The Impact of Venture Capital Holding on the Firms' Life-cycle: Evidence from IPO Firms*

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Abstract

Venture capital funds often remain shareholders of their investee companies, with representation on the board of directors, even after they have gone public. This paper examines the impact of venture capital ownership beyond the IPO listing on important consequential, corporate decisions in a firm's lifetime, including time to dividend initiation. Using a sample of 1,409 US firms listed between 2000 and 2017, we find that venture capital funds delay the time to initiate dividends by approximately two years. The presence of venture capital shareholders further delays the use of external growth strategies (through acquisitions) and postpones the introduction to the corporate bond market, but does not influence the timing of seasoned equity offerings. Several robustness checks are performed, including controlling for possible reverse causality through the Entropy Balancing method. These results are consistent with the view that venture capital funds extend the growth phase of the firms' life-cycle prior to becoming a mature firm. We show that the presence of VC funds in the IPO firm, at the time of these decisions, leads to positive stock price reactions when the decisions are made, suggesting they signal a certification effect for continued growth opportunities.

Keywords: venture capital; corporate ownership; IPO; corporate governance

JEL classifications: D25; G32

1. Introduction

Venture capital (VC) funds invest in high-growth startups and generate returns on their investments through a positive exit in the form of either a trade sale or an initial public offering (IPO) (Cumming, 2008; Megginson and Weiss, 1991). Often however, they remain as shareholders and even members of the board of directors in these newly listed firms for many years (Krishnan, Ivanov, Masulis, and Singh, 2011; Paeglis and Veeren, 2013). Little is known about the VC's impact on important corporate decisions after the firm has gone public. Some firms continue raising VC despite having gone public (Iliev and Lowry, 2020). In this paper, we study how the continued presence of VC funds, after the IPO, impacts important corporate decisions that characterize a firm's corporate life-cycle, namely dividend initiation (DI), the first bond and seasoned equity issuances, and the first decision to acquire another company after the public listing.

While going public is certainly in itself an important consequential event in a firm's lifetime (Celikyurt, Sevilir, and Shivfasani, 2010), other events are also important milestones once the company is listed on a stock market. One is the decision to start paying dividends (Asquith and Mullins, 1983). Announcements of DI increase the trading volume of the firm's stock (Richardson, Sefcik, and Thompson, 1986) and leads to important changes in stock prices (Kale et al., 2012), which contain important information on the firm's future prospects. This attracts new investor types (Kale, Kini, and Payne, 2012). The decision on DI is especially crucial for high-growth firms, since these typically require significant investments and thus prefer reinvesting excess cash over paying out dividends to shareholders. For these firms, DI likely signals a possible shift from a firm with significant growth opportunities to one that has entered a more mature stage of development (consistent with the financial life-cycle explanation of dividend policy; DeAngelo, DeAngelo, and Stulz, 2006; Owen and Yawson, 2010; see also Miller and Friesen, 1984, for a conceptual discussion on the corporate life-cycle of firms).[1] In

[1] In line with prior literature on payout policy, we focus exclusively on DI. For instance, Brav, Graham, Harvey, and Michaely (2005) offer empirical evidence that DI is more important for a firm than share repurchase (the alternative

this case, DI means the firm lacks further investment opportunities and thus its future growth should go down to a more moderate level; empirically, this translates into negative abnormal returns at time of announcement if it comes as a surprise, and at best no stock market reaction if anticipated by the market. We postulate that the presence of VC funds as shareholders in the firm will mitigate the possibly negative announcement effect, as their presence indicates persistence in investment opportunities. Another reason for expecting a positive stock market reaction in response to DI in the presence of VC funds is that they impose restrictions on managers and increase external monitoring of corporate agency problems (DeAngelo and DeAngelo, 2006). While DI also restricts managerial discretion in the use of corporate earnings to pursue their private interests and precludes them from investing free cash flow in suboptimal projects, the monitoring done by VC funds offers an additional mechanism to control management. Celikyurt, Sevilir, and Shivfasani (2014) show that this argument of monitoring even applies for mature firms that have done public many years ago and in which VC funds continue to be present on the board directors as active investors.

We further postulate that the VC funds' presence is associated with a delay of DI. Indeed, the presence of VC funds as shareholders may reflect the fact that these firms are still in industries that have not yet matured enough and continue to invest in innovation and growth. Similarly, the reliance on corporate bonds indicates the company is ready to commit to significant interest payments in the future and thus has shifted to the next phase of its life-cycle. In contrast, we expect firms with still significant VC backing to rely more on equity and thus accelerate its first seasoned equity issuance while postponing the issuance of corporate bonds. Finally, we explore the timing of a first acquisition after the IPO, as a sign of shifting from an internal growth to an external growth strategy of the firm. In the presence of VC funds, we expect a longer use of internal growth strategy and thus a postponement of the first acquisition after the listing. Taken together, these effects on different corporate decisions constitute outcomes of an extended life-cycle explanation of firms.

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way of paying out cash to shareholders), since DI represents a crucial milestone in the development of a firm due to its "inflexibility" to regularly change the policy. Share repurchases are considered instead as short-term measure.

In order to investigate these issues, we hand-collect relevant information on a large sample of 1,409 IPOs that took in the United States from 2000 to 2017. For each IPO, we collect information until end of 2018 on whether the firm received VC, when the VC funds have exited the firm, the presence of other institutional investors, and various stock price and accounting data post-IPO. We collect ownership information for each year after IPO until end of 2018. We retrieve the date of DI, first corporate bond and seasoned equity issuance, and the date of their first, important corporate acquisition. Out of the 1,409 IPOs in the sample, 43% of VC-backed IPO firms but 73% of non-VC-backed IPO firms did a DI within the first 10 years after the IPO, while the rest paid dividends much later or never. The difference between VC-backed and non-VC-backed IPO firms is consistent with our prediction on DI. About 22% of the firms have had a first major M&A and 39% their first bond issuance, with little differences between the two subsamples. For first seasoned equity, we obtain a value of 50% for VC-backed and 71% for non-VC-backed samples.

For our main analyses, we use survival models, which have been often used in corporate finance to study related issues (e.g., Kale, Kini, and Payne, 2012, for dividend initiation). We then identify the relationship between VC ownership (in percentage of shares owned and number of VC firms as shareholders) and the time until a specific corporate decision is made, such as dividend initiation. We find that VC presence in IPO firms delays DI, consistent with the financial life-cycle explanation of dividend policy (DeAngelo, DeAngelo, and Stulz, 2006). While prior research has shown that the initiation of dividend payments is driven by the earned/contributed capital mix (the proxy for firm's life-cycle stage), we show that VC presence matters as an important player in this shift of strategy. Moreover, we find that DI no longer constitutes a negative signal (as measured by abnormal stock market reaction) as long as a VC fund is participating. In this case, the effect is significantly positive, suggesting that the company is still in its growth phase and VC presence offers an important sign of continued commitment to growth and innovation. As to the other important consequential, corporate decisions in a company's lifetime, we show that the presence of VC firms delays the use of external growth strategies (through acquisitions) and postpones the introduction to the corporate bond market.

We however find no significant difference for the timing of seasoned equity offerings as source of follow-up funding. These results can all be interpreted using the lens of the firm's financial life-cycle explanation, except for seasoned equity where we also expected a significant difference.

Several robustness checks are performed on these results, including controlling for possible reverse causality using the Entropy Balancing method (Chapman, Miller, and White, 2019). We find that VC characteristics are not different between the IPO year and a year prior to the corporate event, which leads us to the conclusion that VC characteristics do not affect our results. All our regression specifications throughout the entire analysis include various control variables that enable us to take into account major differences between VC-backed and non-VC-backed IPO firms. These controls are important since VC-backed IPO firms may be different, notably because they tend to be younger at time of the public listing. Controlling for various differences in firm characteristics therefore helps ruling out the possible alternative hypothesis that the documented differences in timing in VC-backed firms are due to the simple fact that they are younger or still investing more in R&D at time of their IPO. As additional test, we show that the main results regarding the higher participation of VC on corporate decisions also holds within the subsample of VC-backed IPO firms only. This suggests that our results cannot be explained by this alternative hypothesis.

