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Board Dynamics Over the Startup Life Cycle

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Abstract

We explore the dynamics of venture capital (VC)-backed startup boards using novel data on director entry, exit, and characteristics. At formation, a typical board is entrepreneur-controlled. Independent directors join the median board after the second financing and hold a tie-breaking vote. Their presence is particularly likely when potential VC-entrepreneur conflicts are larger. At later stages, control switches to VCs and independent director characteristics change. These patterns align with key financial contracting theories, but also highlight unique roles of independent directors over the life cycle: mediation followed by advising. Independent directors thus represent another potential source of value-add to startup performance.

Keywords: venture capital, board of directors, corporate governance, independent directors, mediation

JEL Classifications: G24,G34

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*Michael Ewens is at Columbia University and NBER. Nadya Malenko is at Boston College. Data on board composition is available here: `https://github.com/michaelewens/vc_backed_boards/`. We are grateful to the Editor (Amit Seru), Associate Editor, two anonymous referees, Rustam Abuzov, Aymeric Bellon, Audra Boone, Brian Broughman, Aycan Corum, Matthew Denes, Ofer Eldar, Rüdiger Fahlenbrach, Brian Gibbons, Erik Gordon, Will Gornall, Camille Hebert, Peter Iliev, Arthur Korteweg, Marie Lambert, Jonathan Macey, Andrey Malenko, Daniel Metzger, Salvatore Miglietta, Ramana Nanda, Oghenovo Obrimah, Enrico Perotti, Elizabeth Pollman, Uday Rajan, Sven Riethmueller, Merih Sevilir, Per Strömberg, Tarik Umar, Fei Xie, and conference and seminar participants at the Private Equity Research Symposium, PCOB Workshop on Entrepreneurship and Finance, Corporate Governance Conference at Drexel University, AFA, EFA, SFS Cavalcade, FIRS, MFA, NFA, Advances in VC and PE Research Online Workshop, SDU Finance Workshop, Owners as Strategists Conference, ENTFIN Conference, Greater Boston Corporate Governance Workshop, seminar participants at BI Norwegian Business School, Caltech, Clemson, CMU, Colorado State, Columbia, EDHEC, ESSEC, FRB of Richmond, FIU, Frankfurt School of Finance & Management, Georgia State, HKU, Indiana, INSEAD, Lehigh, LSU, Lund University, McGill, MSU, Northwestern, Oxford, Penn State, Rice, SMU, Stockholm School of Economics, Tsinghua University, University of Amsterdam, UIUC, UNC-Chapel Hill, UIBE, Michigan, University of Mississippi, Oregon, Pittsburgh, UNSW, Virtual Corporate Finance seminar, Yale, and Yeshiva for helpful comments, and to Simran Khurana, Jiajie Xu, Shiyu Zhang, and Luman Zuo for research assistance. We thank the Private Capital Research Institute (PCRI) for access to the certificates of incorporation data.

Understanding corporate decisions requires documenting the composition and control of the board of directors, which holds the ultimate decision-making authority within a firm. The board's role is particularly important in venture capital (VC)-backed startups, as their major shareholders – entrepreneurs and VCs – have different payoffs from decisions facing the board, are both active in management and operations, and their roles change substantially over the startup life cycle. While the literature has studied VC directors on startup boards (Lerner, 1995; Kaplan and Strömberg, 2003; Amornsiripanitch, Gompers, and Xuan, 2019),[1] The two other director types – entrepreneurs and independent directors – and how their roles on the board change over the firm's life, are yet to be explored. In particular, the distinct ownership structure of startups relative to public firms, with VCs being large and active blockholders, suggests that independent directors (i.e., directors not affiliated with either investors or entrepreneurs) play more than the traditional monitoring role. Our goal in this paper is to explore the dynamics of startup board composition and control, examine them in the context of key financial contracting theories, and understand the unique roles of independent directors over the firm's life cycle.

Data limitations present challenges when answering these research questions because it has not yet been possible to identify all board members across many years and startups, determine their affiliations, and analyze when they join and exit the board. This limitation is particularly problematic for entrepreneur/executive directors and independent directors, who, as we document in this paper, are often missing or misclassified in the existing commercial databases.[2] Our first contribution is to fill this gap in startup board data by leveraging state and federal filings, commercial databases, and online resources. The resulting data provide a view on the full board composition – director types and allocation of control – and its dynamic evolution over the firm's life. Our second contribution is to use these data to explore the key

[1] Gorman and Sahlman (1989), Sahlman (1990), Kaplan and Strömberg (2004), Broughman (2010), and Venugopal and Yerramilli (2020) have also analyzed startup boards. We discuss our contributions to the literature below.

[2] For example, in almost half of observations, our data has more executive directors than VentureSource, leading to a different classification of board control in 49% of firm-years. Section IV in the Internet Appendix offers a detailed comparison of different data sources for researchers studying startup board composition.

predictions of financial contracting theories, understand board dynamics from their perspective, and highlight that independent directors play a previously under-explored "mediation" role on the startup board. In essence, their presence helps mediate potential conflicts between VCs and entrepreneurs (Broughman, 2010, 2013; Blair, 2014). Moreover, the patterns of board composition over time and across firms are consistent with this mediation role being important in the early life of the startup and developing into an advisory role in later stages.

Building our panel database of startup boards requires merging three data sources. The first is Form D filings from SEC EDGAR, which list individual directors, indicate executive directors, and provide information on directors' start and end dates on the board. We merge these data with VentureSource, which provides information on investor-directors and some independent directors, but has limited information on executive directors and poor coverage of directors' start and end dates. The final piece is an extensive manual categorization of director types. The resulting sample covers 7,780 startups over 2002 to 2017, which represents one of the largest samples in the literature in terms of both the set of startups and sample period. The distinctive feature of this data set is the ability to observe all director types and thus precisely measure the allocation of control between investors, executives, and independent directors over time.

Analyzing whether investors or entrepreneurs have the majority of board seats, that is, have control over the board, is essential to understanding the balance of power in the firm. This is because the board is responsible for many major decisions facing the startup: hiring and firing the executives, approving large budget items, and initiating fundamental transactions, such as the sale of the firm, the issuance of shares, IPO, and liquidation (e.g., Ramsinghani, 2021). While voting rights and protective provisions may enable investors to block unfavorable transactions, they do not give them the power to initiate these transactions, making board seats a key control mechanism (see Section I for more details).

We show that the average board size across a startup's life is 4.5, with approximately 2 seats held by VCs, 1.7 by executives, and 0.8 by independent directors. The dynamics of board composition reveal a shift of control over the firm's life cycle. At first financing, the average (median) board has 3.6 (3) members, and board control is most frequently allocated to the

entrepreneurs/executives. As the startup grows and raises capital, it adds both VC directors and independent directors, and at later stages of the life cycle, board control is typically allocated to VCs. Independent directors are widespread: they are present in about half of all firm-year observations, even though, unlike in public firms, their presence is not required by law. Moreover, independent directors play a key role in the evolution of board control over the life cycle: As the board transitions from entrepreneur to investor control, it typically goes through a stage that we call "shared control." At this stage, neither the VCs nor the entrepreneurs hold the majority of seats on the board, so whenever these two parties disagree, independent directors have a tie-breaking vote and thus have substantial power over the decision. Such shared control is particularly common after the second financing round. The median firm at this stage has two executive directors, two VC directors, and one independent director.

To understand these life cycle dynamics, we explore the predictions of key financial contracting theories that study the allocation of control between entrepreneurs and investors. First, the transition of control from entrepreneurs to VCs could simply reflect the evolution of ownership: as the startup goes through financing rounds, the entrepreneur's stake is diluted, whereas investors' ownership grows, resulting in their increased control over the board (Grossman and Hart, 1988; Harris and Raviv, 1988). We show that while the evolution of ownership explains part of the life cycle dynamics, it is not the sole predictor of board composition: the shift from entrepreneur to VC control persists even when accounting for changes in ownership.

The incomplete contracting literature highlights three key factors influencing the allocation of control, which could help further explain board composition dynamics. The first is the need to incentivize firm-specific investments. In the presence of a hold-up problem, the entrepreneur may be reluctant to invest his human capital in the startup, so granting him control encourages firm-specific investments, initiative, and acquisition of information (Grossman and Hart, 1986; Hart and Moore, 1990; Burkart, Gromb, and Panunzi, 1997; Aghion and Tirole, 1997). This mechanism aligns well with the prevalence of entrepreneur control in early stages and VC control in late stages. As the startup progresses from developing the initial idea to the stage of a tangible, marketable product, the role of the entrepreneur's human capital decreases (Rajan, 2012; Kaplan, Sensoy, and Strömberg, 2009), and hence the need to grant him control to

encourage firm-specific investments decreases as well.

The second factor emphasized by theories as influencing the allocation of control is information. When the entrepreneur has valuable information about the firm, granting him control can be advantageous for both the entrepreneur and the investor, as long as their interests are relatively aligned. This is because, under the investor's control, the entrepreneur's information may be lost due to imperfect communication between them (e.g., Dessein, 2002; Harris and Raviv, 2008). Since the informational advantage of the entrepreneur over investors is often most significant in the early stages of the life cycle, and their interests are relatively more aligned in early stages, these theories predict that entrepreneur control is particularly likely during these early stages, consistent with our empirical evidence.

The third factor highlighted in the literature is the role of financing constraints: when the entrepreneur needs capital from the investor and anticipates potential disagreements over future decisions, ceding control to the investor may be necessary to incentivize their capital contribution (Aghion and Bolton, 1992; Berglöf, 1994; Hellmann, 2006). As discussed in Section B, this mechanism does not have a clear prediction for the evolution of control over the life cycle. However, it provides other testable implications. First, a decrease in the required amount of capital investment should shift board control from the investor to the entrepreneur. To test this prediction, we exploit a negative shock to the need for VC capital brought by the introduction of Amazon Web Services cloud computing in 2006. This technological advancement reduced the necessity for large upfront investments in hardware, thereby decreasing the capital provided by VCs in the early stages. We follow Ewens, Nanda, and Rhodes-Kropf (2018) and use a difference-in-difference design, defining industry segments as treated if they were particularly affected by the introduction of cloud computing. In line with the theories, we find that relative to control firms, treated firms experienced a significant reduction in the likelihood of VC control over the board following the shock.

More generally, the financing constraints theories predict a key role of bargaining power in the allocation of control: as the importance of the VC's capital contribution for the startup decreases, so does the VC's bargaining power, making VC control less likely. We document several pieces of evidence aligning with this prediction. First, our data reveal a significant shift

in the allocation of board control over the past two decades. For example, the occurrence of VC control after the second financing round fell from 60% for startups first financed in 2003 to about 25% for the 2013 cohort. Over that time, entrepreneur control has almost doubled. These trends are in line with the increased supply of private equity capital over the last decades (Fang, Ivashina, and Lerner, 2015; Chernenko, Lerner, and Zeng, 2021; Ewens and Farre-Mensa, 2020) and, accordingly, stronger bargaining power of entrepreneurs relative to investors. We also directly test this prediction by creating several proxies for entrepreneurs' bargaining power relative to VCs: the supply of VC capital in the region (using a measure of dry powder), the attractiveness of exit opportunities in the industry (assessed through M&A market conditions), and the strength of entrepreneurs' bargaining power in negotiations over firms' valuations (proxied by the average equity stake obtained by VCs for a given amount of contributed capital). Across all these proxies, we find consistent evidence that as entrepreneurs' relative bargaining power increases, the probability of entrepreneur control rises, while the likelihood of VC control diminishes.

Overall, the allocation of control between investors and entrepreneurs is broadly consistent with the key financial contracting theories. However, what remains unexplained by these theories is the prevalence of shared control, that is, the widespread presence of independent directors with a tie-breaking vote. We thus shift our focus to studying the roles of independent directors on startup boards. While independent directors could be invited to provide advice and access to resources, this alone cannot explain why these directors frequently hold substantial voting power: if their role were purely advisory, giving them a tie-breaking vote would be unnecessary.[3]

We therefore investigate a different role of independent directors, which has been proposed in the law literature and by industry practitioners – the "mediation" role. We formalize this role and derive our key predictions building on Broughman (2010, 2013). The idea of the mediation role is that in an incomplete-contracts setting, independent directors can ensure the board's efficient decision-making and, ex-ante, incentivize the VCs and the entrepreneur to

[3]Moreover, the firm could establish an advisory board (as is frequently done in private firms) or add these individuals to the board as "board observers."

make capital and human capital investments, respectively. In particular, suppose that at a certain point, the firm is in a situation where the VCs and the entrepreneur disagree on the appropriate course of action. Such disagreements are likely to arise for decisions concerning the timing of exit, the sale of the firm, or CEO replacement, and particularly after negative shocks that require reorganization. If either the VCs or the entrepreneur has control over the board, the controlling party will pick the decision it prefers the most. However, it may be more efficient to take some "middle-ground" action, and this can be achieved by allocating a tie-breaking vote to an independent director, who is more unbiased than any of the two parties. Moreover, anticipating that the board will make efficient decisions, and not those that favor one party at the expense of the other, both the entrepreneur and the VCs are more willing to make ex-ante investments in the startup. Put differently, allocating the tie-breaking vote to independent directors offers a commitment to both parties to refrain from future opportunistic behavior.[4]

The mediation mechanism predicts that the shift of control from entrepreneurs to VCs over the firm's life cycle should happen through shared control. This is exactly what our evidence shows: the allocation of control shifts from the entrepreneur (47% of firms at the first financing), to shared control (36% of firms at the second financing), and then to VC control (62% of firms by the fourth financing). Conditional on a change in board control from one year to the next, entrepreneur control is 71% likely to switch to shared control, and shared control is 85% likely to switch to VC control.

Furthermore, if independent directors are invited to mediate future conflicts between VCs and entrepreneurs, their presence should be more likely when the ex-ante potential for such conflicts is higher. A clear conflict arises when the decision is about whether to replace the founder, and the ex-ante likelihood of this conflict is higher if the VC has a reputation for doing so in the past. We identify VCs with a particularly high propensity to replace the CEO in their past portfolio firms and show that if the first financing round involves at least one such VC, there is a 19% higher probability of an independent director being on the board in this round and

[4]See Fried and Ganor (2006), Atanasov, Ivanov, and Litvak (2012), and Eldar, Grennan, and Waldock (2021) for discussions of opportunistic behavior by VCs, and *In re Trados* and *In re Nine Systems* for case studies.

having a tie-breaking role. This suggests that unlike in public firms, where independent directors are added to protect investors from the opportunistic behavior of executives (monitoring), independent directors on startup boards are added to protect both, executives and investors, from the opportunistic behavior of the other party (mediation). As another measure of potential conflicts, we analyze past interactions between VCs and executives, specifically whether VCs have previously invested in a startup led by the current founder or CEO. When such past interactions have occurred, there is a lower probability of independent directors in a tie-breaking role. Intuitively, a repeated investment relationship is more likely when VCs and executives share similar views, reducing the need for mediation.

Finally, we find that independent director characteristics evolve over the life cycle in a manner suggesting their changing role on the board. Directors joining in later stages have typically held several executive positions and served on public company boards, with their inclusion being notably more likely in the period leading up to an IPO. This evidence aligns with the need to professionalize the firm (Hellmann and Puri, 2002; Rajan, 2012) and the advisory role of independent directors becoming relatively more important as the startup matures and approaches exit. Conversely, directors joining in early stages often possess founder experience, potentially predisposing them towards entrepreneurs. This can make such directors more effective mediators by counteracting the incentives to prioritize VC interests, which may arise if VCs exert undue influence over director appointments. In addition, early-stage directors are more likely to lack past connections to either VCs or entrepreneurs, emphasizing the impartiality required for mediation. Together, these results highlight the unique roles of independent directors on startup boards, suggesting that they could present an additional source of value-add to startup performance.

