

Internet Appendix for “Board Dynamics over the Startup Life Cycle”

MICHAEL EWENS and NADYA MALENKO

I Form D data collection

To our knowledge, our data is the first comprehensive view of VC-backed startup boards used by researchers. Creating this data revealed several gaps in both public and commercial databases. This section aims to provide more detail about how we created the startup board database with the goal of highlighting the benefits relative to alternative data sources (and a caution for other researchers that may rely on only one source). The data has three major parts: Form D pdfs, Form D XML documents, VentureSource, and PitchBook, and we also rely on Crunchbase, LinkedIn, and Google search to classify some directors’ types when needed. We describe how we merge these data sets together and discuss the advantages and shortcomings of each data set. The sample of startups used for the Form D search was all VC-backed startups first financed from 2002 to 2017 that raised some equity from U.S.-based VCs during this period according to VentureSource (see Section II in the paper for more details about the sample selection criteria). For each startup, we also need to gather their CIK, the unique identifier in the SEC database. Figure IA.1 summarizes our data collection steps.

I.A Form D pdf files: 2002 – 2009

From late 2002 to 2009, Form Ds were filed with the SEC using a paper document, subsequently scanned by the SEC staff and posted to EDGAR. We first downloaded all filed pdfs from the SEC website for the set of VC-backed firms financed between 2002 and 2009. Figure IA.2 shows the section of these files with the board data. Some parts of the pdfs are machine readable, including the names, addresses, and firm information. Unfortunately, the checked boxes that show whether a person is an executive and/or director are difficult to extract. We therefore created an online application to facilitate manual transcription of this information.¹ A team of research assistants compared the machine-scraped names from the pdfs with the pdfs themselves. This comparison allowed them to both correct name transcription errors and check the correct box for the person’s type. An RA reviewed each Form D pdf, while a second RA checked a random 5% for quality assurance. For the 25,756 filings, over 212,000 rows – person and firm – were collected.

¹The Python web application is available by request to the authors.

I.B Form D XML files: 2009 – present

Starting in 2009, the SEC switched to electronic Form D filing that resulted in machine-readable XML files. Thus, the director data in this time period is relatively easy to collect for our list of VC-backed startups. Figure IA.3 shows an example of a post-2008 Form D filing. As above, we search out the SEC’s CIK identifier for each post-2008 VC-backed startup in VentureSource and PitchBook. We downloaded and parsed all Form D filings associated with these startups. Unlike the pdf files, the person’s type (e.g., “Executive officer”, “Director”) is readily accessible.

I.C Merging Form D with VentureSource

For both pre-2008 and post-2008 Form Ds, we flag an “executive director” as an individual in the Form D that has both “Executive Officer” and “Director” checked. Those with only “Director” checked are either investors or independent directors. To identify their types, we merge these directors with VentureSource. Any director that merges with the set of partners or employees of any VC firm or other investor (such as a corporate VC) that invested in this startup, as well as the set of investor directors of this startup from VentureSource (which includes its VC directors, angel investor directors, or any other investor directors) is flagged as an investor director (who we refer to for simplicity as a “VC director.”) In addition, VentureSource has data on some independent directors, called “Outsiders.”. Among the remaining directors from Form Ds, some merged with “Outsiders” in VentureSource, and we then classify them as “independent.” For all the remaining directors from Form Ds, we perform a manual check using CrunchBase, LinkedIn, and Google, which allows us to further classify those directors into executives, investors (including angels), and independent. In particular, this manual check allowed us to identify some angel investors on the board (that had not matched with VentureSource) as investor directors. We also used PitchBook to do random checks for data quality, clear up edge cases, and supplement the data on directors’ start dates (see Section II in the paper for how we obtain start and end dates of directors). Approximately 19% of independent directors are only found in the Form D filings.² Finally, we supplement the list of directors from Form Ds with those that VentureSource reports as investor-directors or independent directors and that we do not find in a contemporaneous Form D (about 85% of the investor-directors listed in VentureSource are found in the Form D). We believe that these are cases where the election of the director happened *after* the Form D filing deadline.

²Form D filings also have a “Beneficial Owner” tick box that could potentially identify investor-directors. However, we could not rely on Form D for this purpose because only some years have such a tick box, and we also found many instances where a director did not have “Beneficial Owner” checked but was known to be a major investor.

II Form D regulations and disclosure rules for startup financings

The regulatory apparatus that generates Form D filings in our data is Regulation D. Passed in 1982, this part of the Securities Act of 1933 regulates the private offerings of securities.³ The regulation can be viewed as a set of requirements that must be met by the issuers and the security offering itself to allow exemption from security registration. Form D filings are the record of an issuer’s exemption request. The form and the exemption requirements have changed several times over the years, but at the heart are several pieces. The first is the exemption type, which depends on the size of the offering, the timing since the last offering, the investor types, or the financial disclosures. The Form D document – example screenshots from pre- and post-2008 found in Figures IA.2 and IA.3 – shows the exemption type, company information, offering characteristics, and most important for this paper, directors. Each subset of Form D data has both filings and amendments. Amendments are required if the issuer significantly changes the amount of securities sold, has a mistake in the original filing, or has a material change such as a change to related persons (e.g., directors). Amendments are matched to original filings using a “date first sold” field. We use the most recent amendment for any director data, while assigning the date of board seat as the date of the original amended filing. As discussed in the paper, our sample has a requirement that a startup file a Form D with at least one executive director over its life. Thus, it is important to consider the set of startups that may not file a Form D.

II.A Avoiding Form D filing requirements

Outside of pure non-compliance, there are several ways that the startups raising capital can avoid the requirement to file a Form D. The SEC provides the following summary of one of the more popular means to do this: 4(a)(2).⁴

To qualify for this exemption, which is sometimes referred to as the “private placement” exemption, the purchasers of the securities must:

- either have enough knowledge and experience in finance and business matters to be “sophisticated investors” (able to evaluate the risks and merits of the investment), or be able to bear the investment’s economic risk
- have access to the type of information normally provided in a prospectus for a registered securities offering and
- agree not to resell or distribute the securities to the public

In general, public advertising of the offering, and general solicitation of investors, is incompatible with the private placement exemption. The precise limits of the private

³See Title 17 of the Code of Federal Regulations, part 230, Sections 501 through 508.

⁴<https://www.sec.gov/smallbusiness/exemptofferings/rule506b>

placement exemption are not defined by rule. *As the number of purchasers increases and their relationship to the company and its management becomes more remote, it is more difficult to show that the offering qualifies for this exemption. If your company offers securities to even one person who does not meet the necessary conditions, the entire offering may be in violation of the Securities Act.* [Emphasis added]

Similarly, the law firm Morrison Foerster describes several factors that have to be met to use 4(a)(2).⁵ The number of investors should be relatively small, the pool of investors should have some preexisting connections to the issuing company, investors should have “[g]eneral business knowledge and experience,” the offering’s information “disclosure need not be as extensive as that in a registered offering, but must be factually equivalent,” and there should be no resales allowed.

The SEC concludes that if these conditions are not met, then the issuers should rely on “safer harbor” 506(b)/(c) exemption, which triggers a Form D filing. A comparison of the 506(b)/(c) safe harbor to the 4(a)(2)-only rule reveals some clear differences:

- 506(b)/(c) has an “unlimited # of accredited” investors. The SEC suggests that a larger pool of investors is likely to violate the conditions for 4(a)(2)-only.
- 506(b)/(c) has no information rule for these investors. Thus, if the 4(a)(2) information condition is difficult to satisfy – particularly with many investors – then a startup will have to use another exemption type and likely file a Form D.
- 506(b)/(c) allows the issuers to ignore blue sky (state-level) securities laws, while 4(a)(2)-only does not. Thus, a 4(a)(2)-only with three investors in three states will have to deal with three non-SEC regulators.

Altogether, the conditions that allow a startup to avoid Form D suggests that non-filers may differ from filers. The most obvious expected differences are financing size, number of investors, and investor characteristics. We will explore some of these differences below and also examine how these differences relate to potential differences in board of directors characteristics.

Note that there are two other ways that a startup can avoid filing a Form D when raising capital: Section 3(a)(11) and Rule 147 offerings. Both have strict requirements that the startup raise capital from one state and do operations only in that state. These conditions are hard to meet for most startups that raise a significant amount of capital in syndicated financings. For example, a startup raising capital from investors based only in California can file a registration exemption called Limited Offering Exemption Notice (LOEN) following Section 25102(f) of the California securities law. However, it is also possible that such startups have similar unobserved differences in governance to those considered using 4(a)(2) given the “closeness” of their investors.

⁵<https://media2.mofo.com/documents/170608-4a2.pdf>

All these issues lead one to ask whether the startups filing Form Ds are representative and whether the board data that we extract from the filings – combined with commercial databases – is both accurate and representative of the typical VC-backed startup board. We explore each of these below.

III Assessing board of directors data: is the data representative and accurate?

In this section, we examine whether our sample, which is based on Form Ds, is representative of the entire venture capital universe.

III.A Startups and financings with missing Form D data

The first question is how the set of Form D filing startups compare to other VC-backed startups that do not file. Recall that the latter group could either have failed to comply with the regulations – punishment is weak even according to the SEC – or they found an alternative way (e.g., Section 4(a)(2)) to avoid registering their securities. To start, we consider the set of VC-backed startups found in VentureSource – a data provider that does not rely solely on the Form D filings for data collection – that pass similar filters to those described in the main paper, i.e., raised capital from a U.S.-based VC investor and raised equity financing over our sample period (the exact conditions are listed in Table IA.I). We search for each startup on the EDGAR site to identify its CIK (SEC identifier) and in turn whether it has a Form D. Note that this sample creation differs slightly from the one used in the paper as the latter also includes filters that (i) condition on having a Form D before the first known VC financing and (ii) condition on having at least one Form D with an executive director. For the [2002, 2018] sample period, there are 14,064 startups that are VC-backed and pass similar filters to those in the main paper. Of these, 31.5% (4170) do not have a CIK nor a Form D filing over their life.⁶ We compare these startups in several ways below.

III.A.1 Cross-sectional differences between Form D filers and non-filers

The discussion in Section II.A suggests there may be some observable differences between startups with and without a Form D filing. Table IA.I presents this comparison using startup features and their outcomes. First, likely due to a combination of backfill of Form Ds by firms going public⁷ and

⁶The biggest reason why the “full” Form D sample in this analysis (Table IA.I) has more observations than our sample in the paper is the rule in the paper that we drop startups with a VC financing that occurs before the first Form D filing. We impose this rule in the paper to ensure that we see the full board over the entire life cycle of the startup starting at first VC financing, but we do not impose it in this analysis because our goal here is to understand the overall differences between startups filing and not filing Form D.

⁷Our conversations with practitioners suggest that companies planning an IPO often file Form Ds for their earlier financings retroactively, as public listing requires firms to comply with disclosure regulations. This leads to some backfill in Form D filings in the subsample of firms doing an IPO.

larger size, Form D filers are four times as likely to go public. Second, startups without a Form D filing are more likely to be headquartered in California and less likely to be based in Massachusetts. The stark difference in geography is likely driven by the concentration of capital in CA: any startup outside of CA that raises capital from outside of the state will have difficulty satisfying exemptions used to avoid Form D filing, as discussed in Section II.A above. Note, however, that the failure rates are not significantly different. Both the year of first VC and founding year also show that filers are a bit older, which is likely driven by the decline in compliance over time that we document in Section III.A.2 below. The most striking difference – likely correlated with the IPO rate – is the total capital raised: filers raise an average of \$43.9m versus \$27.5m for non-filers. This size difference does not appear to be driven by first-round syndicate size, so it is possible that startups with lower capital demand or lower growth prospects do not file Form Ds. This could be done via the 4(a)(2) rule or alternatively, simple non-compliance given the low risk of sanction.

Overall, we conclude that there are indeed observable differences between startups with and without a Form D filing. Startups with Form D filings are a bit older, more likely to reside outside of California, and raise significant amounts of capital. Unfortunately, the fact that the non-filers do not have Form Ds limits our ability to discuss whether their boards are different using this analysis. To that end, in Section III.B, we collect another database of startup boards where we can observe the full set of directors regardless of whether they file a Form D. We show that while there are certain differences in board characteristics between Form D filers and non-Form D filers, our main results are qualitatively similar between the two.

III.A.2 Form D filing over time

Figure IA.4 reports the time series trends of Form D filings for first time VC financings. The figure considers the sample of startups with and without Form D filings reported in Table IA.I and documents the fraction that ever filed a form D. Two patterns emerge. First, there is a decreasing probability that a startup files a Form D over the sample period, from over 75% on or before 2010, to an average of 60% since 2010. Hanley and Yu (2023) explore this decline as a focus of the paper and find similar patterns in Form D filing rates. Note that these changes are not directly driven by startups raising more angel financing or convertible debt (two common ways to avoid Form D filing) because we condition on raising capital from VC investors (which typically involves equity).⁸ These patterns lead to a concern that the trends that we show in board composition and control might be driven by selection in Form D filing over time. Simply, our conclusions about the increasing entrepreneur control over boards and decreasing VC control could be a consequence of a smaller set of startups filing Form D and those filers having different board structures. We explore this possibility in Section III.B and do not find evidence that this is the case.

⁸In an unreported figure, we repeat this time series analysis conditioning on some of the most active VCs over the same period (Sequoia Capital, Accel, Benchmark, Kleiner Perkins, NEA, and Andreessen Horowitz). These VCs' portfolio companies exhibit the same trends over time and slightly higher levels of Form D filing by year.