We offer the following contributions to the academic literature. First, we contribute to the literature on the firm's financial life-cycle explanation by extending it to important corporate decisions other than dividend payout (DeAngelo, DeAngelo, and Stulz, 2006) and acquisition (Owen and Yawson, 2010). Crucially, we extend the discussion by introducing the impact of VC presence on all of these corporate decisions, including DI and first M&A. Second, we add to the academic debate on dividend policy (Short and Keasey 2002; Allen and Michael, 2004; Grinstein and Michaely 2005; Kale, Kini, and Payne, 2012; Grennan, 2019), the underlying signaling effects (Venkatesh, 1989; John and Williams, 1985; and Allen, Bernardo, and Welch, 2000), and the timing of DI (Bulan, Subramanian, and Tanlu, 2007; Kale et al., 2012). Grennan (2019) examines the dividend decision for mature companies and finds that the decision to initiate

dividend is a direct response to a peer influence within the same industry. Prior research has also shown that the presence of institutional investors affect the timing of DI (Kane, Kini, and Payne, 2012), without however studying the presence of VC funds.[2] Kane et al. (2012) find that the presence of institutional investors leads to earlier DI, arguing that they have enhanced ability to identify the IPO firms going public who are able to pay out dividends more quickly (Allen, Bernardo, and Welch, 2000). Extending the analysis is important given the role played by VC funds in high-growth firms, especially given that the mechanism likely to explain VC presence is different from that of institutional investors. Typically, institutional investors buy stakes of the IPO firms and hold as part of their long-term investment strategy, while VC funds holding beyond the IPO is driven by their incentives to time their exit. Hence, these opposing strategies have different information effects. Third, we contribute to the understanding of how VC funds help companies to grow. It is well documented in the literature that VC-backed IPO firms outperform non-VC-backed ones (Brav and Gompers, 1997), but the underlying mechanism remains understudied. VCs are also known to enhance the value of their IPOs and provide certification on their qualities at time of the IPO (Megginson and Weiss, 1991). We document that the capacity of VC funds to deal with information asymmetry problem extends beyond the initial stage and the IPO certification, to the post-IPO life of the firm. Fourth, we contribute to the literature on VC exits, which is mostly focusing on the choice of different exit routes (Cumming, 2008) – assuming VC funds exit immediately after the IPO is conducted – and whether VC-backed IPOs are any different from non-VC-backed IPOs. However, we are not aware of any study that explores the impact of VC presence on important corporate decisions post-IPO and on DI in particular. One that is closest to this study is the work by Iliev and Lowry (2020) that studied the VC financing of publicly listed firms, evidencing that some newly listed firms continue to raise VC after the IPO. Their findings are consistent with the view that VC funds continue to finance these firms due to remaining information asymmetry problems that generally plague VC-backed firms while being private. Paeglis and Veeren (2013) document the

[2] Kale et al. (2012) use the CDA/Spectrum database (now called Thomson-Reuters Mutual Fund Holdings database) to assess institutional holdings. It does not include VC participation. VC funds are generally not considered in databases as being institutional investors. This is also true for our database, so we hand-collected this information.

fact that VC funds often stay well beyond the IPO, and that the decision to exit has negative consequences for stock prices. However, both of these studies are silent about how VC funds affect the important corporate decisions studied here.

The rest of the paper is organized as follows. Section 2 describes the dataset, sample selection and methodology. Section 3 describes the sample and presents the results and different robustness checks. Section 6 concludes.

2. Data and Methodology

Our initial sample consists of all IPOs listed between January 2000 and December 2017 collected from the Thomson Financials Securities Data Companies (SDC) Platinum New Issues database and cross-checked with Ritter's database. Consistent with the IPO literature, we exclude closed-end funds, right offerings, and unit offerings (Hasan et al., 2011). Following Loughran and McDonald (2013), we also exclude IPO companies with offering price less than $5.00. Firm-level IPO characteristics are collected from the Compustat database, information on whether the IPO is VC-backed or not is collected from SDC Platinum. VC holdings at the time of IPO and post-IPO are collected manually from Thomson Reuters Eikon database. This involves searching the IPO firm manually on the Thomson Reuters Eikon database and cross-checking the name and CUSIP with SDC Platinum. Next, we use the ownership section of the database and select the shareholders history report for the IPO firm. The report provides detail information on investor name, type, and the number of shares they held on quarterly basis in each year. We collect the holding for each VC firm in the last quarter of each year and then aggregate the holding for all VC firms for a specific IPO firm in each year up to the end of 2018. For institutional investors, we collect the aggregate holding from Thomson Reuters Institutional (13f) Holdings. Underwriters' reputation data is from Loughran and Ritter (2004) (collected from Jay Ritter's website), while data on the dividend premium is collected from Baker and Wurgler (2004). The data on dividend premium is available on a monthly basis from Wurgler's website. To be

included in the final IPO sample, we require both accounting data and market data to be available for the listed firms. We use COMPUSTAT to collect accounting information and CRSP for market data. If the accounting value is missing for both the IPO year and pre-IPO year, we attempt to search manually using various sources including the IPO prospectus. After imposing these restrictions, we are left with the final sample of 1,409 IPOs. To eliminate the impact of outliers, we winsorize all firm-level variables at 1% level.

We track each IPO firm in our sample until December 2018 to determine whether and when it initiated a dividend payment from Compustat. We define time to dividend initiation as the time elapsed between the IPO date and the date in which an IPO firm announces its first dividend payment. IPO firms that have not initiated dividend payments by the end of December 2018 are classified as right-censored observations and therefore retained in the analysis to avoid creating a bias for the latest firms. In our sample of 1,409 IPOs, 861 of them are classified as right-censored, while the remaining 548 IPO firms have initiated dividend payments during our sample period. Similar to the time to dividend initiation, we track the IPO firms from the IPO date to the first date of being an acquirer, issuing corporate bonds, and seasoned equity offerings. We measure the time to first M&A (first corporate bond issuance, first seasoned equity offering) after IPO as the time elapsed between the IPO date and the date of first M&A announcement (first corporate bond issuance, first seasoned equity offering) from the SDC database. In our sample of 1,409 IPO firms, 223 have had an M&A (375 IPO firms have started issuing corporate bonds and 567 have had seasoned equity offerings) during our sample period. All our variables are defined in Appendix Table 1.

We estimate the time to dividend initiation using a survival model known as the Accelerated Failure Time (AFT) model. The model has been used in several previous studies (e.g., Kale, Kini, and Payne, 2012). The AFT model allows the impact of the independent variables on time to dividend initiation to vary over the post-IPO period depending on the length of time since listing. We use the same method to model the time to first acquisition, time to first corporate bond issuance, and time to first seasoned equity offering. Some studies use the AFT model with cross-sectional data, where all IPO characteristics are measured at the time of listing. This

approach does not serve the purpose of understanding fully the dynamics of VC influence on major corporate decisions. To capture fully the impact of VCs on such significant decisions, we use a panel data setting, where both VCs and IPO characteristics are collected up to the event of interest (i.e. dividend initiation, first M&A, first bond issuance, or first seasoned equity offering) and observations are added for each year until the event occurred.

The AFT model is expressed in terms of a log-linear function with respect to time:

$$\mathrm{Ln}(T_{jt}) = \beta_0 + \beta_1 X_{1t} + \ldots \beta_p X_{pt} + \varepsilon_{jt}$$

In the AFT model, $\exp(\beta_i X_{it})$ is an "acceleration factor". The effect of a covariate is to extend or shrink the length of time to dividend initiation by a constant relative amount $\exp(\beta_i X_{it})$. If $\exp(\beta_i X_{it}) > 1$ time to the event is increased (thus, a postponement), and if $\exp(\beta_i X_i) < 1$ it is decreased (Bradburn et al., 2003). It is necessary to specify the distribution of the baseline survival function when using the AFT. Hence, we use AIC criteria to choose the appropriate distribution for our data. Based on the test, we choose the Log-normal distribution for the analysis of our data.

As a robustness check and for comparison purposes with other studies, we also estimate the Cox Proportional Hazard model applied by Kale et al (2012). The Cox model makes no assumption about the failure distribution. The dependent variable in the Cox model measures the "risk" of initiating dividend (hazard rate) as opposed to time to dividend initiation in the AFT model. In the Cox model, the marginal effect of an independent variable is measured by the so-called hazard ratio. A positive coefficient implies a hazard ratio (calculated as the exponentiated coefficient from the Cox model; see e.g., Kleinbaum, 1996) of greater than one, suggesting that an increase of the covariate increases the hazard rate (risk of initiating dividend) and decreases the time to dividend initiation. Similarly, a negative coefficient implies a hazard ratio of less than one, increases the time to dividend initiation when the covariates increase by a unit.

The corresponding measure of the marginal effect in the AFT model is the so-called time ratio. The time ratio is calculated as the exponential of the AFT coefficient (see, e.g., Bradburn et al., 2003, p. 434). A positive AFT coefficient implies a time ratio of greater than one, which indicates that an increase in the covariate increases the time to dividend initiation. As a consequence, we expect that a given independent variable with a positive sign and a time ratio above one in the AFT model will have a negative coefficient and a hazard ratio of less than one in the Cox model due to the structural differences between the Cox and AFT models.

3. Results

The following section provides discussions on univariate and multivariate analyses. We start with univariate analysis followed by multivariate analysis.

3.1 Univariate analysis

We start with the proportion of VC holdings in VC-backed IPO firms (i.e., we exclude here non-VC-backed firms, and drop firms in follow-up years when VCs have left) up to 10 years after the listing. Table 1 shows the mean and median values of VC holdings and VC numbers from the IPO year (i.e., Year 0) to year 10 post IPO. The mean VC holding at the time of listing is 29.7% and median of 27%. VCs sell about a third of their holdings within the first year of listing (which corresponds to a reduction from 29.7% to 19.3% of total shares) and further 5% of total shares are sold by VC funds during the second year.[3] However, from year 3 onwards they sell approximately 1% total shares on average every year. After three years, VC funds continue to hold, on average, 10.6% of ownership in their firms. The fact that VCs sell substantially less of their holding 3 years post listing is consistent with the study by Krishnan et al. (2011), who finds similar patterns in the context of lead VCs. The interesting observation is the fact that VCs do

[3] Part of the drop in the first year can be explained by the expiration of the lockup period for major shareholders (Brav and Gompers, 2003), which typically lasts up to 180 days (6 months). During the lockup period, they are not allowed to sell. However, as it will become evident from our summary statistics (Appendix Table 2), this lockup period has no impact on our analysis, since the corporate decisions we examine take place on average 6-9 years after the IPO for VC-backed firms, so well after the expiry of the lockup period. We manually checked whether some firms did take any of their corporate decisions within the first year after the IPO, and there was none.

not fully liquidate their holdings in IPO firms quickly after the public listing, but rather stay involved for many years. On average the number of VCs involved with the IPO firms at the time of listing is 2.97 and median of 3 VCs. The table shows a small marginal change in the mean and median values of the number of VCs between year 1 and year 4. More generally, the average number of VCs that stay involved decreases slowly. This is further highlighted by the number of observations used for the calculation, which is significant for the first three years only (from 777 in year 0 to 332 in year 4). For instance, it shows that VCs continue to be involved in 172 IPO firms (out of 777 that were VC-backed at time of IPO) five years after the listing. Hence, it is likely that the length of VCs presence could have a significant impact on important corporate decisions. A second reason for why the number of observations decrease over the years is because the more recent IPOs are excluded in later years; e.g., an IPO from 2015 would drop after year 4 in the table, since we do not have any information on what this IPO firm will do in the future.

