. Thus, our sample is based on the *union* of these two databases after the elimination of duplicates.

CB and AL identify the individuals who serve as directors on the boards of startups and provide the LinkedIn profile links of these individuals. For 87.4% of directors in our sample, the combination of CB and AL also provides information on the year of appointment for each director-startup combination, and biographical information for the directors, such as their location, past work experience, past director appointments, and education. If some of this information is missing in CB and AL, we attempt to fill the gaps by scraping the LinkedIn profiles of the directors. Only a very small subset of directors in our sample match with the BoardEx North America file, because BoardEx's coverage is skewed toward directors at large public and private companies. In such cases, we find that most of the biographical information in BoardEx is already available through the combination of CB, AL and LinkedIn, which provides validation of the accuracy of these data sources. However, in a few cases, BoardEx contained additional information on non-profit affiliations of some of the directors in our sample. Table IA.2.1 in the Online Appendix provides a detailed breakup of how we collect director information from these different sources.

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 match the names of companies, founders, investors, and directors in our startup database

with the names of assignees, inventors, and lawyers in the patent database. To increase the accuracy of matching, we require that the individual be listed as being in the same state during the same year in both databases.

1.2. Sample Selection

We restrict attention to startups that survive till the series A stage, because this is the stage at which startups begin focusing on establishing a viable business model to scale up their operations, and this process may also involve professionalizing the company's board of directors by hiring NE directors. Indeed, most startups in our sample that appoint NE directors do so at the series A stage or after. We also restrict attention to startups founded in or after 2005, the year in which CB's parent company TechCrunch came into existence, because of potential concerns about back-filling bias in the pre-2005 data.[7] Finally, to be included in our sample, we require information on fundraising dates and amounts, the year of appointment of directors (if any), and the identities and biographical profiles of founders, investors, and directors. 30,205 early-stage startups satisfy all these conditions. Section IA.2 in the Online Appendix provides more details on the attrition at various stages of the sample selection and filtration process.

In Table 1, we provide a breakdown of our sample by "product-market" category (using the definitions provided by CB) and city for the top 10 product market categories and cities, respectively. The top 10 cities account for 34% of the startups, and as expected, many cities in the San Francisco Bay Area feature in this list.

[7]The concern is that CB is more likely to back-fill data for successful startups compared to failed ones, which would bias our pre-2005 sample. Hence, although CB covers startups founded as early as 1990, we exclude startups founded before 2005 from our analysis. In a previous version of the paper, we verified that all our results are robust to the inclusion of startups founded before 2005.

1.3. Data Coverage and Limitations

Obtaining detailed information on early-stage startups and their investors and directors is challenging because such information is not readily available from commercial databases. We overcome this problem by hand-collecting data from multiple sources, but this naturally leads to concerns about sample selection bias. Specifically, given the crowd-sourced nature of CB and AL, we are more likely to observe the director appointments and financing activities for the more successful or popular startups, which may bias our findings regarding the effects of directors on startup performance. As detailed in Section IA.2 of the Online Appendix, we are forced to drop many startups due to missing information on fundraising amounts and amounts, and the identities of investors. We are also likely to miss director appointments that were never publicly disclosed or advertised by either the startup or the director. However, as noted above, we are able to find the biographical profiles of almost all the directors and investors identified in our data.

Although sample selection bias is a serious concern, the direction of the bias for our results is not a priori obvious. For instance, consider the role of directors in leveraging their network connections to attract future stakeholders to their startups. We may overstate the true effect because our sample is more likely to include well-networked directors. On the other hand, we may understate the true effect because our sample excludes less visible startups that are more likely to benefit from their directors' networks. Unfortunately, we cannot eliminate sample selection bias because there is no database that provides complete coverage of startups and their investors and directors. In general, sample selection bias is a major concern for all empirical research in entrepreneurial finance, because all the available databases, including well-known databases in VC research, suffer from this problem (see Kaplan and Lerner (2017)).

Despite these concerns, CB provides more comprehensive coverage of early-stage startups

compared to other data sources because it collects and authenticates data through multiple channels: crowd-sourcing from more than 80,000 contributors (Freytag (2014)); partnerships with more than 3,600 VCs, accelerators and incubators (Crunchbase (2018)); and by capturing information from Form D filings, news articles and industry announcements. In contrast, commercially available databases– such as Refinitv (SDC VentureXpert), Burgiss, and PitchBook– collect data from a smaller sample of limited/general VC fund partners. One well-known bias with CB is that its coverage is tilted toward startups in technology-oriented industries (because CB started as the data collection arm of TechCrunch), but this is an important sliver of the market for which it provides better coverage than other databases.[8] By combining CB with other data sources like AL, information scraped from LinkedIn profile pages, and BoardEx, we are able to track the financing activities and board formation in a large sample of early-stage startups at a granular level that was not previously possible.

Our sample is significantly larger and provides a wider coverage of early-stage startups that are not funded by VCs compared to those in recent studies on startup boards. In particular, Amornsiripanitch et al. (2019) rely on VentureSource which only covers VC-backed startups and VC directors; and Ewens and Malenko (2022) rely on SEC Form D filings which are only one of the many sources from which CB collects its information. Because CB uses a variety of other sources in addition to Form D filings, it is likely to capture information on financing rounds and director appointments even when such information is not disclosed in Form D filings. As we detail in Section IA.2 in the Online Appendix, over the 2009–2015 period during which Form D filings are available in machine-readable format, we are able to capture director information for 7,857 startups whereas Form D filings only capture this information for 2,211 of these startups.[9] Our data also allow us to develop a rich measure

[8] Block and Sandner (2009) and Wu (2016) compare CB with hand-collected data on startup creation in technology-oriented industries, and find that it captures more than 90% of startups.

[9] Although startups are required to notify the SEC through Form D filings when they make a private offering of securities, in practice, startups can claim a variety of exceptions to avoid filing Form D. One of the more commonly used methods is section 4(a)(2) under Rule 506b, commonly referred to as the 'private place-

of director experience profiles along multiple dimensions, and to identify the professional connections and educational connections that directors share with startup founders, startup investors, and outside executives.

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 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.

NE directors may be classified into two broad categories: "investor-directors" who are also investors in their startup; and "non-investor directors" who are not investors in their startup. To identify investor-directors, we name-match each NE 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 have already invested in the startup, such as VC funds or angel groups. To account for the possibility that some investors simultaneously negotiate investment terms and board seats and take up a board seat prior to the investment date, we classify a director as an investor-director if the time between his appointment date and a future investment round is less than or equal to 180 days.

ment' exemption, where all investors are deemed as sophisticated investors and have access to information that would normally be available in a prospectus (see Ewens and Malenko (2022) for more information). Similarly, startups that raise funds within a single state– e.g., California startups raising funds within California– are exempt from the Form D requirement (see https://www.sec.gov/smallbusiness/exemptofferings/exemptofferingschart). Industry analysts have also noted that penalties for non-compliance with the Form D requirement are low, which explains the declining trend in Form D filings (e.g., see the article titled *"The disappearing Form D"*: https://techcrunch.com/2018/11/07/the-disappearing-form-d/). Even for startups filing Form D, the information tends to be patchy due to the non-mandatory nature of many of the fields. Moreover, director appointments that do not coincide with a financing round may not be reported on Form D.

Investor-directors are further classified as VC directors and non-VC investor-directors, where the latter category mainly comprises either individual angels or representatives of angel groups who take up director roles in the startups they invest in, plus a few directors who represent accelerators and incubators. Hence, for convenience, we refer to non-VC investor-directors as angel directors.

We define the dummy variables *Early Non-investor Director*, *Early VC Director* and *Early Angel Director* to identify startups that appoint non-investor directors, VC directors, and angel directors, respectively, at the series A stage.

2.2. Network Measures

Network connections may play an important role in startups' ability to attract NE directors and investors. We use the following procedure 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.) each year from the year they first appeared in the sample. We define a pair of individuals as connected, which we denote using the *Connected* indicator, if any of the following conditions are met: (a) the pair attended the same college or university during an overlapping time period (*Same School* indicator); or (b) the pair collaborated on a previous startup as co-founders, co-investors, or co-directors, or founder and director, or founder and investor, or investor and director (*Same Startup* indicator); or (c) the pair worked for the same employer during an overlapping time period (*Same Employer* indicator).

2.3. Experience Measures

A likely motivation for early-stage startups to appoint NE directors is that the directors may possess the experience or expertise that the startup founders lack. Accordingly, we

define indicator variables to track the past experience or expertise of founders and directors across the following six dimensions, which we argue are highly relevant for startup firms: (1) *entrepreneurial experience* in having founded a startup; (2) *board experience* gained by serving as a director on the board of either a public or a private firm; (3) *C-suite experience* gained by serving in a C-suite executive role at either a public or a private firm[10]; (4) *Patenting experience* gained by filing a past patent; (5) *M&A experience* gained by serving as a director or top executive at either the acquirer or the target company in a M&A transaction; and (6) *IPO experience* gained by serving as a director or top executive at a company that undertook an IPO.

We focus on entrepreneurial experience, board experience, and C-suite experience because past literature highlights that entrepreneurs often lack the experience of managing, supervising and growing young businesses (e.g., Gorman and Sahlman (1989); Hellmann and Puri (2002)), and hence, are likely to seek these experiences from NE directors. Patenting experience is clearly relevant for startup firms given their focus on innovation. Given the importance of exit through IPO or M&A for startups, it is natural to examine M&A experience and IPO experience because past literature highlights the value of directors with experience in these transactions (e.g., Harford and Schonlau (2013); Huang, Jiang, Lie, and Yang (2014); Field and Mkrtchyan (2017)).

For each individual, we define *Experience Index* as an aggregate measure of experience that is obtained by adding the six experience indicator variables listed above. Thus, *Experience Index* is a category variable that takes values from 0 to 6, where 0 denotes lack of experience on any of the dimensions noted above, and 6 denotes experience on all dimensions.

For each startup-director pair, we construct a variable called *Complementary Index* to measure experiences that the startup's founders lack but that the director possesses. For-

[10]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.

mally, for each of the six experience dimensions above, we create an indicator variable, *Complementary Experience*, which takes the value of 1 if the director possesses the experience but none of the founders do, and the value of 0 otherwise. Hence, the *Complementary Experience* indicators identify experience gaps being filled by the directors. We define *Complementary Index* as the sum of these six *Complementary Experience* indicator variables. Thus, *Complementary Index* is also a category variable that takes values from 0 to 6, with a higher value denoting that the director possesses more experiences that the founders lack.

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 an exit via IPO or acquisition. We define the indicator variable, *Later-stage Funding*, 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 an indicator variable which identifies whether the startup was able to attract venture capital funding in later-stage funding rounds.

Similarly, we define the indicator variable, *Exit*, to identify startups that exit via an IPO or acquisition. Conditional on exit, the indicator 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 $6.08 million, the median startup raised only

$3.78 million. The median age of the startup at the first series A round is 4.51 years, and 49% obtained some VC funding in the early stages (mostly at the series A stage). In 24% 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 10,185 startups (34% of the sample) appointed a NE director at the early stage, and out of these, 37% appointed one of their early-stage investors to this role. Among the startups that appointed a NE director at the series A stage, the average number of early NE directors is 2.85.[11] The early-stage director has a past professional or educational connection with the startup's founder in 33% of startups, and has a past professional or educational connection with the early-stage investor in 30% of startups.

Among the startups that appoint early NE directors, the most common experience possessed by the directors are board experience (59% of cases) and M&A experience (57% of cases), followed by IPO experience (32% of cases) and patenting experience (23% of cases). The average NE director is experienced on about 2 out of the 6 experience dimensions that we track (mean of *Director Experience Index* is 1.98) and possesses one type of experience that the founder lacks (mean of *Complementary Index* is 1.09).

In terms of later-stage outcomes, only 9,337 startups (31% of the sample) successfully progress from series A to series B, which is considered to be the beginning of the growth stage; and out of these, 66% obtain VC funding in later stages. Only 4,964 startups (16% of the sample) eventually exit via an IPO or acquisition: of these, 81% exit via acquisition

[11]The average number of NE directors across all stages is 3.27. This is comparable to total board size estimates (which also include executive directors) in the literature: 5.7 in Kaplan and Stromberg (2003), 4.3 in Amornsiripanitch et al. (2019), and 4.4 in Ewens and Malenko (2022). However, we have a higher number of non-investor directors in our sample: an average of 1.77 versus the average of 1.37 reported in Kaplan and Stromberg (2003) and the average of 0.59 reported in Ewens and Malenko (2022). This is likely because other papers focus exclusively on VC-backed startups, whereas we examine early-stage startups, many of which are not funded by VCs. Moreover, as noted above, Ewens and Malenko (2022) are likely to miss non-investor director appointments that do not coincide with financing rounds, and hence, are not reported on Form D filings.

and 19% via an IPO.