Discussions with practitioners – VCs and angel investors – suggest that one of the main drivers of this decline in Form D filing is a demand for secrecy. Particularly after Form Ds switched to machine-readable XML, there was much more transparency about who was raising capital. Some startups and investors sought to avoid disclosing this information by non-compliance or finding alternative exemption paths that did not require Form D filing (e.g., 4(a)(2)). Such considerations matter for our conclusions only if they correlate with board control allocation and structure. Why this correlation would exist is not obvious. We examine this formally in Section III.B.

III.A.3 Financing-level Form D filing

The analysis in Sections III.A.1 and III.A.2 compares firms that never filed a Form D to those with at least one Form D. In this section, we focus on the set of startups with at least one Form D and ask whether each *financing* of these firms has an associated Form D. For each firm in this set of startups and each its VC financing, we determine whether a Form D was filed in any of the three months before or after the closing date reported in VentureSource. Figure IA.5 presents the count of Form D filings (solid bars) and the percent with a matched Form D. The latter peaks at nearly 85% in 2008 and averages to 81% over the 15 sample years. Given the complexity of defining financings (e.g., tranche financings, milestone payments, and convertible note conversions), we view this high percentage as reassuring.

III.B Comparing MA boards with and without Form Ds

Without quality information about startup boards that lack a Form D, we cannot address whether the cross-sectional and time series differences discussed in Sections III.A.1 and III.A.2 matter for our results. We cannot rely on the main commercial databases as we find that they have their own gaps based on the Form Ds that we have collected (see Section IV of this appendix). Fortunately, the state of Massachusetts requires firms headquartered there to file annual reports.⁹ These reports should list all the directors of the firm since 2010.¹⁰ Our goals here are two-fold. First, we want to determine whether the boards of non-Form D filers are different from the boards of filers and if so, how. Second, we will compare the trends across the two samples since 2010.

To begin, we collect all VC-backed startups from 2010 to 2018 using the VentureSource data that did not have a Form D (i.e., the subset of Table IA.I for MA-based startups). For each startup, we collect the MA incorporation identifier using the secretary of state website search.¹¹ Of the 153 startups in the full MA sample, we found some information on 93% (142). We collect each of

⁹Both corporations organized in Massachusetts (called “domestic corporations”) and corporations organized or chartered in another state or country (called “foreign corporations”) but doing business in Massachusetts are required to file an annual report with the Secretary of the Commonwealth within two and one-half months after the close of their fiscal year. See <https://www.mass.gov/service-details/an-introduction-to-corporations>.

¹⁰MA has a 10-year retention policy.

¹¹See <http://corp.sec.state.ma.us/CorpWeb/CorpSearch/CorpSearch.aspx>

the startup’s annual reports (example of such a filing is in Figure IA.6) and PitchBook profiles. Combined with VentureSource, the latter allows us to identify the director type: entrepreneur, investor, or independent director. Any uncertainty about director type was resolved through searches on Google and LinkedIn. We record the name of each director, their type, start date, and end date. The start date is assigned as six months prior to the first annual report in which the director appears, and the end date is assigned as six months prior to the first annual report in which the director no longer appears. Of these 142 startups, 111 had at least one executive director and all directors had an identifiable type, which forms our MA sample of non-Form D filers.

Before we present the results of this data collection, it is useful to revisit our predictions about the types of firms that are not filing Form Ds (see Sections III.A.1 and III.A.2) and discuss how these predictions about the startups map to their boards. First, the boards are likely to be smaller because the conditions to avoid Form D filing require lower capital raises and fewer, closer investors. Fewer investors also means fewer agents seeking board representation. Similarly, if Form Ds are not filed for secrecy concerns, then we would also expect non-filing startups to have smaller boards because larger boards mean less secrecy. Second, it is likely that non-Form D filer boards have fewer independent directors. This is because if secrecy is the goal, then restricting the board to investors or managers is a good strategy.

Figure IA.7 and Table IA.II compare MA startups with at least one Form D and non-filing MA startups by firm-year. We first excluded Form D-filing startups with IPOs because zero of those without Form Ds went public, and it is likely that firms going public may backfill their Form Ds. There are 347 startups based in MA that have a Form D filing and did not go public, so the sample in Figure IA.7 and Table IA.II consists of 347 Form D filers and 111 non-filers. A unit of observation is a firm-year starting from first VC financing to either exit or end of sample period. A startup enters the sample once it has at least one director seat. Our key variables of interest are board size and the percentage of seats held by each director type.

Figure IA.7 explores the differences in board size and composition between Form D-filing and non-filing firms across the firm’s life cycle, averaging each variable by firm age. The top left panel shows that board size of non-filing firms is smaller over the whole firm’s life, consistent with the above predictions. Reassuringly, both the percent of VCs and executives on the board – conditional on at least one director – show no difference from the time of first VC financing to age six. The percent of independent directors is lower in non-filing firms until age four.

Table IA.II presents the regression results, controlling for capital raised, syndicate size, the presence of out-of-state investors, age at first VC financing, as well as industry and startup age fixed effects. The dependent variable in the first column is the log of board size, and other dependent variables are the same as in Figure IA.7. Consistent with Figure IA.7, the results show that startups without Form Ds have boards that are about 20% smaller across years. There are fewer independent directors and weakly more VC directors on boards of non-filing firms. The coefficients are economically significant as they represent 45% and 12% of the sample average, respectively.

Overall, these results are consistent with our predictions about non-Form D filers.

We next compare the allocation of board control between the two types of firms. Table IA.III asks whether startups without Form D filings have different control dynamics over the life cycle. In each column we consider a sub-sample by firm age (zero to three) where the dependent variables are dummies for control: VC, entrepreneur, or shared. The first four columns show that there is no difference in the likelihood a startup has VC control. The next four columns show that outside of the first year post-VC, there is also no difference in the likelihood a startup has entrepreneur control (when compared to the mean of the dependent variable and ignoring statistical significance, there is some evidence that entrepreneur control is more likely among startups without Form Ds in their early years). The main difference between the two types of firms is the lower likelihood of shared control among non-filers in the early years. These results are consistent with the findings of smaller boards and fewer IDs in Table IA.II: boards of non-filing firms use independent directors less, and thereby are smaller and are more likely to be controlled by entrepreneurs than to have shared control in early years.

Importantly, despite these differences in early years, the within-firm dynamics in the allocation of control is similar across the two samples. Recall that Tables IV and VII in the paper show that the average startup begins with entrepreneur control, and as it matures, shifts to shared control, and then to VC control, consistent with Prediction 2. Tables IA.IV and IA.V show similar dynamics for non-Form D filers. Specifically, Table IA.IV reports transition probabilities for non-Form D filing MA startups and shows that conditional on a change in board control from one year to the next, entrepreneur control is 72% likely to switch to shared control and shared control is 89% likely to switch to VC control; and that conditional on VC control, VCs retain control with probability 87% (the corresponding probabilities for our main sample are 71%, 85%, and 89%, respectively). Next, recall that Table IV in the paper showed that the probability of entrepreneur control decreases over the startup’s life, while the probability of VC control increases. Table IA.V repeats this analysis for the MA sample without Form Ds. Although we lack the power for statistical significance, it shows similar within-firm control dynamics. We also find, similar to the patterns reported in the paper, that the likelihood the startup has an independent director increases with age. Overall, the results demonstrate that the Form D data exhibits similar board control dynamics as our sample of non-filers.

Form D filers and trends over time. Finally, we address whether the time series trends showing the decline in VC control and the increase in entrepreneur control over the board are an artifact of Form D filing selection over time. In other words, a potential concern is that the trends found in Figure 4 of the paper are due to a smaller set of firms filing Form D over time and these firms having different board characteristics from non-filers. The limitations on the sample period in our MA data prevent a full time series comparison as in Figure 4. However, the results of Tables IA.II and IA.III help alleviate this concern. As discussed above, Table IA.II shows that non-Form

D filers have smaller boards and a lower percent of independent directors, and columns 5-8 of Table IA.III show that non-Form D filers are more likely to have entrepreneur control in early stages. Given that the rate of Form D filers has been decreasing over time (Figure IA.4) and assuming that this was the only change occurring, we would then predict: a) decreased entrepreneur control over time; b) increased board size over time; and c) increased use of independent directors over time in our selected sample of Form D filers, because more and more boards with entrepreneur control, small boards, and boards with a low percent of independent directors are moving out of the sample with time. However, we see the opposite trends for all these variables. First, Figure 4 shows increasing entrepreneur control over time. Second, Figure IA.10 plots the trends in VC presence of the board, board size, and the use of independent directors at the time of the first VC equity financing. This figure shows decreasing board size and a reduction in the use of independent directors over time. These trends are opposite of those that we would predict from Tables IA.II and IA.III if selection were the driving force. Hence, the trends of decreasing board size, fewer IDs, and increasing entrepreneur control are likely to be even stronger than what we see in our sample.

Summary. Overall, the collection of evidence using the Massachusetts startups without Form D shows that our main Form D-based sample has two limitations. First, the financings and startup characteristics that trigger a Form D filing correlate with larger boards and higher use of independent directors. Second, these differences result in some differences in cross-sectional measures of control early in the startup’s life. The differences reassuringly stop there, thus revealing that the major conclusions in the paper about within-firm and time series trends of board control are not a by-product of any selection from Form D filing.

III.C Is the data from Form D accurate? Comparison to annual reports for MA startups.

The Massachusetts data also allows us to validate whether the Form D data on boards is accurate. Assuming the annual reports filed with the state have an exhaustive list of directors as of the end of each year, we can compare the board members from our data (which is based on Form D, VentureSource, and PitchBook) with these filings.

We selected 25 random MA-headquartered startups that first raised VC financing on or after 2010 and had a Form D filing. The data collection process from Section III.B is repeated to get the annual reports and PitchBook profiles. For each startup we compare the board constructed from the annual reports to those in our main data. Of the 25 startups, 21 had a perfect match of the set of directors between the first VC financing and exit.¹² Start dates and end dates did not match perfectly, but the discrepancies were minor. The remaining four startups had some directors

¹²For one company, Get Human, we realized that the Form D filing failed to have an “Executive Officer” box checked for a director, which we manually corrected in our data.

listed in the MA annual report but not in our data. Here is a summary of the companies with discrepancies:

- Dragon Innovation stopped filing Form Ds after its first financing. This discovery led us to add a robustness check in the main paper that drops startups that have not filed a Form D for two years since their last VC financing (see Section VI of the paper and Figures IA.13 and IA.14 and Table IA.VI of this Appendix). This robustness check shows no meaningful change in our main results.
- eXIthera had a missing board member who was in the original Form D but disappeared from an amended Form D. We believe this is an edge case, and it was corrected in our data.
- N-of-One Inc. has one VC director not in our data. Here, the individual is not in the Form D, but is in VentureSource. However, the VentureSource data has no information on a start date. Our data creation in the paper is conservative with directors sourced only from VentureSource and not in Form D: we require a start date for them to be available. So in this case, the VC director is dropped.
- Azigo has a complex history with name changes and long gaps between its founding and first VC financing. The company appears to have reorganized (i.e. a restart) without raising capital, thus failing to trigger a Form D filing. Their board changed in years without financings in ways our data does not see. This example highlights another limitation of the Form D data: it relies on VC financing events to coincide with changes in the board. We believe that these are the most common times for such changes, with the average startup in our sample raising capital every 1.7 years. If a startup does not raise capital after 2 years, then we assume it has failed. We therefore do not think this reveals a major problem with our data.

These diagnostic tests point to no systematic issues with our data creation process, while the tests themselves improved some of the logic we use in that process.

IV Comparing our board data to other data sources

In this section, we discuss several alternative sources of board data: Certificates of Incorporation, VentureSource, Crunchbase, and PitchBook, and discuss the advantages and limitations of each data source. The goal is to compare the data used in our paper to modern alternatives and highlight how best to use those alternatives going forward. The latter is important because the value of Form D data has fallen post-2017 given the decline in Form D filing highlighted in Section III.

IV.A Comparison to Certificates of Incorporation

Form Ds are not the only regulatory filing that has information on boards of directors. Certificates of incorporation (COI) include information about the rights that certain classes of shares have for election of directors. COIs are typically filed when the company issues new shares or meaningfully restructures its capital structure. Figure IA.11 presents an example of a typical paragraph in a COI about board rights. We reviewed ten random startups in our sample that were also found in the COI data provided by PCRI (PCRI, 2020). Our goals were to determine whether such filings are an alternative source of board data and how the filings can isolate any issues with our Form D-based data collection approach. Overall, we conclude that while COIs capture the potential influence of founders or VCs, they do not provide a full picture of the board and its dynamics, while there is no evidence from COI that the Form D data has major coverage gaps.

Specifically, in many cases where we have both a COI and Form D, there is no board size listed in the COI. In half of those COIs that do provide board size, it is only done several years after the first VC financing event. The lack of board size information complicates the interpretation of independent board seats. In addition, in all of the COI filings, there are seats referred to as “jointly elected by the common and preferred.” The Form D data suggests that these jointly elected seats can be independent directors, investors, or entrepreneurs, so the exact director type would not be known based solely on the COI data. For example, in one case, there were two jointly elected seats that appear to have been split between the VCs and the entrepreneur. Overall, the missing information about board size and the ambiguity about jointly elected directors do not allow for an easy identification of board composition from the COI data.

We found no cases where the board size inferred from the Form D exceeds that of the COI. In three cases, we have fewer VC directors on the board than are available to preferred shareholders listed in COI. These discrepancies could be explained by the VCs and common shareholders jointly electing a VC representative as a “jointly elected” director. This analysis suggests that Form Ds – combined with commercial databases – provide an unbiased view of boards of directors.