Please insert (Table 1 here)

Table 2 shows the percentage of VC and non-VC-backed IPO firms that have initiated dividends, conducted a first acquisition, issued first corporate bonds and seasoned equity after the listing. Values reported are cumulated up to the reported year. The cumulative proportions of VC-backed IPOs are lower than non-VC-backed IPOs from year 1 to year 10 for dividend initiation and first seasoned equity offering. For the two others, there is almost no difference. Over the first 10 years of listing, the cumulative percentage of VC-backed IPOs initiating dividends is 30 percentage points lower than for their non-VC-backed counterpart. Over the same period, the proportion for the first M&A activity is around 21% for joint sample and 39% for the joint sample for the first bond issuance. For the first seasoned equity offerings, the percentages 49.5% for VC-backed and 71.2% for non-VC-backed IPOs at the end of the first 10 years of listing. It is therefore the opposite of what we predicted for equity; in the multivariate analysis, this difference is no longer significant. For the first M&A and first bond issuance, we also predicted a significant difference. The univariate analysis therefore only offers partially support for the firm's life-cycle hypothesis.

Please insert (Table 2 here)

Next, we examine the characteristics of the IPO firms in different cross-sectional settings. Table 3, Panel A reports the mean and median values of the firm and IPO characteristics for different years and sub-samples. First, we report values at time of the IPO (Year 0), one year after the IPO (Year 1), the year of DI, the year of first M&A, year of first corporate bond and equity issuances. Comparing the sample sizes, one can see that 39% (548 out of 1,409) of IPO firms in our full sample had a DI, 16% (223 out of 1,409) did a first M&A, 27% (375 out of 1,409) already issued corporate bonds, and 40% (567 out of 1,409) did a seasoned equity offering during our sample period.

The table shows that the mean (median) VC holding is 13.9% (0%), while the mean (median) number of VCs involved in IPO firms is 1.38 (0). These values are lower than in Table 1, where they are calculated for the full sample of VC-backed and non-VC-backed firms. During the year of listing, the mean age of the IPO firm is 12.78 years and median of 11.92 (values not explicitly reported in Table 3, where we report statistics for *ln(Firm age)*). The mean age of the IPO firms is consistent with Krishnan et al. (2011). On average the ratio of R&D expenditure to total asset is 14.6%, with a median of 10.8%, which is somewhat higher than that reported by Kale et al (2012). The operating margin is negative 2.1% for the IPO firms, while the median is positive 6.3%.[4] The negative mean and positive median suggests that the operating profit for the IPO firms is skewed to the left. The dividend premium measures the premium placed by investors to dividend paying stocks in the market. It is calculated as the difference between the logarithms of the market to book ratios in each year for all dividend and non-dividend paying firms in the market. The mean and median dividend premium is -7.059% and -8.530% respectively. This indicates a stock price premium for non-dividend paying firms during our sample period. A negative dividend premium for dividend initiating firms has also been documented in previous

[4] Our variable of operating margin, called operating income (scaled by total asset in the analysis) and used by Kale et al. (2012), is quite similar to earned/contributed capital mix used in DeAngelo, DeAngelo, and Stulz (2006). They proxy the mix by the ratio of retained earnings over total assets (or retained earnings over total equity) and is meant to capture a firm's operating lifecycle. Their variable and ours is highly correlated, so we only include one in our multivariate analyses.

studies (see Kale et al., 2012). Only 30% of the IPOs in our sample are listed at the New York stock exchange, while 11.9% of the IPOs are listed during the financial crisis. The average ranking of underwriters at the time of listing is 7 and the median is 8, consistent with Krishnan et al. (2011**)**. The mean institutional holding during the IPO year is 43.1%; a year prior to DI it is 48%, which is somewhat higher than value of 36% reported in Kale et al. (2012).

The characteristics of the IPO firms remained qualitatively similar one year after the IPO except for the VC holding, where the proportion of VC holding decreases by 55.3% (from 13.9% to 7.7%). During the year of dividend initiation, the IPO firms are older and more profitable (as shown by positive operating margins). VC funds tend to hold 4.2% on average when the IPO firm initiates dividend payments. There are no substantial differences in the IPO firm characteristics between the year of dividend initiations, the first year of acquisition, the first year of issuing corporate bond or equity to the public, even for *VC holding*. Indeed, the VCs maintain holding of 4% on average when the IPO firm initiates its first dividend payment, first M&A, and issues its first corporate bonds. The only exception is for seasoned equity offerings, where the mean VC holding is 7.3%. This difference for seasoned equity offering is consistent with the observation in Table 2 that they occur much earlier than any other corporate decision.

Panel B of Table 3 shows the market reactions around the announcement, for the same samples. The market reacts positively between 1 and 2% around DI, first M&A and first corporate bond issuance over the (-1, +1) and (-2, +2) windows. For the first seasoned equity issuance, the market however seems to reacts negatively on both (-1, +1) and (-2, +2) windows by 1.5 and 1.2% respectively.

Finally, we examine differences in mean announcement returns between VC and non-VC backed IPOs for the various events. Panel C shows that announcement returns are positive for the VCs and significantly higher than for non-VC backed IPOs over three and five day windows, except for the equity issue. These positive effects are consistent for DI, first M&A and first corporate bond issuance. Nonetheless, for the equity issue, the announcement returns are negative for all IPOs, but the negative impact is smaller for VCs than for non-VC backed IPOs. These different

findings are consistent with our prediction that the presence of VC firms during these important corporate events adds credibility to the company's decisions and timing.[5]

Please insert (Table 3 here)

3.2 Multivariate analysis

In this section, we examine in a multivariate setting the impact of VC holdings and the number of VCs involved with the IPO firm on the time to the different corporate events, starting with dividend initiation.

Time to dividend initiation

Table 4 reports the results of time to dividend initiation using the AFT model. We add in the specifications various market and firm characteristics to control for any possible differences between VC-backed and non-VC-backed IPO firms. In particular, to deal with the alternative hypothesis that differences in timing may be due to the fact that VC-backed firms are just younger and possibly still in a less mature stage, we control for firm age, market-to-book ratio, R&A/TA, and operating income, among other things. We further include interactions between industry and year dummies in all the specifications, to capture the effect of possible technological waves for the VC-backed industries that would affect industry dummies differently across the years. Industry dummies are based on the Fama-French 12 industry classification. Model 1 shows the baseline regression using only VC holding, while Model 2 shows the impact of VC holding controlling for only IPO characteristics and Model 3 controls for IPO and market characteristics. A positive coefficient suggests that the covariates accelerate the time, while a negative coefficient indicates that the independent variables shorten the time to dividend initiation. Model 1 shows that VC holding has positive impact on the time to dividend initiations, leading to a longer time to dividend initiation. The positive effect of VC holding persists in

[5] Appendix Table 2 shows the descriptive statistics for the full sample (panel data) and the sub-sample of VC-backed and non-VC-backed IPO firms at the time of listing. Moreover, Appendix Table 3 provides a list of the 10 most active VC firms in our sample, by number of post-IPO involvements.

Models 2 and 3 even controlling for IPO firm and market characteristics. According to Model 3, a one-STD increase in *VC holding* delays the average time to dividend initiation by 1.06 years.[6] In addition to the VC holding, firm and market characteristics influence the time to initiate dividends. For instance, high leverage postpones the time, while firm age shortens the time to dividend initiations. A highly levered firm had strong commitment to pay out cash to lenders, which limits its possibility to pay out dividends. The result on firm age is consistent with the fact that more mature firms have more stable cash flows and fewer investment opportunities, leading to greater capacity to pay out dividends. The time to initiate dividend is also influenced by other factors such as institutional holding in the IPO firm, general market conditions (as measured by the market volume), and whether the IPO is underwritten by reputable underwriters.

In Models 4-6, we use the number of VCs instead of their holding. Similarly, the number of VCs involved with the IPO firms tends to postpone the time to dividend initiations. Stated differently, the higher the number of VCs prior to dividend initiation the longer it takes for the firm to initiate dividend. For instance, in Model 6, the coefficient of *VC number* is 0.031. This indicates that an increase in the number of VCs by one unit delays the average time to dividend initiation by 0.0314 years (i.e. approximately 3 months). The magnitude of the coefficient is relatively small compared to a one-STD increase in VC holding, suggesting that total holding of VCs is a dominant effect on the time to dividend initiation as compared to the number of the VCs. Overall, the results from Table 4 show that the number of VCs involved with the IPO firms and their holding influence the decision to initiate dividends. In other word, the time to dividend initiation is longer the higher the number of the VCs or their holding prior to dividend initiations.