In Panel B of Table 2, we describe the stages at which startups appoint their first NE 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. Column (1) shows the number of startups that survive till each stage; column (2) shows the number of startups that appoint a NE director; and columns (3), (4), and (5) show the number of startups that appoint non-investor directors, VC directors and angel directors, respectively (the numbers in parentheses denote the fraction with respect to the number of startups in column (1)). It is evident from column (2) that most of the startups that appoint a NE director do so at the early stage, but a smaller number of startups appoint their first NE director at the growth stage or late stage. Columns (3) through (5) indicate that startups that appoint their first NE director at the growth stage are more (less) likely to appoint VC directors (non-investor directors) compared to startups that appoint early NE directors.

Panel C is similar to Panel B except that columns (2) through (5) report the *cumulative* number of startups at each stage with any NE director, non-investor directors, VC directors and angel directors, respectively, regardless of the stage at which the directors were appointed. Moreover, we also report these statistics for startups just prior to exit, separately for exits via IPO ("Pre-exit: IPO") and exits via the M&A market ("Pre-exit: M&A"). As can be seen, 70% of startups that survive till the late stage have at least one NE director: 35% have a non-investor director, 23% have a VC director and 16% have an angel director (the sum of these percentages exceeds 70% because some startups may have multiple categories of NE directors). It is noteworthy that almost 30% of startups that survive till the late stage do not have a single NE director on their board. However, 97% of startups that exit via an IPO and 77% of startups that exit via the M&A market have at least one NE director on their board just prior to exit.

Non-executive Director Experience: We summarize the past experience profiles of early

NE directors in our sample in Panel A of Table 3. We do this separately for non-investor directors in column (A), VC directors in column (B), and angel directors in column (C). The next three columns report differences $(A-B)$, $(A-C)$, and $(B-C)$, respectively. We find that, on average, early non-investor directors are more likely to possess entrepreneurial experience, board experience, C-suite experience, and patenting experience compared to investor-directors (both VC directors and angel directors), whereas investor-directors are significantly more likely to possess IPO experience and M&A experience compared to non-investor directors. There are similar, albeit smaller, differences between early VC and angel directors (see column $(B-C)$): on average, VC directors are more likely to possess IPO experience, whereas angel directors are more likely to possess entrepreneurial experience, board experience, C-suite experience, and patenting experience.

In Panel B of Table 3 we compare the experience profiles of early NE directors versus those appointed at later stages (series B and beyond). We note that directors appointed at later stages are significantly more likely than early-stage directors to possess board experience, IPO experience, and M&A experience, which suggests that late-stage director appointments are more likely to be shaped by exit strategies. On the other hand, early-stage directors are more likely to possess entrepreneurial experience and patenting experience.

3. Appointment of Non-Executive Directors

In this section we use a conditional linear probability model to investigate the factors that determine the endogenous matching between early-stage startups and NE directors.[12] 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 pairs in which

[12]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. 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.

the actual startup is paired with another individual of the same director type as the actual director (i.e., non-investor, angel, or VC director) who could have potentially served as a director on the startup's board but did not, and four 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 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.[13] 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*); an indicator variable to identify whether any of the founders had prior experience in founding a startup (*Serial Entrepreneur*); and an indicator variable to identify whether the startup obtained VC funding in either the seed or series A stage (*VC in Early-Stage*). The regression includes fixed effects for each actual startup-director pair and its corresponding control pairs ("group fixed effect"). The results of these regressions are presented in Table 4.

In Panel A we focus on the effect of network connections in determining the match be-

[13]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. Following Bena and Li (2014), we repeat the main analyses presented in this paper by randomly drawing 1,000 control groups (i.e., we randomly draw eight control observations for each treated observation repeatedly 1000 times) and report the median and standard deviation of the empirical distribution of coefficient estimates in Table IA.3.1 in the Online Appendix. The results are robust and qualitatively similar. We thank the anonymous referee for suggesting this analysis.

tween startups and early NE directors. The positive coefficients on *Connected to Founder* and *Connected to Early Investor* in column (1) indicate that, all else equal, an individual is significantly more likely to be appointed as a NE director if he has a past connection to the startup's founders and early-stage investors, respectively. As expected, the positive coefficient on *Investor* in column (1) indicates that an individual is more likely to be appointed as a NE director if he is an investor in that startup.

In column (2) we decompose *Connected to Founder* into three indicator variables to identify the types of connections between potential directors and founders that increase the likelihood of a director-startup match: *Same Startup* identifies whether the potential director and the founder collaborated on a previous startup (as co-investors, co-directors, or as investor and director); *Same Employer* identifies whether they worked together for the same employer; and *Same School* identifies whether they attended the same college or university. We also do a similar decomposition for *Connected to Early Investor*. We find that the most important connections are professional connections formed by the director and the founder (or early-stage investor) having collaborated on a previous startup or having worked together for the same employer. Although educational connections between directors and founders (or early-stage investors) also positively affect the likelihood of director-startup matches, the magnitude of this effect is weaker than the effect of professional connections.

Does the effect of network connections on the startup-director match vary for the three different categories of NE directors? To test this we estimate the regression in column (1) separately for the three different categories of early NE directors: non-investor directors (column (3)), VC directors (column (4)), and angel directors (column (5)). In the bottom rows of the table, we report the $p-$values for the statistical difference between coefficients on *Connected to Founder* for each pair of columns, and similarly for the coefficients on *Connected to Early Investor*. The coefficients on *Connected to Founder* and *Connected to Early Investor* are positive and significant in all three columns, which indicates that

network connections with the startup's founders and early-stage investors matter for all three categories of NE director appointments. However, connections with the startup's founders are far more important in the case of non-investor directors compared to both VC directors and angel directors; and also more important in the case of angel directors compared to VC directors. In contrast, connections with the startup's early-stage investors are more important in the case of VC directors compared to non-investor directors and angel directors.

In Panel B we focus on the effect of the experience complementarity between NE directors and startup founders on the startup-director match. The key independent variable of interest is *Complementary Index*, a category variable that counts the number of experience dimensions a director possesses but the founder lacks. We control for the director and founder experience measures and all the variables from panel A but suppress these coefficients to conserve space. The positive and significant coefficient on *Complementary Index* in column (1) indicates that startups seek to appoint early NE directors who possess experiences that their founders lack. The coefficient estimate indicates that an additional experience possessed by the director which the founder lacks increases the likelihood of the director-startup match by 9.8%.

In the remaining columns, we examine the effects of *Complementary Index* separately for the three categories of early NE directors: non-investor directors in column (2), VC directors in column (4), and angel directors in column (6). For each category, we also decompose *Complementary Index* into its individual dimensions to understand the specific experience gaps filled by each category of directors (see columns (3), (5) and (7)). We find that the coefficient of *Complementary Index* is positive and statistically significant only for non-investor and angel directors. Further, this effect is stronger in the case of non-investor directors compared to both VC directors and angel directors (the $p-$values reported in the bottom row indicate that the differences in these coefficients are statistically significant).

In other words, early non-investor directors are more likely than investor-directors to be appointed to complement the experience profile of startup founders. This finding suggests a more supportive and advisory role for non-investor directors compared to investor-directors.

The results in columns (3), (5) and (7) highlight some interesting contrasts between the three categories of NE directors in terms of the experience gaps they fill. The appointment of early non-investor directors is driven by their ability to fill experience gaps across all dimensions, but most strongly, board experience, entrepreneurial experience, and C-suite experience. We have similar findings for early angel directors, except that the coefficients on patent experience complementarity and IPO experience complementarity are insignificant. On the other hand, early VC directors are more likely to be appointed to fill experience gaps in C-suite experience and exit (both IPO and M&A) experiences.

4. Benefits of Non-Executive Directors for Startups

Theory highlights two primary roles for NE directors in the 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 Ferreira (2007) and Harris and Raviv (2008)). In the context of early-stage startups, NE directors may also benefit startups by leveraging their network connections to attract key stakeholders to the startup, such as new investors and directors in later stages (i.e., series B and beyond), outside executives to serve in the startup, and potential acquirers in case of M&A exits.

To investigate this hypothesis, we use conditional linear probability models to analyze the matching between startups and each of the following categories of key stakeholders: later-stage investors, outside CEOs, other outside C-suite executives, and potential acquirers. Specifically, for each actual startup-stakeholder combination, we create eight *control* pairs that are very similar but did not result in an actual match; four pairs in which the actual

startup is paired with a potential stakeholder, and four pairs in which the actual stakeholder is paired with a potential startup. The mechanics of defining the control pairs are described in the subsections below because they vary with the type of stakeholder being considered.

We then estimate linear probability regressions to understand how the matching between startups and future stakeholders varies with the network connections between potential stakeholders and early NE directors, after controlling for the effect of any network connections that future stakeholders may share with the startups' founders and early-stage investors. We estimate these regressions on a sample that includes all the actual startup-stakeholder pairs and their corresponding control pairs, where the dependent variable is a dummy that identifies the actual startup-stakeholder pairs. The regression includes fixed effects for each actual startup-stakeholder pair and its corresponding control pairs ("group fixed effect"). The regressions also include controls for startup characteristics and director experience variables but we suppress these coefficients to conserve space.

4.1. Role in attracting later-stage investors

Do early NE directors help attract new investors in the later-stage funding rounds of the startup? To investigate this, we focus on the subset of startups that appointed early NE directors and attracted later-stage investors. We then use a conditional linear probability model (as described above) to analyze how the matching between startups and later-stage investors is affected by the connections shared by early NE directors with potential later-stage investors. To form the control pairs, 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. The results of the linear probability regression are presented in Table 5.

The main variable of interest in column (1) is *Connected to Early NE Director*, which is a dummy variable that identifies whether the late-stage investor has a past connection with the early NE director. The positive coefficient on *Connected to Early NE Director* indicates that a later-stage investor's participation in a funding round is 5.6% more likely if he shares a social connection with an early NE director of the startup, which is economically significant compared to the 11.1% probability of an actual investor-startup match in our regression sample.[14] We note that this result holds even after we have controlled for the effect of any past connections that the later-stage investor has with the startup's founder or early-stage investors.

In column (2) we decompose *Connected to Early NE Director* into three indicator variables to identify the types of social connections that drive the result in column (2). The positive and significant coefficients on *Same Startup* and *Same Employer* indicate that the most important social connections are professional connections that were formed by the investor and early-stage director either having collaborated on a previous startup or having worked together for the same employer. On the other hand, the insignificant coefficient on *Same School* indicates that educational connections formed by having studied together in the same college or university do not affect the late-stage investor's propensity to invest in the startup.

Next, we repeat the analysis in column (1) separately for the three different categories of early NE directors: non-investor directors (column (3)), VC directors (column (4)) and angel directors (column (5)), respectively. The coefficient on *Connected to Early NE Director* is positive and significant in all columns, which indicates that all three categories of NE

[14] Recall that 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. Hence, the average probability of an actual match in our regression sample is 1/9 or 11.1%.

directors use their network connections to attract later-stage investors to the startup. In the bottom rows of the table, we report the $p-$values for the statistical difference between coefficients on *Connected to Early NE Director* for each pair of columns. The $p-$values indicate that there are no significant differences between these three categories of early NE directors in their ability to leverage their network connections to attract later-stage investors to startups.[15]

4.2. Role in attracting outside executives

We use a similar empirical strategy as in Section 4.1 to examine whether early NE directors play a role in professionalizing the startup by attracting outside talent to serve as CEOs or C-suite executives in the startup. That is, we estimate the conditional linear probability model on the subset of startups that appointed early NE directors and subsequently appointed an outside CEO. To form the control pairs in the model, we define the set of potential CEOs for a startup as all unaffiliated CEOs, founders, directors, and executives from the same industry as 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. The results of the linear probability regression are presented in Panel A of Table 6.

The positive coefficient on *Connected to Early NE Director* in column (1) indicates that an outside CEO is 7.5% more likely to join a startup if he has a past connection with an early NE director of the startup, and this effect is economically significant compared to the 11.1% probability of an actual CEO-startup match in our regression sample. On the other

[15]We break down the *Connected to Early NE Director* variable into *Same Startup*, *Same Employer* and *Same School* components to run the regressions for the three categories of Early NE Directors and present the results in Table IA.3.2. in the Online Appendix.

hand, the insignificant coefficients on *Connected to Founder* and *Connected to Early-Stage Investor* indicate that outside CEO appointments are not driven by network connections that the outside CEO shares with either the startup's founder or early-stage investors.

The results in column (2) indicate that the most important connections that affect the CEO-startup match are professional connections that were formed by the outside CEO and the early NE director either having collaborated on a previous startup or having worked together for the same employer (positive and significant coefficients on *Same Startup* and *Same Employer*), whereas educational connections do not play a significant role (insignificant coefficient on *Same School*).