We also spoke to a venture capitalist with a portfolio of over 150 startups to get some additional clarity on the differences between Form D and COI data. We asked whether investors and common do not always elect all the directors made available in the COI, and they confirmed that this was the case. Thus, while the COI data capture the potential influence of founders or VCs through their ability to elect a representative to the board, these data often do not reflect the seats that were ultimately filled and, consequently, the actual composition of the board. Hence, ideally, the COI data would be supplemented with other sources to get a full picture of the board.

IV.B Comparison to VentureSource

VentureSource (now CB Insights) is our second major source of board data together with Form Ds. We use VentureSource to classify directors in Form Ds that are not flagged as executives in Form

D into investor-directors and independent. In particular, VentureSource has data on investors of the startup (and their partners and employees) and investor-directors (including angel investors), as well as some data on independent directors (which are called “outsiders”). The limitations of VentureSource board data that we have identified are the following:

1. **VentureSource does not list executive directors.** In particular, although it has data on the executives of startups, it does not provide information on which of them, if any, have board seats (moreover, 45% of startups in VentureSource do not have the CEO reported). Hence, it is necessary to use Form Ds to identify all executive directors and, accordingly, to classify the allocation of control into “VC control,” “Entrepreneur control,” and “Shared control.” VentureSource has some coverage of chairmen, which can include executives, but this may only capture a subset of executive directors, and the information on chairmen is not consistent (for example, out of 25K boards with at least one VC director, only 13K have a “chairman” listed).

For comparison with Form D data, we gathered all individuals in VentureSource (VS) that had either “CEO” or “chairman” in their title and (given the lack of start/end dates) assigned them as executive directors to all firm-years. We found:

- In 42.6% of firm-years, our data has more executive directors than VS.
- In 14.5% of firm-years, our data has fewer executive directors than VS.
- If we recalculate board control using this VS-based way to define executive directors, this gives a different allocation of control than using our data (e.g., VentureSource and our data disagree about shared control in 32% of firm-years, and in 17% of firm-years for entrepreneur/VC control).

2. **VentureSource has incomplete coverage of directors’ start dates and very poor coverage of directors’ end dates.** For example, only 26% of “outsiders” in VentureSource have a reported start date; similarly, only 25% of VC directors have a reported start date and only 6% have a reported end date. Hence, it is important to rely on other sources to get the dynamic evolution of the board over the life cycle. In particular, we rely on Form D filing dates for directors’ end dates, and we rely on both Form D filing dates and VentureSource for directors’ start dates (using the earliest of the two when both are available), as well as PitchBook. (See Section II in the paper for details on how we identify start and end dates.)
3. **The “outsiders” in VentureSource are sometimes misclassified, i.e., “outsiders” are not always independent directors.** Most common mis-classifications are cases where directors identified as “outsiders” in VentureSource are actually investors (angels or VCs). In fact, after we identified these mistakes in late 2018, VentureSource reviewed their board data and sent us some fixes for mis-classifications, which resulted in over 3,400 independent

directors being reclassified as VC directors. There are also cases where “outsiders” in VentureSource were flagged as executives in Form Ds, and manual check verified that they were indeed the co-founders. Finally, 19% of all independent directors in our sample are only found in Form Ds but are not in VentureSource.

At the same time, VentureSource has some investor-directors and independent directors not found in a contemporaneous Form D. We believe these are cases where the director was elected after the Form D filing deadline, so our sample also includes directors only available in VentureSource.

IV.C Comparison to Crunchbase

To assess the differences in coverage between our database and Crunchbase, we selected 40 random startups’ board histories. A research assistant searched for each startup in Crunchbase and compared the board of directors coverage. In most instances, our data has more board members than what is reported in Crunchbase (for example, in many cases Crunchbase had empty boards when, in fact, the board had many directors according to our data). For six startups, there were board members in Crunchbase not in our data. However, we were unable to validate those board members in four of the cases using PitchBook, company websites, or Form Ds. More important, in each of these cases Crunchbase did not have some of the board members listed on the Form D and confirmed in PitchBook, so overall, we are not convinced that these data are trustworthy. A key reason for the cases when Crunchbase had data on actual board members not in our database was that the company stopped filing Form Ds even though it continued raising VC financing. This highlights one limitation of Form D data (“stale boards”): for companies that stop filing a Form D we rely exclusively on VentureSource to identify subsequent changes in board composition. However, as we discuss in Section VI of the paper, removing such stale boards from the sample does not change any of the results (see Figures IA.13 and IA.14 and Table IA.VI).

IV.D Comparison to PitchBook

The final alternative data source that we evaluate is PitchBook. Founded in 2007 and owned by Morningstar, PitchBook is one of the preferred sources for contemporary data on venture capital and private equity financings. A comparison of VentureSource and PitchBook for the pre-2010 data shows that the former has more extensive historical VC financing coverage. However, for the last 15 years of startups backed by VC, PitchBook’s board data has had advantages over the version of VentureSource used in this paper.

First, PitchBook explicitly tracks executive board members and has better start date coverage for all director types (63% in PitchBook vs. 35% of directors in VentureSource have a start date). However, PitchBook rarely reports director end dates (as VentureSource), so missing start and end dates is still a critical problem for any attempt to measure the dynamics of board composition.

Next, PitchBook has no explicit flag for investors (VC) or independent directors. A field called “Representing” can help one approximate the director’s type (see Section IV.E below for details), but we found many ambiguities in merging our data and PitchBook discussed below. These issues are also found in VentureSource, which, together with the need to identify directors’ start and end dates, motivated us to use the Form D data. Overall, our analysis of all commercial databases reviewed in this paper has revealed that no single source provides complete coverage of board dynamics.

We next provide a detailed analysis comparing PitchBook to the data used in this paper.

Merging Form D/VentureSource (Ewens and Malenko, 2024) and PitchBook. We completed a merge of our data to PitchBook using startup names and financing dates. To ensure a fair comparison with our sample period, we only considered startups in both databases that exited up to 2017. Firms that survive after 2017 may have directors only available in PitchBook if those directors join after the end of our sample period.

For these 1,668 firms, our data has 9,951 unique director-startups. We find 3,362 of these director-startup pairs (34%) in our data in PitchBook. Specifically, the merge revealed the following differences between the two datasets. On average, 31% of the board in a given startup that we have in our sample can be found in PitchBook. In 36% of the startups in the merged sample, PitchBook has no director that we have in our sample. A manual check of a random set of directors only found in our data revealed individuals listed in Form D filings that are not in PitchBook. These examples suggest that PitchBook is not using Form D information for all startups.

These gaps are more pronounced in the earlier sample. To show this, we calculate the percentage of startups in the merged sample for which at least one director in our sample matches to a director in PitchBook. We find that for startups financed before 2012, we can find at least one matched director in 62% of startups, but this percentage increases to 77% for the 2012–2017 period and reaches 100% of startups with at least one match in 2017. The lower coverage in the early sample years is possibly due to PitchBook’s relatively recent founding (by former VentureSource employees) in 2007 and the significant time it took to build the data.

We can also compare the coverage by director type in our data:

- 20% of the entrepreneur director-startup pairs in our data are found in PitchBook.
- 33% of the independent directors in our data are found in PitchBook.
- 46% of the venture capital directors in our data are found in PitchBook.

Thus, PitchBook’s coverage of director-startup pairs over the 2002–2017 sample period is best for VC directors. Note that our merge is fuzzy, so these percentages could underestimate the actual overlaps (see below).

There are cases where PitchBook has directors that are not in our data. These directors represent about 10% of our total director-startup pairs. We investigated a random subset of these cases to ensure that we did not miss directors. The first explanation for director-startup pairs only in PitchBook is stale Form D data (note that our results are robust to ignoring these startups; see Section VI of the paper). The percentage of startups with stale boards is twice for those startups where PitchBook has a director that we do not have. We confirmed with LinkedIn and Google searches that these new directors were indeed on the board. Deeper analysis revealed the following patterns for the PitchBook-only directors:

- Our merge is fuzzy and either the Form D or PitchBook may have spelling errors. We estimate this accounts for 15% of the directors only in PitchBook and suggests that the numbers above are lower bounds on coverage.
- Individuals are listed as directors in PitchBook, but they are, in fact, board observers or advisors to the startup.
- The individual was on the board for a short period of time – e.g., between financings – and did not appear in the Form D filing.
- The individual does not have a start date in PitchBook, so we cannot determine the association or timing.

Overall, comparing our data in 2002–2017 for startups that exited up to 2017 reveals that PitchBook does not provide the same information on board composition or control. However, there is strong evidence that the PitchBook’s coverage significantly improves in later years of our sample.

IV.E Building board data going forward

In this subsection, we describe how researchers interested in startup board composition could use the commercially available datasets going forward.

- We will release as much of our data on the boards of directors as possible for 2002–2017. That data can be merged with PitchBook to expand the time series and fill gaps. Section III shows that for this period, our data provides a high-quality addition to commercial data.
- Form D filings are less valuable as a supplement to commercial datasets for post-2017 financings given the decline in Form D filing rates documented in Section III. Post-2017, researchers could use the following steps to improve the data on board composition and control.
- For the PitchBook data, researchers have found ways to assign director type (e.g., Cassel et al., 2023). The key step is to connect directors in PitchBook to (i) PitchBook’s data

on the startup’s executive team and (ii) PitchBook’s data on the employees of VCs. The former would be classified as executive directors, and the latter as VC directors. Those directors that are not merged using this algorithm are likely independent directors. However, much like what we did in this paper, it is valuable to hand-check whether these potential independent directors are not affiliated with VCs or the startup using sources such as LinkedIn, CrunchBase, and Google. These additional sources could also help identify board observers in PitchBook. While these VC representatives attend board meetings, observers do not vote. Thus, observer classification can be useful if the researcher’s goal is to identify individuals with voting power on the board, rather than all individuals affiliated with the board.

- To build a panel of board data and study the dynamic evolution of the board and allocation of control, the researcher would need to define directors’ start and end dates on the board. PitchBook provides start dates for a subset of directors (see the discussion in Section IV.D) and rarely provides end dates. The researcher would thus need to collect missing start dates from other sources and make assumptions about directors’ end dates. The following steps could be used:
 - For VC directors with missing start dates, their start date could be set to the financing year where the VC first serves as the lead investor.
 - For independent directors, start and end dates could be inferred from their LinkedIn profiles and Google search.
 - If there are two directors from the same VC firm on the board, it is likely that there was a switch in the individual representing this VC firm at a certain point in time (it is rare for the same VC to have two voting representatives on the board). In such cases, identifying these VC directors’ start and end dates is important and could be done using their LinkedIn profiles and Google search.
 - For the subset of firms doing business in Massachusetts, researchers can collect annual report data from MA – we will make the pdfs from 2010–2024 available – to (i) identify directors’ start and end dates and (ii) stress test their data.

V Data on director connections

Our results are robust to a more conservative definition of independent directors, which accounts for past connections between independent directors on the one hand, and VCs and/or entrepreneurs on the other. We classify an independent director as being connected if the director has had prior interactions with VC directors or entrepreneurs on the board in any of his prior positions.

An interaction between an independent director (ID) and one of his co-directors on the board can occur one of three main ways. First, the ID could have a past interaction via a board seat. In

this interaction type, the ID’s past board positions could be in the role of an ID or an investor as found in VentureSource. Second, an independent director could have had a past executive or founding position at a previous startup as recorded in VentureSource and, through these past positions, could be connected to that previous startup’s investors or board members. In particular, a connection or interaction with a past investor can happen because (i) the investor was a director in the past startup or (ii) was a partner at a firm of any of the investors in the past startup (e.g., a general partner at an investor that did not take a board seat). Third, the ID could have previously had an investor role such as lead investor, investor-director, or partner at a VC firm. These past experiences introduce a wealth of possible connections through syndication and/or board seats. In sum, each pair of “investor and ID” and “executive and ID” on the current board can have a connection via any past investment activity, board activity, or employment within the VC industry. We then classify the independent director in such a pair to be “connected” (to the investor or executive, respectively). This connection definition is agnostic about the past roles that the ID or the other co-director played in the past (e.g., the ID could be a founder in the past, while the entrepreneur on the current board could have been a VC). Finally, if the ID is connected to *both* the entrepreneur and VC, then we effectively ignore the connections and define this director as being unconnected.

We next redefine board control given these connection classifications: we consider an ID connected to VCs (entrepreneurs) through his past professional experience as a representative of VCs (entrepreneurs). Under this new definition, some startup boards that were previously classified as having shared control are now reclassified as having VC (entrepreneur) control.

Table IA.IX presents the descriptive statistics on director connections and the reclassification of board control. Table IA.X repeats the analysis in Tables IV, V, and VI using these new definitions of board control and shows that our results are robust to a more conservative definition of independent directors.

In-depth analysis of connections. The analysis of connections above is based solely on directors’ employment histories in the startup/VC industry. We also investigate in-depth other sources of potential ties between directors for a small subsample of firms. In particular, we pick a random sample of 100 boards in which the independent director has as a tie-breaking vote and perform a comprehensive analysis of all possible prior ties (educational, employment, and social) between this independent director and other directors on the board using LinkedIn (primary source) and Google search. Among these 100 boards, we have found one board where an independent director was connected to the founder through prior employment in a startup, and these two directors were already identified as “connected” based on our analysis above. In one more case, the independent director shared an educational connection (MIT) with an executive, however, the two directors attended MIT ten years apart from each other.