Please insert (Table 4 here)

Time to first M&A, corporate bonds, and equity issuance

[6] i.e., exp(0.262*0.208), where 0.262 is the coefficient for the VC holding from the AFT model and 0.208 is the STD of VC holding calculated from the panel-data sample reported in Appendix Table 2.

So far the results of Table 4 show that VC holding and VC number delay the time to dividend initiation. The decision to acquire, issuing bonds or seasoned equity are also important corporate decisions in firms' life-cycle. We next aim to shed light on the influence of VC holding or number of VCs involved with the IPO firms to these important corporate decisions. In Table 5, we first examine how VC holding and VC number have an effect on time to first M&A (Models 1 and 2), time to issue corporate bonds (Models 3 and 4), and time to issue first seasoned equity (Models 5 and 6).

The results of Table 5, Model 1 show that one-STD increase in *VC holding* delays the average time to become an acquirer by 1.05 years, controlling for firm and market characteristics. Similarly, a unit increase in the number of VCs involved with the IPO firm lengthens the average time to acquire by 0.075 years equivalent to 9 months. For the decisions to issue first corporate bonds, both VC holding and VC number appear to postpone the decision. For instance, a one-STD increase in *VC holding* delays the time to issue the first bond by 1.04 years compared to approximately 3 months delay for a unit increase in the number of VCs involved with the firm. For seasoned equity offerings, we find no significant impact for any of the two measures. Taken together, the results of Table 5 show that VCs appear to delay the time to acquire, issue corporate bond, but have no impact on seasoned equity offering. VC involvements therefore have a significant impact on key corporate decisions post-listing. They appear to extend the growth phase of the firm's life-cycle. The fact that we do not find significant results for seasoned equity could be because of larger issuances made by VC-backed IPO firms. In this paper, we focus on the timing to conduct seasoned equity offering, while the issue of the amount raised is beyond the scope of this paper. However, it could explain the lack of differences observed here. .

Please insert (Table 5 here)

Robustness checks: Alternative estimation models

In line with previous work on timing of DI (Kale et al., 2012), we also use alternative models to investigate the impact of VC holding or the number of VCs involved with IPO firms on the

probability of dividend initiations. Table 6 reports the results of the Probit model and Cox proportional hazard models. In the Probit model, the dependent variable is equal to one if the IPO firm initiated dividend in a given year and zero otherwise. The control variables are similar to the AFT model. Model 1 shows the results for the VC holding, while Model 2 shows the results for the number of VCs backing the IPOs. We report the marginal effect instead of raw coefficients to facilitate the interpretations. Leverage and market volume have negative impact, while the age of the IPO firm and institutional holding have positive effect on the probability of dividend initiations. Model 2 shows that a one-unit increase in the number of VCs involved with the IPO firm decreases the probability of dividend initiation by 8.1%, controlling for both firm and market characteristics. Overall, we obtain qualitatively similar results for DI as for the AFT model.

Next, we use the Cox (1972) Proportional Hazard model, which was also used in Kale et al. (2012). The Cox (1972) model is a non-parametric model that does not require distributional assumption of time to dividend initiation. The dependent variable in the Cox (1972) model measures the time of not initiated dividend, by contrast, the dependent variable in the AFT model is the natural logarithm of time to dividend initiation. In the Cox (1972) model, the marginal effect of an independent variable is measured by the hazard ratio (calculated as the exponential coefficient from the Cox (1972) model). A positive (negative) coefficient implies a hazard ratio of greater (less) than one and indicates that an increase in the covariate reduces (increase) the time to dividend initiation. In comparing the results of the AFT and Cox (1972) models, we expect that a given independent variable with a positive sign and a time ratio above one in the AFT model will have a negative coefficient and a hazard ratio of less than one in the Cox (1972) model (due to the structural differences between the two models). Models 3 and 4 of Table 6 report the results of Cox Proportional Hazard model. The main variables of interest are again *VC holding* and *VC number*. The impact of both variables on dividend initiation remains significant and robust. A one-unit increase in the number of VCs backing the IPO firm decreases the hazard by 6.2% from the average time. Thus, our results show that VC holding and the number of VCs involved with the IPOs decreases the probability of dividend initiations controlling for IPO

characteristics and market conditions. The results of the Cox model are robust and consistent with the results reported in Table 4.

Please insert (Table 6 here)

3.3 Stock market reactions

In Tables 4 and 5, we find that VCs play an important role in the key corporate decisions. They tend to affect the timing of these decisions significantly. Still, often these decisions are taken while VC funds remain involved. This is even true for dividend initiation. Hence, it remains an open question whether the market reacts more favorably under their presence at time of announcement if it signals that the IPO firm is still in its growth phase. In Tables 7 and 8, we examine the influence of *VC holding* and *VC number* on market reactions. To measure the market reactions, we use cumulative abnormal returns (CAR) over 3-days window (-1 to +1) and 5-days window (-2 to +2) around the announcements of each corporate event for the IPO firms. The CAR is calculated using market model with value weighted market index. Table 7 reports the results for the announcement of dividend initiation, while Table 8 reports the results for first M&A, corporate bond and seasoned equity issuances. The sample size varies along the different corporate decisions, since all IPO firms have not initiated most of these events.

Table 7 reports a positive CAR over the 3-days window. Model 1 shows that a one-STD increase in VC holding increases the CAR by 0.31%, while a one-unit increase in VC number (Model 2) increases the CAR by 1.10%. In Models 3 and 4, we use the 5-days window around the dividend announcement. The results are consistent and show that a one-STD increase in VC holding (one-unit increase in VC number) increases the announcement returns by 0.31% (1.20%). We control for IPO and market characteristics a year prior to the dividend initiation in all the models.

In Table 8, Models 1-4 show the impact of VC holding and VC number on CAR around the first M&A announcement. A one-STD increase in *VC holding* increases the CAR by 0.49% over a three-day window and 0.16% over a five-day window. By contrast, the CAR increases by 0.60% and 0.70% respectively for one-unit increase in the number of VCs. Model 5 through Model 8

show the market reactions to the first corporate bond issuance. A one-STD increase in *VC holding* enhances the announcement returns by 0.71% (Model 5) and 0.58% (Model 7) over three-day and five-day windows correspondingly. The impact of *VC number* (i.e., Models 6 and 8) on CAR is 0.70% (three-day window) and 0.50% (five-day window) for one-unit increase. For first seasoned equity issuance announcements, neither *VC holding* nor *VC number* influences significantly the announcement returns (i.e., Model 9 through Model 12).

Overall, the results of Tables 7 and 8 show that despite the fact that VCs affect the timing of major corporate life-cycle decisions; the market seems to favor such outcome and reacts positively at time of their announcements. Thus, while many of these decisions have been shown to induce a negative stock market reaction on average, the fact that VC funds are on board provides a positive signal. The results also suggest that the market recognizes the importance of VCs influence in delaying these decisions.

Please insert (Tables 7 and 8 here)

In Table 9, we test whether our result on the market reaction of DI still holds when controlling for the presence of other institutional investors. Previous studies have shown that their presence also affects market reaction, although for different reasons than certification (e.g., Kale et al., 2012). In order to be comprehensive in this robustness test, we hand-collect information on the type of investor in order to classify the proportion that is active versus passive, following the methodology proposed by Almazan, Hartzell, and Starks (2005).[7] Under their definition, active institutional investors are those who actively monitor through their voice rather than taking over the firm. Similar to Table 6, we measure the announcement returns over three-day and five-day windows. The results in Table 9 show that coefficients of *VC holding* remain positive with similar magnitude despite the inclusion of control for institution investors. An increase in institutional ownership at time of announcement also has a positive effect, consistent with Kale et al. (2012). The overall findings of Table 9 is that the market reacts positively to VC holdings

[7] Please see detailed definitions of active and passive in the Appendix Table 1.

around DI even in the presence of active and passive institutional holdings, which offer evidence that VC presence has a distinct effect from institutional investors.

Please insert (Table 9 here)

3.3 Endogeneity and further robustness checks

So far we have assumed that VC participation directly affects important corporate decisions such as dividend initiation, first M&A, corporate bond, and seasoned equity issuance. Presumably, VCs could have simply selected firms that are more prone to such changes, leading for reverse causality. To disentangle this possible endogeneity issue, we use the Entropy Balancing method following Chapman, Miller, and White (2019). Specifically, we test whether the impact of *VC holding* on these events is explained by observable differences in IPO firm characteristics. Typically, entropy balancing achieves balanced covariates between VC-backed (treatment) and non-VC-backed (control) IPO firms along several determinants.[8] Unlike Propensity Score Matching (PSM), the entropy balancing technique preserves our full sample and ensures the balance of our covariates between treatment and control observations by re-weighting observations such that the post-weighting mean and variance for treatment and control groups are identical based on the different firm characteristics. The entropy method works by first determining the distributional properties (i.e., mean and variance) of the treatment observations. These distributional properties become the target distributional properties of the post-weighting control sample (the balance conditions). The algorithm proceeds by first assigning possible weights to control observations and then testing whether the balancing conditions are satisfied (i.e., the distributional properties of treatment and post-weighted control observations are identical). This process is repeated over multiple iterations until a set of weights is found that satisfies the balance conditions. While the control observations are assigned a positive weight that may be greater or less than 1, the treatment observations are not re-weighted and retain their

[8] We choose the entropy balancing method over the propensity score matching approach, because the later reduces the sample size as compared to the former, due to imbalance of observations between treatment and control group.

default weighting of 1. In addition, entropy balancing has higher model efficiency and less first-stage model dependency than PSM (Hainmueller, 2012).