A Related literature

Our paper contributes to the large literature on corporate boards (see Adams, Hermalin, and Weisbach (2010) for a comprehensive survey). Given the data limitations, most of this literature focuses on boards of publicly listed firms. Our contribution to the literature is to analyze boards' composition and dynamic evolution for a comprehensive sample of VC-backed

startups. In particular, the combination of Form D filings, VentureSource, and manual data collection allows us to identify board members beyond the VC directors and capture directors' start and end dates. These additions fill the gaps in board coverage common to commercial datasets such as VentureSource (incomplete executive director coverage and missing dates), Crunchbase (missing directors and dates), and PitchBook (missing directors and incomplete coverage of start dates). The advantage of filling these gaps is our ability to determine how control over the board and the voting power given to independent directors change over the life cycle, which are the key questions we study in the paper.

Our interest in the dynamics of board control and the unique roles of independent directors distinguish our paper from other studies of VC-backed boards, which mostly focus on VC directors. Lerner (1995) offers the first comprehensive analysis of VC board activity, studying VC directors' role in CEO turnover and how VC board positions relate to their geographic distance from the firm. Amornsiripanitch, Gompers, and Xuan (2019) analyze a large sample of startup boards and show that prior VC-founder relationships and lead investor status are important predictors of VC board membership and that the presence of VC directors is associated with recruiting from their networks and relationship-based acquisitions. Venugopal and Yerramilli (2020) study Series A boards and examine how non-executive directors' appointment is related to their experience and ties with founders and investors, as well as to subsequent outcomes. These two papers rely, respectively, on VentureSource and Crunchbase, which we believe are insufficient to document the board's full composition, control, and dynamics (see Section IV of the Internet Appendix for details).[5] Kaplan and Strömberg (2003) study the role of board seats in contracts and find that most contracts in their sample separately define board seats, cash flow rights, and voting rights. They show that while state-contingent provisions for cash flow and voting rights are common, board rights are typically not state-contingent.[6] The role

[5]Montag (2024) analyzes the role of non-executive directors' expertise in Swedish limited liability companies. Cornelli and Karakaş (2015) analyze boards in LBOs backed by private equity funds.

[6]Out of 213 contracts in their sample, only 0.5% (one contract) features board control that is contingent on financial performance and no contract features board control contingent on non-financial performance. While 19% of contracts feature dividend/redemption default contingencies, these are rare and refer to borderline

of independent directors is not a focus of their study. Kaplan and Strömberg (2004) find that two measures of risks faced by startups – internal and external – are related to investor board membership, and that VC board control is predictive of interventions such as CEO replacement.

In the context of public firms, the literature emphasizes two roles of independent directors: monitoring and advising.[7] While we find evidence consistent with advising, especially as the firm approaches an IPO, our focus is on the mediation role and on the transition from mediation to advising over the life cycle. We also highlight the distinction between monitoring and mediation: monitoring is important in pubic firms with dispersed ownership, whereas mediation is important in startups, where ownership is concentrated, and both VCs and entrepreneurs are large shareholders with board representation. These differences in ownership structures and the roles of independent directors can explain differences in the dynamics of startup boards and public boards (e.g., Denis and Sarin, 1999; Boone et al., 2007; Graham, Kim, and Leary, 2020).[8] Our paper is also related to studies of boards of VC-backed firms after their IPOs. Field, Lowry, and Mkrtchyan (2013) and Iliev and Lowry (2020) show that VCs continue to play an active role on the board even after the IPO, and Baker and Gompers (2003) and Hochberg (2012) find that VC-backed firms have a higher fraction of independent directors at the IPO, hypothesizing that VCs bring independent outsiders to monitor the manager. In contrast, our paper studies the evolution of boards prior to the IPO, when the monitoring role of independent directors is less important given the concentrated ownership structure.

The idea of the mediation role goes back to Blair and Stout (2001), who view directors "as

financial milestones.

[7]See, for example, Weisbach (1988), Yermack (1996), Hermalin and Weisbach (1998), and Fich and Shivdasani (2006) for the monitoring role and Adams and Ferreira (2007), Coles, Daniel, and Naveen (2008), Field, Lowry, and Mkrtchyan (2013), and Harford and Schonlau (2013) for the advisory role.

[8]For example, the key source of board size growth over the startup life cycle is the addition of investor-directors (see Figure 1), whereas Boone et al. (2007) show that after the IPO, the board grows primarily due to the addition of independent directors. Another difference is the dynamics of CEO power: while we show that executives in startups lose board control over time, Graham, Kim, and Leary (2020) show that as CEO tenure increases, the CEO gets more power (board independence declines and CEO-chair duality becomes more likely), and Boone et al. (2007) find a negative relation between CEO tenure and board independence.

'mediating hierarchs' ... charged with the task of balancing the sometimes-conflicting claims and interests of the many different groups." Blair (2014) contrasts the monitoring and mediation roles and highlights the importance of mediation in VC-backed firms. Broughman (2010, 2013) presents a theory showing how independent directors can mediate between VCs and entrepreneurs, which we build on in our paper, and provides descriptive statistics on 54 startups. While the mediation role has received attention in the law literature, it has been discussed less in the finance literature. Burkart, Miglietta, and Ostergaard (2023) analyze Norwegian public firms at the turn of the 20th century and show that firms with large, heterogeneous shareholder bases were more likely to set up a board, hypothesizing that boards both mediated among shareholders and monitored managers. Villalonga et al. (2019) study closely held Colombian firms and find that boards are more likely to arise when the number of shareholders is larger, consistent with the need for a board to mitigate collective action problems and conflicts. These papers view the entire board as a mediator between shareholders, whereas our focus is on independent directors mediating between other directors on the board.

The paper proceeds as follows. Section I discusses the board's role in VC-backed startups. Section II outlines the data construction process, and Section III presents the key patterns observed in the data. Section IV discusses these patterns through the lens of financial contracting theories and provides further analyses to distinguish between them. Section V explores the role of independent directors. Section VI discusses robustness tests, and Section VII concludes.

I The startup board

The role of the board in shaping decision-making and strategy is particularly important in the context of VC-backed startups (Pollman, 2019). According to Fried and Ganor (2006),

> "startup boards—unlike public company boards—are frequently and intimately involved in strategic decision-making and personnel issues."

This heightened significance of the board can be attributed to several factors. First, the presence of non-professional managers, often the founders themselves, amplifies the board's role in steering strategic decisions. This feature is distinct from more established public companies,

where professional managers often dominate decision-making. Second, unlike in public firms, investors in startups go beyond providing capital: they actively participate in management and operations, given their concentrated positions and strong incentives. Furthermore, the firm's major shareholders – founders and investors – often have different beliefs about the best strategic direction for the firm, as well as different payoffs from the key decisions it faces. These disagreements underscore the pivotal role of the board, especially in the dynamic context of startups that undergo rapid evolution (e.g., Garlappi, Giammarino, and Lazrak, 2017; Donaldson, Malenko, and Piacentino, 2020).

Through surveys, small sample data collection, and practitioner texts (Ramsinghani, 2021; Feld, Blumberg, and Ramsinghani, 2022), we have a broad understanding of what VC-backed boards do and what powers they have. A recent survey of venture capitalists by Gompers et al. (2020) shows that a typical VC considers board control an important part of deal negotiation. In line with this, Ramsinghani (2021) argues that "the boardroom is where the venture capitalist wields the greatest influence on a company's future growth" (p. 362). Ramsinghani further elaborates that the board holds significant authority in crucial decisions: it hires and fires top executives, determines their compensation, and approves all key decisions: the sale of the firm, the issuance of stock, debt obligations, major budget items, as well as any changes to board structure or election procedures (pp. 340–342). These key decisions can lead to potential disagreements between VCs and entrepreneurs, and the allocation of board control is crucial to resolving these disagreements.

The board plays a central role in the control hierarchy. While the CEO and executive team manage day-to-day operations, the board's formal responsibilities discussed above are the major levers of its control. According to Fried and Ganor (2006), board control empowers the controlling party to "initiate fundamental transactions such as mergers, IPOs, and liquidations" (p. 987). Indeed, common shareholders – regardless of whether they have a majority of the shares – rely on the board to allow them to vote on major decisions. Moreover, even preferred shareholders, who often have additional contractual rights (protective provisions), can exert control only following the board's decision: while protective provisions allow preferred shareholders to veto exits or large investments (Bengtsson, 2011), they do not give them the

power to initiate these transactions.[9] More generally, contracts are incomplete, so control over the board is key for decisions and situations that have not been specified in the contract.

An example of the role of board control is provided in Ramsinghani (2021), who writes: "In another case where the VCs lacked board control, the VCs offered a carveout to obtain the support of other directors for the sale." In line with this example, Broughman and Fried (2010) explore the terms of sales of VC-backed startups and find that when VCs do not control the board, common shareholders are more likely to receive a payment before VCs' liquidation preferences are satisfied. This reflects the idea that without board control, VCs cannot unilaterally authorize the sale of the firm and need to obtain cooperation from non-VC directors, for example, by carving out a portion of their liquidation preferences. In Section VI of the Internet Appendix, we discuss the data on protective provisions and why we believe our results are unaffected by their presence.

These arguments suggest that while having a majority of board seats does not always guarantee exclusive authority over key decisions, it is a crucial mechanism of control that protective provisions and voting rights cannot override. Accordingly, Fried and Ganor (2006) conclude that "board control gives VCs substantial power over and above whatever contractual provisions they have negotiated" (p. 987). For these reasons, for simplicity, we will use the term "control" to refer to board control throughout the rest of the paper.

II Data

We aim to build a database that addresses the limitations of commercial and public data sources on VC-backed boards. For example, in the process of building our data we learned that commercial databases used in the literature do not track executive directors, miscategorize directors' types, and typically lack directors' start and end dates. Similarly, public data sources (i.e., Form D filings) can only show a partial picture of the board. The combination of the two –

[9] See, for example, Broughman and Fried (2010), who conclude: "Unlike protective provisions, which give VCs the power only to block unfavorable transactions, board control enables VCs to replace managers as well as initiate fundamental transactions such as sales, IPOs, and dissolutions."

along with other data collection – provides the best view of board composition.

We analyze the boards of U.S.-based VC-backed startups financed from 2002 to 2017. Our key source of data are Form D filings combined with VentureSource. Identifying the full board, especially executive directors, demands that we impose several sample filters on the set of startups in VentureSource to minimize measurement error. First, to ensure that there are some shareholders who could have board rights, we require the startup to raise equity financing (e.g., not convertible notes or straight debt) at least once during 2002 to 2017. Second, for at least one financing during the sample period, equity capital has to be provided by at least one traditional U.S.-headquartered VC.[10] Third, to ensure that we see the board over the entire life cycle starting at first VC financing, we require that the startup's first VC financing in VentureSource is accompanied (within 15 days) by the filing of a Form D. A lack of a filing may be because the startup raised capital in only one state or simply failed to comply with regulation. Fourth, the startup's Form Ds must report at least one executive director by the end of the sample period. This condition is important because VentureSource has limited information on executive directors (see Section IV.B of the Internet Appendix). We start tracking startups after they raise their first VC financing (as reported in VentureSource). With the VentureSource sample defined this way, we search for these startups on the SEC EDGAR site, that is, find their CIK identifiers, to extract their Form D filings.

Form D filings are exemption requests made by startups raising private capital. Regulations

[10]Most commercial data providers define a traditional VC as a firm that manages limited life funds that raise capital from institutional investors; those funds have a fee and carry compensation scheme for general partners and a stated objective of investing in high-growth private firms. Investors not classified as traditional VCs include corporate VCs, angels, individuals, and large private equity investors (e.g., buyout or growth equity investors). Startups in VentureSource that raised capital *only* from these other investors are thus not in our sample. However, if a startup raised capital from at least one traditional U.S.-based VC, then we classify *all* its directors affiliated with investors (including these other types) as investor-directors. Finally, to avoid capturing startups that are mis-classified as VC-backed or that are relatively developed by the time they are tracked by VentureSource, we also exclude startups whose first observed financing is a public investment in private equity, a restart round, a secondary transaction, a later-stage financing, or a grant from a private organization.

require that Form Ds are filed within 15 days of the first sale of securities. They contain a list of the firm's directors, and for each director, indicate whether the director is an executive (see Figures IA.2 and IA.3 in the Internet Appendix). For 2002 to 2009, these filings are available in pdf form. Individual names and titles, such as executive or director, were extracted with a combination of pdf processing and manual data collection. Filings posted after 2008 are in machine-readable format (XML). The resulting list of directors is next merged with VentureSource. VentureSource provides information on investor-directors and some independent directors (called "Outsiders"); it also has information on partners at the investing VC firms and the startup's executives, whereas Form D data are crucial for identifying executive directors. In particular, we classify as "executive directors" those who have two boxes checked on the Form D ("Director" and "Executive Officer"). For other directors on the Form D, we begin by relying on VentureSource to determine their type. In particular, we classify directors on the Form D as investor-directors if they match with the startup's investors, their partners, or investor-directors from VentureSource, and we classify directors that match with VentureSource's "Outsiders"as "independent." We manually review all remaining directors using CrunchBase, LinkedIn, and Google to classify them as investors, executives, or independent. Directors are deemed independent if they have no affiliation (employee, shareholder, or partner) with any of the investors (including angels) and are not employees or founders of the startup. In Section VI, we discuss the robustness of our results to a more stringent definition of independence.

The combination of these databases thus provides information on executive directors and flags directors in Form Ds as one of three types: executives, who we refer to interchangeably as entrepreneurs; investors (who we call "VC directors"); or independent. The Form Ds are themselves an imperfect source of board data. There are cases where VentureSource reports investor-directors or independent directors not found in a contemporaneous Form D. These are likely the cases where the election of the director happened *after* the Form D filing deadline, so we add directors only available in VentureSource to our sample.

The Form D data also provide a crucial piece of information most often missing in commercial datasets: director start and end dates. We assign the date of the first Form D that mentions a director as that director's start date. In cases where a director's start date is also available in

VentureSource, we use the earlier of the Form D-based and VentureSource start dates.[11] We use PitchBook to provide additional information on start dates in cases when we lack a start date after combining these data. As for a director's end date, it is set either to six months prior to the first Form D in which the director is no longer listed,[12] or to the date of exit (e.g., IPO, failure, or acquisition), whichever is earlier. Startups without exits by the end of the sample period are tracked for two years after their last VC financing event, to ensure that we do not impose stale board data from still-private startups. The Internet Appendix provides more details on our data collection process, with Figure IA.1 offering an illustration.

Because Form Ds are only filed during or immediately after new financings, we mostly observe board composition in years when new financings are raised (we supplement it with VentureSource, which provides some information between financings). However, based on anecdotal evidence and conversations with practitioners, the right to elect board members is almost always negotiated at the same time as financing events, when new shares are issued. For this reason, our main unit of observation is firm-financing round, and we restrict attention to firm-financing years, that is, firm-years in which the firm raised at least one equity financing.[13] The final data set provides the evolution of the full board, from first VC financing to exit, for a

[11]To get start dates for directors only available in VentureSource, we use a combination of reported start dates in VentureSource and dates when the VentureSource research team updated the board data. During most of our sample period, VentureSource contacted a startup or its investors twice a year. If a start date is missing, but the "last update date" field is known and varies across directors (if they are all the same, VentureSource said it is most likely late backfill), then we use this updated date.

[12]If the previous Form D filing is less than six months from the current filing, then the end date is set to the halfway point between the two filings.