VI Protective provisions

The board of directors is not the only means for VCs to exercise control. Contracts between VCs and startups typically involve several protective provisions, which give VCs the right to veto certain transactions, such as a sale, liquidation, or new securities issuance, or change the number of directors (e.g., Bengtsson, 2011). Nevertheless, as we explain in Section I, control over the board is crucial for important decisions, such as exits and CEO replacement. For example, a sale transaction needs to be first approved by the board, to go up for a shareholder vote. While protective provisions give VCs the right to veto the sale, they cannot prevent the board from blocking such a sale in the first place. Similarly, going public can only happen upon the board’s approval. More generally, contracts are incomplete, so many situations may not be specified in the contract, making board control crucial. Broughman (2010) provides a further discussion of the effects of protective provisions and board control (p. 478).

Despite these considerations, we perform the analysis of protective provisions to see if their prevalence is positively or negatively correlated with board control. The analysis starts with the PCRI Certificate of Incorporation database of corporate charters. These documents provide a view of the protective provisions available to preferred shareholders. After merging VentureSource to the list of startups in the PCRI data, we collect a random subsample of 220 contract terms associated with financing events and code up the presence and count of protective provisions. If these terms are substitutes for board control, then we predict that VC control of the board at any financing round negatively correlates with the presence and count of protective provisions. Alternatively, VC board members with control may have the bargaining power to supplement control with additional provisions (i.e., the two may be complements). In unreported regressions we find that financing years with and without VC control are equally likely to have at least one protective provision, while conditional on having at least one provision, there is no statistical difference in the number of provisions between years with and without VC control. There is also no clear relationship between shared board control and the presence or count of provisions. Bengtsson (2011) performs a similar analysis by studying certificates of incorporation (COIs) of 182 startups. He finds that firms with (without) VC control over the board have on average 2.5 (3.1) protective provisions, concluding that there is some evidence of substitution between board control and the use of such provisions. Therefore, the differences between our analysis and that in Bengtsson (2011) are not substantial. They could be explained by Bengtsson (2011)’s use only of first round financings and the use of COIs to infer board composition (see Section IV for a discussion of this source of board data and its differences from our data).

Overall, we conclude that there is not a strong connection between protective provisions and board control. Combined with the argument that protective provisions do not override the role of board control, we believe that the patterns (e.g., the board’s life cycle, time series trends, etc.) documented in the paper are unlikely to be offset by changes in protective provisions.

VII Modeling the mediation role

To formalize the mediation role, we build on Broughman (2010, 2013), who considers an incomplete-contracts setting similar to Aghion and Bolton (1992).

There is a risk-neutral entrepreneur (E) and a risk-neutral venture capitalist (VC). The entrepreneur is cash-constrained, while the VC is not. At time t_0 , the VC decides whether to finance the firm, and the entrepreneur decides whether to contribute his human capital. Both parties receive their outside options, I^{VC} and I^E , if these ex-ante investments are not made.

If both parties make investments, then at time t_1 , the firm can choose between one of three possible actions $\{1, 2, 3\}$. For example, these actions could represent the timing of the IPO (early, intermediate, and late) or the terms of the next round of financing. The payoffs for the entrepreneur and VC from Action i are given by V_i^E and V_i^{VC} , respectively, and there is no discounting. For simplicity, we assume that these payoffs are non-transferable.¹³

Suppose that the VC prefers Action 1 the most (V_i^{VC} is the highest for $i = 1$), whereas the entrepreneur prefers Action 3 (V_i^E is the highest for $i = 3$). However, Action 2 is efficient in that it maximizes their combined payoff, $V_i^{VC} + V_i^E$. Together, these three assumptions imply that $V_3^E > V_2^E > V_1^E$ and $V_1^{VC} > V_2^{VC} > V_3^{VC}$.

Contracts are incomplete, and the parties cannot contract on actions. Instead, the decision is made by the board, which can be controlled in three different ways. In an entrepreneur-controlled (VC-controlled) board, the entrepreneur (VC investor) has full authority to choose the action. In a board with shared control, neither the VC nor the entrepreneur have authority. Instead, there is an independent director, who effectively acts as a mediator: the VC and the entrepreneur each suggest an action, and the independent director chooses between the two proposed actions.

We assume that the independent director maximizes the parties' joint payoff, $V_i^E + V_i^{VC}$. Broughman (2013) considers more general preferences of the independent director, allowing him to favor one party over the other. In particular, he assumes that the independent director maximizes the weighted average of the entrepreneur's and VC's payoff, with potentially non-equal weights. As Broughman (2013) shows, the mediation role and shared control are valuable as long as the independent director is at least partially unbiased (i.e., puts a positive weight on each party's payoff), so our focus on an unbiased director simplifies the analysis but is not crucial.

We next consider the board's choice over the actions and the ex-ante investment decisions by both parties under the three types of allocation of control.

Entrepreneur control. If the entrepreneur has control, he wants to choose Action 3. However, since the VC investor is not cash constrained, there is a possibility of renegotiation: we assume

¹³A standard assumption in the literature is that part of the payoffs is non-transferable (e.g., private benefits) and part is transferable (security benefits). The model can be extended to capture this more general assumption at the cost of additional complexity but without changing the intuition (see Broughman, 2013).

that the VC can make a take-it-or-leave-it offer to the entrepreneur to convince him to take a different action. Then, the VC will offer the entrepreneur just enough cash to induce the efficient Action 2 (inducing the entrepreneur to take the VC's preferred Action 1 would be too costly). That is, the VC makes the entrepreneur indifferent between Actions 2 and 3 by offering $V_3^E - V_2^E$. Thus, Action 2 is taken, and the expected payoffs of the entrepreneur and the VC are, respectively, V_3^E and $V_2^{VC} - (V_3^E - V_2^E)$. In order for this allocation of control to ensure ex-ante investments of both parties, the following constraints need to be satisfied:

$$\begin{aligned} V_3^E &\geq I^E, \\ V_2^{VC} - (V_3^E - V_2^E) &\geq I^{VC}. \end{aligned} \tag{1}$$

VC control. Under VC control, the VC wants to choose Action 1. Because the entrepreneur is cash constrained and the payoffs are non-transferable, there is no renegotiation, so Action 1 is taken. The parties are willing to make ex-ante investments if and only if¹⁴

$$\begin{aligned} V_1^E &\geq I^E, \\ V_1^{VC} &\geq I^{VC}. \end{aligned} \tag{2}$$

Shared control with an independent director as the mediator. Suppose that $V_1^E + V_1^{VC} \neq V_3^E + V_3^{VC}$, so that the independent director is never indifferent between the two proposed actions. Then, in equilibrium, at least one of the parties will propose Action 2, which will be chosen by the independent director.¹⁵ Hence, the board's chosen action is efficient, even without any renegotiation. The parties are willing to make ex-ante investments if and only if

$$\begin{aligned} V_2^E &\geq I^E, \\ V_2^{VC} &\geq I^{VC}. \end{aligned} \tag{3}$$

Ex-ante investments and board control. The above discussion shows that both entrepreneur and shared control result in the efficient decision being made. However, they may have different implications for the parties' ex-ante investment decisions. While under entrepreneur control, the VC needs to make a time- t_1 transfer to the entrepreneur for the efficient action to be taken, no transfers are needed to achieve efficiency under shared control. Hence, from the ex-ante perspective, shared control gives the VC a higher payoff than entrepreneur control and makes it easier to

¹⁴Note that if $V_1^E < I^E$, it is technically possible for the VC to offer cash to the entrepreneur at time t_0 to convince him to participate. For simplicity, we shut down this option, motivating it by the lack of commitment power by the entrepreneur: if his human capital investment is non-verifiable, he could take cash at time t_0 and then still not invest his human capital and exercise his outside option, so such transfers would not occur.

¹⁵For example, the independent director cannot choose Action 1 in equilibrium. If he does, the entrepreneur will deviate from his equilibrium strategy and propose Action 2: the independent director will choose this action since he prefers it the most, and it will also benefit the entrepreneur because $V_2^E > V_1^E$.

convince the VC to contribute capital. Overall, the VC's payoff is the highest under VC control, followed by shared control, and is the lowest under entrepreneur control. The rankings from the entrepreneur's perspective are exactly the opposite.

Thus, a key departure from Aghion and Bolton (1992), which is what gives rise to the mediation role of the independent director, is the presence of a “middle-ground” action that is more efficient than the actions preferred by either the entrepreneur or the VC. Note, however, that if the most efficient action were instead the action preferred by either party (or if there were just two actions), then shared control would be equivalent to full control of that party and would implement the efficient decision, so shared control could not be worse.

It follows that if I^{VC} is low, $I^{VC} \leq V_2^{VC} - (V_3^E - V_2^E)$, then the VC is willing to invest even under entrepreneur control. If, at the same time, I^E is high ($I^E > V_2^E$), the only way to ensure the entrepreneur's human capital investment is to give him control. However, as I^{VC} increases above $V_2^{VC} - (V_3^E - V_2^E)$, entrepreneur control becomes insufficient to convince the VC to invest. As long as neither I^{VC} nor I^E are too high ($I^{VC} \leq V_2^{VC}$ and $I^E \leq V_2^E$), shared control with an independent director as the mediator gives both the VC and the entrepreneur sufficient expected payoffs to induce their ex-ante investments, and also results in efficient decision-making by the board. Finally, if I^{VC} is high enough (above V_2^{VC}), the only way to ensure the VC's investment is to give the VC full control, potentially sacrificing ex-post efficiency. The entrepreneur is willing to do this if his own outside option is relatively low, $I^E \leq V_1^E$.

Implications. A key implication from the above analysis is that as I^E decreases relative to I^{VC} , control will shift from (1) entrepreneur control, to (2) shared control, and then to (3) VC control.¹⁶

One way to interpret a reduction in I^E is through the declining role of the entrepreneur's human capital. If his human capital becomes less important for the startup, the entrepreneur becomes easier to replace, and hence, his participation constraint is easier to satisfy. Hence, assuming that the importance and irreplaceability of the entrepreneur's human capital decline over the life cycle (e.g., Rajan, 2012; Kaplan et al., 2009), the model predicts that control over the board will shift from entrepreneur control in early stages to shared control in intermediate stages, and to VC control in later stages.

¹⁶To see this, suppose that at the beginning of the game, the entrepreneur makes a take-it-or-leave-it offer to the VC, offering him a given allocation of board control in exchange for capital. If I^{VC} is low ($I^{VC} \leq V_2^{VC} - (V_3^E - V_2^E)$), the entrepreneur will offer entrepreneur control, and the VC will agree. If I^{VC} is not too high and not too low ($V_2^{VC} - (V_3^E - V_2^E) < I^{VC} \leq V_2^{VC}$), the entrepreneur will offer shared control as long as his own outside option is not too high either ($I^E \leq V_2^E$). Finally, if I^{VC} is very high, whereas I^E is low enough ($I^{VC} > V_2^{VC}$ and $I^E \leq V_1^E$), the entrepreneur will offer VC control. In all other cases, no allocation of control is acceptable for both the VC and entrepreneur simultaneously, so an agreement will not be reached.

References

- Aghion, Philippe, and Patrick Bolton, 1992, An incomplete contracts approach to financial contracting, *Review of Economic Studies* 59, 473–494.
- Bengtsson, Ola, 2011, Covenants in venture capital contracts, *Management Science* 57, 1926–1943.
- Broughman, Brian, 2010, The role of independent directors in startup firms, *Utah Law Review* 2010, 461–510.
- Broughman, Brian, 2013, Independent directors and shared board control in venture finance, *Review of Law and Economics* 9, 41–72.
- Cassel, Johan, James Weston, and Emmanuel Yimfor, 2023, Board diversity in private vs. public firms, *Columbia Business School Research Paper No. 4622698* .
- Hanley, Kathleen Weiss, and Qianqian Yu, 2023, Strategic regulatory non-disclosure: The case of the missing Form D, *Working paper* .
- Kaplan, Steven N., Berk A. Sensoy, and Per Strömberg, 2009, Should investors bet on the jockey or the horse? Evidence from the evolution of firms from early business plans to public companies, *Journal of Finance* 64, 75–115.
- Rajan, Raghuram G., 2012, Presidential address: The corporation in finance, *Journal of Finance* 67, 1173–1217.
- PCRI Company Public Filings Digital Library, Private Capital Research Institute, https://secure.smartroom.com/app/main/#/COI_Library

VIII Figures and Tables

Figure IA.1: Data construction

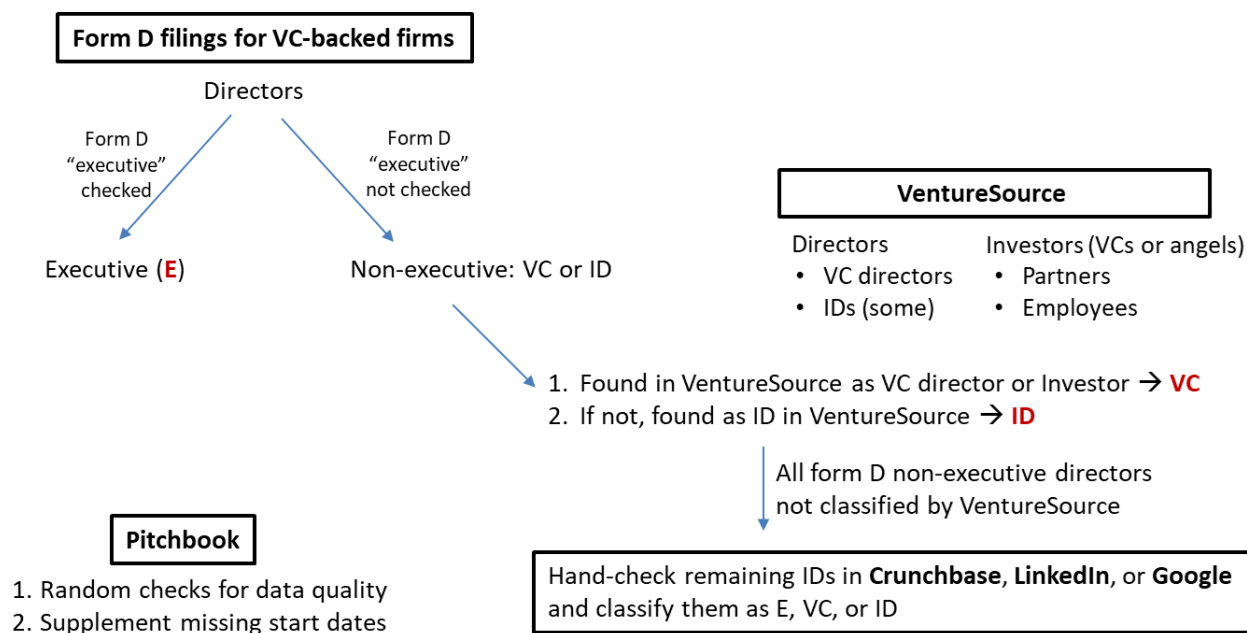


Figure IA.2: Example Form D filing: Pre-2008

An example of a pre-2008 Form D filing. It was filed in paper form and scanned by the SEC.