The multivariate results using the balanced sample are reported in Table 10 and are consistent with the results of our baseline analysis in Tables 4 (Model 3) and 5 (Models 1, 3, and 5) when controlling for endogeneity.[9] The results of Table 10 show that *VC holding* has a positive impact (thus, delays) on time to DI, first M&A, and first bond issuance, and no impact on the time to first seasoned equity offerings using the matched sample. These results suggest that VC holding exerts influence on important corporate decisions that are linked to a firm's life-cycle. Note that all firm characteristics have become non-significant in all the regressions (except some at 10% level) as a result of the good matching process.

Please insert (Table 10 here)

Finally, we propose three additional robustness checks that are summarized in Table 11 and Appendix Table 5 (Panels A-C). The first concern is related to the sample of IPO firms used in the analysis. For firms that had their IPO towards the end of the sample period, we have very few observations to observe the different corporate decisions. While the AFT models control for that by explicitly labeling them as right-censored, it may nevertheless affect the results. To rule this out, we rerun the analysis on the timing of corporate events for the subsample of IPO firms that went public until 2015and exclude those who had their IPO in 2016, 2017, or 2018. Table 11 reports the results for DI, using the same specification as in Table 4. Results for the other corporate events are reported in Appendix Table 5. We draw similar conclusions, with somewhat larger economic effects than for the full sample. Second, to further strengthen our confidence that our results are not driven by the possible alternative hypothesis that VC firms take their portfolio companies earlier to a public listing, we rerun the analysis on the subsample of only VC-backed IPO firms. If VC firms really influence corporate events, we expect our conclusions

[9] We use eleven variables for the entropy balancing matching processes. Appendix Table 4 reports the descriptive statistics of our matching variables for VC- and non-VC-backed IPO firms post-entropy balancing. These statistics confirm that our treatment and control samples are well balanced.

to also hold within the subsample of VC backed IPOs. This would also suggest that our results are not driven by this alternative hypothesis. Results are shown in Models 2 Table 11 and Appendix Table 5, which indicate that our results hold within the subsample of VC-backed IPO firms. And third, we rerun the analysis with an alternative measure of VC participation. Instead of using the percentage ownership or the number of VCs, we construct a dummy variable equal to 1 if there is VC participation, regardless of the extent, and 0 otherwise. We find similar results for all corporate events (see Models 3 in Table 11 and Panels A-C of Appendix Table 5).

Please insert (Table 11 here)

3.4 VC characteristics

Drawing from the analysis of the previous sections, it is evident that VC involvement plays a role in the life cycle of corporate decisions. Possibly, the influence of VC firms on IPOs might be driven by the VC characteristics at the time of such important corporate decisions. As a final test we examine whether the VC firms that stay until corporate events take place are different from those leaving soon after the IPO. As evidenced in Table 1 above, some VC firms leave within the first two years or so, while others stay longer post IPO. This could suggest that less experienced VC firms belong to the first group, while more experience ones stay much longer to continue helping the firm to develop. That may further explain why the market reacts positively to some of the corporate events in the presence of VC firms on the board of directors.

To shed light into this possibility, we hand collected more detailed information on VC characteristics of 50 randomly selected VC-backed IPO firms in our sample. Summary statistics are presented in Table 12. For each corporate event, it shows means of the number of VC firms involved, the average VC firm age, and the percentage of them holding a board seat. At time of IPO, this random sample shows that on average there were 2.3 VC firms involved, with average age of 16.4 years, and 31.7% holding a seat on the board of directors. Thus, the VC firms are on average well experienced and often actively involved with the companies (although not all, since typically one VC firms acts as lead investor). More importantly, the values are not significantly

different between the time of IPO and the time of any of the corporate events, with one exception only for the time of first bond issuance. Thus, while the number of VC firms involved with IPO companies declines over time after flotation, the characteristics of the VC firms that stay longer with the IPO firm remain stable on average. Therefore, this would suggest no particular difference in the characteristics of the group of VC firms leaving early and those leaving later.

Please insert (Table 12 here)

4. Conclusion

Whilst it is often assumed that VC firms use the IPO process as a means to exit, in practice VC firms often continue to stay as shareholder and on the board of directors of companies well after they have gone public. This paper shows that VC ownership beyond the IPO listing impacts important consequential, corporate decisions in a firm's lifetime. In particular, we find that VC firms delay the time to initiate dividends, the use of external growth strategies (through acquisitions), and the introduction to the corporate bond market. These different results are consistent with the firms' financial life-cycle explanation. Moreover, we show that the presence of VC firms at DI leads to a positive abnormal stock market reaction, suggesting that their presence can alleviate the negative market response of DI. Similar evidence is found for the decision on its first M&A and first bond issuance.

Our study contributes to the literature on the firm's financial life-cycle explanation by extending it to important corporate decisions other than dividend payout (DeAngelo, DeAngelo, and Stulz, 2006) and acquisition (Owen and Yawson, 2010). Grennan (2019) finds that the decision to initiate dividend is due to a peer influence within the same industry, while our study shows that the presence of VC funds influences dividend initiations and other corporate decisions. We contribute to the understanding of how VC funds help their portfolio companies to grow and show that their capacity to deal with information asymmetry problem extends beyond the initial stage and the IPO certification, to the post-IPO life of the firm. We also add to the literature of

VC exits through different routes (Cumming, 2008), by demonstrating that they remain with their portfolio companies after the IPO is conducted. In line with other recent studies (e.g., Iliev and Lowry, 2020), our findings are consistent with the view that VC funds continue associations with their portfolio companies post-IPO listing. In particular, our study compliments other studies by showing how VC funds involvements affect important corporate decisions associated with the firm's life-cycle.

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Table 1: Descriptive statistics for the VC holding

This table shows VC holding of VC-backed firms from the IPO year (year 0) to 10 years post-IPO. The values of *VC holding* and *VC number* are reported by mean and median for each year for the sample of firms that have at least one VC as shareholder, leading to a sample size reduction over time. The variables are defined in Appendix Table 1.

		VC holding		VC number	
Post-IPO year	Number of observations	Mean	Median	Mean	Median
0	777	0.297	0.270	2.967	3
1	489	0.193	0.150	2.794	2
2	416	0.139	0.092	2.493	2
3	332	0.106	0.059	2.181	2
4	246	0.094	0.050	2.027	2
5	172	0.082	0.020	1.828	1
6	111	0.075	0.019	1.731	1
7	83	0.075	0.021	1.587	1
8	73	0.059	0.016	1.424	1
9	59	0.062	0.020	1.346	1
10	47	0.050	0.011	1.487	1

Table 2: Descriptive statistics for timing of events

This table shows the percentage of the sample of VC-backed and non-VC-backed IPO firms that initiated the first time a specific event, *cumulated* up to Year 10 after the IPO. For instance, 25.327% of all VC-backed IPO firms have initiated dividend payouts within the first 5 years after their IPO. The sample considered for the calculations only include IPO firms for which we have the needed period of observations (e.g., for Year 10, we exclude all IPOs done after 2007, since we can only observe their decisions for the first 9 years). The variables are defined in Appendix Table 1.

	Dividend initiation		First M&A		First bond issuance		First seasoned equity issuance	
Post-IPO year	VC (%)	Non-VC (%)	VC (%)	Non-VC (%)	VC (%)	Non-VC (%)	VC (%)	Non-VC (%)
0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1	3.047	15.704	4.633	3.481	14.028	13.608	16.154	25.606
2	9.236	19.362	7.412	5.769	18.336	17.147	23.271	34.185
3	14.168	25.383	9.840	7.516	21.676	21.078	28.093	40.625
4	18.497	33.080	12.500	9.710	24.148	23.169	31.068	45.363
5	25.327	44.113	14.422	12.454	28.526	27.323	36.632	52.229
6	30.828	54.164	16.667	15.481	32.292	32.008	41.855	60.016
7	34.127	58.799	18.378	17.802	34.414	34.945	44.783	64.989
8	35.839	62.329	19.450	18.889	35.780	37.111	46.060	67.019
9	40.742	70.268	21.415	20.413	38.623	38.532	48.711	69.846
10	42.360	73.256	21.857	21.395	39.265	39.302	49.516	71.163

Table 3: Descriptive statistics for the full sample of IPO firms (cross-sectional data)

This table provides in Panel A descriptive statistics for all variables by mean and median. Panel B provides statistics of CAR for two different windows. Statistics are provided each time for different subsamples; i.e., Year 0 (IPO year), Year 1 (one year after IPO), Year of DI, Year of first M&A, Year of first bond issuance, and Year of first seasoned equity issuance. Panel C provides statistics for CAR by VC and non-VC backed for different windows. All the variables are defined in Appendix Table 1.