[13]While the rights to elect board members are negotiated at financing events (see the discussion of certificates of incorporation in Section IV of the Internet Appendix), the actual election of board members may sometimes occur later. In this case, Form D may be filed before the agreed upon board seat is filled. However, we do not think this happens often, or that it introduces any bias. First, as noted above, if the director is also available in VentureSource, we use the earliest of the two start dates; moreover, the VentureSource date rarely disagrees with the Form D-based date by more than 4-6 months. Second, we observe such a director in the subsequent Form D, and since most startups raise capital every 1.6 years, the lag is about a year and is uniform over the life cycle.

sample of 7,780 startups.

Form D filers and data accuracy. Table I reports the characteristics of firms in our sample and compares them to firms in VentureSource that satisfied the main sample rules (raised equity financing by at least one traditional U.S.-based VC during our sample period), but either never filed a Form D (62% of that sample) or filed it at some point but did not satisfy other sample rules (e.g., because there was a VC financing before the first Form D filing). Firms in our sample are more likely to have a first round Series A because seed financings are often raised from smaller, non-traditional VCs, who are less likely to comply with Form D regulations. Sample firms are also more likely to be headquartered outside CA: startups in CA are more likely to raise capital in-state and so can avoid a Form D filing. Next, driven by some backfill in Form D filings by firms going public, sample firms are more likely to go public and in turn, have more financings.[14] Despite these differences, we believe that our sample of firms is generally representative of the VC universe during the sample period.

[Table I here]

In Section II of the Internet Appendix, we describe Form D filing requirements, and in Sections III–IV, we provide a comprehensive analysis to alleviate potential concerns about using Form Ds and compare them to other data sources. First, we ask whether startups with at least one Form D filing differ from the average VC-backed startup. The analysis suggests that Form D filers are a bit older, are less likely to be based in CA, and raise more capital over their lives. We explore the sources of these differences based on the existing disclosure regulations. Next, we investigate whether these differences manifest themselves in board characteristics. Using a small, nearly-comprehensive sample of board data for non-Form D filers in one state (MA), we find that boards of Form D filers are larger but exhibit no major differences in composition or dynamics. Finally, we examine whether Form Ds provide accurate data on directors. We compare Form Ds and annual reports for a small sample of firms from MA and show that in

[14] In particular, based on our conversations with practitioners, firms doing an IPO tend to retroactively file Form Ds for their prior financings, because going public requires compliance with disclosure regulations.

the vast majority of cases, there is agreement between the two, and any disagreements are driven by the startup's idiosyncratic features. We also analyze a small sample of certificates of incorporation and find no evidence that Form D data has major gaps in coverage. Our sample ends in 2017. This choice is motivated by the declining Form D filing rates documented in the Internet Appendix and the analysis in Hanley and Yu (2023). In Section IV of the Internet Appendix, we analyze alternative data sources for researchers interested in startup board composition post-2017.

Allocation of control. We call a board "*VC-controlled*" if VC directors hold strictly more than 50% of seats, or if they hold exactly 50% of seats and executives hold strictly less (i.e., the remaining 50% of seats are split between executives and independent directors).[15] We call a board "*entrepreneur-controlled*" if executives hold strictly more than 50% of seats, or if they hold exactly 50% and VCs hold strictly less. In addition, our sample includes some startups whose boards are initially empty but add directors in subsequent rounds of financing. We define such boards at their initial, empty stage as entrepreneur-controlled because the absence of a board likely means that the entrepreneur has control over the decisions. We refer to the remaining boards as having *"shared control."* In a typical board in this category, both VCs and entrepreneurs hold strictly less than 50% of seats, while the remaining seats are held by independent directors, who thus have a tie-breaking vote when the two parties disagree.[16]

We follow Kaplan and Strömberg (2003) and treat all investors in the firm as fully aligned, focusing on conflicts between VCs and entrepreneurs. This allows us to group all investor directors together and categorize boards into the three types defined above: VC-controlled, entrepreneur-controlled, and those with shared control. To study potential conflicts among VCs, tracking the number of seats held by each VC would be important, leading to a larger

[15]In this second case, the most unfavorable situation for the VCs is one where independent directors always side with executives, resulting in deadlock. In all other scenarios, the VCs can implement their preferred decision.

[16]Some boards with shared control feature exactly 50% of seats held by both VCs and executives and do not have independent directors; we call them "deadlock boards" (e.g., Donaldson, Malenko, and Piacentino, 2020). In unreported regressions, we verified that our results are robust to excluding deadlock boards.

number of possible board types. We discuss conflicts among investors in Section VI.

III Startup board over the life cycle

This section describes the basic patterns in our board data. Table II presents summary statistics for all firm-financing years, that is, firm-years in which the firm raised at least one equity financing. The average board size across a firm's life is 4.5. About 2 seats are held by VCs, while 1.7 and 0.8 seats are held by executives and independent directors, respectively. This composition corresponds to an average of 40%, 45%, and 15% of seats held by VCs, executives, and independent directors. Independent directors are very common: they are present in 49% of firm-financing year observations.

[Table II here]

Figure 1 reports board seat counts by financing round, where the first round is one where the startup first raises VC equity financing. On average, boards start with fewer VCs than executives. However, the number of VC directors grows over time, whereas the number of executives does not. The number of independent directors also grows (from zero to one for the median firm), and the median firm adds an independent director around the second financing round.[17] These dynamics are not driven by survivorship: restricting the sample to startups that survived for at least N years has no impact on the patterns (see Figure IA.12 of the Internet Appendix).

[Figure 1 here]

Figure 2 reports board size and the fraction of the board composed by each type of director by financing round. Consistent with the patterns in Figure 1, the fraction of executives on

[17] Figure 1 is not directly informative about board composition and the allocation of control, which are reported in Figures 2 and 3. This is because it reports averages (medians) of the number of directors of each type, whereas the allocation of control in the average (median) firm is determined by the average (median) proportion of each type of director, and the ratio of averages (medians) is generally different from the average (median) of ratios.

the board decreases (from 0.55 in the first round to 0.25 in later rounds), and the fraction of investor-directors increases. The median fraction of seats held by independent directors first increases but stabilizes at about 0.17 after the first two rounds. These patterns are consistent with entrepreneurs having control over the board in early stages but losing it over time, and VCs gaining control. In many years, however, neither the executives nor the VCs have a majority of the seats, suggesting that independent directors have a tie-breaking vote.

[Figure 2 here]

To investigate these patterns further, we present detailed statistics about the typical board composition at each financing round in Table III. In the first round, entrepreneurs control about 56% of seats in an average board, and the median board has two entrepreneurs and one VC director. In the second round, the firm adds another VC director, but simultaneously also adds an independent director. The most common arrangement is thus shared control: the median board has two entrepreneurs, two investors, and one independent director to break the tie in case of disagreement, and the average percentages of entrepreneur and VC board seats are 43% and 41% respectively. Over subsequent rounds of financing, the number and fraction of VC directors gradually increase, and by the fourth financing round, the average firm has 53% of board seats controlled by investors.

[Table III here]

Figure 3 uses the definitions of board control introduced in Section II to show the evolution of control over the life cycle. Entrepreneur control is most common after the first financing round: 48% of startups are controlled by entrepreneurs, as opposed to 20% by VCs and 32% with shared control. As the firm raises additional financing, entrepreneur control declines, whereas shared control and VC control become more prevalent. Shared control is overall very common: across all stages of the life cycle, it is observed in about a third of startups, and it is the most common arrangement in intermediate stages. Finally, VC control is most common in later stages: it is observed in more than 60% of firms after the fourth round.

[Figure 3 here]

To formally show these dynamics, we analyze the regression analog of Figure 3 that includes several important controls. In particular, we run the following regression on the sample of firm-financing years:

$$Y_{it} = \beta_0 + \sum_{s=1}^{5} \rho_s 1_{\text{round}_{it}=s} + \beta_1 K_{it} + X_{it} + \varepsilon_{it}, \tag{1}$$

where Y_{it} is the indicator for either VC or entrepreneur control and $1_{round_{it}=s}$ is the dummy for whether the startup is in financing round s.[18] The excluded category is the first financing round ($s = 1$). We aggregate all rounds at or after the fifth into "5." K_{it} is the log of the total capital raised by the startup by year t (i.e., capital stock), and X_{it} contains industry-year and startup location fixed effects (location is based on the nine Census divisions).

Columns 1–2 of Table IV present the regression results, and the top panel of Figure 5 plots the estimated coefficients. Consistent with Figure 3, entrepreneur control is most prevalent in the first financing round and becomes increasingly less likely over the life cycle, whereas VC control becomes increasingly more likely. In columns 3–4 of Table IV and the bottom panel of Figure 5, we replace financing rounds by firm age (restricting the sample to firm-financing years) and document similar patterns as the firm's age increases.

[Table IV here]

Finally, we ask whether the allocation of control has changed over our sample period. The left panel of Figure 4 presents the time series frequency of VC board control for age cohorts. The x-axis is the year a startup raises its first round of VC equity, and each time series presents the fraction of that cohort that had a VC-controlled board in round one, two, and three. (The x-axis ends in 2013 because the third financing round for the 2013 cohort corresponds to the end of our sample period, that is, 2017.) The figure reveals a significant decline in the probability of VC control. The youngest firms have experienced the largest decline: first- and second-round boards have roughly half the probability of VC control since 2012 than those in the early 2000s.

[18] We only present the results for VC and entrepreneur control, and not for shared control, because the set of firms with shared control is a residual of the set of firms with VC and entrepreneur control.

The middle panel of Figure 4 presents the same time series analysis, but for the fraction of firms with entrepreneur control, respectively. Together, these figures show a shift in board control from VC investors to entrepreneurs. In contrast, the fraction of firms with shared control (the right panel of Figure 4) has remained relatively stable or even slightly increased.[19]

[Figure 4 here]

Summary. Overall, the data reveal the following patterns. First, over the firm's life cycle, entrepreneurs lose control over the board, and VC investors gain control. Second, independent directors play a key role in this transition, with shared control particularly common in the second financing round. Moreover, an independent director is typically added together with a new VC director as if to prevent a deadlock situation or a switch of control to VCs that would have occurred otherwise. Finally, over the last decades, control has shifted from VCs to entrepreneurs, but the role of independent directors has remained important.

Next, we discuss these patterns in the context of different financial contracting theories and conduct further analysis to distinguish between them. Most theoretical literature examines the interactions between two parties – investor and entrepreneur (or more broadly, principal and agent), without studying the role of independent directors. We, therefore, structure our discussion into two steps. In Section IV, our emphasis is on the allocation of control between VCs and entrepreneurs. In Section V, we focus on the roles played by independent directors.

IV Allocation of control between VCs and entrepreneurs

A Ownership and control

One way to explain board composition dynamics is through the evolution of ownership. As the startup grows and goes through new financing rounds, the entrepreneur's stake gets

[19] In Figures IA.8 and IA.9 of the Internet Appendix, we show that similar trends are observed within the IT and healthcare industry separately, and in Figure IA.10 of the Internet Appendix, we explore the trends in additional board characteristics, such as board size and the presence of independent directors.

diluted, while the stake held by investors increases. Many theories show that it is efficient to tie control to ownership (e.g., Grossman and Hart (1988) and Harris and Raviv (1988); see Burkart and Lee (2008) for a review of the related literature) and predict a positive relation between an agent's ownership stake and control given to him (see, for example, Hellmann (1998) and Dessein (2005) in the VC context). According to these theories, control will transition to investors over the startup life cycle, reflecting the growth in their combined ownership.

We construct a proxy for the entrepreneur's stake to explore the connection between board control and equity ownership. For each financing round where the valuation is known, we denote by i_t the equity stake bought by new investors in that round. Then, the equity stake retained by the existing owners as of that round, which we denote by e_t, is $1 - i_t$. For example, if a Series B financing results in the sale of 20% equity (i_t), then the founder and previous investors hold the remaining 80% (e_t). This logic allows us to track the entrepreneur's equity stake in the firm starting with the first financing as follows: his equity stake x_s after the s'th financing is simply the product of e_t for $t = 1, \ldots, s$. If any valuation is missing in the financing series, we can only calculate x_s until the last financing with a valuation.

To study the relationship between ownership and board control and understand whether it fully explains the life cycle dynamics, we augment specification (1) with the entrepreneur's equity stake and report the results in Columns 5–8 of Table IV. The entrepreneur's stake is significantly and positively related to the likelihood of entrepreneur control, which is in line with the above theories. However, entrepreneur (VC) control continues to decrease (increase) with financing rounds and age even after controlling for ownership. This suggests that the dynamics of control are not purely a reflection of VCs' increased ownership over the life cycle.[20]

[20]Note that including the entrepreneur's equity stake results in a significant decrease in the number of observations. This is because many firms do not report valuations; in fact, the set of firms that do is a positively selected sample (for example, firms that go public tend to report their valuations; see Korteweg and Sorensen, 2010). For these reasons, we perform subsequent tests on the full sample, without controlling for ownership. In the Internet Appendix, we repeat the key specifications controlling for ownership and show that our results remain robust.

B Determinants of control beyond ownership

Since our results reveal life cycle dynamics in the allocation of control even after accounting for ownership, it is important to explore other factors influencing board control. The literature on incomplete contracts offers valuable insights, emphasizing the role of control allocation beyond its relationship with ownership. This literature identifies three key channels:

- **Firm-specific investments.** As pointed out by Grossman and Hart (1986) and Hart and Moore (1990), giving control to an agent may encourage him to make firm-specific investments. The idea is that after the agent's investment is made, he may become vulnerable to opportunistic behavior by the other party (hold-up problem), which may discourage him from making investments in the first place. Giving control to the agent ensures that he can reap the benefits of his investment, thereby giving him the appropriate incentives. Similarly, Burkart, Gromb, and Panunzi (1997) emphasize the role of control in fostering managerial initiative. Aghion and Tirole (1997) show a related benefit of giving control to an agent: it incentivizes the agent to invest in information acquisition, by ensuring that he can benefit from this information later on. The idea that control can encourage ex-ante investments has also been explored in the VC context: the literature highlights that entrepreneur control can foster entrepreneurial effort (De Bettignies, 2008; Cestone, 2014), whereas investor control can motivate the VC's costly search for a professional management team (Hellmann, 1998).

- **Financing constraints.** When the entrepreneur is financially constrained, allocation of control matters both for efficiency of the firm's decisions ex-post and for obtaining funding from investors ex-ante. Aghion and Bolton (1992) illustrate both of these forces. In their setting, entrepreneur control always leads to efficient ex-post decisions, but investor control does not. This is because, under entrepreneur control, the investor can bribe the entrepreneur into taking efficient action (ex-post negotiation), whereas under investor control, the entrepreneur lacks this capability given his financial constraints. However, because entrepreneur control allows him to extract a substantial surplus in such ex-post negotiations, it may decrease the investor's ex-ante willingness to provide

financing. Aghion and Bolton (1992) show how state-contingent control can help achieve efficient ex-post decisions and, at the same time, secure funding from the investor. Several papers have explored related forces in the VC context for decisions about project selection or exit strategy (e.g., Berglöf, 1994; Bascha and Walz, 2001; Hellmann, 2006). The general idea in this literature is that the allocation of control determines who has authority about decisions concerning the firm and, if ex-post negotiations about such decisions take place, affects parties' outside options in these negotiations. As a result, the allocation of control influences the division of surplus between parties, affecting whether their ex-ante participation constraints are satisfied.