FORM D

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM D

NOTICE OF SALES OF SECURITIES
PURSUANT TO REGULATION D,
SECTION 4(b), AND/OR
UNIFORM LIMITED OFFERING EXEMPTION

OMB APPROVAL
OMB NUMBER: 3215-0076
Expires: November 30, 2001
Estimated average burden hours per response: 16.00

SEC USE ONLY
Prefix: _____ Serial: _____
DATE RECEIVED: _____

Name of Offering (check if this is an amendment and name has changed, and indicate change):
Filing Under (check boxes) that apply: ☐ Rule 504 ☐ Rule 505 ☒ Rule 506 ☐ Section 4(b) ☐ ULOE
Type of Filing: ☒ New Filing ☐ Amendment

1. Enter the information requested about the issuer:
Name of Issuer (check if this is an amendment and name has changed, and indicate change):
Away.com, Inc. 02031994

Address of Executive Offices (Number and Street, City, State, Zip Code)
702 H Street, NW #200, Washington, DC 20001 Telephone Number (Including Area Code)
202.654.8060

Address of Principal Business Operations (if different from Executive Offices) (Number and Street, City, State, Zip Code)
Telephone Number (Including Area Code)

Brief Description of Business
Internet travel and media

Type of Business Organization
☒ Corporate ☐ limited partnership, already formed ☐ other (please specify):
☐ business trust ☐ limited partnership, to be formed

Actual or Estimated Date of Incorporation or Organization: Month: 11 Year: 2001 ☒ Actual ☐ Estimated
Jurisdiction of Incorporation or Organization: (Enter two-letter U.S. Postal Service abbreviation for State: Delaware
CN for Canada, FN for other foreign jurisdiction) ©

PROCESSED
APR 30 2002
THOMSON
FINANCIAL

1104863

A. BASIC IDENTIFICATION DATA

2. Enter the information requested for the following:
• Each promoter of the issuer, if the issuer has been organized within the past five years;
• Each beneficial owner having the power to vote or dispose, or direct the vote or disposition of, 10% or more of a class of equity securities of the issuer;
• Each executive officer and director of corporate issuers and of corporate general and managing partners of partnership issuers, and
• Each general and managing partner of partnership issuers.

Check Box(es) that Apply: ☐ Promoter ☐ Beneficial Owner ☒ Executive Officer ☒ Director ☐ General and/or Managing Partner

Full Name (Last name first, if individual) **Green, Sean**

Business or Residence Address (Number and Street, City, State, Zip Code)
702 H Street, NW #200, Washington, DC 20001

Check Box(es) that Apply: ☐ Promoter ☐ Beneficial Owner ☐ Executive Officer ☒ Director ☐ General and/or Managing Partner

Full Name (Last name first, if individual) **Burke, Lawrence**

Business or Residence Address (Number and Street, City, State, Zip Code)
Mariah Media, 400 Market Street, Santa Fe, NM, 87501

Check Box(es) that Apply: ☐ Promoter ☐ Beneficial Owner ☐ Executive Officer ☒ Director ☐ General and/or Managing Partner

Full Name (Last name first, if individual) **Fritzer, Jay Robert**

Business or Residence Address (Number and Street, City, State, Zip Code)
New World Ventures, 1603 Orrington, Suite 1870, Evanston, IL 60201

Check Box(es) that Apply: ☐ Promoter ☒ Beneficial Owner ☐ Executive Officer ☒ Director ☐ General and/or Managing Partner

Full Name (Last name first, if individual) **Ehrman, Daniel**

Business or Residence Address (Number and Street, City, State, Zip Code)
Gannett Co., 7950 Jones Branch Drive, McLean, VA 22107

Check Box(es) that Apply: ☐ Promoter ☐ Beneficial Owner ☐ Executive Officer ☒ Director ☐ General and/or Managing Partner

Full Name (Last name first, if individual) **Ross, Tom**

Business or Residence Address (Number and Street, City, State, Zip Code)
Potomac Ventures, 4535 Jamestown Road, Bethesda, MD 20816

Check Box(es) that Apply: ☐ Promoter ☐ Beneficial Owner ☐ Executive Officer ☒ Director ☐ General and/or Managing Partner

Full Name (Last name first, if individual) **Platt, Seth**

Business or Residence Address (Number and Street, City, State, Zip Code)
Circle-T Partners, 153 E. 53rd St., Suite 5501, New York, NY 10022

Check Box(es) that Apply: ☐ Promoter ☐ Beneficial Owner ☐ Executive Officer ☒ Director ☐ General and/or Managing Partner

Full Name (Last name first, if individual) **Herman, Robert**

Business or Residence Address (Number and Street, City, State, Zip Code)
Callen Group, 135 E. 57th St., 16th Floor, New York, NY 10022

Figure IA.3: Example Form D filing: Post-2008

An example of a post-2008 Form D filing. This is a representation of the underlying XML format in an internet browser.

1. Issuer's Identity			
CIK (Filer ID Number) 0001598674	Previous Names Providence Mattress Company	<input type="checkbox"/> None	Entity Type <input checked="" type="checkbox"/> Corporation <input type="checkbox"/> Limited Partnership <input type="checkbox"/> Limited Liability Company <input type="checkbox"/> General Partnership <input type="checkbox"/> Business Trust <input type="checkbox"/> Other (Specify)
Name of Issuer Casper Sleep Inc.			
Jurisdiction of Incorporation/Organization DELAWARE			
Year of Incorporation/Organization <input type="checkbox"/> Over Five Years Ago <input checked="" type="checkbox"/> Within Last Five Years (Specify Year) 2013 <input type="checkbox"/> Yet to Be Formed			

2. Principal Place of Business and Contact Information			
Name of Issuer Casper Sleep Inc.			
Street Address 1 45 BOND STREET, SECOND FLOOR		Street Address 2	
City NEW YORK	State/Province/Country NEW YORK	ZIP/PostalCode 10012	Phone Number of Issuer (713) 269-4861

3. Related Persons			
Last Name Krim	First Name Philip	Middle Name	
Street Address 1 45 Bond Street, Second Floor	Street Address 2		
City New York	State/Province/Country NEW YORK	ZIP/PostalCode 10012	
Relationship: <input checked="" type="checkbox"/> Executive Officer <input checked="" type="checkbox"/> Director <input type="checkbox"/> Promoter			
Clarification of Response (if Necessary):			
Last Name Parikh	First Name Neil	Middle Name	
Street Address 1 45 Bond Street, Second Floor	Street Address 2		
City New York	State/Province/Country NEW YORK	ZIP/PostalCode 10012	
Relationship: <input checked="" type="checkbox"/> Executive Officer <input checked="" type="checkbox"/> Director <input type="checkbox"/> Promoter			
Clarification of Response (if Necessary):			
Last Name Florence	First Name Tony	Middle Name	
Street Address 1 45 Bond Street, Second Floor	Street Address 2		
City New York	State/Province/Country NEW YORK	ZIP/PostalCode 10012	
Relationship: <input type="checkbox"/> Executive Officer <input checked="" type="checkbox"/> Director <input type="checkbox"/> Promoter			

Figure IA.4: Form D or CIK likelihood

The raw probability that a startup – one in the “risk set” defined in Section III.A – has a CIK and Form D.

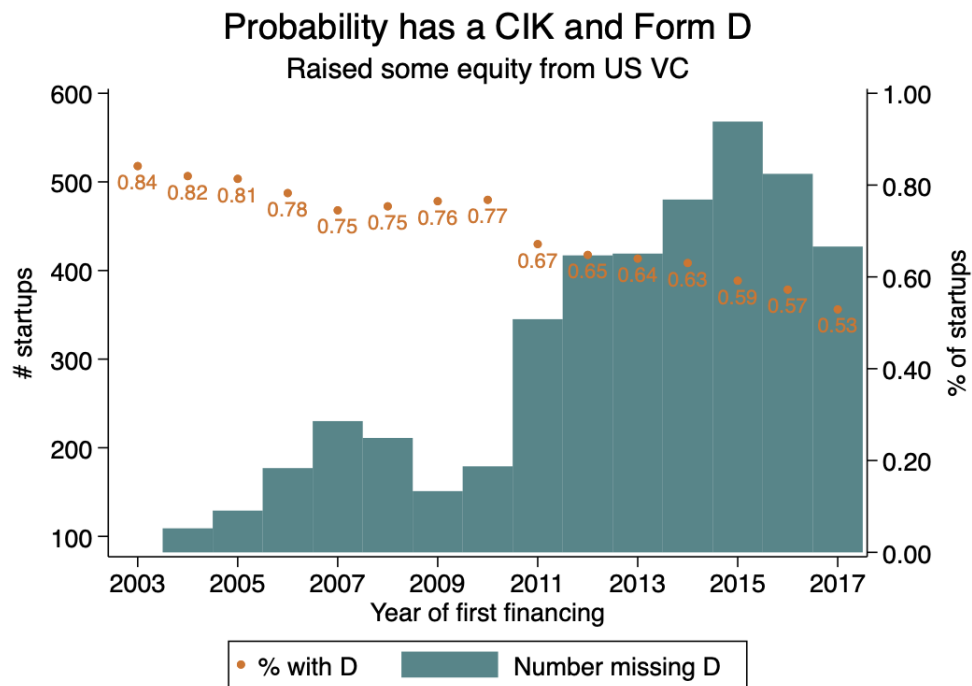


Figure IA.5: Financings and Form D filings

The figure reports the sample of startups that are in the “risk set” defined in Section III.A and have at least one Form D. We then try to match a Form D filing to the known financings in VentureSource using the quarter before and after the financing date reported in VentureSource. The line reports the % of financings in that year for which we found a Form D for the startup in the quarters around the VentureSource financing date.

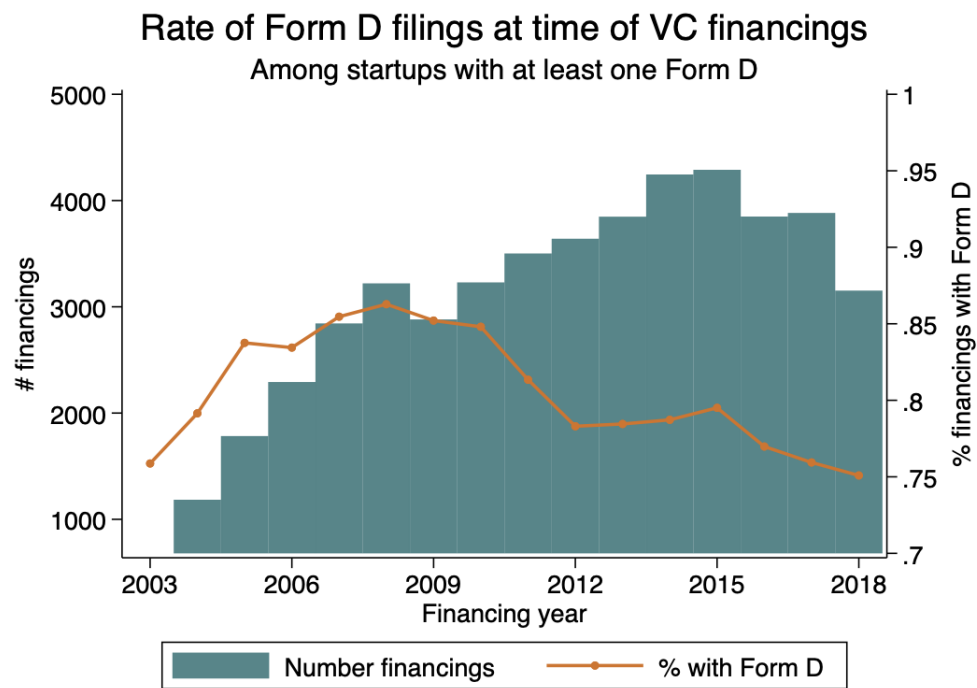


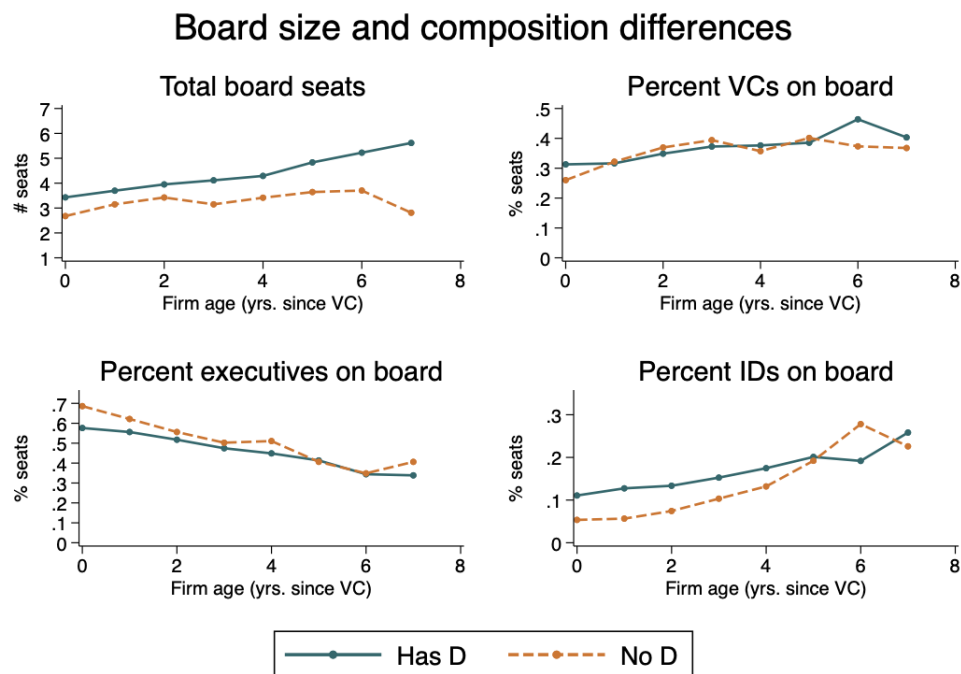
Figure IA.6: Example Massachusetts annual report: Padlock Therapeutics

An annual report for Padlock Therapeutics found on the Massachusetts Secretary of State website.