The results in columns (3) through (5) indicate that all three categories of early NE directors use their network connections to attract outside CEOs to their startups, as evidenced by the positive and significant coefficient on *Connected to Early NE Director* in all three columns. This effect is significantly stronger for non-investor directors compared to VC directors ($p-$value of difference in coefficients between columns (3) and (4) is 0.000), and for angel directors compared to VC directors ($p-$value of difference in coefficients between columns (5) and (6) is 0.051).

In Panel B of Table 6 we use a similar approach to understand the determinants of the matching between startups and outside C-suite executives, and find very similar results that highlight the contrast between the three categories of early NE directors. Outside C-suite executives are more likely to join a startup if they share a past connection with the early NE director (column (1)), and this effect is mainly driven by professional connections rather than educational connections (column (2)). Moreover, the results in columns (3) through (5) indicate that the effect of connections is stronger for early non-investor directors and angel directors compared to early VC directors. Indeed, the coefficient on *Connected to Early NE Director* corresponding to early VC directors in column (4) is statistically insignificant.

4.3. Role in attracting later-stage non-executive directors

We use a similar empirical strategy as in previous sections to examine whether early NE directors play a role in attracting later-stage NE directors to their startups. Specifically, for the subset of startups that appointed both early-stage and later-stage NE directors, we estimated a conditional linear probability model to examine whether the matching between startups and later-stage NE directors is related to the network connections between later-stage NE directors and early NE directors. While forming control pairs, we ensure that the control group of potential later-stage NE directors belong to the same type (i.e., non-investor, angel, or VC director) as the actual later-stage NE director. The results are reported in Table 7. The positive coefficient on *Investor* in all columns indicate that an individual is more likely to be appointed as a later-stage NE director if he is also an investor in the startup.

The positive coefficient on *Connected to Early NE Director* in column (1) indicates that an individual is 17.5% more likely to join the startup's board as a NE director at later stages if he has a past connection with the startup's early NE director. Interestingly, the insignificant coefficients on *Connected to Founder* and *Connected to Early Investor* indicate that connections with founders and early-stage investors do not affect an individual's propensity to join the startup as a later-stage NE director. As in earlier tables, the results in column (2) indicate that the most important connections are professional connections that were formed either by collaborating on a previous startup or having worked together for the same employer, whereas educational connections play no significant role.

The positive coefficients on *Connected to Early NE Director* in columns (3) through (5) indicate that all three categories of early NE directors —non-investor directors, VC directors, and angel directors— use their network connections to attract later-stage NE directors to their startups. However, this effect is significantly stronger for non-investor directors and angel directors compared to VC directors, as evidenced by the $p-$values reported in the last

two rows of the table.

4.4. Role in attracting potential acquirers

We use a similar empirical strategy as above to investigate whether early NE directors play a role in attracting potential acquirers for the startup. Specifically, for the subset of startups that appointed an early NE director and were subsequently acquired, we estimate a conditional linear probability model to examine whether the likelihood of the acquirer-startup match is related to the network connections between C-suite executives at the acquiring company and the startup's early NE directors. To form control pairs, 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; and we define the potential targets for an acquirer as startups that are in the same industry and have raised a similar amount of funding as the actual startup.[16] The results of the model are reported in Table 8.

The positive coefficient on *Connected to Early NE Director* in column (1) indicates that an acquirer-startup match is 13% more likely if a C-suite executive at the acquirer shares a social connection with an early NE director of the startup. As in earlier tables, the results in column (2) indicate that the most important connections are professional connections formed by having worked together at the same employer (positive coefficient on *Same Employer*) or having collaborated on a previous startup (positive coefficient on *Same Startup*), whereas educational connections do not play a significant role. A striking finding is that the presence of a connection between C-suite executives at the acquiring company and the startup's founder increases the likelihood of an acquirer-startup match by 32%, whereas connections with early-stage investors do not have a significant effect.

The positive coefficients on *Connected to Early NE Director* in columns (3) through (5)

[16] We use the nearest-neighbor matching procedure with a caliper of 0.1 to identify potential acquirers that are similar in size as the actual acquirer; and to identify potential targets that are similar in terms of the amount of funding raised as the actual startup.

indicate that all three categories of early NE directors– non-investor directors, VC directors, and angel directors– use their network connections to attract potential acquirers to bid for their startups. However, this effect is significantly stronger for VC directors (column (4)) and angel directors (column (5)) compared with non-investor directors (column (3)), as evidenced by the $p-$values reported in the last two rows of the table. This evidence suggests that investor-directors play a stronger role than non-investor directors in using their network connections to attract potential acquirers for their startups.

4.5. Role of early NE director's complementary experience

We showed above that early NE directors use their network connections to attract key future stakeholders to the startup. In this section, we examine whether a startup's ability to attract key future stakeholders is related to the complementary experiences of its early NE directors (i.e., experience gaps of founders that are filled by early NE directors). Accordingly, we estimate OLS regressions to examine the association between complementary early NE director experience and the following outcome variables of interest (all dummies): whether the startup receives later-stage funding, whether the startup appoints an outside CEO, whether the startup appoints outside C-Suite executives, whether the startup attracts later-stage NE directors, and whether the startup is acquired. We perform this analysis on the sub-sample of startups that appointed an early NE director. We control for startup characteristics, founders' experience, directors' experience, and include fixed effects for startup founding year, product market category, and city.[17]

The results of these regressions are presented in Table 9. The positive and significant coefficients on *Complementary Index* in all columns of Panel A indicate that, among startups that appoint early NE directors, the startups' ability to attract key future stakeholders is

[17]We also repeat this analysis separately for the three categories of early NE directors: non-investor directors, VC directors, and angel directors. To conserve space in the paper, we report these results in Table IA.3.3 of the Online Appendix.

positively related to the experience gaps of founders that are filled by early NE directors. Moreover, the coefficient on *Complementary Index* is as large as or larger than the coefficient on *Founder Experience Index*, which speaks to the importance of the experiences of early NE directors and the experience gaps they fill.

In Panel B, we repeat the regressions in Panel A after decomposing *Complementary Index* into its six components. We do the same for *Director Experience Index* and *Founder Experience Index*, but suppress these coefficients to conserve space. We find that complementary board experience correlates positively with startups' ability to attract all key stakeholders, with the exception of acquirers. The coefficient on complementary board experience is significantly larger than those on other complementary experience variables when it comes to the propensity to raise later-stage funding and attract later-stage NE directors; and is as large as those on other complementary experience variables when it comes to the propensity to attract outside CEOs/C-Suite Executives. We also find that complementary exit experiences —M&A experience and IPO experience— relate positively to all outcomes, except the ability to attract later-stage NE directors.

4.6. Early NE directors and future performance of the startup

Our results thus far hint at the possibility that early NE directors have a beneficial effect on the future performance of their startups. However, identifying the causal effect of early NE directors on the future performance and exit strategies of their startups is challenging because the choice of whether and who to hire as a NE director is endogenous and may depend on a host of unobserved factors that we cannot possibly control for. Establishing causality ideally requires an exogenous event or shock that causes random variation in the appointment of early NE directors. To our knowledge, no such event exists. Thus, the best we can do is to try and circumvent the endogeneity concerns using an instrumental variables

approach.

It is difficult to come up with a valid instrument for director appointments because, in general, the choice to appoint directors is likely to be driven by omitted factors that also affect future firm performance. We follow Knyazeva et al. (2013) and use the local supply of directors as an instrument for director appointment. Specifically, for each early-stage startup, let *Director Supply* denote the number of 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 three years, and hence, can be thought of as potential directors for the startup. If directors are a scarce resource, we expect that *Director Supply* will positively affect the propensity to appoint early NE directors ("relevance criterion"). We control for the startup characteristics listed in Table 4, and account for unobserved heterogeneity by including fixed effects for product market, city, and founding year in both the first- and second-stage regressions. The key assumption is that, conditional on all these covariates and granular fixed effects, *Director Supply* does not directly affect the startup's future performance except through its impact on the early NE director appointment ("exclusion restriction").

We present the results of the IV regression model, implemented using the two-stage least squares (2SLS) estimator, in Panel A of Table 10. The positive and significant coefficient on *Ln(1+Director Supply)* in the first-stage regression in column (1) indicates that the instrument satisfies the relevance criterion. Following Staiger and Stock (1997), it is common to examine first-stage power using the $F-$statistic for the excluded instrument in the first-stage regression. With one exogenous instrument, the first-stage F-statistic must exceed 8.96 for the 2SLS inference to be reliable (see Table 1 in Stock, Wright, and Yogo (2002)). We note that the $F-$statistic of 26.678 comfortably exceeds this threshold.

We present the results of the second-stage regressions for the various outcome variables in columns (2) through (6). These results indicate that startups which appoint NE directors at the series A stage raise larger amounts in later stages (column (2)), are more likely to

attract VC funding in later stages (column (3)), develop more patents (column (4)), and are more likely to exit (column (5)) especially through IPOs (column (6)) compared with otherwise similar early-stage startups that did not appoint NE directors.[18]

Next, we estimate a variant of the 2SLS IV model on the subset of startups that appoint an early NE director to examine how the future performance and exit strategies vary between startups that appoint non-investor directors (*Early Non-investor director*= 1) versus those that appoint investor-directors (*Early Non-investor director*= 0). Once again, we use the local supply of directors as an instrument in the first-stage regression because startups are more likely to be able to appoint non-investor directors when the local supply of directors is high; put differently, investors are more likely to serve as NE directors when there is a local scarcity of directors. We present the results of this model in Panel B.

The positive coefficient on *Ln(1+Director Supply)* in the first-stage regression in column (1) confirms that the instrument satisfies the relevance criterion. The results of the second-stage regressions indicate that, among the startups that appoint an early NE director, those that appoint non-investor directors raise smaller amounts in later stages (column (2)), are less likely to attract VC funding in later stages (column (3)), and are less likely to exit (column (5)) compared to similar startups that appoint investor-directors. This may be because investor-directors have stronger co-investment connections with larger investors and VCs compared to non-investor directors. Interestingly, however, startups that appoint early non-investor directors develop more patents (column (4)) and are more likely to exit via IPO rather than M&A (column (6)) compared to similar startups that chose to appoint investor-directors.

[18]For the regression in columns (2) and (3), 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 NE 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 (6) is smaller because it only includes startups that eventually exit. The unreported first-stage regression corresponding to column (6) shows that the instrument satisfies the relevance criterion in this smaller sample as well.

It is important to emphasize that the results in Table 10 cannot be explained by differences in startups' observable characteristics at the time of the appointment of early NE directors, or unobserved heterogeneity across cities, product market categories, or year of founding because we account for these through granular fixed effects. Moreover, there is substantial uncertainty about the future prospects of startups at the series A stage, and the average time between series A and exit for startups that exit via IPO or M&A is 7.2 years. Hence, it is implausible that reverse causality can fully account for the results in Table 10.

5. Conclusion

We use unique hand-collected data to examine the role of NE directors in a large sample of early-stage startups. Unlike in the past papers on startup boards, the vast majority of NE directors in our sample are either non-investor directors or angel directors, and only a small fraction are VC directors. Non-investor directors differ substantially from investor-directors in their experience profiles and are more likely to be appointed when they possess experiences that founders lack, which suggests a more advisory role for these directors.

Our analysis suggests that early NE directors leverage their network connections to attract key future stakeholders to the startup, such as new investors and directors in later stages (i.e., series B and beyond), outside CEOs and C-suite executives to serve in the startup, and potential acquirers in case of M&A exits. Early-stage startups that appoint NE directors experience better later-stage funding outcomes, have higher patenting activity, and are more likely to exit, especially through IPOs, compared with similar startups that did not appoint early NE directors. Among early-stage startups that appoint NE directors, those with investor-directors experience better later-stage funding outcomes and a higher likelihood of exit, but also file fewer patents and are more likely to exit via acquisitions rather than IPOs compared to 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 30,205 startups that were founded between 2005 to 2015 and have survived till the series A stage.

Product Market Category	Startups	% of Total Sample	City	Startups	% of Total Sample
Biotechnology	2246	7.44	San Francisco	2868	9.50
Commerce and Shopping	1859	6.15	New York	2587	8.56
Software	1785	5.91	Austin	717	2.37
Internet Services	1734	5.74	Seattle	658	2.18
Hardware	1473	4.88	Boston	656	2.17
Information Technology	1431	4.74	San Jose	621	2.06
Health Care	1430	4.73	San Diego	560	1.85
Data and Analytics	1411	4.67	Mountain View	546	1.81
Financial Services	1025	3.39	Palo Alto	536	1.77
Advertising	1006	3.33	Los Angeles	533	1.76
Total	15400	50.98	Total	10282	34.04

Table 2 Descriptive Statistics

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 30,205 startups that were founded between 2005 to 2015 and have survived till the series A stage. All variables are defined in Section IA.1 of the Online Appendix.
Panel B reports the number of startups that appoint their first NE director at each financing stage (column (2)), and whether the NE director is also an investor (column (3)). We scale the number in each cell by the number of startups surviving at each stage and report the fraction in parentheses. Panel C reports the cumulative number of startups at each stage that has appointed a NE director, regardless of the stage at which the NE director is appointed. The numbers in parentheses denote the fraction of surviving firms at that stage that have a NE director (column (2)) and an investor as director (column (3)).