- **Efficient information use.** When parties are privately informed about the decisions facing the firm but have conflicting interests, allocation of control between them affects how efficiently their information is incorporated into the decisions. For example, Dessein (2002) points out that if the principal (e.g., investor) has control, whereas the agent (e.g., entrepreneur) has valuable private information but different preferences regarding the decision, communication from the agent to the principal can be compromised. The agent has incentives to misreport his information to sway the principal's decision in the direction preferred by the agent. Thus, under the principal's control, the agent's information will not be used efficiently, whereas under the agent's control, it will be used efficiently but at the cost of biased decision-making. The trade-off between information and bias determines the principal's optimal allocation of control. A large follow-up literature explores related trade-offs, for example, in the context of board composition (Adams and Ferreira, 2007; Harris and Raviv, 2008; Baldenius, Melumad, and Meng, 2014) and decisions concerning the timing of taking an action (Grenadier, Malenko, and Malenko, 2016).

The life cycle dynamics documented in Section III align with the "firm-specific investments" and "efficient information use" channels, as they both predict that board control will transition from entrepreneurs in early stages to investors in late stages. The logic is the following.

According to the literature on firm-specific investments, control should be allocated to the entrepreneur when his human capital investment and initiative are particularly valuable. This

is more likely in the early stages because the role of the founder's human capital declines as the startup moves from developing the initial idea to the stage of a tangible, marketable product (Rajan, 2012; Kaplan, Sensoy, and Strömberg, 2009; Khanna and Mathews, 2016; Pollman, 2019). In contrast, giving control to VCs in later stages can incentivize them to engage in a costly search for a professional management team, as in Hellmann (1998).

According to the literature on the information channel (e.g., Dessein, 2002), the investor will give control to the entrepreneur when (i) the entrepreneur's information is relatively more important and (ii) his preferences are relatively aligned with those of the investor. Both (i) and (ii) are arguably more likely in the early stages of the life cycle, before the startup matures and requires more general managerial expertise, and before investors' pressure to exit, founder-CEO fit issues, or startup performance create a conflict between VCs and the entrepreneur. Moreover, a key decision in the later stages of the life cycle concerns the timing of exit (e.g., sale or an IPO), and the founders often prefer a later exit than investors. Grenadier, Malenko, and Malenko (2016), who extend Dessein (2002) to decisions about timing, predict that in such scenarios, it is optimal for the investor to retain control, in line with our empirical evidence.

Unlike the "firm-specific investments" and "efficient information use" channels, the "financing constraints" channel does not have a clear prediction for the transition of board control over the life cycle. On the one hand, as the startup grows, its financing needs rise, which may necessitate granting investors more control in later stages to incentivize them to contribute more capital. On the other hand, as the startup grows and its value increases, it may become easier to satisfy investors' participation constraint by simply offering them a large enough equity stake, without the need to grant them control over the board. Therefore, to directly examine the financing constraints channel, we move beyond the life cycle dynamics and explore the variation in board control over time and across firms.

C The role of financing constraints for board control

C.1 Introduction of cloud computing and the shift in board control

The first prediction of the financing constraints channel is that a negative shock to the required amount of VCs' capital investment should shift board control from VCs to entrepreneurs (e.g., Aghion and Bolton, 1992). To test this prediction, we exploit the introduction of Amazon Web Services (AWS) cloud computing in early 2006. This technological shock significantly lowered the cost of forming new internet-based startups by removing the need for large upfront investments in hardware. As Ewens, Nanda, and Rhodes-Kropf (2018) show, the introduction of AWS increased the prevalence of the "spray and pray" investment approach, whereby VC investors provide lower amounts of funding to a larger number of startups. Thus, it can be viewed as a negative shock to the financing needs of firms affected by the shock, which would predict a shift from VC control to entrepreneur control in such firms compared to those not affected by the shock. Since AWS had a particularly strong effect on early-stage financings, we focus on board control in the Series A financing event.

We follow the approach of Ewens, Nanda, and Rhodes-Kropf (2018) in classifying the 28 industry-segments in VentureSource into those that benefited the most from AWS ("treated") and all others ("control"); see Table 2 in their paper. We then perform a differences-in-differences estimation, where a firm-year observation belongs to the post-period if the first VC financing happened between 2006 and 2010. Ewens, Nanda, and Rhodes-Kropf (2018) provide several tests validating the parallel trends assumption, and also discuss why the results cannot be explained by other changes that occurred around 2006 (see Section 3.2 and Section 5 of their paper). The same arguments apply in our setting as well.

Table V presents the results controlling for state, year, and industry fixed effects (there are seven major industries). Consistent with the prediction, there is a significant (19% = .067/.36) increase in the likelihood of entrepreneur control and a significant (25% =.073/.29) decrease in the likelihood of VC control in treated firms relative to control firms (columns 1 and 2). In columns 3 and 4, we add the interaction between industry fixed effects and a time trend variable to address the concern that our controls for industry and year do not fully capture

aggregate trends. Finally, in columns 5–8, we perform the same tests but on a smaller sample: since Ewens, Nanda, and Rhodes-Kropf (2018) show that AWS resulted in a lower probability of VCs taking board seats, we restrict the sample to boards that include at least one VC director. This allows us to distinguish changes in board control (intensive margin) from changes in the presence of VCs on the board (extensive margin). The results remain almost unchanged. In Table IA.VII of the Internet Appendix, we show that controlling for ownership does not change these results either, providing further support for the financing constraints channel.

[Table V here]

C.2 Bargaining power and board control

A broader implication of the financing constraints mechanism concerns the role of bargaining power. Effectively, this mechanism suggests that a party (investor or entrepreneur) is given more control when this party's participation constraint is harder to satisfy, that is, its outside option is higher. Higher outside options can be interpreted as having stronger bargaining power than the other party. Hence, this prediction can be stated as:

When the entrepreneur's (investor's) relative bargaining power is higher, entrepreneur (VC) control over the board is more likely.

We first note that the trends in board control presented in Figure 4 are consistent with the bargaining power prediction. The last decades have seen increased availability of private equity capital. First, the 1996 deregulation of private equity markets made it easier for startups to raise capital from out-of-state investors and for VC funds to raise larger amounts of capital (Ewens and Farre-Mensa, 2020). Second, non-traditional investors, such as mutual funds, hedge funds, and sovereign wealth funds, have become increasingly active in making direct private equity investments in startups (e.g., Fang, Ivashina, and Lerner, 2015; Chernenko, Lerner, and Zeng, 2021). Both changes increased the outside opportunities of entrepreneurs relative to VCs, which could have increased entrepreneurs' bargaining power and led to a shift of board control from investors to entrepreneurs. Thus, the trend towards greater entrepreneur control observed in Figure 4 is in line with other trends highlighted in the literature and tied to greater availability of

private equity capital: a decrease in the number of firms going public (Ewens and Farre-Mensa, 2020), the growing use of dual-class structures by firms that do go public (Aggarwal et al., 2022; Field and Lowry, 2022), and a decline in investor-friendly contracting features such as redemption rights, participating preferred stock, and large liquidation preferences (Ewens and Farre-Mensa, 2020, 2022).

To study the role of bargaining power directly, we analyze the relationship between board control and several measures of VC bargaining power in Table VI. We define these measures in detail in the Appendix and only provide a brief description here. Our first measure captures firms' valuations in the industry and is calculated as the average equity stake of VCs (i.e., the ratio of capital invested by VCs to post-money valuation) in early financing rounds across all firms in the industry. The idea of this measure is that a higher average VC equity stake corresponds to higher VC bargaining power in negotiations over firms' valuations. We divide the sample into quartiles (columns 1–2) or quintiles (columns 3–4) of VC bargaining power defined this way. Our second proxy (columns 5–8 of Table VI) measures "dry powder," that is, the supply of VC capital available for investment in a geographical region. We calculate it as the total capital raised by VC funds in a region minus the capital invested into startups in that region. Our third measure (the last four columns of Table VI) captures exit opportunities based on M&A activity in the industry. Few exit opportunities require startups to continue to raise capital to survive and hence are likely to indicate greater bargaining power of VCs. Our preferred measure is the equity-based proxy since, as discussed in the Appendix, the dry powder and exit-based proxies require a noisy mapping from either fund or industry. For each measure, the excluded category is the middle of the distribution of VC bargaining power.

The outcomes of interest are indicators for entrepreneur and VC control in the first financing round. We do not consider subsequent financing rounds because the allocation of control in them depends on the allocation of control in the previous rounds, which makes the results harder to interpret. All regressions include the log of capital raised and industry and region fixed effects. We do not include year fixed effects because while there are differences across industries and regions in year-to-year variation in our measures of bargaining power, these differences are not large enough.

Table VI shows that entrepreneur control becomes increasingly less likely as VC bargaining power increases based on the equity stake proxy. For example, the fraction of startups with entrepreneur control in the lowest (highest) quartile of VC bargaining power is higher (lower) than in the middle of the distribution by 0.07 (0.13). These effects are economically significant, given that the average frequency of entrepreneur-controlled boards in the first financing round is 0.46. In contrast, the fraction of VC-controlled boards increases with VC bargaining power: it is by 0.05 lower (0.11 higher) in the bottom (top) quartile than in the middle of the distribution, with a sample average of 0.21. The dry powder and exit-based proxies results are noisier but are all broadly consistent with the bargaining power prediction. In Table A8 of the Internet Appendix, we add a control for the entrepreneur's equity stake and show that our results remain robust, although they become noisier given the reduced sample size.

[Table VI here]

Summary. Overall, the analysis presented so far suggests the following conclusions:

1. The evolution of board control reflects the firm's ownership structure change but is not fully explained by it.

2. Board dynamics over the life cycle are consistent with three roles of control rights discussed in the literature: (i) incentivizing firm-specific investments; (ii) encouraging efficient use of information; and (iii) relaxing entrepreneurs' financing constraints.

3. In line with (iii), the bargaining power of entrepreneurs relative to investors seems to be an important determinant of board control cross-sectionally and in the time series.

V Roles of independent directors

The literature discussed in Section IV focuses on the choice between investor and entrepreneur control. It does not consider the possibility of shared control, where a third party (independent director) has a tie-breaking vote. Yet, shared control is very common, including in recent years

(Figures 3 and 4). In this section, we explain shared control through the lens of independent directors' mediation role and explore how it varies cross-sectionally and over the life cycle.

A Mediation role

The idea of the mediation role is that independent directors can resolve conflicts between entrepreneurs and VCs and help reach a compromise. This idea aligns with industry practitioners' views. For example, venture capitalists Brad Feld and Jason Mendelson write: "... these outsiders can mediate issues that arise between the company and investor-elected board members" (Feld and Mendelson, 2019). According to Reid Hoffman, LinkedIn's co-founder and venture capitalist, "one of the really important roles for independents is to serve as a catalyst and bridge between management and investors." Hoffman describes his experience as an independent director in building a compromise in the decision on equity grants, which he views as an example of conflicts "which an independent board member can help mediate" and concludes: "It's the independent director's job to provide this kind of balanced perspective on conflicts."[21]

Theory. We formalize the mediation role by describing the key elements and implications of the theory in Broughman (2013). In addition, in Section VII of the Internet Appendix, we present a simplified and modified version of his theory that demonstrates the main ideas behind mediation and has additional implications.

Broughman (2013)'s model considers an incomplete-contracts setting similar to Aghion and Bolton (1992). At the initial stage, a cash-constrained entrepreneur seeks financing from a VC by offering a contract that specifies the division of cash flow rights and the allocation of board control. If the VC agrees to provide funding, then at a later stage, the board makes a decision over which the VC and entrepreneur may disagree. Each possible decision brings some monetary payoff, which is contractually divided between parties, and a non-transferrable private benefit to the entrepreneur, which is the reason for disagreements.

A key departure from Aghion and Bolton (1992), which gives rise to the mediation role of independent directors, is the following. In Aghion and Bolton (1992), there are only two

[21] See `https://greylock.com/greymatter/building-a-great-startup-board-pt-2`.

possible choices, and hence, the efficient decision is always the most preferred choice of either the investor or the entrepreneur, depending on the state of the world. As a result, in their setting, giving control to the party whose preferred choice is efficient (which can be implemented via state-contingent control) guarantees efficiency. In contrast, Broughman (2013) points out that more than two choices are often available. In particular, a "middle-ground" action can be more efficient than those preferred by the entrepreneur and the VC. For example, in decisions regarding the timing of an IPO, the VC may prefer an earlier timing than what is efficient given his incentives to exit and raise a new fund, whereas the entrepreneur may prefer a later timing than what is efficient given his reluctance to face the pressures of public markets.

Broughman (2013) shows that if the board is controlled by either the VC or the entrepreneur, a trade-off similar to that in Aghion and Bolton (1992) arises. Entrepreneur control ensures efficiency (because the VC can bribe the entrepreneur into making an efficient choice) but may not give the VC enough surplus, making it impossible to obtain funding. In contrast, VC control guarantees getting funding but may lead to inefficient decisions. This is exactly why the parties may optimally agree to give a tie-breaking vote to an independent director. Under such shared control, in equilibrium, the board settles on the option that is most preferred by the independent director. Because the director is not as biased as either the entrepreneur or the VC, this results in a compromise solution, which dominates the one that would have been chosen under VC control. And because this compromise is reached without the need for the VC to bribe the entrepreneur, it makes it easier to obtain funding compared to entrepreneur control. Moreover, Broughman (2013) shows that the independent director does not need to be completely unbiased for the board to reach an efficient outcome (Proposition 4 in his paper).

The model we analyze in the Internet Appendix highlights another benefit of shared control: it gives the entrepreneur stronger incentives to contribute his human capital to the startup compared to VC control. Put simply, giving a tie-breaking vote to an independent director serves as a commitment by each party to not engage in opportunistic behavior and thereby encourages the other party to participate in the relationship (see also Broughman, 2010).

Empirical analysis. Next, we test the empirical implications of the mediation role, starting with the life cycle dynamics. Broughman (2013)'s model predicts that as the amount invested by the VCs increases, the board will move from entrepreneur control to shared control, and then to VC control (p. 64 in his paper). In addition, our model in the Internet Appendix predicts that as the entrepreneur's human capital becomes less important, the board will move from entrepreneur control to shared control, and then to VC control. These predictions imply that over the life cycle, as the startup raises additional financing and starts relying less on the founder's human capital, the board should move from entrepreneur control in the early stages to shared control in the intermediate stages and to VC control in the late stages.

The evidence so far shows that shared control is common (Figure 3) and that control over the life cycle shifts from entrepreneurs to investors (Table IV and Figure 5), but does not establish that shared control occurs between entrepreneur and investor control. To determine whether the evolution of control indeed proceeds through the intermediate stage of shared control, we calculate the transition probabilities between the three types of board control in Table VII. This analysis asks: conditional on a given allocation of control in one year, what is the likelihood the board will have a different allocation of control in the next year? Panel A of Table VII, which considers all financing years, is consistent with the life cycle hypothesis: conditional on a change in control from one year to the next, entrepreneur control is 71% likely to switch to shared control ($31.36/(31.36 + 12.85)$), whereas shared control is 85% likely to switch to VC control ($30.78/(30.78 + 5.41)$). Conditional on the board being controlled by the VCs, VCs are 89% likely to retain control in the next year. The transition probabilities in Panel B, which only considers financing years in which there was a change in board size, are very similar.

[Table VII here]

Apart from the life cycle dynamics, the concept of mediation suggests that the presence of independent directors and shared control should vary across firms. If independent directors are added to mediate future conflicts between entrepreneurs and VCs, their presence should be particularly likely in startups where the ex-ante probability of future conflicts is high.

One important source of conflict is the decision about whether to replace the founder/CEO, and the ex-ante potential of such a conflict is higher if the VC investor has a reputation for replacing the founders of its portfolio firms in the past. To construct a measure of such reputation, for each VC investor and quarter-year, we calculate the number of CEOs replaced in firms in the VC's portfolio up to that point and divide it by the overall number of firms in the VC's portfolio up to that point. We then define VCs who are in the top quartile based on this ratio as "top CEO replacers" in the respective quarter-year. For each startup-financing year, our key explanatory variable is the dummy "*Has top CEO replacer*," which equals one if at least one of the investors in that financing is identified as a top CEO replacer.