	Year 0			Year 1			Year of DI			Year of first M&A			Year of first bond issuance			Year of first seasoned equity issuance		
Panel A	N	Mean	Median	N	Mean	Median	N	Mean	Median	N	Mean	Median	N	Mean	Median	N	Mean	Median
VC holding	1409	0.139	0.000	1171	0.077	0.000	548	0.042	0.000	223	0.041	0.000	375	0.046	0.000	567	0.073	0.000
VC number	1409	1.380	0.000	1171	1.114	0.000	548	0.677	0.000	223	0.801	0.000	375	0.979	0.000	567	1.060	0.000
Firm size	1409	5.443	5.184	1171	5.475	5.319	548	5.914	5.902	223	5.778	5.812	375	5.693	5.616	567	5.819	5.684
Ln(Leverage)	1409	-1.150	-1.010	1171	-1.138	-0.988	548	-0.918	-0.737	223	-1.091	-1.000	375	-0.972	-0.784	567	-1.072	-0.897
Market-to-book ratio	1409	4.650	3.613	1171	3.985	2.826	548	3.985	2.933	223	4.477	2.749	375	3.663	2.987	567	3.442	3.634
Ln(Firm age)	1409	2.447	2.303	1171	2.456	2.303	548	2.723	2.708	223	2.526	2.485	375	2.552	2.485	567	2.620	2.485
R&D/TA	1409	0.146	0.108	1171	0.183	0.127	548	0.204	0.116	223	0.158	0.116	375	0.255	0.190	567	0.178	0.107
Operating income	1409	-0.021	0.063	1171	0.026	0.075	548	0.066	0.096	223	0.003	0.046	375	0.023	0.077	567	0.048	0.092
Dividend premium (%)	1409	-7.059	-8.530	1171	-4.763	-5.384	548	-7.296	-8.785	223	-5.348	-6.188	375	-5.965	-6.686	567	-6.212	-6.686
Turnover	1409	3.808	2.786	1171	4.007	2.786	548	3.815	2.786	223	4.920	2.786	375	3.570	2.786	567	3.687	2.786
NYSE listing	1409	0.305	0.000	1171	0.265	0.000	548	0.327	0.000	223	0.219	0.000	375	0.241	0.000	567	0.305	0.000
Crisis dummy	1409	0.119	0.000	1171	0.103	0.000	548	0.084	0.000	223	0.117	0.000	375	0.147	0.000	567	0.101	0.000
Underwriter reputation	1409	7.340	8.334	1171	7.435	8.251	548	7.420	8.501	223	7.407	8.101	375	7.281	8.001	567	7.435	8.355
Institutional holding	1409	0.431	0.360	1171	0.484	0.434	548	0.546	0.541	223	0.556	0.552	375	0.538	0.531	567	0.567	0.553

Table 3 continues

Panel B	Year of DI			Year of first M&A			Year of first bond issuance			Year of first seasoned equity issuance		
	N	Mean	Median	N	Mean	Median	N	Mean	Median	N	Mean	Median
CAR (-1,+1)	548	0.010	0.005	223	0.015	0.014	375	0.010	0.006	567	-0.015	-0.010
CAR (-2,+2)	548	0.021	0.002	223	0.016	0.021	375	0.017	0.008	567	-0.012	-0. 008

Panel C	Year of DI			Year of first M&A			Year of first bond issuance			Year of first seasoned equity issuance		
	VC	Non-VC		VC	Non-VC		VC	Non-VC		VC	Non-VC	
	Mean	Mean	T-test	Mean	Mean	T-test	Mean	Mean	T-test	Mean	Mean	T-test
CAR (-1,+1)	0.015	0.006	2.01**	0.022	0.009	1.98**	0.014	0.008	2.17**	-0.008	-0.023	-2.07**
CAR (-2,+2)	0.029	0.013	1.87*	0.023	0.007	2.01**	0.021	0.014	1.64	-0.009	-0.016	-1.87*
N	226	322		104	119		174	201		283	284	

Table 4: Determinants of time to dividend initiation

This table shows the estimation results of Accelerated Failure Time (AFT) models. The dependent variable is the logarithm of time to dividend initiations from the date of IPO listing (the variable *Time to dividend initiation*). Models 1 to 3 show the results for *VC holding* and Panel B for *VC number*. All the specifications below include all combinations of industry dummies interacted with year dummies. All variables are defined in Appendix Table 1. ***, **, * indicate 1%, 5%, and 10% significance levels.

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
VC holding	0.782***	0.367***	0.262***			
VC number				0.105***	0.034*	0.031**
Firm size		0.042**	0.053***		0.070**	0.570***
Ln(Leverage)		0.670***	0.505***		0.697***	0.526***
Market-to-book ratio		0.035	0.0640**		0.033	0.0635**
Ln(Firm age)		-0.217***	-0.234***		-0.219***	-0.238***
R&D/TA		0.016	-0.018		0.015	-0.019
Operating income		0.029	0.017		0.022	0.011
Dividend premium		0.001	0.002		0.001	0.002
Turnover			0.091**			0.0877*
NYSE listing			-0.036			-0.045
Institutional holding			0.191***			0.116***
Underwriter reputation			0.0291***			0.0272***
Industry x Year dummies incl.?	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	8,007	8,007	8,007	8,007	8,007	8,007
Log likelihood	-5515.7	-5461.8	-5376.7	-5449.8	-5394.3	-5309
Chi-squared	855.3	1429.3	1041.7	812.9	1394	1014.6

Table 5: Determinants of time to first M&A initiation, bond, and equity issuance

This table shows the estimation results of AFT models. The dependent variable is the logarithm of *Time to first M&A* for Models 1 and 2, *Time to first bond issuance* for Models 3 and 4, and *Time to first seasoned equity issuance* for Models 5 and 6. All the specifications below include all combinations of industry dummies interacted with year dummies. All variables are defined in Appendix Table 1. ***, **, * indicate 1%, 5%, and 10% significance levels.

	Time to first M&A		Time to first bond issuance		Time to first seasoned equity issuance	
Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
VC holding	0.227***		0.186***		0.006	
VC number		0.073***		0.036***		0.005
Firm size	0.081***	0.080***	0.065***	0.067***	0.145***	0.145***
Ln(Leverage)	0.152***	0.228***	0.166***	0.193***	0.514***	0.519***
Market-to-book ratio	0.020*	0.014*	0.017*	0.016*	0.157**	0.154**
Ln(Firm age)	-0.188***	-0.186***	-0.0398***	-0.040***	-0.019*	-0.018*
R&D/TA	-0.052***	-0.047**	-0.0582**	-0.064**	-0.319***	-0.318***
Operating income	0.019*	0.013*	0.032**	0.032*	0.077**	0.077**
Dividend premium	0.002	0.001	0.001	0.007	0.003	0.002
Turnover	0.172***	0.173***	0.148***	0.147***	0.296***	0.291***
NYSE listing	-0.402***	-0.412***	-0.097***	-0.102***	-0.191***	-0.192***
Institutional holding	0 .082*	0.053*	0.248***	0.246***	0.152***	0.142***
Underwriter reputation	0.079***	0.076***	0.015*	0.021*	0.026**	0.024**
Industry x Year dummies included?	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	8,007	8,007	8,007	8,007	8,007	8,007
Log likelihood	-26217.7	-25890.4	-42520.4	-42018.8	-48495.7	-47988.5
Chi-squared	1001.1	987.7	3265.2	3153.5	2447.5	2416.4

Table 6: Determinants of time to dividend initiation (robustness)

This table shows the estimation results of Probit and Cox Proportional Hazard models. The dependent variable in Models 1 and 2 (Probit models) is a dummy equal to 1 if the IPO firm initiated dividend, and 0 otherwise. The dependent variable in Models 3 and 4 (Cox models) is the inverse of *Time to dividend initiation* (i.e., the hazard rate). All the specifications below include all combinations of industry dummies interacted with year dummies. All variables are defined in Appendix Table 1. ***, **, * indicate 1%, 5%, and 10% significance levels.

	Probit model		Cox model	
Variables	Model 1	Model 2	Model 3	Model 4
VC holding	-0.161***		-0.326**	
VC number		-0.081***		-0.062**
Firm size	0.172***	0.187***	-0.080***	-0.084***
Ln(Leverage)	-0.153***	-0.162***	-0.332**	-0.336**
Market-to-book ratio	0.003	0.004	-0.069*	-0.068*
Ln(Firm age)	0.002	0.002	0.273***	0.276***
R&D/TA	-0.0319*	-0.028	0.023	0.025
Operating income	-0.011	-0.015	-0.113	-0.126
Dividend premium	0.001	0.001	0.003	0.003
Turnover	-0.0873***	-0.0848***	-0.064*	-0.057*
NYSE listing	0.018	0.016	0.098	0.101
Institutional holding	0.082***	0.083***	-0.060***	-0.061***
Underwriter reputation	-0.003	-0.001	-0.029**	-0.028**
Industry x Year dummies included?	Yes	Yes	Yes	Yes
Number of observations	8,007	8,007	8,007	8,007
Log likelihood	-4914.49	-4946.56	-10453.1	-10288.2
Chi-squared	1244.87	1278.45	1321.3	1295.9

Table 7: Stock market reactions of DI announcements

This table shows the estimation results of cross-sectional announcement returns of dividend initiations. The dependent variable is the CAR around the time of DI announcement measured over (-1,+1) and (-2,+2) windows respectively. All other variables are defined in Appendix Table 1. ***, **, * indicate 1%, 5%, and 10% significance levels.