Panel A: Key Variables

Variable	Mean	SD	p25	p50	p75	N
Early-stage Startup Characteristics						
Serial Entrepreneur	0.08	0.26	0.00	0.00	0.00	30205
Connected Founder & Early Investor	0.24	0.42	0.00	0.00	0.00	30205
Early-stage Funds	6.08	11.86	0.55	3.78	6.37	30205
VC in Early-stages	0.49	0.50	0.00	0.00	1.00	30205
Age at Series A	4.99	5.69	1.38	4.51	7.20	30205
Later-stage Outcomes						
Later-stage Funding	0.31	0.46	0.00	0.00	1.00	30205
Later-stage Funds	32.93	56.68	6.51	15.39	39.01	10185
VC in Later-stages	0.66	0.48	0.00	1.00	1.00	10185
Exit	0.16	0.37	0.00	0.00	0.00	30205
Acquired	0.81	0.41	1.00	1.00	1.00	4964
IPO	0.19	0.41	0.00	0.00	0.00	4964
NE Director Characteristics						
Early NE Director	0.34	0.47	0.00	0.00	1.00	30205
Early Non-investor Director	0.63	0.48	0.00	1.00	1.00	10185
Early Investor Director	0.37	0.48	0.00	0.00	1.00	10185
Early VC Director	0.13	0.34	0.00	0.00	0.00	10185
Early Angel Director	0.23	0.42	0.00	0.00	0.00	10185
No. of Early NE Directors	2.85	3.83	1.00	2.00	3.00	10185
No. of Early Non-investor Directors	1.77	3.41	0.00	1.00	3.00	10185
No. of Early Investor Directors	1.09	1.85	0.00	0.00	2.00	10185
Connected Founder & Early NE Director	0.33	0.47	0.00	0.00	1.00	10185
Connected Early Investor & Early NE Director	0.30	0.46	0.00	0.00	1.00	10185
Early NE Director Experience						
Entrepreneurial Experience	0.19	0.39	0.00	0.00	0.21	10185
Board Experience	0.59	0.49	0.15	0.61	1.00	10185
C-suite Experience	0.09	0.29	0.00	0.00	0.00	10185
Patent Experience	0.23	0.42	0.00	0.00	0.39	10185
M&A Experience	0.57	0.50	0.00	1.00	1.00	10185
IPO Experience	0.32	0.47	0.00	0.00	1.00	10185
Director Experience Index	1.98	1.01	1.00	1.00	2.06	10185
Complementary Index	1.09	1.03	0.00	1.00	2.00	10185

Panel B: Stage at which first NE director is appointed

Stage	Startups surviving (1)	NE Director=1 (2)	Non-investor Director=1 (3)	VC Director=1 (4)	Angel Director=1 (5)
Early	30205	10185	6459	1368	2358
		(0.34)	(0.21)	(0.05)	(0.08)
Growth	9337	2011	1004	526	481
		(0.22)	(0.11)	(0.06)	(0.05)
Late	6930	1341	375	669	297
		(0.19)	(0.05)	(0.10)	(0.04)

Panel C: Stage-wise breakup of startups with NE directors

Stage	Startups surviving (1)	NE Director=1 (2)	Non-investor Director=1 (3)	VC Director=1 (4)	Angel Director=1 (5)
Early	30205	10,185	6,472	1,368	2,366
		(0.34)	(0.21)	(0.05)	(0.08)
Growth	9337	5,813	3,216	1,302	1,609
		(0.62)	(0.34)	(0.14)	(0.17)
Late	6930	4,849	2,393	1,627	1,135
		(0.70)	(0.35)	(0.23)	(0.16)
Pre-exit: M&A	3997	3,058	980	1,426	918
		(0.77)	(0.25)	(0.36)	(0.23)
Pre-exit: IPO	967	939	528	619	491
		(0.97)	(0.55)	(0.64)	(0.51)

Table 3 Early NE Director Experience Summary

Panel A of this table summarizes the past experience of early NE directors and founders in our sample. Each observation corresponds to a director or founder. Column (A) summarizes the experience of Non-investor Early NE directors. Columns (B) and (C) summarize VC investor- and Angel investor-directors who were appointed in the early stages of a startup. Column (D) summarizes the experience of the founder or founding team. Panel B provides a uni-variate comparison of the past experience of directors appointed in the early stages with those directors appointed in the later stages.

Panel A: Early NE Director Experience

	Early Non-investor Director	Early VC Director	Early Angel Director	Founder	t-test		
Variable	(A)	(B)	(C)	(D)	(A-B)	(A-C)	(B-C)
Entrepreneurial exp.	0.24	0.04	0.10	0.09	0.21***	0.14***	-0.07***
Board exp.	0.64	0.41	0.55	0.16	0.23***	0.09***	-0.14***
C-suite exp.	0.11	0.03	0.06	0.01	0.09***	0.06***	-0.03***
Patent exp.	0.29	0.11	0.23	0.17	0.18***	0.06***	-0.12***
M&A exp.	0.43	0.69	0.68	0.10	-0.26***	-0.25***	0.01
IPO exp.	0.23	0.50	0.43	0.03	-0.27***	-0.20***	0.07***
Director exp. index	1.94	1.92	1.93		0.02	0.01	-0.01
Complementary Index	1.19	0.91	0.99		0.28***	0.20***	-0.08***
N	17984	4443	6645	49596			

Panel B: Early-stage vs. Later-stage NE Director Experience

	Early NE Director	Later NE Director	(A-B)
Variable	(A)	(B)	t-test
Entrepreneurial exp.	0.18	0.13	0.05***
Board exp.	0.58	0.83	-0.25***
C-suite exp.	0.08	0.10	-0.02***
Patent exp.	0.25	0.22	0.03***
M&A exp.	0.53	0.62	-0.09***
IPO exp.	0.32	0.38	-0.06***
Director exp. index	1.94	2.01	-0.07***
Complementarity Index	1.10	1.19	-0.09***
N	29072	6728	

Table 4 Matching between Startups and Early NE Directors

This table reports the results of a conditional linear probability model aimed at understanding the factors that determine the matching between startups and early NE directors (see Section 3 for details). We examine the effect of network connections in Panel A and the effect of complementary experience in Panel B. In both panels, the dependent variable is an indicator variable that identifies the actual startup-director pair, and the regression is estimated on a sample that includes the actual pairs and their corresponding control pairs. We control for startup characteristics and include fixed effects for the actual startup-director pair and corresponding control pairs ("Group FE") in all specifications. Standard errors (reported in parentheses) are heteroskedasticity robust and clustered at the product market level. We use ***, **, and * to denote statistical significance at 1%, 5%, and 10% levels, respectively. All variables are defined in Section IA.1 of the Online Appendix.

Panel A: Effect of social connections

	Startup-Early NE Director Match				
	Early NE Director		Early Non-investor Director	Early VC Director	Early Angel Director
	(1)	(2)	(3)	(4)	(5)
Investor	0.063***	0.058***			
	(0.003)	(0.003)			
Network Connections					
Connected to founder	0.068***		0.089***	0.030***	0.056***
	(0.010)		(0.007)	(0.009)	(0.008)
Same Startup		0.073***			
		(0.002)			
Same Employer		0.070***			
		(0.005)			
Same School		0.010**			
		(0.004)			
Connected to Early Investor	0.094***		0.071***	0.095***	0.062***
	(0.009)		(0.006)	(0.009)	(0.008)
Same Startup		0.077***			
		(0.002)			
Same Employer		0.065***			
		(0.002)			
Same School		0.022***			
		(0.004)			
Startup Characteristics					
Ln(1 + Age at Series A)	0.008	0.008	0.012**	-0.003	-0.002
	(0.005)	(0.005)	(0.006)	(0.005)	(0.006)
Ln(1 + Early-stage Funds)	0.011	0.010	-0.001	0.010	0.007
	(0.008)	(0.008)	(0.007)	(0.008)	(0.007)
VC in Early-stages	0.008	0.008	-0.020**	0.018**	-0.006
	(0.006)	(0.006)	(0.009)	(0.009)	(0.010)
Serial Entrepreneur	0.012	0.011	0.022**	-0.013	-0.011
	(0.010)	(0.011)	(0.010)	(0.012)	(0.011)
Obs	186276	186276	118317	27238	40721
Adj. R^2	0.393	0.400	0.354	0.333	0.326
Group FE	Yes	Yes	Yes	Yes	Yes
p-values from difference tests for Connected to:					
Founder $\beta_{Non-inv.} = \beta_{VC}/\beta_{Non-inv.} = \beta_{Angel}$				0.000	0.002
Founder $\beta_{VC} = \beta_{Angel}$				0.031	
Early-stage Inv. $\beta_{Non-inv.} = \beta_{VC}/\beta_{Non-inv.} = \beta_{Angel}$				0.027	0.368
Early-stage Inv. $\beta_{VC} = \beta_{Angel}$				0.006	

Panel B: Effect of complementary experience between founders and directors

	Startup-Early NE Director Match						
	Early NE Director	Early Non-investor Director		Early VC Director		Early Angel Director	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Complementary Index	0.098***	0.124***		0.034		0.068***	
	(0.016)	(0.019)		(0.021)		(0.022)	
Complementary Experience							
Entrepreneurial exp.			0.052***		0.010		0.050***
			(0.010)		(0.011)		(0.011)
Board exp.			0.077***		0.020		0.046***
			(0.011)		(0.013)		(0.014)
C-Suite exp.			0.040***		0.026*		0.022**
			(0.013)		(0.015)		(0.011)
Patent exp.			0.023**		0.018		0.020
			(0.010)		(0.011)		(0.013)
M&A exp.			0.020*		0.025**		0.029***
			(0.011)		(0.011)		(0.010)
IPO exp.			0.018*		0.020**		0.017
			(0.010)		(0.010)		(0.011)
Obs	186276	118317	118317	27238	27238	40721	40721
Adj. R^2	0.427	0.382	0.396	0.355	0.362	0.360	0.368
Startup Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Group FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Connection Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Founder & Director Experience Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
p-values from difference tests for Complementary Index:							
Founder $\beta_{Non-inv.} = \beta_{VC}/\beta_{Non-inv.} = \beta_{Angel}$				0.002	0.054		
Founder $\beta_{VC} = \beta_{Angel}$				0.264			

Table 5 Early NE Director and Later-Stage Investors

This table reports the results of a conditional linear probability model aimed at understanding how the matching between startups and later-stage investors is affected by early-stage directors (see section 4.1 for details). The dependent variable is an indicator variable that identifies the actual startup-investor pair, and the regression is estimated on a sample that includes the actual pairs and their corresponding control pairs. We control for startup characteristics and director experience but suppress the coefficients to conserve space; and include fixed effects for the actual startup-investor pair and corresponding control pairs ("Group FE") in all specifications. Standard errors (reported in parentheses) are heteroskedasticity robust and clustered at the product market level. We use ***, **, and * to denote statistical significance at 1%, 5%, and 10% levels, respectively. All variables are defined in Section IA.1 of the Online Appendix.

	Startup-Later-stage Investor Match				
	Early NE Director		Early Non-investor Director	Early VC Director	Early Angel Director
	(1)	(2)	(3)	(4)	(5)
Later-stage investor is:					
Connected to Early NE Director	0.056***		0.046**	0.050***	0.042**
	(0.017)		(0.019)	(0.019)	(0.017)
Same Startup		0.067***			
		(0.026)			
Same Employer		0.043***			
		(0.016)			
Same School		0.030			
		(0.023)			
Connected to Founder	0.050***	0.040***	0.049***	0.045***	0.037***
	(0.004)	(0.008)	(0.005)	(0.008)	(0.008)
Connected to Early Investor	0.139***	0.110***	0.135***	0.129***	0.142***
	(0.007)	(0.011)	(0.005)	(0.006)	(0.008)
Obs.	68825	68825	47317	8699	12808
Adj. R^2	0.442	0.443	0.434	0.467	0.446
Startup & Director Exp. controls	Yes	Yes	Yes	Yes	Yes
Group FE	Yes	Yes	Yes	Yes	Yes
p-values from difference tests for Connected to Early NE Director					
$\beta_{Non-inv.} = \beta_{VC} / \beta_{Non-inv.} = \beta_{Angel}$				0.887	0.875
$\beta_{VC} = \beta_{Angel}$				0.754	

Table 6 Early NE Director and Outside CEO/C-suite Executive Appointments

This table reports the results of a conditional linear probability model aimed at understanding the role played by early NE directors in attracting outside CEOs (Panel A) and other outside C-suite executives (Panel B) to the startup (see section 4.2 for details). The dependent variable is an indicator variable that identifies the actual startup-executive pair, and the regression is estimated on a sample that includes the actual pairs and their corresponding control pairs. We control for startup characteristics and director experience but suppress the coefficients to conserve space; and include fixed effects for the actual startup-executive pair and corresponding control pairs ("Group FE") in all specifications. Standard errors (reported in parentheses) are heteroskedasticity robust and clustered at the product market level. We use ***, **, and * to denote statistical significance at 1%, 5%, and 10% levels, respectively. All variables are defined in Section IA.1 of the Online Appendix.