Identification Number: <u>001132711</u>		
1. Exact name of the corporation: <u>PADLOCK THERAPEUTICS, INC.</u>		
2. Jurisdiction of Incorporation: State: <u>DE</u> Country: <u>USA</u>		
3.4. Street address of the corporation registered office in the commonwealth and the name of the registered agent at that office: Name: <u>MICHAEL GILMAN</u> No. and Street: <u>25 FIRST ST., STE 303</u> City or Town: <u>CAMBRIDGE</u> State: <u>MA</u> Zip: <u>02141</u> Country: <u>USA</u>		
5. Street address of the corporation's principal office: No. and Street: <u>25 FIRST ST., STE 303</u> City or Town: <u>CAMBRIDGE</u> State: <u>MA</u> Zip: <u>02141</u> Country: <u>USA</u>		
6. Provide the name and business street address of the officers and of all the directors of the corporation: <i>(A president, treasurer, secretary and at least one director are required.)</i>		
Title	Individual Name First, Middle, Last, Suffix	Address (no PO Box) Address, City or Town, State, Zip Code
PRESIDENT	MICHAEL GILMAN	25 FIRST ST., STE 303 CAMBRIDGE, MA 02141 USA
TREASURER	DAVID NEAFUS	25 FIRST ST., STE 303 CAMBRIDGE, MA 02141 USA
SECRETARY	MICHAEL GILMAN	25 FIRST ST., STE 303 CAMBRIDGE, MA 02141 USA
DIRECTOR	MICHAEL GILMAN	25 FIRST ST., STE 303 CAMBRIDGE, MA 02141 USA
DIRECTOR	BRUCE BOOTH	25 FIRST ST., STE 303 CAMBRIDGE, MA 02141 USA
DIRECTOR	DAVID GRAINGER	25 FIRST ST., STE 303 CAMBRIDGE, MA 02141 USA
DIRECTOR	NILESH KUMAR	25 FIRST ST., STE 303 CAMBRIDGE, MA 02141 USA
DIRECTOR	MARIAN NAKEDA	25 FIRST ST., STE 303 CAMBRIDGE, MA 02141 USA
DIRECTOR	TODD HUFFMAN	25 FIRST ST., STE 303 CAMBRIDGE, MA 02141 USA

Figure IA.7: Board size and composition differences over the life cycle: MA startups

The figure reports the by-age statistics for the set of MA-headquartered startups with and without Form D filings. Age is defined from the year of the startup's first standard VC financing. "Total board seats" is the count of seats across all types. The sample of startups excludes those that go public because the no-Form-D sample had zero such firms and it is likely firms that file to go public may backfill their Form Ds. Startups are tracked from their first VC financing until (i) exit or (ii) if they are still private, then the end of the sample.



Excludes firms with IPO (to avoid backfill).

Figure IA.8: Control over time: Information Technology startups

The time series of board control for IT startups.

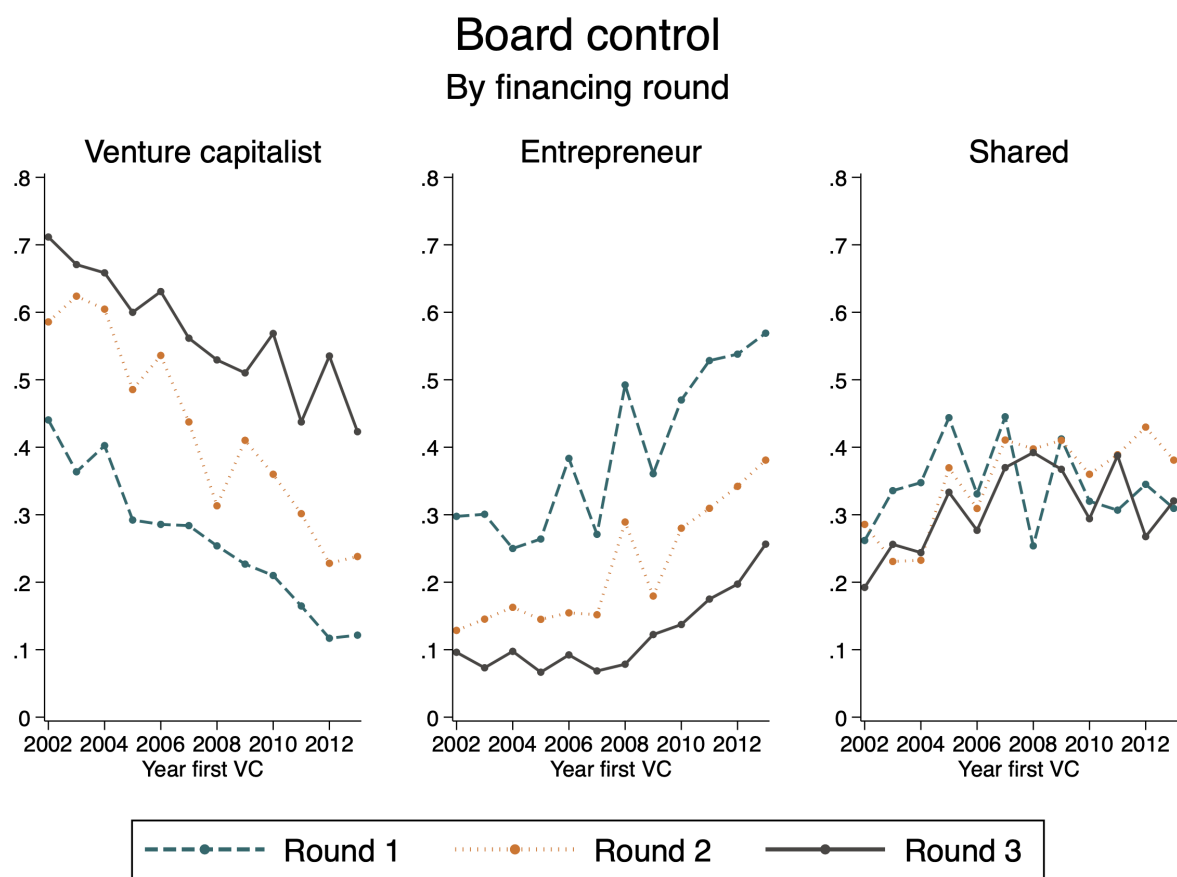


Figure IA.9: Control over time: Healthcare startups

The time series of board control for healthcare startups.

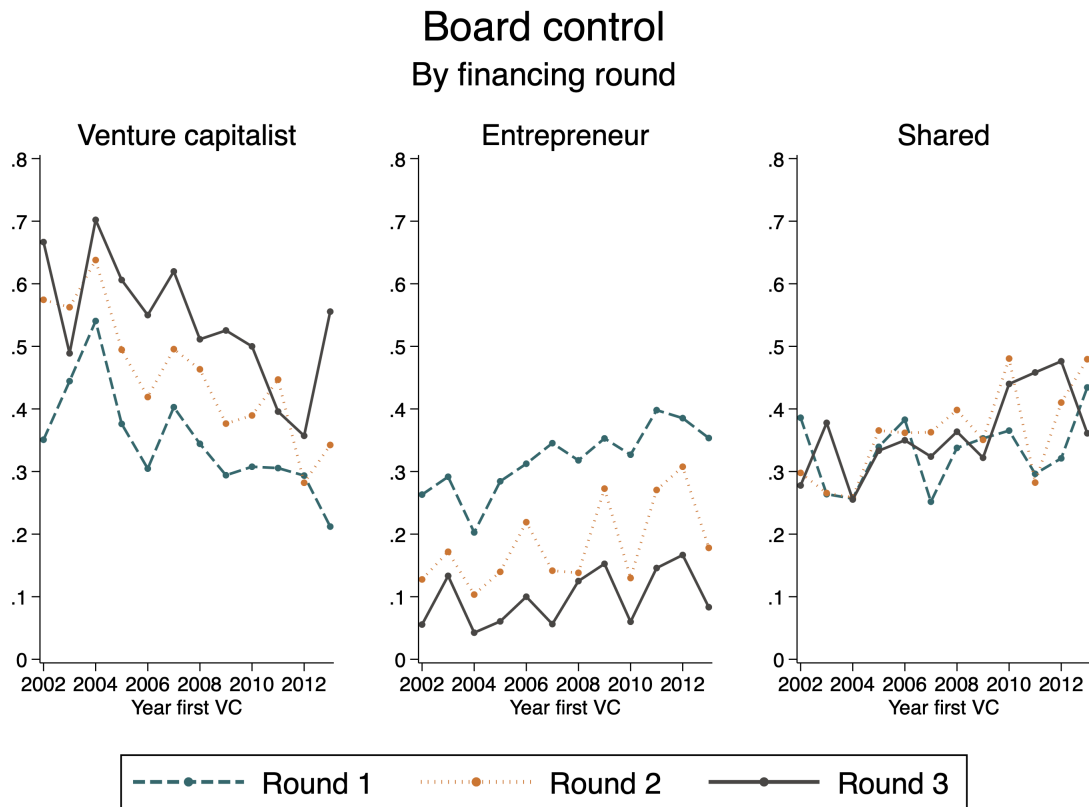


Figure IA.10: Boards at first financing

The left y-axis reports the percentage of startup boards (with at least one director) that have at least one independent director (dotted line) and at least one VC-director (solid line) in the year of the first VC equity financing. The right y-axis reports the average board size in the year of the first VC equity financing. The x-axis is the year of the first VC equity financing.

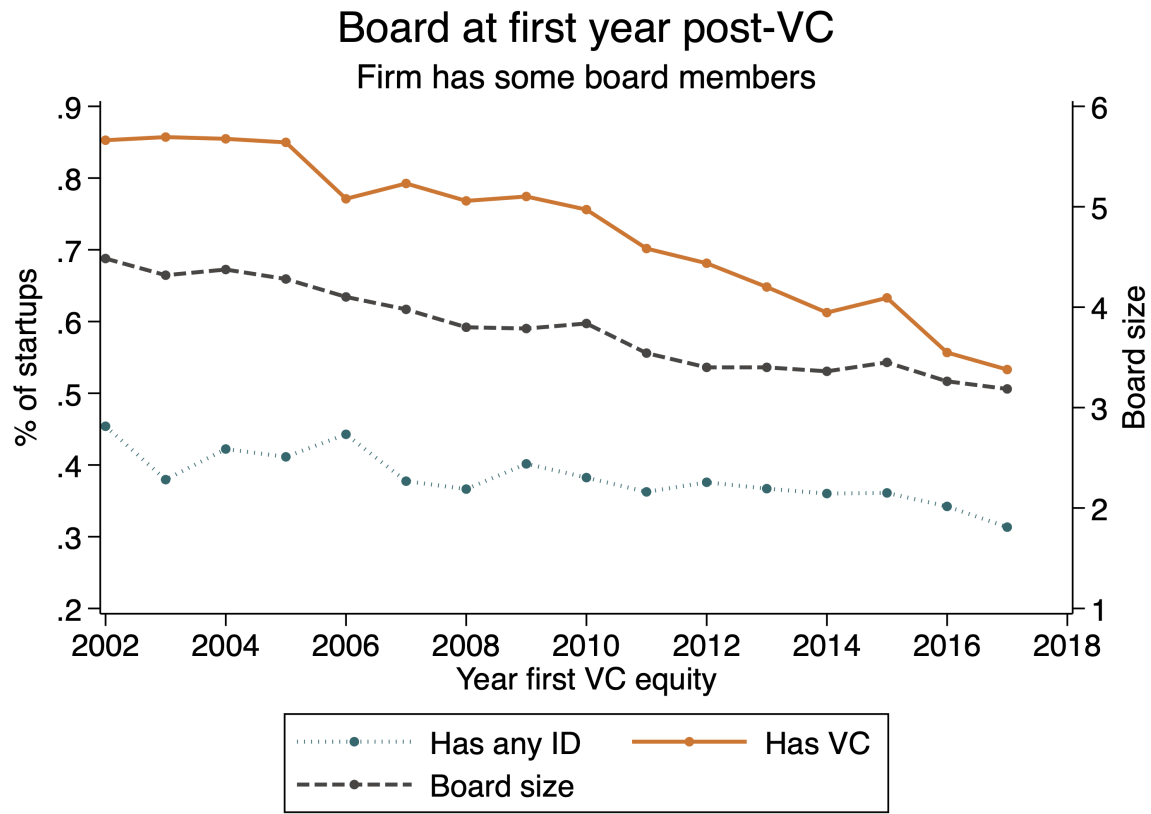


Figure IA.11: Board of directors section of ANDevices, Inc. Certificate of Incorporation