	CAR (-1,+1)		CAR (-2,+2)	
Variables	Model 1	Model 2	Model 3	Model 4
VC holding	0.026***		0.026***	
VC number		0.011*		0.012*
Firm size	0.008	0.007	0.003	0.004
Ln(Leverage)	-0.010**	-0.021*	-0.012*	-0.015*
Market-to-book ratio	-0.013*	-0.017*	-0.015*	-0.018*
Ln(Firm age)	0.003	0.001	0.001	0.001
R&D/TA	0.081**	0.106**	0.102**	0.129**
Underwriter reputation	0.001*	0.002*	0.002*	0.001*
NYSE listing	0.004	0.005	0.002	0.005
Crisis dummy	-0.007**	-0.014**	-0.013*	-0.001*
Industry dummies included	Yes	Yes	Yes	Yes
Number of observations	548	548	548	548
R-square	0.176	0.157	0.177	0.142

Table 8: Stock market reactions of other announcement events (VC holding)

This table shows the estimation results of cross-sectional announcement returns of time to first M&A, time to first bond issuance, and time to first seasoned equity issuance respectively. The dependent variable is the CAR measured over (-1,+1) and (-2,+2) windows respectively. All other variables are defined in Appendix Table 1. ***, **, * indicate 1%, 5%, and 10% significance levels.

	Time to first M&A				Time to first bond issuance				Time to first seasoned equity issuance			
	CAR (-1,+1)		CAR (-2,+2)		CAR (-1,+1)		CAR (-2,+2)		CAR (-1,+1)		CAR (-2,+2)	
Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
VC holding	0.042**		0.014***		0.060**		0.049***		-0.001		-0.001	
VC number		0.006***		0.007***		0.007***		0.005***		-0.001		-0.001
Firm size	0.008	0.005	0.018	0.013	0.025	0.0044	0.041*	0.063**	0.0079	0.009	0.029	0.014
Ln(Leverage)	-0.076***	-0.092***	-0.095**	-0.091***	-0.016	-0.005	-0.026*	-0.034**	-0.085***	-0.047*	-0.094***	-0.109***
Market-to-book ratio	-0.009***	-0.015***	-0.007	-0.006	-0.001	-0.001	-0.003	-0.002	-0.026***	-0.007	-0.016**	-0.017***
Ln(Firm age)	0.001	0.003	0.008	0.012***	0.004	0.006**	0.001	0.001	0.001	0.001	0.002	0.002
R&D/TA	0.016*	0.068***	0.153***	0.105***	0.073***	0.009	0.034***	0.042***	0.034**	0.011*	0.003*	0.012*
Underwriter Reputation	0.003*	0.003*	0.006*	0.005*	0.007*	0.005***	0.001	0.005*	0.002	0.002	0.001	0.001
NYSE listing	0.001	0.004	0.022	0.039***	0.005	0.004	0.0124	0.005	0.008	0.002	0.005	0.006
Crisis dummy	-0.026**	-0.046**	-0.024*	-0.035**	-0.013*	-0.026*	-0.009	-0.013**	-0.047***	-0.042**	-0.012*	-0.019*
Industry dummies incl.?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	223	223	223	223	375	375	375	375	567	567	567	567
R-square	0.153	0.155	0.181	0.145	0.152	0.238	0.194	0.142	0.129	0.118	0.141	0.128

Table 9: Stock market reactions of DI announcements, controlling for active and passive institutional investors

This table shows the estimation results of cross-sectional announcement returns of dividend initiations. The dependent variable is the CAR around the time of DI announcement measured over (-1,+1) and (-2,+2) windows respectively. All other variables are defined in Appendix Table 1. ***, **, * indicate 1%, 5%, and 10% significance levels.

	CAR (-1,+1)		CAR (-2,+2)		CAR (-1,+1)	CAR (-2,+2)
Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Active institutional holding	0.035**		0.011*		0.031**	0.010*
Passive institutional holding		0.021**		0.016*	0.010**	0.014*
VC holding	0.028**	0.027**	0.026**	0.025**	0.025**	0.022**
Firm size	0.004	0.002	0.005	0.004	0.004	0.006
Ln(Leverage)	-0.017*	-0.016*	-0.018*	-0.012*	-0.017*	-0.013*
Market-to-book ratio	-0.015*	-0.013*	-0.012*	-0.010*	-0.016*	-0.014*
Ln(Firm age)	0.001	0.001	0.003	0.004	0.006	0.003
R&D/TA	0.032*	0.072*	0.023*	0.091*	0.025*	0.023*
Underwriter reputation	0.008	0.007	0.006	0.004	0.009	0.005
NYSE listing	0.009	0.006	0.004	0.002	0.005	0.003
Crisis dummy	-0.013*	-0.019*	-0.016*	-0.012*	-0.015*	-0.019*
Industry dummies included	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	548	548	548	548	548	548
Adj-R-square	0.186	0.171	0.181	0.169	0.191	0.188

Table 10: Determinants of corporate decisions, controlling for endogeneity (Entropy balancing method)

This table shows the estimation results of AFT models for the matched VC- with non-VC-backed IPO firms using the Entropy balancing method. The dependent variable is the logarithm of *Time to DI* for Model 1, *Time to first M&A* for Model 2, *Time to first bond issuance* for Model 3, and *Time to first seasoned equity issuance* for Model 4. All the specifications below include all combinations of industry dummies interacted with year dummies. All variables are defined in Appendix Table 1. ***, **, * indicate 1%, 5%, and 10% significance levels.

	DI	First M&A	First bond issuance	First seasoned equity issuance
Variables	Model 1	Model 2	Model 3	Model 4
VC holding	0.282***	0.197***	0.188***	0.061
Firm size	0.053*	0.080*	0.065*	0.045*
Ln(Leverage)	0.050	0.015	0.017	0.051
Market-to-book ratio	0.024	0.020	0.017	0.027
Ln(Firm age)	-0.0234*	-0.0188*	-0.0398*	-0.019*
R&D/TA	-0.018	-0.011	-0.015	-0.013
Operating income	0.017	0.009	0.003	0.007
Dividend premium	0.002	0.002	0.001	0.000
Turnover	0.019	0.017	0.014	0.029
NYSE listing	-0.036	-0.024	0.019	-0.011
Institutional holding	0.059*	0.031*	0.0248*	0.052*
Underwriter reputation	0.003	0.007	0.002	0.002
Industry x Year dummies included?	Yes	Yes	Yes	Yes
Number of observations	8,007	8,007	8,007	8,007
Log likelihood	-5376.7	-26217.7	-42520.4	-48495.7
Chi-squared	1041.7	1001.1	3265.2	2447.5

Table 11: Additional robustness checks

This table shows the estimation results of Accelerated Failure Time (AFT) models for various subsamples of the data and alternative measures. The dependent variable is the logarithm of time to dividend initiations from the date of IPO listing (the variable *Time to dividend initiation*). Model 1 shows the results for the subsample of IPO firms that did their IPO up to 2015 (excluding therefore those who did the IPO in subsequent years). Model 2 shows the results for the subsample of VC-backed IPO firms only. Finally Model 3 uses the full sample but with an alternative measure of VC presence based on a dummy variable equal to 1 if at least one VC is participating. All the specifications below include all combinations of industry dummies interacted with year dummies. All variables are defined in Appendix Table 1. ***, **, * indicate 1%, 5%, and 10% significance levels.

	Subsample up to 2015	Subsample of VC backed only	VC backed indicator
Variables	Model 1	Model 2	Model 3
VC holding	0.249***	0.287***	
VC Dummy			0.137***
Firm size	0.055***	0.091*	0.047***
Ln(Leverage)	0.515***	0.433***	0.471***
Market-to-book ratio	0.067**	0.011*	0.074**
Ln(Firm age)	-0.024***	-0.038*	-0.021***
R&D/TA	-0.019	-0.013	-0.024
Operating income	0.031	0.033	0.013
Dividend premium	0.002	0.001	0.003
Turnover	0.096*	0.083*	0.068*
NYSE listing	-0.037	-0.197**	-0.035
Institutional holding	0.129***	0.137***	0.118***
Underwriter reputation	0.032***	0.020**	0.0268***
Industry X Year dummies incl.?	Yes	Yes	Yes
Number of observations	7900	4230	8007
Log likelihood	-5248.8	-2489.9	-5374.7
Chi-squared	1050.5	1173.2	1044.7

Table 12: Impact of VC characteristics

The table shows the mean of different VC characteristics at time of IPO, dividend initiation, first bond issuance, first equity offering, and first M&A, for a random sample of 50 VC-backed IPO firms. The variable *VC number* is the number of VC firms involved at the time of listing or a year prior to the corporate event. *VC age* is measured as the difference in years between the founding date of VC firm and the IPO year or a year prior to the corporate event. Value reported is the average of all VC firms owning shares at the relevant time. *VC director* is the percentage of VC firms being board director at the IPO or a year prior to the corporate event. The last four columns show p-values of difference-in-mean tests in VC characteristics at the IPO relative to an individual corporate event. ***, **, * indicate 1%, 5% and 10 % significant levels.

	VC characteristics					***Differences in means***			
Variables	IPO	DI	First bond issuance	First equity issuance	First M&A	(IPO vs. DI)	(IPO vs. bond issuance)	(IPO vs. equity offering)	(IPO vs. M&A)
VC numbers	2.289	1.611	2.154	2.286	1.733	0.057*	0.888	0.993	0.238
VC age	16.447	16.056	19.071	15.524	18.067	0.896	0.415	0.703	0.599
VC director on board	31.690	30.442	13.831	26.607	27.725	0.822	0.002***	0.285	0.544

Appendix Table 1: Definition of variables

This table provides the definition and data source of all variables used in this study.