Panel A: Effect of Early NE Directors on Outside CEO Appointments

	Startup-Outside CEO Match				
	Early NE Director		Early Non-investor Director	Early VC Director	Early Angel Director
	(1)	(2)	(3)	(4)	(5)
Outside CEO is:					
Connected to Early NE Director	0.075***		0.102***	0.033**	0.079***
	(0.013)		(0.012)	(0.014)	(0.019)
Same Startup		0.078***			
		(0.029)			
Same Employer		0.062***			
		(0.021)			
Same School		0.035			
		(0.040)			
Connected to Founder	-0.016	-0.019	-0.014	-0.014	-0.020
	(0.012)	(0.017)	(0.011)	(0.016)	(0.027)
Connected to Early Investor	0.015	0.014	0.010	0.014	-0.005
	(0.011)	(0.021)	(0.019)	(0.018)	(0.035)
Obs.	14622	14622	8269	3396	2957
Adj. R^2	0.042	0.044	0.028	0.036	0.022
Startup & Director Exp. controls	Yes	Yes	Yes	Yes	Yes
Group FE	Yes	Yes	Yes	Yes	Yes
p-values from difference tests for Connected to Early NE Director					
$\beta_{Non-inv.} = \beta_{VC} / \beta_{Non-inv.} = \beta_{Angel}$				0.000	0.306
$\beta_{VC} = \beta_{Angel}$				0.051	

Panel B: Effect of Early NE Directors on Outside C-suite Executive Appointments

	Startup-Outside C-suite Executive Match				
	Early NE Director		Early Non-investor Director	Early VC Director	Early Angel Director
	(1)	(2)	(3)	(4)	(5)
Outside Executive is:					
Connected to Early NE Director	0.102***		0.169***	0.036	0.110***
	(0.030)		(0.034)	(0.035)	(0.039)
Same Startup		0.109***			
		(0.031)			
Same Employer		0.089***			
		(0.031)			
Same School		-0.046			
		(0.029)			
Connected to Founder	-0.030	-0.031	-0.040	-0.037	-0.032
	(0.039)	(0.035)	(0.034)	(0.028)	(0.049)
Connected to Early Investor	-0.042	-0.045	-0.031	0.034	0.059
	(0.037)	(0.047)	(0.033)	(0.039)	(0.096)
Obs.	14222	14222	8469	3247	2506
Adj. R^2	0.072	0.077	0.031	0.053	0.049
Startup & Director Exp. controls	Yes	Yes	Yes	Yes	Yes
Group FE	Yes	Yes	Yes	Yes	Yes
p-values from difference tests for Connected to Early NE Director					
$\beta_{Non-inv.} = \beta_{VC}/\beta_{Non-inv.} = \beta_{Angel}$				0.006	0.254
$\beta_{VC} = \beta_{Angel}$				0.157	

Table 7 Early NE Director and Later-Stage NE Director Appointments

This table reports the results of a conditional linear probability model aimed at understanding the role played by early NE directors in attracting later-stage NE directors to the startup (see section 4.3 for details). The dependent variable is an indicator variable that identifies the actual startup-director pair, and the regression is estimated on a sample that includes the actual pairs and their corresponding control pairs. We control for startup characteristics and early NE director experience but suppress the coefficients to conserve space; and include fixed effects for the actual startup-director pair and corresponding control pairs ("Group FE") in all specifications. Standard errors (reported in parentheses) are heteroskedasticity robust and clustered at the product market level. We use ***, **, and * to denote statistical significance at 1%, 5%, and 10% levels, respectively. All variables are defined in Section IA.1 of the Online Appendix.

	Startup-Later-stage NE Director Match				
	Early NE Director		Early Non-investor Director	Early VC Director	Early Angel Director
	(1)	(2)	(3)	(4)	(5)
Investor	0.046***	0.041***	0.044***	0.042***	0.052***
	(0.013)	(0.011)	(0.015)	(0.014)	(0.013)
Late-stage Director is:					
Connected to Early NE Director	0.175***		0.189***	0.056***	0.197***
	(0.028)		(0.018)	(0.019)	(0.024)
Same Startup		0.191***			
		(0.035)			
Same Employer		0.093***			
		(0.029)			
Same School		0.051			
		(0.032)			
Connected to Founder	0.049	0.040	0.041	0.048	0.078*
	(0.031)	(0.032)	(0.028)	(0.031)	(0.046)
Connected to Early Investor	0.018	0.029	0.031	0.038**	0.038
	(0.018)	(0.030)	(0.020)	(0.019)	(0.026)
Obs	27602	27602	17791	3266	6545
Adj. R^2	0.233	0.238	0.237	0.209	0.216
Startup & Director Exp. Controls	Yes	Yes	Yes	Yes	Yes
Group FE	Yes	Yes	Yes	Yes	Yes
p-values from difference tests for Connected to Early NE Director					
Founder $\beta_{Non-inv.} = \beta_{VC}/\beta_{Non-inv.} = \beta_{Angel}$				0.000	0.789
Founder $\beta_{VC} = \beta_{Angel}$				0.000	

Table 8 Early NE Director and Potential Acquirers

This table reports the results of a conditional linear probability model aimed at understanding the role played by early NE directors in attracting potential acquirers to the startup (see section 4.4 for details). The dependent variable is an indicator variable that identifies the actual startup-acquirer pair, and the regression is estimated on a sample that includes the actual pairs and their corresponding control pairs. The *Connected to Early NE Director* is a binary variable that takes a value '1' if the early NE director shares a network connection with at least one of the C-suite executives of the acquirer. We similarly define *Connected to Founder* and *Connected to Early-stage Investor*. We control for startup characteristics and early NE director experience but suppress the coefficients to conserve space; and include fixed effects for the actual startup-acquirer pair and corresponding control pairs ("Deal FE") in all specifications. Standard errors (reported in parentheses) are heteroskedasticity robust and clustered at the product market level. We use ***, **, and * to denote statistical significance at 1%, 5%, and 10% levels, respectively. All variables are defined in Section IA.1 of the Online Appendix.

	Startup-Acquirer Match				
	Early NE Director		Early Non-investor Director	Early VC Director	Early Angel Director
	(1)	(2)	(3)	(4)	(5)
Acquirer is:					
Connected to Early NE Director	0.130***		0.100***	0.171***	0.276***
	(0.028)		(0.025)	(0.022)	(0.076)
Same Startup		0.156***			
		(0.039)			
Same Employer		0.110***			
		(0.037)			
Same School		0.047			
		(0.030)			
Connected to Founder	0.320***	0.285***	0.346***	0.243***	0.258***
	(0.039)	(0.041)	(0.032)	(0.025)	(0.055)
Connected to Early Investor	-0.009	-0.016	-0.005	0.003	-0.097
	(0.029)	(0.038)	(0.022)	(0.019)	(0.063)
Obs.	11250	11250	6986	2805	1331
Adj. R^2	0.224	0.231	0.192	0.277	0.255
Startup & Director Exp. controls	Yes	Yes	Yes	Yes	Yes
Deal FE	Yes	Yes	Yes	Yes	Yes
p-values from difference tests for Connected to Early NE Director					
$\beta_{Non-inv.} = \beta_{VC}/\beta_{Non-inv.} = \beta_{Angel}$				0.033	0.027
$\beta_{VC} = \beta_{Angel}$				0.185	

Table 9 Early NE Directors' Complementary Experience and Propensity to Attract Key Stakeholders

In this table we report the results of regressions aimed at understanding the relation between early NE directors' complementary experience and startups' ability to attract key stakeholders after the series A stage. We estimate this regression on the sample of startups that appointed early NE directors (i.e., startups with *Early NE Director*= 1). In Panel A we examine the effect of experience on startup outcomes using Director, Founder, and Complementary experience indices. In Panel B, we repeat the analysis after breaking down the indices into their six component experience category dummies.
We control for startup characteristics from Table 4 in all specifications (but suppress the coefficients to conserve space), and include fixed effects for startup 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 variables are defined in Section IA.1 of the Online Appendix.

Panel A: Effect of Experience on Startups Outcomes

	(1) Later-stage Funding	(2) Outside CEO Appointment	(3) Outside C-suite Exec. Appointment	(4) Late-stage NE Dir. App.	(5) Acquired
Complementary Index	0.039***	0.020***	0.019***	0.084***	0.007***
	(0.004)	(0.002)	(0.003)	(0.003)	(0.002)
Founders' Exp. Index	0.005	0.024***	0.013***	-0.007*	0.003
	(0.004)	(0.003)	(0.003)	(0.004)	(0.004)
Early NE Directors' Exp. Index	0.063***	0.003	0.009***	0.040***	0.007*
	(0.005)	(0.003)	(0.002)	(0.005)	(0.004)
Obs.	10185	10185	10185	10185	10185
Adj. R^2	0.213	0.054	0.050	0.264	0.120
Startup Controls	Yes	Yes	Yes	Yes	Yes
Founded Yr, Prod. Market, City FE	Yes	Yes	Yes	Yes	Yes

Panel B: Breakdown of Complementary Experience of Early NE Directors

	(1) Later-stage Funding	(2) Outside CEO Appointment	(3) Outside C-suite Exec. Appointment	(4) Late-stage NE Dir. App.	(5) Acquired
Complementary Experience of Early NE Directors					
Entrepreneurial exp.	-0.014	0.018***	0.024***	-0.007	-0.002
	(0.011)	(0.006)	(0.007)	(0.006)	(0.008)
Board exp.	0.325***	0.046***	0.039***	0.428***	0.001
	(0.023)	(0.009)	(0.007)	(0.022)	(0.008)
C-Suite exp.	0.009	0.049***	0.030***	-0.001	-0.017**
	(0.008)	(0.007)	(0.005)	(0.006)	(0.007)
Patent exp.	0.012	0.025***	0.019***	-0.016**	-0.003
	(0.012)	(0.007)	(0.005)	(0.006)	(0.008)
M&A exp.	0.024**	0.036***	0.050***	-0.007	0.024**
	(0.011)	(0.007)	(0.010)	(0.007)	(0.010)
IPO exp.	0.077***	-0.004	0.060*	-0.016	0.018
	(0.026)	(0.021)	(0.034)	(0.026)	(0.045)
Obs.	10185	10185	10185	10185	10185
Adj. R^2	0.247	0.058	0.055	0.343	0.119
Startup Controls	Yes	Yes	Yes	Yes	Yes
Founder & Director Exp. Controls	Yes	Yes	Yes	Yes	Yes
Founded Yr, Prod. Market, City FE	Yes	Yes	Yes	Yes	Yes

Table 10 Early NE Director and Startup Performance: 2SLS Instrumental Variable Approach

Panel A reports the results of 2-stage least square instrumental variable regressions aimed at understanding the effect of early NE directors on startups' future performance and exit strategies. Panel B reports the results from regressions aimed at understanding the effect of Early Non-investor Director appointments on startups' future performance and exit strategies, for the subset of startups that appointed an early NE director (i.e., startups with *Early NE Director*= 1).
We report the first-stage regression in column (1) and second-stage regressions for the outcome variables in columns (2) to (6). We control for startup characteristics from Table 4 in all specifications but suppress the coefficients to conserve space; and include fixed effects for startup 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 variables are defined in Section IA.1 of the Online Appendix.