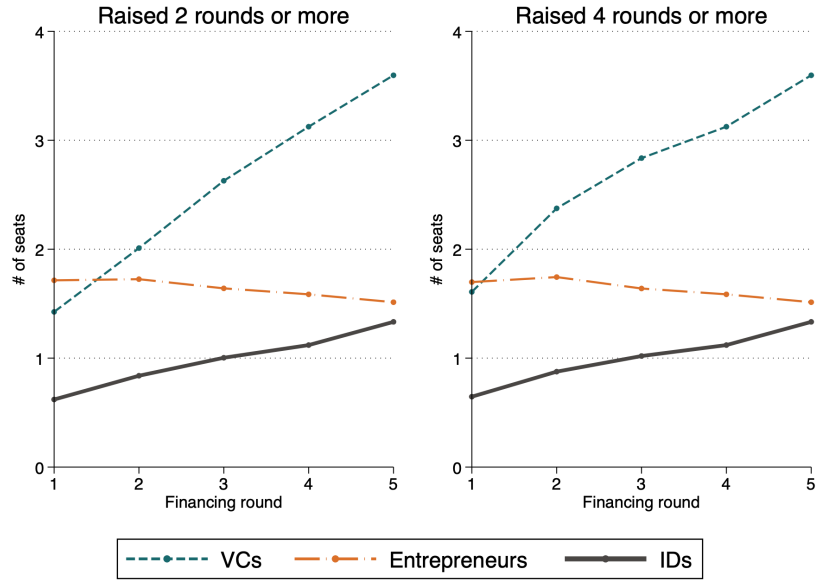
The figure presents an example section of a Certificate of Incorporation (COI) on May 1st, 2006, that details the shareholder rights to elect directors to the board.

b. **Board of Directors.** The number of directors of the Corporation shall be five (5). For so long as shares of Series A Preferred Stock remain outstanding (i) the holders of a majority of the outstanding shares of Common Stock, voting as a separate class, shall be entitled to elect two (2) members of the Board of Directors at each meeting or pursuant to each consent of the Corporation's stockholders for the election of directors, and to remove from office such directors and to fill any vacancy caused by the resignation, death or removal of such directors; (ii) the holders of a majority of the outstanding shares of Series A Preferred Stock, voting as a separate class, shall be entitled to elect two (2) members of the Board of Directors at each meeting or pursuant to each consent of the Corporation's stockholders for the election of directors, and to remove from office such directors and to fill any vacancy caused by the resignation, death or removal of such directors; and (iii) the holders of a majority of the outstanding shares of Common Stock, Series A Preferred Stock and Series B Preferred Stock, voting together, on an as converted basis, shall be entitled to elect one (1) member of the Board of Directors at each meeting or pursuant to each consent of the Corporation's stockholders for the election of directors, and to remove from office such director and to fill any vacancy caused by the resignation, death or removal of such director.

Figure IA.12: Board dynamics and survivorship

The figure reports board dynamics for the set of startups that survive for at least two or four financing rounds, respectively.

(a) Director type over the life cycle



(b) Control over the life cycle

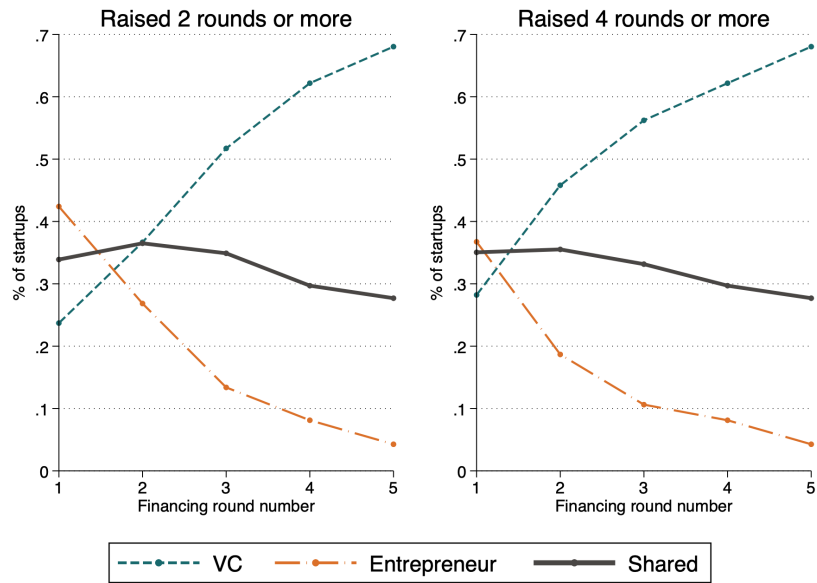


Figure IA.13: Board composition: percentage (No stale boards)

The figure reports the average and median fraction of board seats held by executives, independent directors, and venture capitalists but removing startups with stale boards. In particular, 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 x-axis shows the startup's financing round.

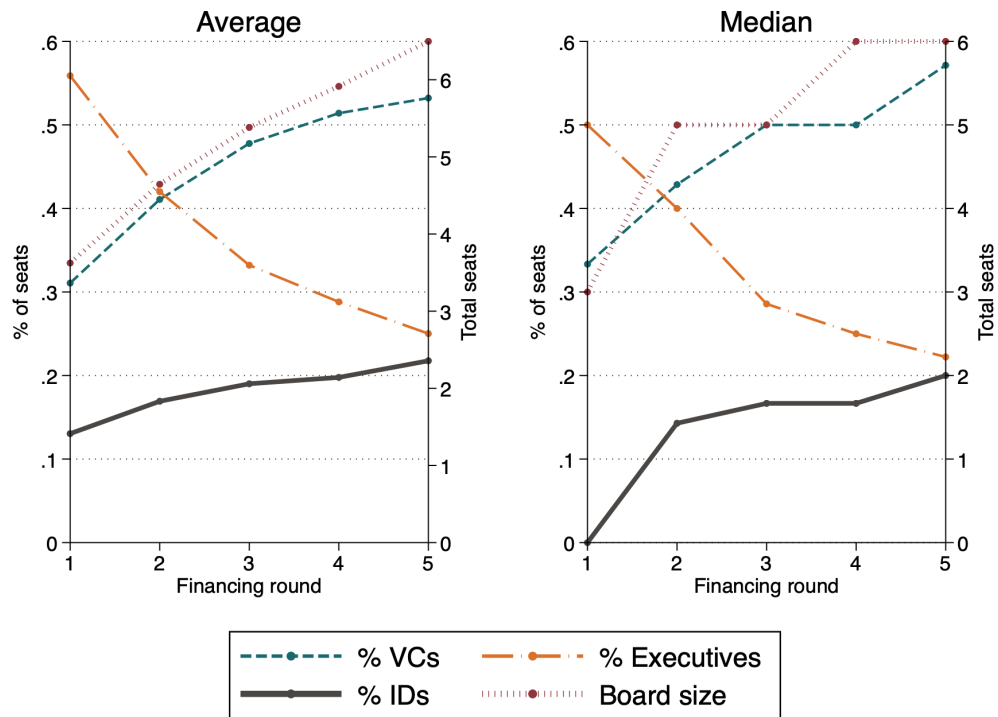


Figure IA.14: Board control by firm stage (no stale boards)

The figure reports the percentage of startups with different types of board control by financing round, but removing startups with stale boards. In particular, we drop a startup from the sample if it has a known VC financing, but no Form D filed in the previous two years. “Entrepreneur” is the percentage of startups where executives/entrepreneurs control the board, “VC” is the percentage of startups where investors control the board, and “Shared” is the percentage of startups where neither VCs nor entrepreneurs control the board.

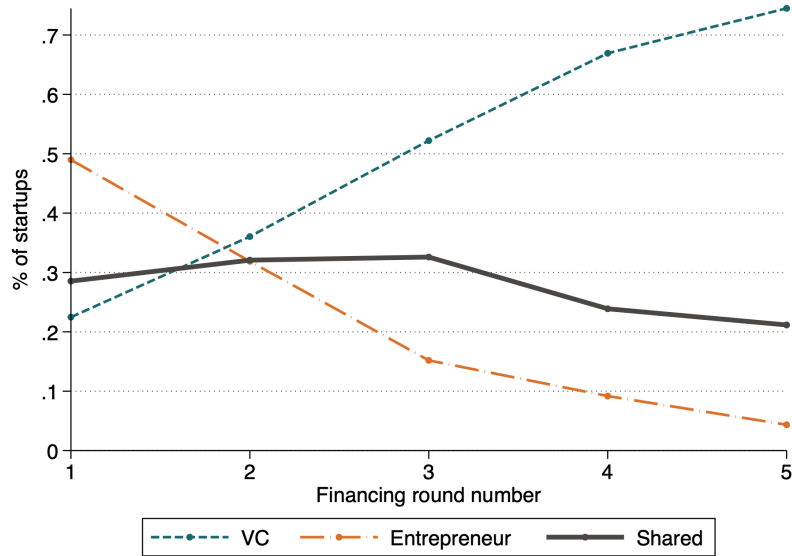


Table IA.I: Summary statistics: with and without at least one Form D.

The table reports the differences between startups with at least one Form D filing and those with none. The sample of startups are those that satisfy the following conditions that ensure we are tracking VC-backed startups that *should* have triggered a Form D filing:

- Raised capital from a U.S.-based VC firm that has ever taken a board seat in at least one of its portfolio companies in VentureSource
- Has at least one non-debt or grant financing round in [2003,2017]
- Its first round was not one of the rounds listed in footnote 4 of the paper

	Has Form D				No Form D			
	Obs	Mean	Median	Std dev	Obs	Mean	Median	Std dev
Year first VC	9,637	2010.387	2011.000	4.108	4,427	2011.942	2013.000	3.805
First round Series A	9,637	0.591	1.000	0.492	4,427	0.536	1.000	0.499
CA	9,637	0.412	0.000	0.492	4,427	0.568	1.000	0.495
MA	9,637	0.098	0.000	0.297	4,427	0.053	0.000	0.223
Went public (as of 2019Q2)	9,637	0.039	0.000	0.193	4,427	0.010	0.000	0.101
Acquired (as of 2019Q2)	9,637	0.317	0.000	0.465	4,427	0.264	0.000	0.441
Failed (as of 2019Q2)	9,637	0.101	0.000	0.301	4,427	0.110	0.000	0.313
Total capital raised	9,551	43.932	14.900	209.895	3,987	27.497	6.000	119.400
# equity financings	9,637	3.110	3.000	1.789	4,427	2.118	2.000	1.348
Year founded	9,637	2008.900	2009.000	4.584	4,427	2010.635	2012.000	4.510
First round synd. size	9,637	2.197	2.000	1.581	4,427	2.159	2.000	1.636
Has LLC in name	9,637	0.039	0.000	0.194	4,427	0.076	0.000	0.265
Raised some VC equity in sample period	9,637	0.990	1.000	0.101	4,427	0.982	1.000	0.133

Table IA.II: Board size and composition for MA startups: with and without Form D

The table reports OLS regressions for a variety of firm-age outcome variables concerning the startup's board of directors for MA startups. The key dependent variable is "No Form D", which equals one if the startup never filed a form D, and zero otherwise. "Log size" is the log of board size at each age. The "%" report the percentage of seats each director type holds. Standard errors are clustered at the startup-level. We use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively.

	Log size	% Execs	% VCs	% IDs
	(1)	(2)	(3)	(4)
No Form D	-0.23*** (0.070)	-0.0048 (0.034)	0.064* (0.037)	-0.059*** (0.017)
Log first capital raised	0.071*** (0.018)	0.036*** (0.010)	-0.044*** (0.011)	0.0082 (0.0064)
Log first syndicate size	0.036 (0.040)	0.065*** (0.022)	-0.043* (0.023)	-0.022 (0.014)
Has a non-MA investor (ever)	0.044 (0.071)	-0.026 (0.037)	0.017 (0.046)	0.0092 (0.026)
Log age at first VC	0.071* (0.040)	0.0087 (0.022)	-0.015 (0.024)	0.0061 (0.016)
Observations	1555	1555	1555	1555
R^2	0.19	0.11	0.17	0.086
Mean dep. var.		0.35	0.52	0.13
Age FE	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y

Table IA.III: Control by life cycle for MA startups: with and without Form D

The table reports OLS regressions for board control indicators by firm age for the sample of MA startups. The key independent variable is “No Form D”, which equals one if the startup never filed a Form D, and zero otherwise. Robust standard errors are reported in parentheses.