Column 1 of Table VIII shows that if the first financing round involves at least one top CEO replacer, there is a 19% (.075/.37) higher likelihood of an independent director being on the board. It is possible that a VC's past aggressiveness in replacing the CEO is correlated with the VC's experience and, in turn, bargaining power. Hence, in column 2, we control for the VC's experience and find that the coefficient on top CEO replacer changes little and remains significant. Moreover, columns 3 and 4 show that the presence of a top CEO replacer is associated with a significantly higher (e.g., 19% = .034/.18 in column 3) likelihood of having the independent director in a tie-breaking role.[22]

These results support the mediation role and distinguish it from other potential roles of independent directors. In particular, they emphasize that unlike in public firms, where independent directors help protect investors from the opportunistic behavior of executives (the monitoring role), independent directors in startups help protect both executives and investors from the opportunism of the other party (the mediation role).

As another measure of ex-ante conflicts, we ask whether the VCs and executives have interacted in the past, particularly whether the VCs have ever invested in a startup founded or headed by the current founder or CEO. Since such past interactions are more likely if the

[22]The outcome variable for this test is an indicator for shared control with an independent director. In particular, it is set to zero for deadlock boards, another case we classify as shared control (see footnote 16). This is because such board composition is ineffective at resolving the disputes between the two parties and can even exacerbate them by causing deadlock.

executives are former founders or CEOs, which could be correlated with executives' bargaining power, we control for the past founder/CEO status in these regressions. Columns 7 and 8 of Table VIII show that the board is less likely to have an independent director in a tie-breaking role if such past interactions occur. This provides suggestive evidence that a repeated investment relationship is more likely when the VCs and executives have similar views and trust each other, which reduces the need for mediation.

[Table VIII here]

B Mediation and advisory roles over the life cycle

In addition to mediation, independent directors could play an advisory role, complementing the value-add of VCs in hiring, strategy, and investment decisions. Our previous arguments suggest that the mediation role is relatively more important in the earlier life cycle stages before investors take control. In contrast, directors who join in the later stages are likelier to play an advisory role and help the startup professionalize. If this is the case, we expect independent directors' characteristics to change over the life cycle, to match the mediation role earlier on and the advisory role later on.

To examine this prediction, we collect the data on independent director characteristics, which is summarized in Table IX. For independent directors found in VentureSource (81% of the sample), we often have a biographical string (e.g., CEO Widgets Inc.; CFO Robots LLC). To capture their managerial experience, we look at the number of past C-level and VP-level positions mentioned in this biographical string. We also match our data with BoardEx and document whether a director has ever served on the board of a publicly traded firm.

[Table IX here]

Table IX reveals that a quarter of independent directors are former entrepreneurs. An average director has held 1.2 C-level positions and 0.6 VP-level positions, and 8.6% of directors have served on a public firm's board. Table X examines these characteristics over the life cycle. Panel A defines directors as "joining a late-stage board" if they joined at least five years after

the first VC financing. It shows that directors with C-level, VP-level, and especially those with public-board experience are significantly more likely to join later (columns 3–5), consistent with the advising and professionalization of the startup becoming more important in later stages.[23] On the other hand, former founders are more likely to join early-on: their founder experience is likely to predispose them towards entrepreneurs and help counteract potential incentives to be VC-friendly, making them more effective mediators. These patterns are also consistent with the changing advisory needs of the startup: entrepreneurial experience is useful in younger firms, whereas managerial-level and public-board experience is useful in more developed startups.

In Panel B of Table X, we relate independent directors' characteristics to the allocation of board control at the time they join, rather than to firm age. The outcome variable is whether the director joins when the board has either shared or entrepreneur control (i.e., the director joins as a tie-breaker or in preparation to be a tie-breaker), and we include firm age fixed effects to distinguish board control from the effect of age explored in Panel A. Most importantly, we see that independent directors joining during this stage are significantly less likely to have prior professional connections with either VCs or entrepreneurs (Section V in the Internet Appendix describes how we measure past connections). This aligns with the idea of mediation, given that unconnected directors are more likely to be impartial and, hence, be more effective mediators. In addition, and consistent with Panel A, directors joining in later stages (the stage of VC control) are more likely to have managerial and public board experience and are less likely to be former founders. Overall, Table X suggests that independent director characteristics match the roles they are expected to play, and that these roles change over the life cycle.

[Table X here]

We also study whether VC characteristics predict the use of independent directors over the life cycle: directors playing an advisory role should be in higher demand by low-experience VCs. Figure 6 shows that there is little difference in the use of independent directors between experienced and inexperienced VCs in the first financing round. This is consistent with mediation

[23] We control for the total number of jobs listed in the director's biography because longer biographical strings are mechanically more likely to mention executive-level positions.

being relatively more important at early stages and VC experience not being directly related to the need for mediation. In contrast, in later rounds, inexperienced VCs are likelier to add new independent directors than experienced VCs. This pattern is consistent with the fact that the advisory role is becoming more important. However, these results need to be interpreted with caution since there is a positive correlation between VC experience and VC bargaining power.

[Figure 6 here]

Finally, we explore the idea that independent directors facilitate the professionalization of the firm from a startup to being a public company (Hellmann and Puri, 2002; Rajan, 2012). Figure 7 compares two subsamples: firms exiting via an IPO and those exiting via an acquisition. The top panel shows that firms going public are much more likely to add an independent director as they approach exit than firms exiting via an acquisition (35% vs. 15% of startups, respectively). Likewise, the bottom panel reveals that while the two types of firms have a similar number of independent directors in the early stages, IPO firms have more in the years leading to exit. A potential explanation is the regulatory requirement to have a majority of independent directors for publicly listed firms: adding such directors in advance, in anticipation of going public, allows directors to learn about the firm and be more effective after the IPO.

[Figure 7 here]

VI Discussion and robustness

Director connections. Due to their extensive networks, VCs may exercise undue influence over director appointments, which could tilt independent directors towards favoring VCs. Importantly, however, the mediation role does not require independent directors to be completely impartial: it only requires them to be more independent than both investors or entrepreneurs (see Section A and the discussion on pages 43 and 58 in Broughman, 2013). There are several reasons to believe that independent directors are not completely beholden to VCs. First, independent directors have fiduciary duties to the corporation and its stockholders as a whole

(see, for example, *In re Trados* and the discussion in Boschner and Simmerman, 2016). Second, they are usually compensated with common, and not preferred, stock, which aligns their interests with those of the firm, rather than the VCs. Third, Table IX (variable "Total board seats") shows that a typical independent director in our sample does not serve in this role more than once: the average (75th percentile) number of board seats over one's career is 1.16 (1). Thus, directors' labor market incentives to develop a VC-friendly reputation and be subsequently invited to other VC-backed boards are likely limited.

To alleviate the remaining concerns, we show that our results remain robust if we use a more conservative definition of independence that accounts for past connections. In particular, each pair of "investor and independent director" and "executive and independent director" on the current board can have a connection via any past investment activity, board activity, or employment within the VC industry, and we then classify the independent director in such a pair to be "connected" (see Section V in the Internet Appendix for details). We next redefine board control by considering a director connected to VCs (entrepreneurs) through his past professional experience as a representative of VCs (entrepreneurs).

Connections to entrepreneurs are rare (1% of independent directors), so among connected independent directors, most are connected to VCs. The fraction of connected independent directors increases over financing rounds, from 20% in the first round to 30% in the fourth round. Given these connections, around 10%–13% (1%–3%) of startups that were previously classified as having shared control are reclassified as having VC (entrepreneur) control. Table A9 in the Internet Appendix repeats the analysis in Tables IV, V, and VI, but using these new definitions of board control and shows that our main conclusions remain robust.

In addition, we performed an in-depth analysis of potential ties (educational, employment, and social) for a small random sample using LinkedIn and Google searches. This analysis did not reveal any relevant connections beyond those already identified in our data on professional connections (see Section V in the Internet Appendix).

Other robustness tests. While our sample creation requires filing Form D during the startup's first VC financing, it does not require filing Form D with every subsequent financing.

This means that for startups that stopped filing Form D at a certain point, we rely solely on VentureSource to identify any changes to the board after that point. To explore whether the presence of such stale boards affects the results, we drop a startup from the sample if it has a known VC financing, but no Form D filed in the previous two years. The resulting sample has 6,463 startups (17% sample loss), and the results are quantitatively unchanged (Figures IA.13 and IA.14 and Table IA.VI in the Internet Appendix). Next, our results are robust to the exclusion of firms that exited via an IPO. There are fewer than 300 such firms in our sample. Finally, in unreported regressions and figures, we find the results robust when considering each of the two most represented industries in our sample, IT and healthcare.

Conflicts between VCs. Our assumption that investors are fully aligned leaves independent directors solely mediating conflicts between VCs and entrepreneurs. Most startups have multiple VC investors, raising the possibility of conflicts inside the investor base. Introducing conflicts among VCs is interesting; however, such conflicts are likely second order to the VC-entrepreneur conflicts for two reasons. First, a large VC contracts literature primarily focuses on VC-entrepreneur conflicts, consistent with these conflicts driving most contracting decisions. Second, existing investors have influence over the choice of subsequent investors and are thus likely to pick those with whom they expect to agree (see also footnote 5 in Kaplan and Strömberg, 2003). Finally, from a theoretical perspective, introducing conflicts among VCs – and thus a need for mediation between them – likely lowers conflicts between some VCs and the entrepreneur. This change then lowers the need for mediation between the set of VCs and the entrepreneur, so the overall effect on mediation needs is ambiguous.

VII Conclusion

This paper studies the dynamics of VC-backed startup boards using a novel dataset of 7,780 startups from 2002 to 2017. Our findings reveal a transition of board control from entrepreneurs in earlier life cycle stages to investors in later stages, aligning with key financial contracting theories. Importantly, this shift of control happens through the stage of "shared" control, where neither VCs nor entrepreneurs have a majority of board seats, and independent directors hold

a tie-breaking vote. We conclude that independent directors play a "mediation" role, mediating and resolving potential conflicts between VCs and entrepreneurs. Moreover, their role evolves over the life cycle, from mediation in earlier stages to advising in later stages. Finally, we show that over the past decades, control over boards has shifted from VCs to entrepreneurs, consistent with the general trend toward lower VC bargaining power that has been documented in other studies. Nonetheless, the prevalence of boards with shared control has remained high.

Our results highlight a previously underexplored role of independent directors. They suggest that a dynamic theory of shifts in control that involves the mediation role could be an interesting direction for future theoretical research. Furthermore, the mediation role could be important for other types of firms that have two or more large blockholders with conflicting interests. Exploring this role outside of VC-backed startups presents another avenue for future research.

Appendix: Measures of bargaining power

This section describes the construction of three proxies for bargaining power used in Section C.2. Each of the three proxies directly captures industry-level or region-level characteristics rather than startup or VC characteristics (such as the VC's reputation). The challenge with using VC or startup characteristics is matching: reputable VCs tend to match with more promising startups. Thus, VC and startup characteristics per se do not clearly indicate the relative allocation of bargaining power between VCs and entrepreneurs.

Our first proxy is based on valuations that VC investors pay for firms in the industry in a given year. In particular, for each of the seven industry groups, we calculate the average equity stake of investors (i.e., the ratio of capital invested by VCs to post-money valuation) in early financing rounds across all firms during the previous year. We then split all observations within each industry group into three groups: (1) the top quartile of average VC equity in the previous year; (2) the bottom quartile; and (3) the middle 50%. The top (bottom) quartile corresponds to the group with the highest (lowest) VC bargaining power within the industry. The idea of this measure is that if the amount of capital contributed by VCs is determined by the firm's production needs and not by the parties' bargaining power, then a higher average VC equity stake corresponds to higher VC bargaining power in negotiations over the firm's valuation.

For the second proxy, we use a measure of "dry powder," that is, the supply of VC capital available for investment, at the geographical location level, during the deal negotiation phase. Specifically, we consider nine Census divisions (which we refer to as "regions") and allocate each startup and each VC to a given region based on the location of the startup and of the VC firm's headquarters, respectively. For each region-year, we first calculate the total capital raised by all VC funds in this region since 1990 and up to the year prior (funds tend to close at the end of the year and are deployed the following year). We then subtract from this the total capital invested into startups located in this region from 1996 and through that year (the six-year lag captures the fact that the VC fund takes several years to invest the capital it raised), which gives us the dry powder measure at the region-year level. We lag this measure one year to ensure we do not include the startup in the regression and to incorporate the fact

that a deal closed in a given year was likely negotiated for months before closing (Gompers et al., 2020). We then split all observations within each region into (1) the top quartile of dry powder in the previous year; (2) the bottom quartile; and (3) the middle 50%. Higher dry powder corresponds to a higher supply of VC capital in the region, hence lower VC bargaining power. Note that there was a spike in fundraising in 2000. This spike does not affect our results because it increases our measure of dry powder by the same amount in each year of the sample (2002 to 2017) and cancels out when we add region fixed effects.

For each of these two proxies, we first do the quartile splits described above. Next, we similarly split the sample period into quintiles within industry (for the first proxy) or region (for the second proxy). Table VI reports the results for both types of splits. The split for quartiles is in columns 1-2 and 5-6 (the excluded category is the middle 50%). The split by quintiles is in columns 3-4 and 7-8 (the excluded category is the middle quintile).

Our third proxy captures the volume of exit opportunities in the industry. Few exit opportunities require startups to continue to raise capital from VCs to survive, whereas ample exit opportunities provide more outside options to the entrepreneur and increase his bargaining power. Using SDC's M&A data, we count the number of all M&A deals (not only of VC-backed startups) in an industry-quarter over the previous two years ($\text{ma}_{jt-1,t-8}$) and compute the standard deviation of the number of M&A deals over the previous 10 years, $\text{sd(ma)}_{jt-1,t-40}$. A startup's financing event is in a hot (cold) exit market—corresponding to low (high) VC bargaining power—if it occurs in an industry-quarter whose M&A volume is more (less) than $\text{ma}_{jt-1,t-8}$ plus (minus) $\text{sd(ma)}_{jt-1,t-40}$. The results are reported in columns 9-10 (the excluded category are industry quarters in which M&A volume is between these bounds). In the final two columns, we split all observations into quintiles based on M&A volume in that industry-year and report the results for the top two and bottom two quintiles (the excluded category is the middle quintile, as for our two other proxies).

All three proxies reflect *relative* bargaining power, that is, variation in the VC's bargaining power relative to the entrepreneur's bargaining power. Our preferred measure is the equity-based proxy since the dry powder and exit-based measures require a noisy mapping from either fund or industry. There are two reasons why the dry power proxy is noisier than the equity-based

measure. First, to have more than an annual variation, we assigned VC funds to geographic regions based on their headquarters location. Many VCs can invest nationally and may have multiple offices making investments. Second, because it is challenging to observe the exact VC fund that invests in a startup, the capital raised by startups in the region is an imperfect measure of capital deployed by previously closed VC funds. For example, some investors in equity financings are corporate VCs or individuals that do not invest out of traditional funds. Similarly, the exit-based measure requires connecting the SDC acquisition targets to the VentureSource industry classification codes, which adds a layer of noise. In addition, not all acquisition events in SDC represent deals relevant to startups (e.g., public-public transactions), nor are they visible to the VC investor at the time of the investment.

Tables and Figures

Figure 1: Board composition over the life cycle: Counts

The figure reports the average and median number of board seats held by investors, executives, and independent directors over the startup's completed financing rounds. The x-axis is the startup's financing round, where we aggregate all rounds at or after the fifth into "5."