Panel A: Effect of Early NE Director

	First-stage	Second-stage				
	(1) Early NE Director	(2) Ln(1+Later-stage Funds)	(3) VC in Later-stages	(4) Ln(1+# Patents)	(5) Exit	(6) IPO
Ln(1+ Director Supply)	0.011***					
	(0.002)					
$\widehat{Early\ NE\ Director}$		0.266***	0.155***	0.182**	0.068***	0.164**
		(0.058)	(0.030)	(0.067)	(0.018)	(0.073)
Obs.	30205	30205	30205	30205	30205	4961
Adj. R^2	0.353	0.286	0.328	0.024	0.078	0.110
Startup Controls	Yes	Yes	Yes	Yes	Yes	Yes
Founded Yr, Prod. Market, City FE	Yes	Yes	Yes	Yes	Yes	Yes
F statistic of excluded instrument	26.678					
Sample	Full					Success=1

Panel B: Effect of Early Non-investor Director

	First-stage	Second-stage				
	(1) Early Non-investor Director	(2) Ln(1+Later-stage Funds)	(3) VC in Later-stages	(4) Ln(1+# Patents)	(5) Exit	(6) IPO
Ln(1+ Director Supply)	0.015***					
	(0.002)					
$\widehat{Early\ Non-investor\ Director}$		-0.285**	-0.253**	0.268**	-0.139*	0.119**
		(0.126)	(0.121)	(0.130)	(0.080)	(0.057)
Obs.	10185	10185	10185	10185	10185	2283
Adj. R^2	0.191	0.271	0.255	0.047	0.107	0.056
Startup Controls	Yes	Yes	Yes	Yes	Yes	Yes
Founded Yr, Prod. Market, City FE	Yes	Yes	Yes	Yes	Yes	Yes
F statistic of excluded instrument	17.150					
Sample	Early NE Director=1					Early NE Director=1 & Success=1

Online Appendix
for
"Non-Executive Directors at Early-Stage Startups"

IA.1. 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 these stages are as follows:[1]

- *Seed stage:* The purpose of the seed stage 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 involve multiple funding rounds.

Startup Characteristics:

- *Serial Entrepreneur* is an indicator variable to identify 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.

[1] 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 an indicator variable to identify whether a venture capitalist participated in the seed or series A 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 an indicator variable to identify startups that appointed a non-executive director at the series A stage; and *No. of Early NE Directors* is the number of such early-stage non-executive directors. To create these variables, 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.

- *Early Investor Director* is an indicator variable to identify startups that appointed one of their early-stage investors as a non-executive director at the series A stage ("investor-directors"); and *No. of Early Investor Directors* is the number of such early-stage investor directors. To identify investor-directors, 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 have already invested in the startup, such as VC funds or angel groups. To account for the possibility that some investors simultaneously negotiate investment terms and board seats and take up a board seat prior to the investment date, we classify a director as an investor-director if the time between his appointment date and a future investment round is less than or equal to 180 days.

- *Early Non-investor Director* is an indicator variable to identify startups that appointed a non-executive director at the series A stage who is not an investor in the startup ("non-investor director"); and *No. of Early Non-Investor Directors* is the number of such early-stage non-investor directors.

- *Early VC Director* is an indicator variable to identify startups that appointed one of their early-stage VC investors (i.e., senior executives at the VC fund) as a non-executive director at the series A stage.

- *Early Angel Director* is an indicator variable to identify startups that appointed one of their early-stage non-VC investors as a non-executive director at the series A stage. This category mainly comprises either individual angels or representatives of angel groups who take up director roles in the startups they invest in, plus a few directors

who represent accelerators and incubators. Hence, for convenience, we refer to non-VC investor-directors as angel directors.

- *Director Supply* is defined as the number of 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.

Network Connections

We identify network connections between pairs of individuals in our data; for example, founders and early-stage non-executive directors, founders and early-stage investors, early-stage non-executive directors and early-stage investors, early-stage non-executive directors and future stakeholders (e.g., later-stage investors, outside CEOs, later-stage directors, and potential acquirers).

Connected is an indicator variable to identify whether a pair of individuals are connected. It takes a value of 1 if any of the following conditions are satisfied, and a value of 0 otherwise:

- The pair attended the same college or university during an overlapping time period (identified using the *Same School* dummy); or
- The pair collaborated on a previous startup venture as co-founders, co-investors, or co-directors, or founder and director, or founder and investor, or investor and director (identified using the *Same Startup* dummy); or
- The pair worked for the same employer during an overlapping time period (identified using the *Same Employer* dummy).

Experience Measures:

We define *indicator variables* to track the past experience of founders and directors across the following six dimensions:

- *Entrepreneurial Experience* indicates whether the individual has founded a startup in the past.
- *Board Experience* indicates whether the individual has served as a director on the board of either a public or a private firm.

- *C-suite Experience* indicates whether the individual has served in a C-suite executive role at either a public or a 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.

- *Patent Experience* indicates whether the individual has ever filed for a patent.

- *M&A Experience* indicates whether the individual served as a director or top executive at either the acquirer or the target company in a M&A transaction.

- *IPO Experience* indicates whether the individual has served as a director or top executive at a company that undertook an IPO.

Experience Index is the sum of the six experience dimension dummies defined above. It is a category variable that takes values from 0 to 6, where 0 denotes lack of experience and 6 denotes experience across all dimensions.

For each startup-director paper, *Complementary Index* is the number of experiences that the startup's founders lack but the director possesses. Formally, for each of the six experience dimensions above, we create an indicator variable, *Complementary Experience*, which takes the value of 1 if the director possesses the experience but none of the founders do, and the value of 0 otherwise. *Complementary Index* is then defined as the sum of these six *Complementary Experience* indicator variables. Thus, *Complementary Index* is also a category variable that takes values from 0 to 6, with a higher value denoting that the director possesses more experiences that the founders lack.

Later-stage Outcomes:

- *Later-stage Funding* is an indicator variable to identify startups that successfully progress to the series B stage and beyond.

- *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 an indicator variable to identify whether the startup was able to attract venture capital funding in later-stage funding rounds.

- *Outside CEO Appointment* is an indicator variable to identify whether the startup appointed an outside CEO, that is, a CEO who was not an employee at the startup before the appointment.

- *Outside C-suite Executive Appointment* is an indicator variable to identify whether the startup appointed an outside C-suite Executive, that is, an individual who was not an employee at the startup before the appointment.

- *Later-stage Director Appointment* is an indicator variable to identify whether the startup appointed a non-executive director after the Series A stage.

- *Exit* is an indicator variable to identify startups that exit via an IPO or acquisition. Conditional on exit, the indicator variables, *IPO* and *Acquisition*, identify the mode of exit.

IA.2. Data Appendix

IA.2.1. Data sources and sample construction

As noted in the paper, our primary data source is CrunchBase ("CB"), which is the largest crowd-sourced database on startups. We augment information from CB using AngelList ("AL"), which is the leading online fund-raising platform for startups. We extract data using the application programming interfaces (APIs) of CB and AL.[2] Our raw CB data contains data on 75,714 (145,395 funding rounds) startups that raised financing between 2005 to 2015. For the same period, AL contains data on 31,815 (53,092) fund-raising startups. While both CB and AL contain data as far back as 1990, we focus on startups founded on or after 2005, the year in which Crunchbase's parent company came into existence, to avoid any back-filling bias in the pre-2005 data.

We use a 3-gram vectorial decomposition algorithm on startup names and website domain addresses followed by a manual check to eliminate duplicates between CB and AL.[3] There is significant overlap between CB and AL, but each data set has some information that may not be available in the other. For example, in our CB data for the startup 'Instacart' we observe the funding rounds, amounts, and the investors who participated in each round. However, the location of some of these investors was missing in CB but was available in AL.

Our sample construction process is as follows: First, we identify startups for which we have complete information on fundraising dates and amounts at the seed and series A stage. In the post-2005 period, there are 43,867 such startups in CB with complete information; another 7,635 startups in CB with partial information which we could complete with the aid of AL; and 5,382 such startups in AL with complete information that are not present in CB. Thus, the union of CB and AL (henceforth "CB+AL") yields 56,884 startups for which we

[2]We had access to CB API from 2015 to 2017 and AL API in 2016. Both CB and AL also provided us with a dump of all their data in 2017 and 2020. Note that during the time we had access to CB and AL, these data sources changed their structure multiple times, and new information was added every month. So we updated the data twice (2016 and 2017) after our initial data collection in 2015.

[3]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.

have complete information on fundraising dates and amounts at the seed and series A stage.

Next, we apply the following filters: (i) We require information on the identities of investors that have invested in the seed and series A rounds of these startups. We drop 13,377 startups due to missing investor identities. (ii) For startups that survive till series B and beyond, we require information on funding dates, amounts, and identities of investors. We drop 5,949 startups because they are missing this information.

For the remaining 37,558 startups, we require biographical information – i.e., education, work experience, and location – for all the founders, investors and directors. We first attempt to collect this information from the individuals' profiles on CB+AL. For information missing on CB+AL, we try to collect it by scraping the LinkedIn profile pages of the individuals. We also use the BoardEx database for a small subset of directors that are covered by BoardEx (whose coverage is known to be skewed toward directors at large public and private companies). Table IA.2.1 below provides a detailed breakup of the different pieces of information collected from CB+AL, LinkedIn and BoardEx. At this stage, we drop: (a) 5,596 startups due to lack of founders' profile information; (b) 682 startups due to lack of directors' profile information; and (c) 1,075 startups due to due to lack of investors' profile information.

After the attrition in the steps above, we are left with 30,205 early-stage startups. Our sample contains 49,596 founders, 29,072 directors and 14,391 investors. Among the investors, 8,237 are individual angel investors, 5,231 are venture capital firms (including Corporate Venture Capitalists), 450 are angel groups, and 472 are accelerators, incubators, or universities. Further, we were able to identify 4,913 individuals who are executives or partners associated with institutional investors.

One piece of data that is important for this paper is the appointment date of directors. We are able to obtain director appointment dates for 25,411 directors from CB+AL; and obtain this information for the remaining directors from their LinkedIn profile pages. Similarly, we rely on LinkedIn to augment our CB+AL data for information on individuals' locations, education, and past work histories. That is, we use LinkedIn to add information to our CB+AL data rather than intersect these data sources. The below table provides a breakdown of the sources of biographical information for founders, investors, and directors. For example, we obtain the city of 47,494 founders from CB+AL, and for the remaining 2,102 founders with missing city information in CB+AL, we obtain this information from their LinkedIn profiles. We were able to match 1,537 directors in our sample with those in BoardEx. We find that most of the biographical information in BoardEx is already available on either CB+AL or LinkedIn, which provides validation of the accuracy of these data sources. However, in

a few cases, BoardEx contained additional information on non-profit affiliations of some of the directors in our sample.

Table IA.2.1 Source of profile information

In the below table, we tabulate the source of profile information for founders, investors, and directors. The 'CB+AL' columns report the number of individuals in each category for whom information was obtained from the union of CrunchBase and AngelList. 'New information from LinkedIn' columns report the number of individuals for whom CB+AL did not have the relevant information but was available on LinkedIn. The BoardEx column reports the number of directors for whom we found relevant data.

	CB+AL			New information from LinkedIn			BoardEx (matched info)
	Founders	Investors	Directors	Founders	Investors	Directors	Directors (1537 matched)
Location(s)	47494	12789	26715	2102	361	2357	916
Educational institutions	29326	10311	24604	6877	1264	1722	532
Education start/end dates	26979	9588	21897	9224	1987	4429	494
Past work experience	32941	11619	23810	7727	742	2646	638
Past work experience start/end dates	30305	10806	20476	10363	1555	5980	589
Board appointment date			25411			3661	

IA.2.2. Comparison with Form D filings

Ewens and Malenko (2022) obtain information on startup directors from Form D filings. As noted in Section 1.3 of the paper, CB collects and authenticates data through multiple channels *including* but not limited to Form D filings. In this section, we provide a comparison of our data with information obtained solely from Form D filings to show that CB+AL provides more comprehensive coverage of the directors of early-stage startups compared to information gleaned from Form D filings.

Because Form D data is available in machine-readable XML format only since 2009, we compare our data with Form Ds filed between 2009 to 2015. During this period, there are 7,857 startups in our sample that appointed at least one early-stage non-executive director. We match the names of these startups with all Form D filers using the fuzzy matching process described in section IA.2.1. We find that only 2,211 of these startups – i.e., only 28% of the startups with early-stage non-executive directors from CB+AL – match with Form D data. When we do this exercise in the reverse – i.e., begin with startups with director information in Form D data and find matches with the CB+AL data – we find that there are 2,319 startups with early-stage non-executive directors in the Form D data, and 2,211 of these

are also covered by the CB+AL data. To summarize, almost all the information in Form D data is contained in CB+AL, whereas only a small fraction of the information in CB+AL is covered in the Form D data. This shows that CB+AL provides more comprehensive coverage of the directors of early-stage startups compared to information gleaned from Form D filings.

There a multiple reasons why CB+AL provides better coverage of the non-executive directors of early-stage startups compared to Form D filings. Although startups are required to notify SEC through Form D filings when they make a private offering of securities, in practice, startups can claim a variety of exceptions to avoid filing Form D. One of the more commonly used methods is section 4(a)(2) under Rule 506b, commonly referred to as the 'private placement' exemption, where all investors are deemed as sophisticated investors and have access to information that would normally be available in a prospectus (see Ewens and Malenko (2022) for more information). Similarly, startups that raise funds within a single state– e.g., California startups raising funds within California– are exempt from the Form D requirement (see https://www.sec.gov/smallbusiness/exemptofferings/exemptofferingschart). Industry analysts have also noted that penalties for non-compliance with the Form D requirement are low, which explains the declining trend in Form D filings (e.g., see the article titled "The disappearing Form D": https://techcrunch.com/2018/11/07/the-disappearing-form-d/). Even for startups filing Form D, the information tends to be patchy due to the non-mandatory nature of many of the fields. Moreover, director appointments that do not coincide with a financing round may not be reported on Form D. Therefore, CB provides better coverage because it collects and authenticates data through multiple channels in addition to Form D filings.