	VC control				Entrepreneur control				Shared control			
	0 (1)	1 (2)	2 (3)	3 (4)	0 (5)	1 (6)	2 (7)	3 (8)	0 (9)	1 (10)	2 (11)	3 (12)
No Form D	0.011 (0.050)	0.013 (0.057)	0.0074 (0.068)	0.023 (0.089)	0.14** (0.061)	0.11 (0.070)	0.068 (0.079)	0.016 (0.092)	-0.16*** (0.052)	-0.13*** (0.057)	-0.075 (0.065)	-0.039 (0.078)
Log first capital raised	0.068*** (0.016)	0.060*** (0.016)	0.042** (0.021)	0.037 (0.026)	-0.12*** (0.022)	-0.088*** (0.022)	-0.082*** (0.022)	-0.040 (0.027)	0.052*** (0.019)	0.028 (0.020)	0.041** (0.017)	0.0037 (0.023)
Log first syndicate size	0.11*** (0.035)	0.12*** (0.038)	0.13*** (0.044)	0.11* (0.058)	-0.030 (0.047)	-0.041 (0.048)	-0.095* (0.050)	-0.15** (0.061)	-0.074* (0.044)	-0.075* (0.043)	-0.036 (0.044)	0.039 (0.057)
Has a non-MA investor (ever)	-0.0033 (0.060)	0.0093 (0.071)	-0.0091 (0.080)	-0.10 (0.13)	-0.037 (0.077)	0.026 (0.082)	0.034 (0.088)	0.19 (0.12)	0.042 (0.068)	-0.035 (0.070)	-0.025 (0.080)	-0.087 (0.11)
Log age at first VC	-0.065 (0.045)	-0.028 (0.047)	-0.032 (0.053)	-0.093 (0.064)	-0.044 (0.055)	0.041 (0.057)	0.021 (0.055)	0.032 (0.067)	0.10** (0.050)	-0.012 (0.050)	0.011 (0.051)	0.061 (0.063)
Observations	316	323	301	222	316	323	301	222	316	323	301	222
R^2	0.23	0.18	0.14	0.10	0.18	0.099	0.12	0.11	0.11	0.081	0.065	0.060
Mean dep. var.	0.22	0.25	0.31	0.36	0.51	0.50	0.42	0.36	0.28	0.25	0.27	0.29
Age FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Table IA.IV: Control over the life cycle: transition probabilities (MA startups; non-form D filers)

This is the analog of Table VII for non-Form D filing MA startups. Panel A reports the percentage of switches in board control across all startup financing-years regardless of the change in board size. Panel B reports the percentage of switches in board control 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		
Board control at $t - 1$	E	E	Shared	VC
	Shared	64.71%	25.49%	9.80%
	VC	4.55%	59.09%	36.36%
		0.00%	12.90%	87.10%
		Panel B: Year w/ board size change		
		Board control at t		
Board control at $t - 1$	E	E	Shared	VC
	Shared	37.04%	44.44%	18.52%
	VC	9.09%	18.18%	72.73%
		0.00%	18.18%	81.82%

Table IA.V: Regressions of board control indicators over the startup life cycle: MA startups without Form D

The table is the analog of Table IV in the paper, but using the set of MA startups that never filed a Form D.

	E control (1)	VC control (2)	E control (3)	VC control (4)
1 y.o.	-0.19* (0.099)	0.096 (0.089)		
2 y.o.	-0.27** (0.12)	0.19* (0.12)		
3 y.o.	-0.31** (0.14)	0.18 (0.13)		
4 y.o.	-0.51*** (0.13)	0.13 (0.15)		
5 y.o.	-0.35** (0.15)	0.20 (0.15)		
Round # 2			-0.26*** (0.088)	0.13 (0.081)
Round # 3			-0.087 (0.12)	0.075 (0.12)
Round # 4			-0.37*** (0.13)	0.26* (0.14)
Round # 5+			-0.66*** (0.15)	0.36** (0.16)
Log capital raised	-0.037 (0.024)	-0.0052 (0.025)	-0.043* (0.023)	0.0036 (0.023)
Observations	208	208	208	208
R^2	0.23	0.13	0.26	0.15
Industry FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Location FE	Y	Y	Y	Y

Table IA.VI: Control over the startup life cycle: transition probabilities (no stale boards)

This table repeats Table VII in the paper, but removing startups with stale boards. In particular, we drop a startup from the sample if it has a known VC financing, but no Form D filed in the previous two years. Panel A reports the percentage of switches in board control across all startup financing-years regardless of the change in board size. Panel B reports the percentage of switches in board control within the subset of financing-years where there is some change in the board size.

		Panel A: All financing years		
		Board control at t		
Board control at $t - 1$	E	E	Shared	VC
	Shared	53.27%	33.64%	13.09%
	VC	5.99%	62.63%	31.39%
		1.53%	11.55%	86.91%
		Panel B: Year w/ board size change		
		Board control at t		
Board control at $t - 1$	E	E	Shared	VC
	Shared	35.47%	47.00%	17.53%
	VC	8.61%	46.90%	44.49%
		1.97%	15.82%	82.21%

Table IA.VII: Impact of changing capital needs due to AWS on early-stage board control: controlling for ownership

The table reports the differences-in-differences estimation of Series A board control for the sample of startups financed between 2002 and 2010. It repeats the analysis in Table V of the main paper with the additional control for founder equity. 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 (1)	VC control (2)	E control (3)	VC control (4)	E control (5)	VC control (6)	E control (7)	VC control (8)
Treated X Post-2005	0.077*** (0.027)	-0.080** (0.029)	0.087** (0.037)	-0.088** (0.034)	0.081** (0.030)	-0.10*** (0.032)	0.098** (0.044)	-0.11** (0.046)
Treated	-0.047 (0.033)	0.019 (0.029)	-0.054* (0.029)	0.025 (0.027)	-0.057** (0.023)	0.033 (0.026)	-0.067*** (0.018)	0.040 (0.024)
Founder equity %	0.32*** (0.062)	-0.41*** (0.048)	0.32*** (0.062)	-0.41*** (0.048)	0.16*** (0.038)	-0.37*** (0.055)	0.16*** (0.038)	-0.37*** (0.055)
Observations	2375	2375	2375	2375	1980	1980	1980	1980
R^2	0.069	0.13	0.070	0.13	0.054	0.13	0.055	0.14
Mean dep. var.	0.31	0.32	0.31	0.32	0.19	0.39	0.19	0.39
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 \times Industry FE	N	N	Y	Y	N	N	Y	Y

Table IA.VIII: Board control and bargaining power: controlling for ownership

The table repeats Table VI from the main paper after including a control for founder equity. 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)
Panel A: Equity stake proxy				
Low VC b.p. (equity)	0.082*** (0.018)	-0.037*** (0.014)		
High VC b.p. (equity)	-0.11*** (0.017)	0.094*** (0.016)		
Lowest VC b.p.			0.061*** (0.021)	-0.011 (0.019)
Low VC b.p.			0.037 (0.025)	-0.021 (0.019)
High VC b.p.			-0.066*** (0.020)	0.043*** (0.015)
Highest VC b.p.			-0.13*** (0.017)	0.11*** (0.016)
Founder equity %	0.30*** (0.042)	-0.32*** (0.040)	0.27*** (0.041)	-0.31*** (0.042)
Observations	5145	5145	5145	5145
R^2	0.12	0.13	0.12	0.13
Mean dep. var.	0.41	0.24	0.41	0.24
Panel B: Dry powder proxy				
Low VC b.p. (DP)	0.029* (0.016)	-0.022* (0.013)		
High VC b.p. (DP)	-0.014 (0.016)	0.012 (0.014)		
Lowest VC b.p.			0.017 (0.024)	-0.026 (0.021)
Low VC b.p.			0.080*** (0.021)	-0.060*** (0.017)
High VC b.p.			0.0017 (0.021)	-0.0044 (0.018)
Highest VC b.p.			0.0086 (0.019)	-0.0069 (0.017)
Founder equity %	0.39*** (0.043)	-0.39*** (0.040)	0.38*** (0.043)	-0.38*** (0.041)
Observations	5145	5145	5145	5145
R^2	0.099	0.12	0.10	0.12
Mean dep. var.	0.41	0.24	0.41	0.24
Panel C: Exit activity (M&A) proxy				
Low VC b.p. (Acq., 2 yrs)	0.053* (0.027)	-0.061*** (0.017)		
High VC b.p. (Acq., 2 yrs)	-0.062*** (0.022)	0.055 (0.034)		
Lowest VC b.p.			0.0021 (0.035)	-0.0061 (0.024)
Low VC b.p.			-0.0021 (0.028)	-0.0095 (0.023)
High VC b.p.			-0.036 (0.037)	0.0092 (0.031)
Highest Acq b.p.			-0.049 (0.047)	0.046 (0.029)
Founder equity %	0.39*** (0.044)	-0.39*** (0.041)	0.39*** (0.044)	-0.39*** (0.040)
Observations	5014	5014	5014	5014
R^2	0.10	0.12	0.099	0.12
Mean dep. var.	0.41	0.24	0.41	0.24
Panels controls				
Year FE	N	N	N	N
Industry FE	Y	Y	Y	Y
Location FE	Y	Y	Y	Y
Log capital control	Y	Y	Y	Y

Table IA.IX: Summary statistics: financing-level connected IDs.

The table reports the financing-level statistics on connected IDs. “Had unconnected ID” is the fraction of all financing-level observations with at least one director unconnected to the VC or the entrepreneur. We then focus on the subsample of financing-level observations with at least one independent director. Within this sample, “% IDs unconnected” is the fraction of independent directors that are unconnected to either VCs or entrepreneurs, and “% IDs VC-connected” (“% IDs Entrep.-connected”) is the fraction of independent directors connected to VCs (entrepreneurs) through their past professional positions. “Change to VC control w/ conn.” (“Change to entrep. control w/ conn.”) is the percent of observations in this sample that were classified as having shared control without the data on connections, but were reclassified as having VC (entrepreneur) control based on director connections.

	Boards at financing # 1					
	Obs	Mean	25th	Median	75th	Std dev
Had unconnected ID	7,780	0.316	0.000	0.000	1.000	0.465
% IDs unconnected	2,870	0.797	0.667	1.000	1.000	0.361
% IDs VC-connected	2,870	0.192	0.000	0.000	0.333	0.353
% IDs Entrep.-connected	2,870	0.011	0.000	0.000	0.000	0.098
Change to VC control w/ conn.	2,870	0.100	0.000	0.000	0.000	0.300
Change to entrep. control w/ conn.	2,870	0.028	0.000	0.000	0.000	0.164
	Boards at financing # 2					
	Obs	Mean	25th	Median	75th	Std dev
Had unconnected ID	4,915	0.422	0.000	0.000	1.000	0.494
% IDs unconnected	2,517	0.752	0.500	1.000	1.000	0.387
% IDs VC-connected	2,517	0.236	0.000	0.000	0.500	0.380
% IDs Entrep.-connected	2,517	0.012	0.000	0.000	0.000	0.102
Change to VC control w/ conn.	2,517	0.124	0.000	0.000	0.000	0.330
Change to entrep. control w/ conn.	2,517	0.019	0.000	0.000	0.000	0.135
	Boards at financing # 3					
	Obs	Mean	25th	Median	75th	Std dev
Had unconnected ID	2,794	0.492	0.000	0.000	1.000	0.500
% IDs unconnected	1,673	0.733	0.500	1.000	1.000	0.387
% IDs VC-connected	1,673	0.256	0.000	0.000	0.500	0.383
% IDs Entrep.-connected	1,673	0.011	0.000	0.000	0.000	0.091
Change to VC control w/ conn.	1,673	0.133	0.000	0.000	0.000	0.340
Change to entrep. control w/ conn.	1,673	0.010	0.000	0.000	0.000	0.100
	Boards at financing # 4					
	Obs	Mean	25th	Median	75th	Std dev
Had unconnected ID	1,478	0.515	0.000	1.000	1.000	0.500
% IDs unconnected	957	0.702	0.500	1.000	1.000	0.402
% IDs VC-connected	957	0.287	0.000	0.000	0.500	0.397
% IDs Entrep.-connected	957	0.011	0.000	0.000	0.000	0.088
Change to VC control w/ conn.	957	0.127	0.000	0.000	0.000	0.334
Change to entrep. control w/ conn.	957	0.010	0.000	0.000	0.000	0.102

Table IA.X: Control over the life cycle and bargaining power predictions (with connections)

Panel A of this table is the analog of Table IV, but using the data on director connections to redefine board control. Panels B repeats the analysis of Table 5 in the paper, but using the data on director connections to redefine board control. Panel C is the analog of Table VI Panel A, but uses the data on director connections to redefine board control. “Controls” in Panels B and C is the log of capital raised in the financing round. Robust standard errors reported in parentheses, clustered as in analogous tables. We use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively.

	Panel A: Control over life cycle	
	E control	VC control
	(1)	(2)
Round # 2	-0.20*** (0.0082)	0.19*** (0.0082)
Round # 3	-0.33*** (0.0087)	0.36*** (0.010)
Round # 4	-0.39*** (0.0096)	0.48*** (0.013)
Round # 5+	-0.44*** (0.0088)	0.56*** (0.013)
Log capital raised	-0.074*** (0.0026)	0.086*** (0.0027)
Observations	17891	17891
R^2	0.20	0.23
Industry \times Year FE	Y	Y
Location FE	Y	Y
	Panel B: AWS Shock	
	E control	VC control
	(1)	(2)
Treated X Post-2005	0.073** (0.029)	-0.065*** (0.019)
Treated	-0.027 (0.035)	-0.0048 (0.024)
Observations	3429	3429
R^2	0.066	0.11
	Panel C: Equity proxy	
	E control	VC control
	(1)	(2)
Low VC b.p. (equity)	0.076*** (0.015)	-0.052*** (0.011)
High VC b.p. (equity)	-0.13*** (0.012)	0.11*** (0.011)
Observations	7543	7543
R^2	0.12	0.13
	Panels B and C controls	
Year FE	N	N
Industry FE	Y	Y
Location FE	Y	Y
Controls	Y	Y