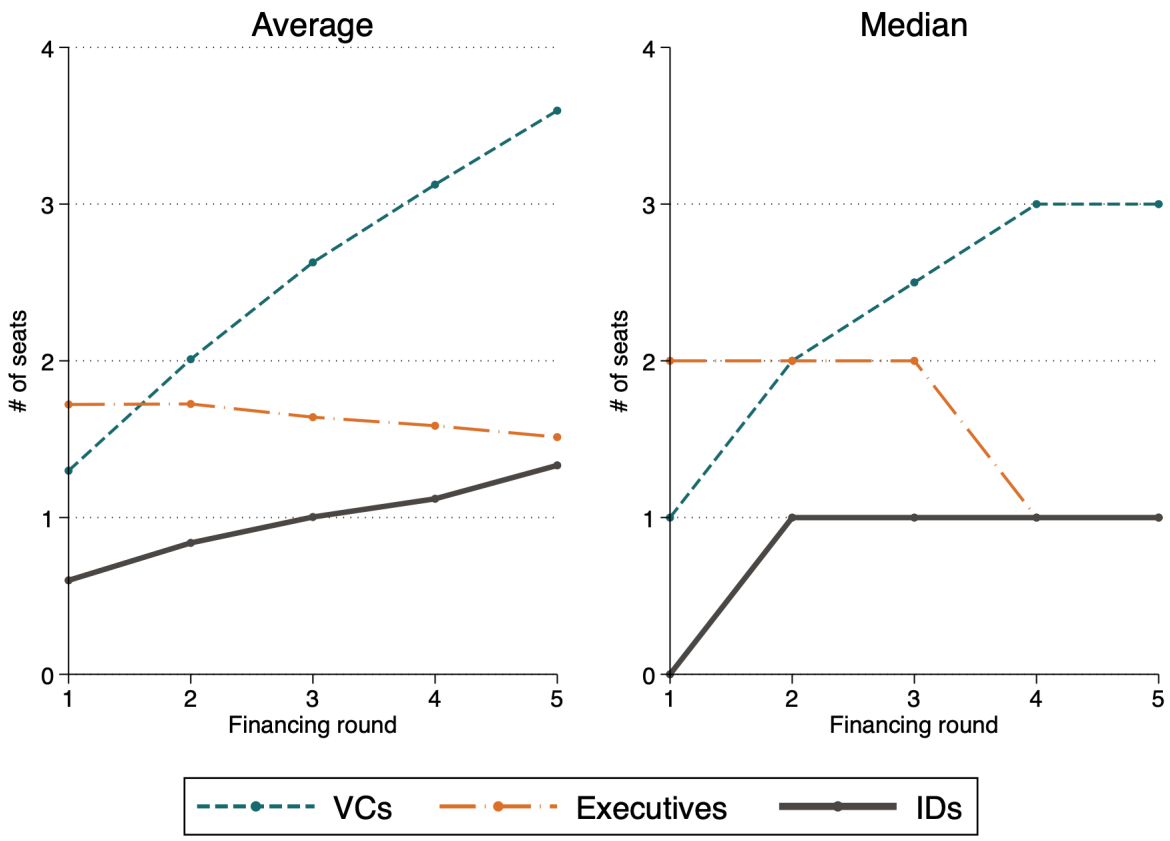


Figure 2: Board composition over the life cycle: Percentages

The figure reports the average and median fraction of board seats held by investors, executives, and independent directors over the startup's completed financing rounds. The x-axis is the startup's financing round, where we aggregate all rounds at or after the fifth into "5." The right y-axis of each figure reports the total board size.

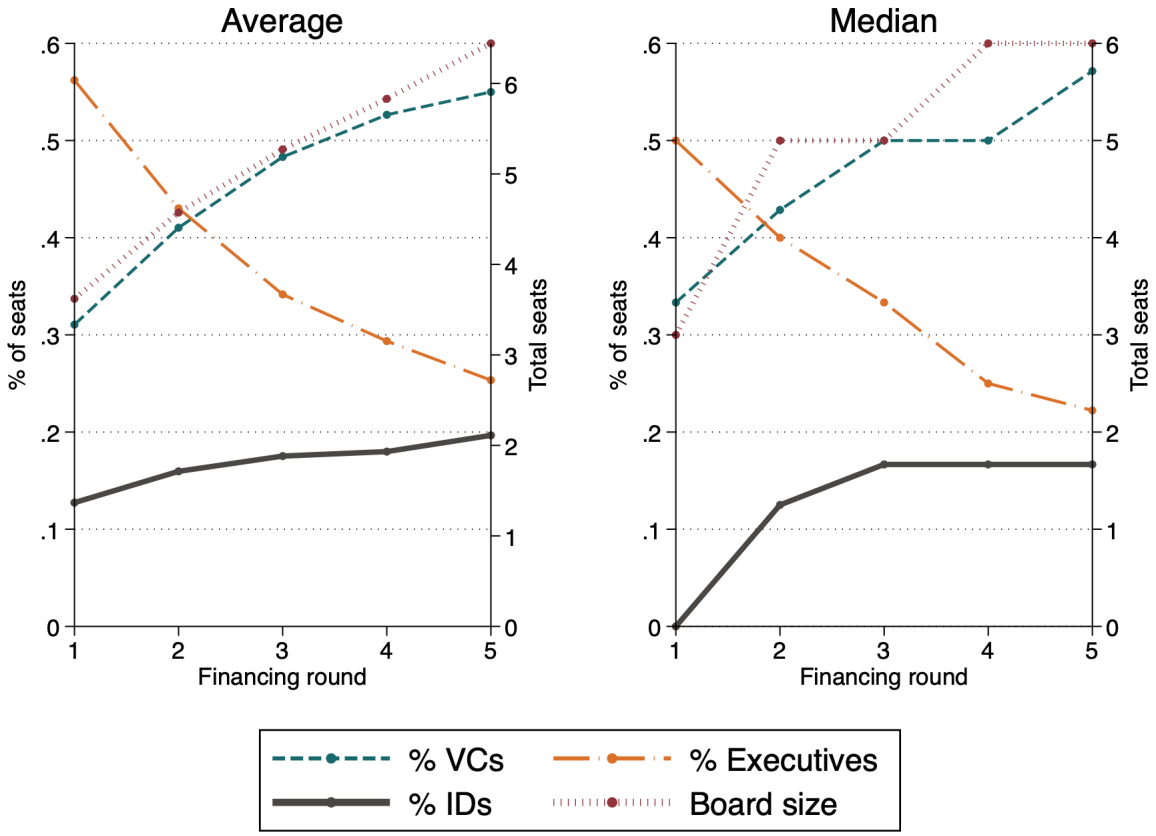


Figure 3: Board control over the life cycle

The figure reports the percentage of startups with a given allocation of board control by financing round. The x-axis is the startup's financing round, where we aggregate all rounds at or after the fifth into "5." "VC" is the percentage of startups where investors control the board, "Entrepreneur" is the percentage of startups where executives/entrepreneurs control the board, and "Shared" is the percentage of startups in which neither VCs nor entrepreneurs control the board. The definitions of board control are given in Section II.

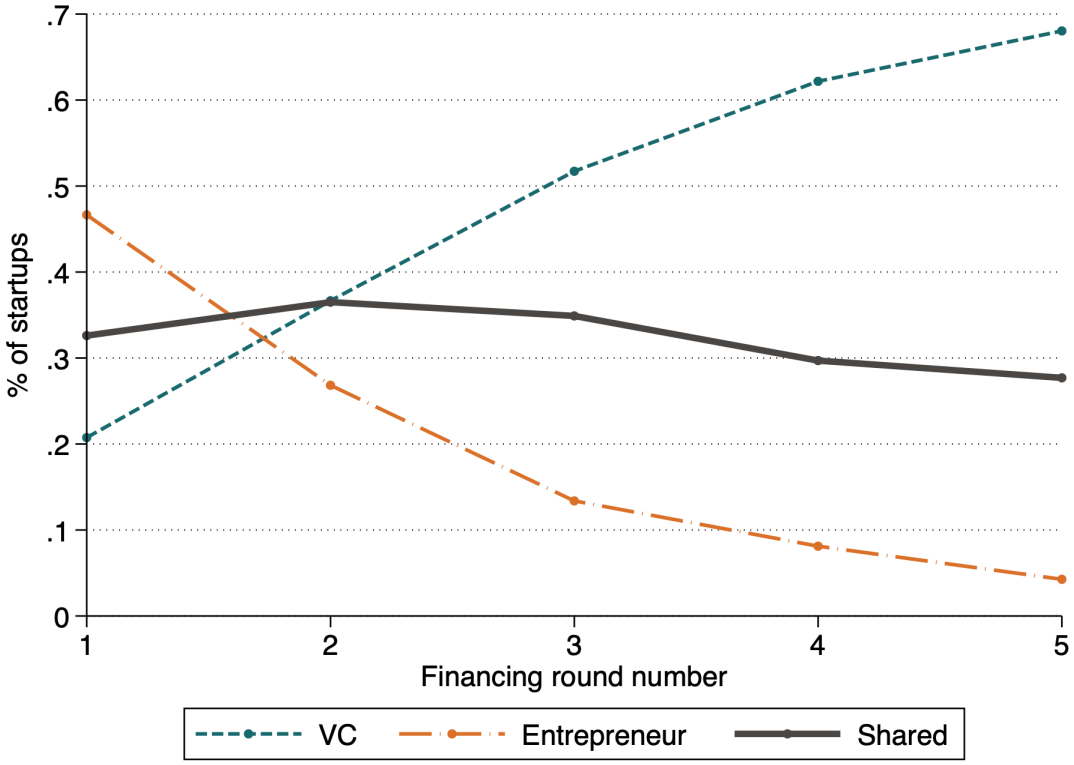


Figure 4: Percent of firms with VC, entrepreneur, and shared control over time

The figure reports the percentage of startups where the board is VC-controlled (left figure), entrepreneur-controlled (middle figure), and has shared control (right figure). The analysis is by age cohorts: the x-axis is the year that the startup raised its first VC equity financing, and each time series presents board control for that cohort in round one, two, and three, respectively. For example, the Round 3 statistics in 2002 describe board control in the third round for the set of startups that were first financed in 2002 (and that had at least three financing rounds by the end of the sample period).

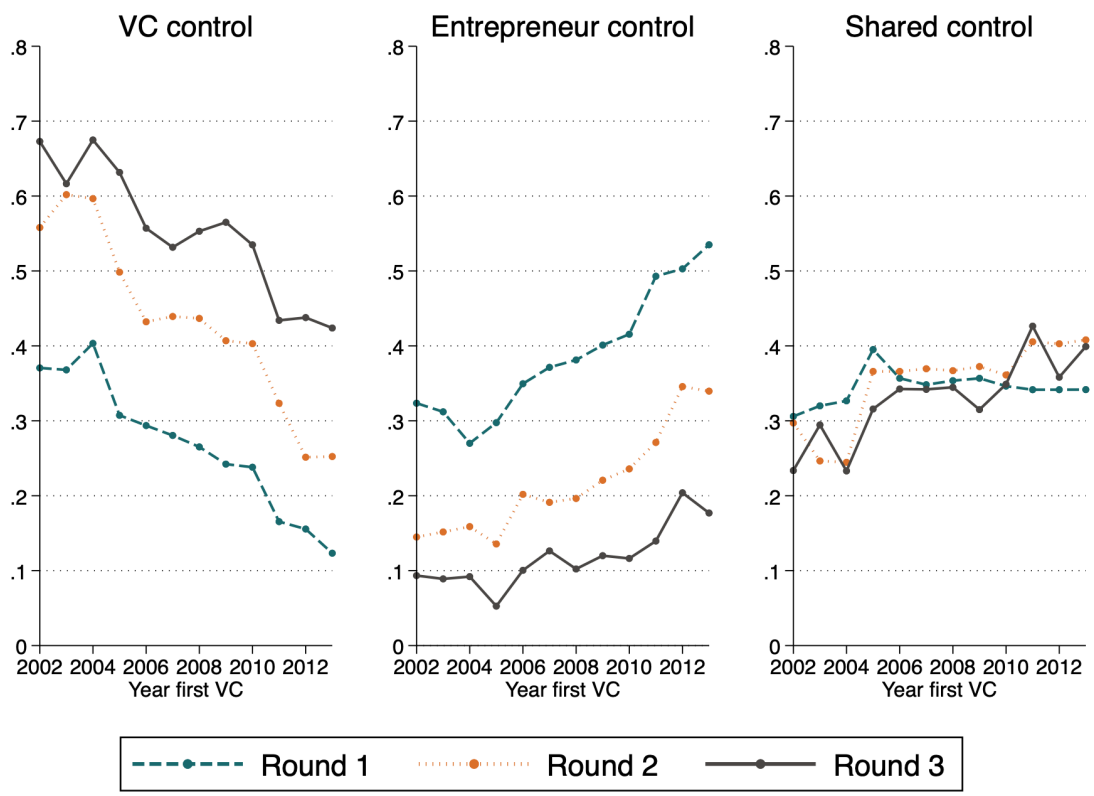
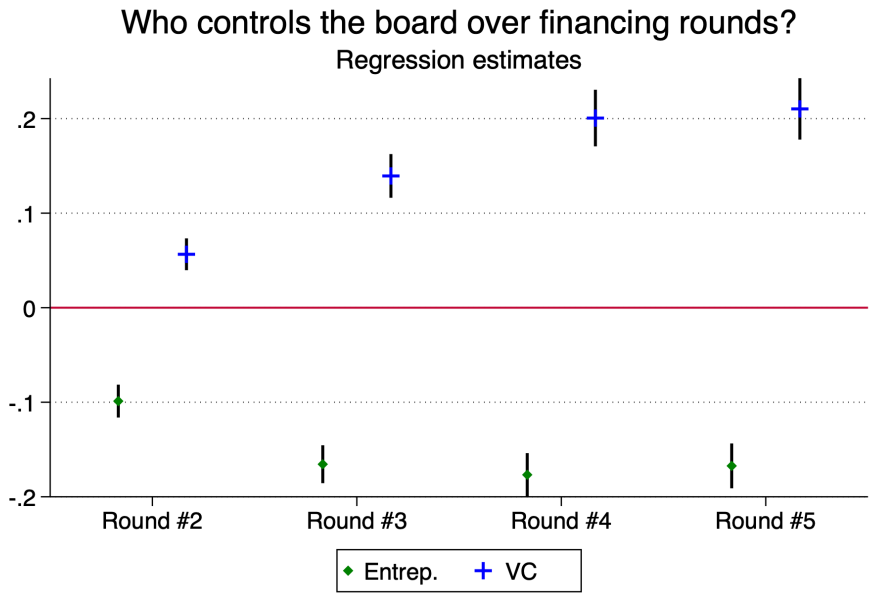
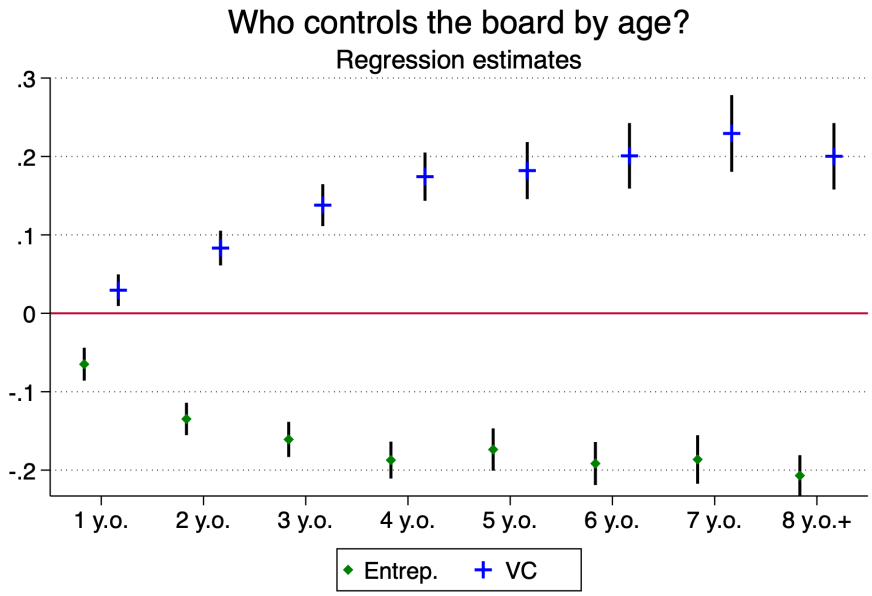


Figure 5: Board control over the life cycle: Regression estimates

The figure reports the coefficient estimates (and 95% confidence intervals with standard errors clustered at the startup level) from the regressions reported in Table IV. The top figure reports coefficients from columns (1)-(2) for firm financing round, and the bottom figure reports coefficients from columns (3)-(4) for firm age. The unit of observation is a startup financing-year, i.e., a year with at least one equity financing event. Controls in the regression include log capital stock, industry-year fixed effects, and location fixed effects.