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IA.3. Additional Tables

Table IA.3.1 Verification of Results with 1,000 Randomly Drawn Control Samples

In this table, we repeat the main analyses presented in the paper by randomly drawing 1,000 control groups (i.e., we randomly draw eight control observations for each treated observation repeatedly 1000 times) and report the median and standard deviation of the empirical distribution of coefficient estimates. In Panel A we investigate the matching between startups and Early NE Directors, in Panels B through E we investigate the effect of Early NE directors on attracting later-stage investors, C-suite executives, later-stage NE Directors, and acquirers, respectively. We use ***, **, and * to denote statistical significance at 1%, 5% and 10% levels, respectively. All variables are defined in Section IA.1 of the Online Appendix.

Panel A: Matching between Startups and Early NE Directors

	Early Non-investor Director		Early VC Director		Early Angel Director	
	(1)	(2)	(3)	(4)	(5)	(6)
Network Connections						
Connected to founder	0.085***		0.032***		0.055***	
	(0.010)		(0.012)		(0.010)	
Connected to Early-stage Investor	0.067***		0.090***		0.058***	
	(0.008)		(0.014)		(0.009)	
Complementary Experience						
Entrepreneurial exp.		0.058***		0.009		0.053***
		(0.011)		(0.012)		(0.013)
Board exp.		0.069***		0.021		0.044***
		(0.013)		(0.014)		(0.016)
C-Suite exp.		0.038***		0.024*		0.020
		(0.012)		(0.014)		(0.014)
Patent exp.		0.025**		0.019		0.017
		(0.011)		(0.012)		(0.011)
M&A exp.		0.018*		0.026**		0.025***
		(0.010)		(0.012)		(0.009)
IPO exp.		0.019**		0.017		0.019
		(0.009)		(0.011)		(0.012)
Adj. R^2	0.351	0.375	0.327	0.348	0.308	0.357
Startup Controls	Yes	Yes	Yes	Yes	Yes	Yes
Connection Controls		Yes		Yes		Yes
Founder & Director Experience Controls		Yes		Yes		Yes
Group F.E.	Yes	Yes	Yes	Yes	Yes	Yes

Panel B: Early NE Directors and Later-Stage Investors

	Startup-Later-stage Investor Match		
	Early Non-investor Director	Early VC Director	Early Angel Director
	(1)	(2)	(3)
Later-stage investor is:			
Connected to Early NE Director	0.043**	0.051**	0.044**
	(0.020)	(0.020)	(0.019)
Connected to Founder	0.048***	0.044***	0.038***
	(0.006)	(0.009)	(0.009)
Connected to Early Investor	0.131***	0.130***	0.141***
	(0.006)	(0.007)	(0.009)
Adj. R^2	0.439	0.470	0.451
Startup & Director Exp. Controls	Yes	Yes	Yes
Group F.E.	Yes	Yes	Yes

Panel C: Early NE Directors and Outside CEO/C-suite Executive Appointments

	Startup-Outside CEO Match			Startup-Outside C-suite Executiv		
	Early Non-investor Director	Early VC Director	Early Angel Director	Early Non-investor Director	Early VC Director	E
	(1)	(2)	(3)	(4)	(5)	
Outside CEO/Executive is:						
Connected to Early NE Director	0.098***	0.030**	0.076***	0.158***	0.038	
	(0.014)	(0.015)	(0.020)	(0.038)	(0.036)	
Connected to Founder	-0.015	-0.015	-0.019	-0.041	-0.038	
	(0.120)	(0.016)	(0.026)	(0.035)	(0.029)	
Connected to Early Investor	0.011	0.015	-0.007	-0.032	0.038	
	(0.020)	(0.018)	(0.033)	(0.035)	(0.040)	
Adj. R^2	0.030	0.037	0.024	0.032	0.055	
Startup & Director Exp. Controls	Yes	Yes	Yes	Yes	Yes	
Group F.E.	Yes	Yes	Yes	Yes	Yes	

Panel D: Matching between Startups and NE Directors in Later-stages

	Startup-Later-stage NE Director Match		
	Early Non-investor Director	Early VC Director	Early Angel Director
	(1)	(2)	(3)
Investor	0.042***	0.040***	0.049***
	(0.012)	(0.013)	(0.012)
Late-stage Director is:			
Connected to Early NE Director	0.177***	0.052***	0.190***
	(0.022)	(0.019)	(0.027)
Connected to Founder	0.038	0.046	0.068
	(0.025)	(0.029)	(0.049)
Connected to Early Investor	0.027	0.037**	0.035
	(0.019)	(0.018)	(0.026)
Adj. R^2	0.232	0.211	0.201
Startup & Director Exp. Controls	Yes	Yes	Yes
Group F.E.	Yes	Yes	Yes

Panel E: Early NE Director and Potential Acquirers

	Startup-Acquirer Match		
	Early Non-investor Director	Early VC Director	Early Angel Director
	(1)	(2)	(3)
Acquirer is:			
Connected to Early NE Director	0.101***	0.168***	0.274***
	(0.026)	(0.024)	(0.078)
Connected to Founder	0.347***	0.245***	0.260***
	(0.033)	(0.026)	(0.056)
Connected to Early Investor	-0.006	0.004	-0.100
	(0.024)	(0.020)	(0.064)
Adj. R^2	0.199	0.275	0.254
Startup & Director Exp. Controls	Yes	Yes	Yes
Group F.E.	Yes	Yes	Yes

Table IA.3.2 Early NE Directors and Future Startup Stakeholders

This table reports additional results of the conditional linear probability models in the paper (Tables 5 to 8) aimed at understanding how the matching between startups and future stakeholders is affected by early-stage directors (see section 4.1 for details). In Panels A through E we investigate the effect of Early NE Directors on attracting later-stage investors, Outside CEOs, Outside C-suite Executives, later-stage NE Directors, and Acquirers, respectively. We control for startup characteristics but suppress the coefficients to conserve space; and include fixed effects for the actual startup-investor pair and corresponding control pairs ("Group FE") in all specifications. Standard errors (reported in parentheses) are heteroskedasticity robust and clustered at the product market level. We use ***, **, and * to denote statistical significance at 1%, 5%, and 10% levels, respectively.

Panel A: Effect of Early NE Directors on Attracting Later-stage Investment

	Startup-Later-stage Investor Match		
	Early Non-investor Director	Early VC Director	Early Angel Director
	(1)	(2)	(3)
Later-stage investor is:			
Connected to Early NE Director			
Same Startup	0.064**	0.050	0.063**
	(0.026)	(0.032)	(0.026)
Same Employer	0.040**	0.068***	0.046**
	(0.018)	(0.025)	(0.021)
Same School	0.036*	0.030	0.028
	(0.021)	(0.029)	(0.030)
Connected to Founder	0.045***	0.041***	0.035***
	(0.015)	(0.011)	(0.010)
Connected to Early-stage Investor	0.129***	0.125***	0.139***
	(0.008)	(0.010)	(0.011)
Obs	47317	8669	12808
Adj. R^2	0.436	0.469	0.448
Startup & Director Exp. Controls	Yes	Yes	Yes
Group F.E.	Yes	Yes	Yes

Panel B: Effect of Early NE Directors on Outside CEO Appointments

	Startup-Outside CEO Match		
	Early Non-investor Director	Early VC Director	Early Angel Director
	(1)	(2)	(3)
Outside CEO is:			
Connected to Early NE Director			
Same Startup	0.119***	0.062*	0.089***
	(0.042)	(0.035)	(0.029)
Same Employer	0.092**	0.055*	0.095***
	(0.038)	(0.033)	(0.028)
Same School	0.056	0.017	0.029
	(0.041)	(0.031)	(0.031)
Connected to Founder	-0.016	-0.015	-0.018
	(0.012)	(0.017)	(0.025)
Connected to Early-stage Investor	0.008	0.011	-0.008
	(0.020)	(0.018)	(0.032)
Obs	8269	3396	2957
Adj. R^2	0.029	0.037	0.024
Startup & Director Exp. Controls	Yes	Yes	Yes
Group F.E.	Yes	Yes	Yes

Panel C: Effect of Early NE Directors on Outside C-suite Executive Appointments

	Startup-Outside C-suite Executive Match		
	Early Non-investor Director	Early VC Director	Early Angel Director
	(1)	(2)	(3)
Outside Executive is:			
Connected to Early NE Director			
Same Startup	0.139***	0.040	0.121**
	(0.042)	(0.038)	(0.049)
Same Employer	0.142***	0.041	0.101**
	(0.048)	(0.039)	(0.041)
Same School	0.061	0.027	0.058
	(0.040)	(0.042)	(0.039)
Connected to Founder	-0.042	-0.039	-0.035
	(0.036)	(0.030)	(0.048)
Connected to Early-stage Investor	-0.035	0.035	0.058
	(0.035)	(0.040)	(0.088)
Obs	8469	3247	2506
Adj. R^2	0.033	0.055	0.051
Startup & Director Exp. Controls	Yes	Yes	Yes
Group F.E.	Yes	Yes	Yes

Panel D: Effect of Early NE Directors on Attracting Later-stage NE Directors

	Startup Later-stage NE Director Match		
	Early Non-investor Director	Early VC Director	Early Angel Director
	(1)	(2)	(3)
Investor	0.049***	0.051***	0.057***
	(0.013)	(0.012)	(0.009)
Late-stage Director is:			
Connected to Early NE Director			
Same Startup	0.221***	0.038*	0.059
	(0.028)	(0.022)	(0.039)
Same Employer	0.105***	0.098***	0.301***
	(0.031)	(0.024)	(0.036)
Same School	0.031	0.033	0.059*
	(0.029)	(0.028)	(0.033)
Connected to Founder	0.040	0.051	0.085
	(0.038)	(0.038)	(0.054)
Connected to Early-stage Investor	0.028	0.034	0.044**
	(0.028)	(0.028)	(0.021)
Obs	25321	4849	9750
Adj. R^2	0.245	0.243	0.208
Startup & Director Exp. Controls	Yes	Yes	Yes
Group F.E.	Yes	Yes	Yes

Panel E: Effect of Early NE Directors on Attracting Potential Acquirers

	Startup-Acquirer Match		
	Early Non-investor Director	Early VC Director	Early Angel Director
	(1)	(2)	(3)
Acquirer is:			
Connected to Early NE Director			
Same Startup	0.098***	0.201***	0.198**
	(0.030)	(0.028)	(0.081)
Same Employer	0.115***	0.152***	0.110
	(0.032)	(0.030)	(0.076)
Same School	0.066*	0.002	0.079
	(0.035)	(0.031)	(0.063)
Connected to Founder	0.342***	0.242***	0.249***
	(0.034)	(0.024)	(0.058)
Connected to Early Investor	-0.009	0.001	-0.091
	(0.025)	(0.020)	(0.065)
Obs	6986	2805	1331
Adj. R^2	0.195	0.279	0.253
Startup & Director Exp. Controls	Yes	Yes	Yes
Group F.E.	Yes	Yes	Yes

Table IA.3.3 Early NE Directors' Complementary Experience and Propensity to Attract Key Stakeholders

This table reports the results of regressions aimed at understanding the relation between early NE directors' complementary experience and startups' ability to attract key stakeholders after the series A stage. We estimate this regression on a sample of startups appointed early NE directors (i.e., startups with *Early NE Director*= 1). Panel A investigates the effect of early NE directors' complementary experience on startups. Panels B, C, and D report the results for the sub-sample of startups that appointed early non-investor directors, early VC directors, and early angel directors, respectively.
We control for startup characteristics from Table 4 in all specifications (but suppress the coefficients to conserve space), and include fixed effects for startup 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 variables are defined in Section IA.1 of the Online Appendix.