Variable	Definition	Source
VC holding	Number of shares held by VC divided by total number of shares outstanding	Data on number of shares by VC comes from Thomson Reuters Eikon. Data on total number of shares outstanding comes from CRSP
VC number	Number of VC funds as shareholder	Thomson Reuters Eikon
Firm size	Natural logarithm of total assets (AT)	Compustat
Leverage	Total debt divided by total assets (DT/ AT)	Compustat
Market-to-book ratio	Closing price at the end of fiscal year divided by book value per share at the end of fiscal year (PRCC_F/BKVLPS); also called Tobin's Q	Compustat
Firm age	Difference in year between foundation year and observation year	Foundation year comes from Jay Ritter's website
R&D/TA	R&D expenditure divided by total assets (XRD/AT)	Compustat
Operating income	Operating income before depreciation divided by total assets (OIBDP/AT)	Compustat
Dividend premium	Difference between the logarithms of the market-to-book ratios of dividend payers and non-payers	Downloaded from Wurgler's website
Turnover	The ratio of annual trading volume to total number of shares outstanding	CRSP
NYSE listing	Dummy variable equal to 1 if the primary exchange of the issuer is NYSE, and 0 otherwise	SDC
Crisis dummy	Dummy variable equal to 1 if the IPO happened during the crisis years 2007 and 2008, and 0 otherwise	SDC
Underwriter reputation	Average rank of underwriters in the underwriting syndicate	ranks are collected from Jay Ritter's website
Time to dividend initiation (years)	Number of years between IPO and dividend initiation	Dividend data is coming from Compustat
Time to first M&A (years)	Number of years between IPO and the first acquisition with minimum value of $10 million	M&A data comes from SDC
Time to first bond issuance (years)	Number of years between IPO and the first date of issuing corporate bond	Debt data comes from SDC
Time to seasoned equity issuance (years)	Number of years between IPO and first seasoned equity offering of the firm	SDC

Table continues

Institutional holding	Percentage of shares held by institutional investors, excluding VC firms (see the SEC website for exact definition used here, following 13f filings: https://www.sec.gov/divisions/investment/13ffaq.htm)	Thomson Reuters Institutional (13f) Holdings
Active institutional holding	Percentage of shares held by active institutional investors. Active institutional investors definition based on Almazan, Hartzell, and Starks (2005)	
Passive institutional holding	Percentage of shares held by passive institutional investors. Passive institutional investors definition based on Almazan, Hartzell, and Starks (2005)	

Appendix Table 2: Descriptive statistics for the full sample and the subsamples by VC backing (Panel Data)

This table provides descriptive statistics for all variables by mean and for the full sample of panel data and the subsamples of VC-backed and non-VC-backed IPOs at the time of listing. The t-test value is based on mean differences test between the two subsamples of the IPO firms. All the variables are as defined in Appendix Table 1. ***, **, * indicate 1%, 5%, and 10% significance levels.

	Full sample of IPO firms			VC-backed firms		Non-VC-backed firms		
Variables	N	Mean	Median	N	Mean	N	Mean	T-test
VC holding	8,294	0.042	0.000	4,111	0.086	4,183	0.000	-34.744***
VC number	8,301	0.662	0.000	4,111	1.337	4,190	0.000	-53.821***
Firm Size	8,403	5.790	5.765	4,230	5.107	4,173	6.483	40.924***
Ln(Leverage)	8,363	-0.935	-0.780	4,195	-1.189	4,168	-0.679	3.181***
Market-to-book ratio	8,308	3.591	2.623	4,189	4.211	4,119	2.961	-16.622***
Ln(Firm age)	8,423	2.809	2.773	4,233	2.487	4,190	3.137	44.469***
R&D/TA	8,423	0.162	0.037	4,233	0.231	4,190	0.092	-4.626***
Operating income	8,350	0.052	0.087	4,204	-0.019	4,146	0.113	3.225***
Dividend premium	8,423	-5.272	-6.188	4,233	-5.154	4,190	-5.391	-1.778*
Turnover	8,423	3.842	2.786	4,233	4.338	4,190	3.341	-10.028***
NYSE listing	8,423	0.270	0.000	4,233	0.116	4,190	0.426	34.122***
Crisis dummy	8,423	0.111	0.000	4,233	0.118	4,190	0.104	-2.125**
Underwriter reputation	8,423	7.485	8.334	4,233	7.323	4,190	7.649	6.737***
Time to DI (years)	8,423	6.422	4.638	4,233	7.511	4,190	5.321	-16.098***
Time to first M&A (years)	8,423	9.525	10.701	4,233	8.950	4,190	10.105	9.251***
Time to first bond issuance (years)	8,423	7.722	7.539	4,233	7.935	4,190	7.459	-6.177***
Time to first seasoned equity issuance (years)	8,423	6.026	2.907	4,233	6.883	4,190	5.159	-12.711***

Appendix Table 3: Top-10 venture capital firms by number of IPO involvements

VC firm name	Number of IPOs involved
Artis Ventures Management	81
New Enterprise Associates	49
Great Oaks Capital Management	43
Sofinnova Investments	42
Foresite Capital Management	36
Domain Associates	31
Alta Partners	28
Sequoia Capital Partners	25
Technology Crossover Ventures	25
HLM Venture Partners	24

Appendix Table 4: Descriptive statistics of the matched sample using the Entropy balancing method

This table provides descriptive statistics for all variables by means for the treatment (VC-backed) and control (non-VC-backed) groups post-entropy balancing. All the variables are as defined in Appendix Table 1.

	Treatment: VC-backed firms		Control: Non-VC-backed firms	
Variables	N	Mean	N	Mean
Firm Size	4,230	5.107	4,173	5.321
Ln(Leverage)	4,195	-1.189	4,168	-1.182
Market-to-book ratio	4,189	4.211	4,119	4.271
Ln(Firm age)	4,233	2.487	4,190	2.384
R&D/TA	4,233	0.231	4,190	0.235
Operating income	4,204	-0.019	4,146	-0.018
Dividend premium	4,233	-5.154	4,190	-5.159
Turnover	4,233	4.338	4,190	4.481
NYSE listing	4,233	0.116	4,190	0.102
Crisis dummy	4,233	0.118	4,190	0.115
Underwriter reputation	4,233	7.323	4,190	7.331

Appendix Table 5: Additional robustness checks for other corporate events

Panel A presents similar robustness checks as Table 11 but for *Time to first M&A*, Panel B for *Time to first bond issuance*, and Panel C for *Time to first seasoned equity issuance*.

PANEL A: Time to first M&A	Subsample up to 2015	Subsample of VC backed only	VC backed indicator
Variables	Model 1	Model 2	Model 3
VC holding	0.145***	0.179***	
VC Dummy			0.110***
Firm size	0.081**	0.106**	0.090*
Ln(Leverage)	0.010	0.011	0.012
Market-to-book ratio	0.022	0.016	0.017
Ln(Firm age)	-0.018*	-0.036*	-0.015*
R&D/TA	-0.054**	-0.061**	-0.018
Operating income	0.001	0.004	0.009
Dividend premium	0.002	0.001	0.002
Turnover	0.013	0.040*	0.014
NYSE listing	-0.042*	-0.026	-0.031
Institutional holding	0.038*	0.065*	0.043*
Underwriter reputation	0.008	0.009	0.008
Industry X Year	Yes	Yes	Yes
Number of observations	7900	4230	8007
Log likelihood	-26133.8	-13767.9	-26215.8
Chi-squared	988.4	702.7	1007.8

PANEL B: Time to first bond issuance	Subsample up to 2015	Subsample of VC backed only	VC backed indicator
Variables	Model 1	Model 2	Model 3
VC holding	0.202***	0.221***	
VC Dummy			0.124***
Firm size	0.058*	0.047*	0.064*
Ln(Leverage)	0.021*	0.026*	0.017
Market-to-book ratio	0.015	0.013	0.014
Ln(Firm age)	-0.043**	-0.071**	-0.039*
R&D/TA	-0.016	-0.013	-0.017
Operating income	0.031*	0.014	0.002
Dividend premium	0.003	0.009	0.006
Turnover	0.015*	0.019*	0.014
NYSE listing	0.090**	0.080**	0.020
Institutional holding	0.027*	0.021*	0.024*
Underwriter reputation	0.005	0.006	0.002
Industry X Year	Yes	Yes	Yes
Number of observations	7900	4230	8007
Log likelihood	-41524	-17839.6	-42305
Chi-squared	2271.4	850.6	2205

Panel C: Time to first seasoned equity issuance	Subsample up to 2015	Subsample of VC backed only	VC backed indicator
Variables	Model 1	Model 2	Model 3
VC holding	0.0402	0.067*	
VC Dummy			0.029
Firm size	0.047*	0.038*	0.046*
Ln(Leverage)	0.051*	0.013	0.059*
Market-to-book ratio	0.015	0.011	0.019
Ln(Firm age)	-0.015*	-0.019*	-0.018*
R&D/TA	-0.030*	-0.033*	-0.013
Operating income	0.018	0.016	0.008
Dividend premium	0.000	0.002	0.000
Turnover	0.033*	0.052*	0.027
NYSE listing	-0.019*	-0.029*	-0.012
Institutional holding	0.075*	0.077*	0.058*
Underwriter reputation	0.025*	0.027*	0.002
Industry X Year	Yes	Yes	Yes
Number of observations	7900	4230	8007
Log likelihood	-47944.4	-22723.3	-48475.7
Chi-squared	2421.5	1739.1	2490.6