Round 1 is baseline. Positive values imply relatively higher probability of control by party.



Age 0 is baseline. Positive values imply relatively higher probability of control by party.

Figure 6: VC experience and use of independent directors over time

The figure reports the percentage of boards at each financing round that have at least one new independent director as of that financing. We split the sample into two parts using the investment experience of the first round lead VC. If the total number of deals completed by the first round lead VC is above the sample median, then the startup is categorized as "Early exp. VC." If it is below the sample median, the startup is categorized as "Early inexp. VC."

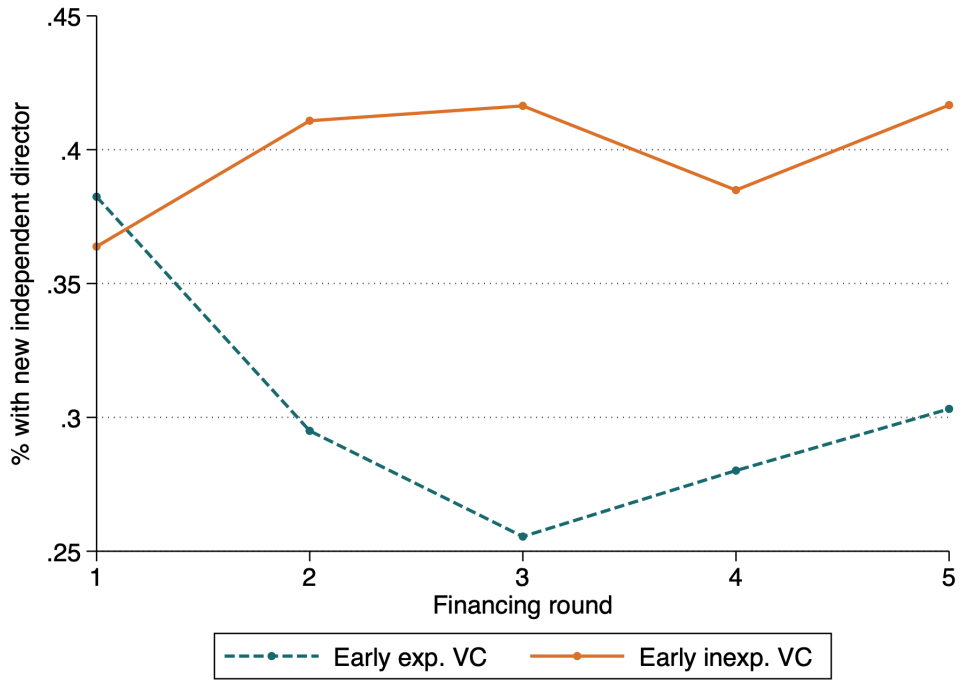


Figure 7: Presence of independent directors by exit type

The figure considers the set of startups that experienced either an IPO or an acquisition by the end of the sample period. We track the board of directors from eight years before the year of either exit for all years with a financing event. The top figure reports the fraction of startups where a new independent director joins the board. The bottom figure reports the average number of independent directors.

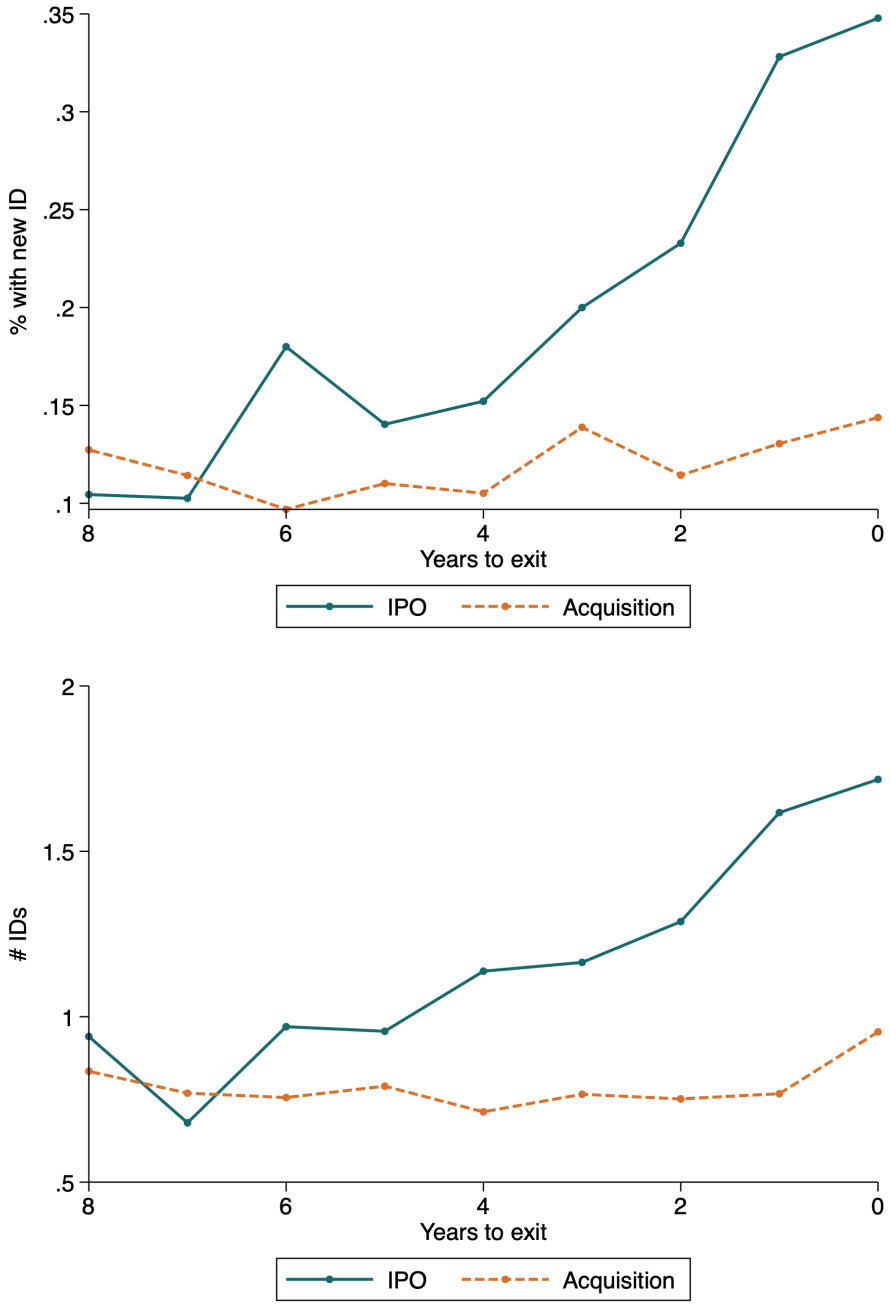


Table I: Summary statistics: firms in and out of sample (2002–2017).

The table reports the firm-level statistics for those in and out of our sample. "In sample" startups are those that ever filed a Form D and satisfied all the conditions listed in Section II. "Out-of-sample" startups are those that raised equity financing by at least one traditional U.S.-based VC during 2002–2017 and first round was not one of the rounds listed in footnote 10, but either (1) never filed a Form D; or (2) filed a Form D at some point but do not satisfy the conditions in Section II, i.e., did not list any executive director over the firm's life or raised a VC financing before the first Form D. "Year first VC" is the year the startup first raised a VC equity financing. "First round Series A" is a dummy for whether that financing round was a Series A (the alternatives: Seed, Later, Growth, PE). "CA" and "MA" are dummy variables for whether the startup is headquartered in California or Massachusetts. "Total capital raised" is the sum of equity capital raised by the startup (in $ million) as of 2019Q3. "# equity financings" is the total number of equity financings as of the end of 2019Q3. "Had Angel or Accel. round" is a dummy variable equal to one if the startup ever had an angel financing or accelerator event. "Has Form D" is a dummy variable if the startup ever filed a Form D.

	In sample				Out-of-sample			
	Obs	Mean	Median	Std dev	Obs	Mean	Median	Std dev
Year first VC	7,780	2010.8	2011.0	4.3	6,973	2011.8	2013.0	4.2
First round Series A	7,780	0.718	1.000	0.450	6,973	0.630	1.000	0.483
CA	7,780	0.393	0.000	0.488	6,973	0.503	1.000	0.500
MA	7,780	0.102	0.000	0.303	6,973	0.064	0.000	0.244
Went public (as of 2019Q3)	7,780	0.036	0.000	0.185	6,973	0.025	0.000	0.156
Acquired (as of 2019Q3)	7,780	0.328	0.000	0.470	6,973	0.279	0.000	0.449
Total capital raised	7,702	39.259	13.190	138.215	6,540	39.854	10.130	228.653
# equity financings	7,780	3.019	3.000	1.804	6,973	2.636	2.000	1.660
Year founded	7,780	2008.6	2009.0	4.7	6,973	2010.3	2011.0	4.8
First round syndicate size	7,780	2.620	2.000	1.683	6,973	2.539	2.000	1.733
Had Angel or Accel. round	7,780	0.122	0.000	0.327	6,973	0.115	0.000	0.319
Has Form D	7,780	1.000	1.000	0.000	6,973	0.376	0.000	0.484

Table II: Summary statistics: firm-year observations

The table reports the summary statistics for startups in our sample. The sample is the set of firm-year observations when the startup raised at least one equity financing. We follow startups from first VC financing to exit (if available). "Has ID" is a dummy variable for whether the board has at least one independent director.

	Firm-financing years; all boards					
	Obs	Mean	25th	Median	75th	Std dev
Board size	18,303	4.513	3.000	4.000	6.000	2.039
# VC directors	18,303	2.008	1.000	2.000	3.000	1.571
# executive directors	18,303	1.684	1.000	2.000	2.000	0.794
# independent directors	18,303	0.821	0.000	0.000	1.000	1.082
% VC directors	18,303	0.399	0.250	0.429	0.600	0.246
% executive directors	18,303	0.449	0.250	0.400	0.500	0.263
% independent directors	18,303	0.153	0.000	0.000	0.250	0.188
Has ID	18,303	0.489	0.000	0.000	1.000	0.500

Table III: Summary statistics: financing-level board composition.

The table reports summary statistics of boards of directors for financing rounds one through four.

	Boards at financing # 1					
	Obs	Mean	25th	Median	75th	Std dev
Board size	7,780	3.621	2.000	3.000	5.000	1.770
# VC directors	7,780	1.299	0.000	1.000	2.000	1.216
# executive directors	7,780	1.722	1.000	2.000	2.000	0.821
# independent directors	7,780	0.600	0.000	0.000	1.000	0.967
% VC directors	7,780	0.311	0.000	0.333	0.500	0.250
% executive directors	7,780	0.562	0.333	0.500	0.750	0.281
% independent directors	7,780	0.127	0.000	0.000	0.250	0.192

	Boards at financing # 2					
	Obs	Mean	25th	Median	75th	Std dev
Board size	4,915	4.573	3.000	5.000	6.000	1.826
# VC directors	4,915	2.010	1.000	2.000	3.000	1.399
# executive directors	4,915	1.725	1.000	2.000	2.000	0.789
# independent directors	4,915	0.838	0.000	1.000	1.000	1.069
% VC directors	4,915	0.410	0.250	0.429	0.571	0.229
% executive directors	4,915	0.430	0.250	0.400	0.500	0.233
% independent directors	4,915	0.160	0.000	0.125	0.250	0.188

	Boards at financing # 3					
	Obs	Mean	25th	Median	75th	Std dev
Board size	2,794	5.272	4.000	5.000	6.000	1.835
# VC directors	2,794	2.628	2.000	2.500	4.000	1.490
# executive directors	2,794	1.641	1.000	2.000	2.000	0.769
# independent directors	2,794	1.004	0.000	1.000	2.000	1.100
% VC directors	2,794	0.483	0.333	0.500	0.625	0.210
% executive directors	2,794	0.342	0.200	0.333	0.400	0.188
% independent directors	2,794	0.175	0.000	0.167	0.286	0.182

	Boards at financing # 4					
	Obs	Mean	25th	Median	75th	Std dev
Board size	1,478	5.830	5.000	6.000	7.000	1.838
# VC directors	1,478	3.124	2.000	3.000	4.000	1.581
# executive directors	1,478	1.586	1.000	1.000	2.000	0.744
# independent directors	1,478	1.120	0.000	1.000	2.000	1.159
% VC directors	1,478	0.526	0.400	0.500	0.667	0.195
% executive directors	1,478	0.294	0.167	0.250	0.400	0.158
% independent directors	1,478	0.180	0.000	0.167	0.286	0.175

Table IV: Board control over the life cycle: Regression analysis

The table reports the OLS regression estimates of board control indicators over the life cycle. The dependent variable in odd columns is a dummy equal to one if the board has entrepreneur (rather than shared or VC) control, and in even columns, it is a dummy equal to one if the board has VC (rather than shared or entrepreneur) control. The unit of observation is a startup financing-year, i.e., a year with at least one equity financing event. The regression specification in columns 1-2 is

$$Y_{it} = \beta_0 + \sum_{s=1}^{5} \rho_s 1_{round_{it}=s} + \beta_1 K_{it} + IndustryYearFE_{it} + LocationFE_i + \varepsilon_{it},$$

where $1_{round_{it}=s}$ is a dummy for whether the startup's financing round is equal to s. The excluded category is the first financing round. We aggregate all rounds at or after the fifth into "5+". K_{it} is the log of the total capital raised by the startup up to and including year t (i.e., capital stock). The regression specification in columns 3-4 is similar, but uses $1_{age_{it}=s}$, which is a dummy for whether the startup is of age s (relative to the first VC equity financing, which is age zero). We aggregate all ages at or after the eighth into "8+". In the last four columns, we add a control for the founder's equity stake and replace the control for capital stock by capital raised in year t ("Log capital raised") because of collinearity between capital stock and founder equity. "Founder equity %" is the founder's equity stake, as defined in Section A. "IndustryYearFE" are fixed effects for the interactions of year and industry. "Location FE" are fixed effects for the Census division of the startup's headquarters. Standard errors clustered at the startup level are reported in parentheses. We use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively.