Panel A: Effect of Early NE Director

	(1) Later-stage Funding	(2) Outside CEO Appointment	(3) Outside C-suite Exec. Appointment	(4) Late-stage NE Dir. App.	(5) Acquired
Complementary Experience of Early NE Directors					
Entrepreneurial exp.	-0.014	0.018***	0.024***	-0.007	-0.002
	(0.011)	(0.006)	(0.007)	(0.006)	(0.008)
Board exp.	0.325***	0.046***	0.039***	0.428***	0.001
	(0.023)	(0.009)	(0.007)	(0.022)	(0.008)
C-Suite exp.	0.009	0.049***	0.030***	-0.001	-0.017**
	(0.008)	(0.007)	(0.005)	(0.006)	(0.007)
Patent exp.	0.012	0.025***	0.019***	-0.016**	-0.003
	(0.012)	(0.007)	(0.005)	(0.006)	(0.008)
M&A exp.	0.024**	0.036***	0.050***	-0.007	0.024**
	(0.011)	(0.007)	(0.010)	(0.007)	(0.010)
IPO exp.	0.077***	-0.004	0.060*	-0.016	0.018
	(0.026)	(0.021)	(0.034)	(0.026)	(0.045)
Founders' Experience					
Entrepreneurial exp.	-0.013	0.029***	0.017	0.000	0.020***
	(0.012)	(0.009)	(0.011)	(0.010)	(0.007)
Board exp.	0.028*	0.023***	0.002	-0.014	-0.003
	(0.015)	(0.006)	(0.009)	(0.010)	(0.011)
C-Suite exp.	0.003	0.046***	0.038***	0.011	-0.003
	(0.016)	(0.014)	(0.011)	(0.012)	(0.013)
Patent exp.	0.044**	0.012	0.001	0.013	-0.008
	(0.017)	(0.016)	(0.009)	(0.008)	(0.013)
M&A exp.	-0.023	-0.037	0.028	-0.004	0.015
	(0.036)	(0.030)	(0.036)	(0.023)	(0.021)
IPO exp.	-0.044	0.074**	-0.021	-0.052***	-0.040*
	(0.035)	(0.036)	(0.020)	(0.018)	(0.020)
Early NE Directors' Experience					
Entrepreneurial exp.	0.046***	0.013**	0.013	0.004	-0.004
	(0.010)	(0.006)	(0.012)	(0.009)	(0.012)
Board exp.	0.112***	0.006	0.009	0.077***	0.017*
	(0.013)	(0.008)	(0.009)	(0.010)	(0.009)
C-Suite exp.	0.016	-0.022*	-0.008	-0.008	0.018
	(0.011)	(0.012)	(0.007)	(0.011)	(0.013)
Patent exp.	0.008	-0.002	0.006	0.015	0.000
	(0.011)	(0.010)	(0.009)	(0.012)	(0.012)
M&A exp.	0.065***	0.017	0.021**	0.029**	-0.004
	(0.015)	(0.014)	(0.010)	(0.014)	(0.015)
IPO exp.	-0.013	0.010	-0.063*	0.067***	-0.025
	(0.039)	(0.044)	(0.034)	(0.025)	(0.039)
Obs.	10185	10185	10185	10185	10185
Adj. R^2	0.247	0.058	0.055	0.343	0.119
Startup Controls	Yes	Yes	Yes	Yes	Yes
Founded Yr, Prod. Market, City F.E.	Yes	Yes	Yes	Yes	Yes

Panel B: Effect of Early Non-investor Director

	(1) Later-stage Funding	(2) Outside CEO Appointment	(3) Outside C-suite Exec. Appointment	(4) Late-stage NE Dir. App.	(5) Acquired
Complementary Experience of Early NE Directors					
Entrepreneurial exp.	-0.016	0.014**	0.019**	-0.007	-0.002
	(0.012)	(0.006)	(0.008)	(0.006)	(0.007)
Board exp.	0.311***	0.052***	0.045***	0.380***	-0.001
	(0.027)	(0.012)	(0.008)	(0.026)	(0.011)
C-Suite exp.	-0.013	0.048***	0.034***	-0.004	-0.015
	(0.008)	(0.009)	(0.006)	(0.005)	(0.010)
Patent exp.	-0.011	0.026***	0.020***	-0.010	0.000
	(0.013)	(0.008)	(0.007)	(0.007)	(0.010)
M&A exp.	0.010	0.052***	0.046***	-0.015*	0.030***
	(0.016)	(0.012)	(0.014)	(0.008)	(0.013)
IPO exp.	0.119**	-0.002	0.082	-0.073**	-0.009
	(0.056)	(0.035)	(0.051)	(0.035)	(0.042)
Founders' Experience					
Entrepreneurial exp.	0.027	0.047***	0.024	0.005	-0.001
	(0.017)	(0.016)	(0.017)	(0.011)	(0.014)
Board exp.	-0.016	0.011	-0.008	0.013	0.013
	(0.023)	(0.016)	(0.011)	(0.011)	(0.016)
C-Suite exp.	0.017	0.019	0.043**	0.002	-0.001
	(0.024)	(0.018)	(0.019)	(0.018)	(0.022)
Patent exp.	0.036	0.007	-0.002	0.017	0.010
	(0.022)	(0.018)	(0.012)	(0.010)	(0.017)
M&A exp.	-0.008	0.027	0.051	0.026	0.004
	(0.042)	(0.034)	(0.052)	(0.026)	(0.037)
IPO exp.	-0.081	0.043	-0.038*	-0.070**	-0.014
	(0.066)	(0.050)	(0.020)	(0.029)	(0.036)
Early NE Directors' Experience					
Entrepreneurial exp.	-0.010	0.010	0.001	-0.002	0.021
	(0.019)	(0.012)	(0.015)	(0.013)	(0.015)
Board exp.	0.136***	0.016	0.021*	0.027**	0.008
	(0.017)	(0.010)	(0.012)	(0.012)	(0.011)
C-Suite exp.	-0.017	-0.010	-0.016	-0.006	0.009
	(0.022)	(0.017)	(0.013)	(0.014)	(0.022)
Patent exp.	0.029	-0.008	0.011	0.023	-0.017
	(0.019)	(0.013)	(0.010)	(0.014)	(0.014)
M&A exp.	0.049	-0.051***	0.002	-0.001	0.009
	(0.034)	(0.017)	(0.017)	(0.015)	(0.025)
IPO exp.	-0.043	0.048	-0.064	0.067*	-0.022
	(0.072)	(0.053)	(0.056)	(0.038)	(0.037)
Obs.	6459	6459	6459	6459	6459
Adj. R^2	0.187	0.051	0.042	0.336	0.103
Startup Controls	Yes	Yes	Yes	Yes	Yes
Founded Yr, Prod. Market, City F.E.	Yes	Yes	Yes	Yes	Yes

Panel C: Effect of Early VC Director

	(1) Later-stage Funding	(2) Outside CEO Appointment	(3) Outside C-suite Exec. Appointment	(4) Late-stage NE Dir. App.	(5) Acquired
Complementary Experience of Early NE Directors					
Entrepreneurial exp.	0.023	0.028	0.036***	-0.006	-0.001
	(0.026)	(0.017)	(0.011)	(0.022)	(0.019)
Board exp.	0.202***	0.007	0.023	0.454***	0.018
	(0.023)	(0.025)	(0.033)	(0.024)	(0.023)
C-Suite exp.	0.033**	0.055***	0.010	-0.019	-0.021
	(0.015)	(0.016)	(0.018)	(0.017)	(0.014)
Patent exp.	0.040**	0.011	0.005	-0.011	-0.017
	(0.019)	(0.016)	(0.018)	(0.011)	(0.013)
M&A exp.	0.013	0.011	0.040**	-0.014	0.040**
	(0.022)	(0.017)	(0.017)	(0.012)	(0.019)
IPO exp.	0.030	-0.025	0.072	-0.034	0.066
	(0.034)	(0.040)	(0.060)	(0.036)	(0.070)
Founders' Experience					
Entrepreneurial exp.	-0.022	0.037**	0.038**	-0.004	0.031**
	(0.014)	(0.014)	(0.018)	(0.019)	(0.012)
Board exp.	0.067***	0.039*	0.006	-0.012	-0.014
	(0.021)	(0.022)	(0.017)	(0.020)	(0.020)
C-Suite exp.	0.004	0.056**	0.033**	0.004	0.009
	(0.019)	(0.024)	(0.016)	(0.019)	(0.025)
Patent exp.	0.049**	0.019	-0.014	-0.012	-0.026
	(0.020)	(0.023)	(0.020)	(0.015)	(0.018)
M&A exp.	-0.031	0.088*	0.004	0.001	-0.001
	(0.044)	(0.048)	(0.044)	(0.041)	(0.045)
IPO exp.	-0.023	0.168**	-0.018	-0.008	-0.076
	(0.083)	(0.075)	(0.056)	(0.048)	(0.052)
Early NE Directors' Experience					
Entrepreneurial exp.	0.058***	-0.018	0.016	0.001	-0.027
	(0.015)	(0.017)	(0.019)	(0.017)	(0.019)
Board exp.	0.056**	0.051*	0.033*	0.015	0.008
	(0.024)	(0.027)	(0.018)	(0.028)	(0.022)
C-Suite exp.	0.021	-0.025	0.002	-0.004	0.024
	(0.014)	(0.016)	(0.016)	(0.016)	(0.019)
Patent exp.	0.048***	0.016	0.008	0.000	0.027
	(0.014)	(0.018)	(0.020)	(0.018)	(0.024)
M&A exp.	0.039**	0.086***	0.049**	0.029	-0.010
	(0.015)	(0.018)	(0.020)	(0.020)	(0.020)
IPO exp.	-0.006	-0.001	-0.116**	0.073**	-0.045
	(0.042)	(0.065)	(0.052)	(0.035)	(0.062)
Obs.	1368	1368	1368	1368	1368
Adj. R^2	0.246	0.058	0.060	0.372	0.111
Startup Controls	Yes	Yes	Yes	Yes	Yes
Founded Yr, Prod. Market, City F.E.	Yes	Yes	Yes	Yes	Yes

Panel D: Effect of Early Angel Director

	(1) Later-stage Funding	(2) Outside CEO Appointment	(3) Outside C-suite Exec. Appointment	(4) Late-stage NE Dir. App.	(5) Acquired
Complementary Experience of Early NE Directors					
Entrepreneurial exp.	-0.057	0.024	0.009	-0.033	-0.013
	(0.050)	(0.029)	(0.033)	(0.032)	(0.038)
Board exp.	0.347***	0.069**	-0.010	0.578***	-0.054
	(0.079)	(0.034)	(0.034)	(0.063)	(0.055)
C-Suite exp.	0.044	0.017	0.027	0.019	-0.034
	(0.043)	(0.032)	(0.032)	(0.024)	(0.030)
Patent exp.	0.001	0.025	0.042*	0.019	0.022
	(0.027)	(0.026)	(0.021)	(0.015)	(0.022)
M&A exp.	0.055	0.011	0.109*	-0.002	0.049**
	(0.053)	(0.038)	(0.061)	(0.024)	(0.021)
IPO exp.	0.049	-0.043	-0.066	-0.020	0.066**
	(0.146)	(0.057)	(0.049)	(0.030)	(0.033)
Founders' Experience					
Entrepreneurial exp.	-0.030	-0.074**	-0.068**	0.003	0.027
	(0.036)	(0.033)	(0.032)	(0.025)	(0.034)
Board exp.	0.118*	0.015	0.038	0.014	-0.023
	(0.062)	(0.022)	(0.034)	(0.026)	(0.040)
C-Suite exp.	-0.049	0.087**	0.004	0.035	-0.008
	(0.043)	(0.038)	(0.032)	(0.027)	(0.048)
Patent exp.	0.032	0.017	0.062**	0.020	-0.009
	(0.067)	(0.040)	(0.030)	(0.030)	(0.060)
M&A exp.	0.024	-0.114	0.077	-0.000	0.120
	(0.139)	(0.072)	(0.105)	(0.065)	(0.110)
IPO exp.	0.137	-0.158***	0.042	0.029	-0.070
	(0.190)	(0.053)	(0.116)	(0.043)	(0.053)
Early NE Directors' Experience					
Entrepreneurial exp.	0.108*	0.052	0.034	0.006	0.004
	(0.055)	(0.037)	(0.038)	(0.028)	(0.029)
Board exp.	-0.095	0.009	0.018	0.029	0.011
	(0.065)	(0.024)	(0.030)	(0.028)	(0.046)
C-Suite exp.	0.037	-0.031	0.002	-0.003	0.029
	(0.046)	(0.031)	(0.032)	(0.018)	(0.024)
Patent exp.	-0.008	-0.028	-0.015	0.005	-0.031
	(0.026)	(0.033)	(0.031)	(0.025)	(0.034)
M&A exp.	0.015	-0.039	-0.052	0.003	0.057
	(0.053)	(0.040)	(0.046)	(0.030)	(0.038)
IPO exp.	0.067	-0.089	0.116	0.044	0.102
	(0.150)	(0.055)	(0.099)	(0.062)	(0.143)
Obs.	2358	2358	2358	2358	2358
Adj. R^2	0.219	0.049	0.043	0.434	0.111
Startup Controls	Yes	Yes	Yes	Yes	Yes
Founded Yr, Prod. Market, City F.E.	Yes	Yes	Yes	Yes	Yes