	Panel A				Panel B			
	E control	VC control	E control	VC control	E control	VC control	E control	VC control
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Round # 2	-0.099***	0.056***			-0.085***	0.10***		
	(0.0077)	(0.0075)			(0.018)	(0.021)		
Round # 3	-0.17***	0.14***			-0.17***	0.25***		
	(0.011)	(0.012)			(0.023)	(0.027)		
Round # 4	-0.18***	0.20***			-0.22***	0.34***		
	(0.013)	(0.016)			(0.025)	(0.031)		
Round # 5+	-0.17***	0.21***			-0.25***	0.41***		
	(0.015)	(0.022)			(0.028)	(0.037)		
1 y.o.			-0.065***	0.029***			-0.041**	0.035
			(0.0094)	(0.0091)			(0.019)	(0.021)
2 y.o.			-0.13***	0.083***			-0.10***	0.11***
			(0.0100)	(0.011)			(0.020)	(0.023)
3 y.o.			-0.16***	0.14***			-0.14***	0.19***
			(0.012)	(0.013)			(0.022)	(0.027)
4 y.o.			-0.19***	0.17***			-0.19***	0.26***
			(0.013)	(0.016)			(0.023)	(0.030)
5 y.o.			-0.17***	0.18***			-0.18***	0.25***
			(0.014)	(0.019)			(0.025)	(0.033)
6 y.o.			-0.19***	0.20***			-0.21***	0.29***
			(0.015)	(0.022)			(0.026)	(0.038)
7 y.o.			-0.19***	0.23***			-0.22***	0.34***
			(0.017)	(0.026)			(0.028)	(0.042)
8 y.o.+			-0.21***	0.20***			-0.24***	0.36***
			(0.015)	(0.028)			(0.029)	(0.046)
Log capital stock	-0.100***	0.10***	-0.098***	0.11***				
	(0.0037)	(0.0039)	(0.0036)	(0.0039)				
Log capital raised					-0.062***	0.076***	-0.058***	0.070***
					(0.0050)	(0.0063)	(0.0049)	(0.0063)
Founder equity %					0.27***	-0.19***	0.30***	-0.27***
					(0.036)	(0.038)	(0.034)	(0.037)
Observations	17820	17820	17820	17820	10828	10828	10828	10828
R^2	0.22	0.22	0.22	0.22	0.19	0.20	0.19	0.20
Industry×Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Location FE	Y	Y	Y	Y	Y	Y	Y	Y

Table V: Impact of changing capital needs due to AWS on early-stage board control

The table reports the differences-in-differences estimation of Series A board control for the sample of startups financed between 2002 and 2010. The dependent variable in odd columns is a dummy equal to one if the board has entrepreneur (rather than shared or VC) control, and in even columns, it is a dummy equal to one if the board has VC (rather than shared or entrepreneur) control. In the first four columns, the sample includes all boards regardless of composition. In the last four columns, the sample of boards includes those with at least one VC director. The treatment is whether the startup is in an industry-segment impacted by the introduction of the AWS cloud (see Table 2 in Ewens et al., 2018). The post variable ("Post-2005") equals one if the startup's first VC financing occurred in 2006 or later. "State FE" are fixed effects for the startup's headquarters state, "Industry FE" are fixed effects for the 7 major industry categories (there are 28 industry-segments used to define the treated variable), "Year FE" are year of first financing fixed effects, and "Trend" is a simple trend variable (i.e., 2020 minus the first financing year). Robust standard errors clustered by industry segment are reported in parentheses. We use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively.

	All boards				Boards with at least one VC			
	E control	VC control	E control	VC control	E control	VC control	E control	VC control
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treated X Post-2005	0.067**	-0.073***	0.067**	-0.072**	0.062**	-0.095***	0.069*	-0.099**
	(0.025)	(0.023)	(0.029)	(0.030)	(0.028)	(0.028)	(0.036)	(0.040)
Treated	-0.022	0.0096	-0.025	0.012	-0.048**	0.029	-0.053***	0.035
	(0.032)	(0.033)	(0.026)	(0.031)	(0.021)	(0.033)	(0.016)	(0.031)
Observations	3429	3429	3429	3429	2694	2694	2694	2694
R^2	0.062	0.10	0.063	0.10	0.039	0.10	0.040	0.11
Mean dep. var.	0.36	0.29	0.36	0.29	0.20	0.37	0.20	0.37
State FE	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Trend × Industry FE	N	N	Y	Y	N	N	Y	Y

Table VI: Board control and bargaining power

The table reports regression analysis of startup boards at their first VC equity financing event. The dependent variable in odd columns is a dummy equal to one if the board has entrepreneur (rather than shared or VC) control, and in even columns, it is a dummy equal to one if the board has VC (rather than shared or entrepreneur) control. The main explanatory variables are three proxies for VC bargaining power. The proxy in the first four columns captures firms' valuations in the industry. It is calculated as the average equity stake of VCs in early financing rounds across all firms in the industry. In columns 1-2, "Low VC b.p. (equity)" is equal to one if the startup raised capital after a year of VC equity stakes that are in the bottom quartile in the industry across the sample period, whereas "High VC b.p. (equity)" is a dummy for the top quartile (the excluded category is the middle 50%) of VC equity stakes. In columns 3-4, we further split the sample periods into quintiles of the bargaining power proxy with the excluded category being the middle quintile. The proxy in columns 5-8 is constructed similarly but using "dry powder," i.e., the supply of VC capital available for investment in a geographical region, computed as total capital raised by VC funds in a region minus the capital invested into startups in that region. The proxy in the final four columns captures exit opportunities based on M&A activity in the industry (active M&A markets correspond to low VC bargaining power). The detailed definitions of each proxy are in the Appendix. For each proxy, the excluded category is the middle of the distribution of VC bargaining power. All regressions include industry and location fixed effects and the log of capital raised. Standard errors clustered at the industry-year level are reported in parentheses. We use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively.

	E control (1)	VC control (2)	E control (3)	VC control (4)	E control (5)	VC control (6)	E control (7)	VC control (8)	E control (9)	VC control (10)	E control (11)	VC control (12)
Low VC b.p. (equity)	0.074***	-0.045***										
	(0.019)	(0.014)										
High VC b.p. (equity)	-0.13***	0.11***										
	(0.019)	(0.013)										
Lowest VC b.p. (equity)			0.067***	-0.025								
			(0.020)	(0.017)								
Low VC b.p. (equity)			0.053**	-0.029**								
			(0.021)	(0.013)								
High VC b.p. (equity)			-0.061***	0.055***								
			(0.019)	(0.012)								
Highest VC b.p. (equity)			-0.15***	0.12***								
			(0.016)	(0.013)								
Low VC b.p. (DP)					0.037**	-0.029**						
					(0.014)	(0.013)						
High VC b.p. (DP)					-0.011	0.020						
					(0.022)	(0.016)						
Lowest VC b.p. (DP)							0.028	-0.033**				
							(0.024)	(0.017)				
Low VC b.p. (DP)							0.080***	-0.065***				
							(0.021)	(0.015)				
High VC b.p. (DP)							0.0089	-0.0057				
							(0.027)	(0.021)				
Highest VC b.p. (DP)							0.0086	0.00081				
							(0.022)	(0.017)				
Low VC b.p. (acq.)									0.060**	-0.062***		
									(0.028)	(0.015)		
High VC b.p. (acq.)									-0.081***	0.061*		
									(0.022)	(0.033)		
Lowest VC b.p. (acq.)											0.015	-0.0060
											(0.038)	(0.024)
Low VC b.p. (acq.)											0.0077	-0.020
											(0.033)	(0.026)
High VC b.p. (acq.)											-0.039	0.022
											(0.045)	(0.034)
Highest VC b.p. (acq.)											-0.045	0.058*
											(0.038)	(0.034)
Observations	7543	7543	7543	7543	7543	7543	7543	7543	7320	7320	7320	7320
R^2	0.12	0.11	0.12	0.12	0.097	0.094	0.098	0.096	0.098	0.095	0.096	0.092
Mean dep. var.	0.46	0.21	0.46	0.21	0.46	0.21	0.46	0.21	0.46	0.21	0.46	0.21
Year FE	N	N	N	N	N	N	N	N	N	N	N	N
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Location FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Log capital control	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Table VII: Board control over the life cycle: Transition probabilities

The table reports the transition probabilities of board control: conditional on the board having a given allocation of control in one year, it presents the likelihood of any of the three types of allocations of control in the next year. Panel A reports these transition probabilities across all startup financing-years regardless of whether there was a change in board size. Panel B reports these transition probabilities within the subset of financing-years where there is some change in the size of the board.

		Panel A: All financing years Board control at t		
		E	Shared	VC
Board control at $t-1$	E	55.79%	31.36%	12.85%
	Shared	5.41%	63.81%	30.78%
	VC	1.25%	10.06%	88.68%

		Panel B: Years with board size change Board control at t		
		E	Shared	VC
Board control at $t-1$	E	35.23%	46.58%	18.20%
	Shared	8.09%	45.84%	46.08%
	VC	1.71%	14.77%	83.52%

Table VIII: Ex-ante conflicts and independent directors in early-stage financings

The table reports regression analysis of startup boards at their first equity financing event. "Has ID" is an indicator variable equal to one if the board in the first financing round has an independent director. "Shared with ID" is an indicator variable equal to one if the board in the first financing round has shared control with an independent director as a tie-breaker (i.e., it equals to one for all boards with shared control except deadlock boards, as defined in footnote 16). "Has top CEO replacer" is an indicator variable equal to one if at least one of the investors in that financing is identified as a "top CEO replacer," where a "top CEO replacer" in a given quarter-year is a VC who is in the top quartile of all VCs based on the following variable: the number of CEOs replaced in firms in the VC's portfolio up to that quarter-year divided by the overall number of firms in the VC's portfolio up to that quarter-year. "VC-founder/CEO past interaction" is an indicator equal to one if one of the VCs has a prior investment relationship with either the founder or the first CEO of the startup, in the sense that the VC has in the past invested in another startup where the executive was either the founder of first CEO. "Log VC experience" is the log of the average number of startups invested in by all the investors in the focal financing before the focal investment. "Has past founder" is an indicator equal to one if one of the firm's founders was the founder of another VC-backed startup in the past. "Has past CEO" is an indicator equal to one if the firm's current CEO was the first CEO of another VC-backed startup in the past. Robust standard errors are reported in parentheses. We use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively.

	Has ID		Shared with ID		Has ID		Shared with ID	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Has top CEO replacer	0.075***	0.070***	0.035***	0.029**				
	(0.014)	(0.014)	(0.012)	(0.012)				
VC-founder/CEO past interaction					0.0013	0.011	-0.042**	-0.034**
					(0.022)	(0.022)	(0.017)	(0.017)
Log VC experience (startups)		-0.019***		-0.019***		-0.021***		-0.018***
		(0.0042)		(0.0034)		(0.0043)		(0.0034)
Has past founder					-0.013	-0.010	-0.0058	-0.0034
					(0.017)	(0.017)	(0.013)	(0.013)
Has past CEO					0.032	0.034	-0.00021	0.0011
					(0.029)	(0.029)	(0.023)	(0.023)
Observations	7777	7777	7777	7777	7777	7777	7777	7777
R^2	0.051	0.054	0.027	0.031	0.047	0.051	0.027	0.031
Mean dep. var.	0.37	0.37	0.18	0.18	0.37	0.37	0.18	0.18
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y
State FE	Y	Y	Y	Y	Y	Y	Y	Y

Table IX: Summary statistics: Independent director characteristics

The table reports the descriptive statistics for the independent directors (IDs) in our sample. "ID is in VentureSource" is a dummy for whether the ID is found in VentureSource. For those directors in VentureSource for which a biographical string is available, # job titles (in bio.); # CEO positions (in bio.); # C-level (in bio.); and # VP-level (in bio.) are, respectively, the number of past jobs listed in the biography; the number of CEO titles listed in the biography; the number of C-level positions listed in the biography; and the number of past VP-level positions listed in the biography, all measured at the time when the ID joins his last board seat in our sample. "Past founder" is a dummy for whether the ID is found as a former founder based on the biographical string or in VentureSource overall. "Total board seats" is the total number of board seats as a VC-director or ID over the director's career in our sample. "Sat on public board" is a dummy equal to one if the director has been found in BoardEx in a director position on a public firm. "Avg. age startup at join (yrs.)" and "Avg. tenure at startup (yrs.)" are, respectively, the average age of the firm when the ID joins the board and the average number of years spent on the board, averaged across all boards of the ID in our sample.

	Independent director characteristics					
	Obs	Mean	25th	Median	75th	Std dev
ID in VentureSource	8,038	0.814	1.000	1.000	1.000	0.389
# job titles (in bio.)	4,624	3.420	2.000	3.000	5.000	2.463
# CEO positions (in bio.)	4,624	0.625	0.000	0.000	1.000	1.026
# C-level (in bio.)	4,624	1.246	0.000	1.000	2.000	1.515
# VP-level (in bio.)	4,624	0.607	0.000	0.000	1.000	0.955
Past founder	4,648	0.250	0.000	0.000	0.000	0.433
Total board seats	8,038	1.159	1.000	1.000	1.000	0.524
Sat on public board	8,038	0.086	0.000	0.000	0.000	0.280
Avg. age startup at join (yrs.)	8,038	2.024	0.000	1.129	3.146	2.516
Avg. tenure at startup (yrs.)	8,038	3.267	1.000	2.000	5.000	2.781
Female	7,704	0.082	0.000	0.000	0.000	0.275

Table X: Mediation and advisory roles over the life cycle

The table reports the regression estimates of the stage when an independent director joins the board on director characteristics. A unit of observation is a financing-year when a new independent director joins the board. The left-hand side variable in Panel A is a dummy "joined a late-stage board", which equals one if the independent director joined the board at least five years following the first VC financing. The left-hand side variable in Panel B is a dummy for "joined board at shared or E-control", which equals one if the independent director joined the board in the year when the board had either shared or entrepreneur control (i.e., not VC control). "Past founder", "Unconnected", and "Sat on public board" are dummy variables, while other right-hand side variables are log one plus the variable. "Unconnected" is defined in Section V of the Internet Appendix, and the definitions of the other right-hand side variables are given in the captions to Table 9. All the variables are at the director-firm level and measure the director's experience *prior* to joining the focal board. "Firm age FE (year)" are the fixed effects for the firm's age measured in years. Robust standard errors are reported in parentheses. We use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively.

	Panel A: Joined a late-stage board				
	(1)	(2)	(3)	(4)	(5)
Past founder	-0.064***				
	(0.0090)				
Unconnected		0.0033			
		(0.0093)			
Log # C-level			0.027***		
			(0.0093)		
Log # VP-level				0.036***	
				(0.011)	
Sat on public board					0.095***
					(0.017)
Log # job titles	0.015*	0.0029	-0.017*	-0.013	-0.0023
	(0.0081)	(0.0082)	(0.010)	(0.0087)	(0.0079)
Observations	5108	5108	5108	5108	5108
R^2	0.081	0.074	0.075	0.076	0.083
Mean dep. var.	0.12	0.12	0.12	0.12	0.12
Year FE	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y
	Panel B: Joined board at shared or E-control				
	(1)	(2)	(3)	(4)	(5)
Past founder	0.023*				
	(0.014)				
Unconnected		0.058***			
		(0.013)			
Log # C-level			-0.033**		
			(0.013)		
Log # VP-level				-0.054***	
				(0.014)	
Sat on public board					-0.054***
					(0.020)
Log # job titles	-0.038***	-0.019	-0.010	-0.011	-0.031***
	(0.012)	(0.012)	(0.015)	(0.013)	(0.012)
Observations	5108	5108	5108	5108	5108
R^2	0.072	0.076	0.073	0.074	0.073
Mean dep. var.	0.73	0.73	0.73	0.73	0.73
Year FE	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y
Firm age FE (year)	Y	Y	Y	Y	Y

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