IPO withdrawals: Are corporate governance and VC characteristics the guiding light in the rough sea of volatile markets?

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ABSTRACT

More than 25% of all US firms that file for an IPO withdraw their offering from registration. Our study, which includes 3438 US domestic first-time IPO filings between 1997 and 2014, examines whether in times of high market volatility, high-quality corporate governance and VC backing may serve as a signal and thus reduce the withdrawal probability. Our results from an interaction term analysis support the view that corporate governance characteristics, but not the VC backing per se, tend to provide signals in highly volatile markets. In addition, our paper delves into the effect of VC characteristics. Local VCs tend to reduce the withdrawal probability. The same holds for VC syndication, particularly in highly volatile markets. Finally, our findings lend support to the conclusion that in highly volatile environments, reputable VCs tend to follow the dual-track strategy or postpone the IPO of their portfolio firms more often than in less volatile markets.

1. Introduction

One of the most important decisions for private firms is whether to stay private or to launch an initial public offering (IPO). Several studies (e.g. Bodnaruk et al., 2007; Chemmanur and Fulghieri, 1999; Chemmanur et al., 2009; Chemmanur and He, 2011; Kim and Weisbach, 2008; Pagano et al., 1998; Zingales, 1995) consider costs and benefits associated with this decision. This paper focuses on firms that decided to go public and launched the official registration process with the Securities and Exchange Commission (SEC) but withdrew from the IPO prior to the listing. In the US, more than 25% of all firms that file the security registration documents with the SEC do not complete the IPO process. In some years (e.g. 2008) even the majority of IPOs filed with the SEC were withdrawn.

Busaba et al. (2001 and 2015) and Busaba (2006) argue that firms receive a valuable option when they file for an IPO. The firm will exercise this option (and go public) when investor valuation exceeds firm's reservation value. When firm's reservation value is above investor valuation, the firm will withdraw its offering and the option expires worthless. At the time of the IPO filing, issuers do not know the exact investor valuations, so the offer price is uncertain. After the filing date, as this information gets revealed during the price discovery process, issuers may withdraw their IPO. In addition, new information may arrive after the filing date that may change investor valuation or issuer reservation value. Several studies (see Boeh and Southam, 2011; Busaba et al., 2001; Dunbar, 1998; Dunbar and Foerster, 2008; Helbing et al., 2019, among others) analyze various factors that may affect firm's reservation value and investor valuation and thus may be related to the probability of a withdrawal. We add to this literature by focusing on the role of signaling in the presence of agency costs that arise during the IPO process.

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Two prominent issues of agency costs are adverse selection and moral hazard. Adverse selection results from the situation in which investors face issuers of unknown quality (Latham and Braun, 2010), which reduces their average valuations (Akerlof, 1970). In this setting, investors may rely on various signals that decrease their uncertainty regarding the value of the firm (Owen-Smith et al., 2015; Benveniste et al., 2002), such as venture capital (VC) backing. Moral hazard arises because the interests of firm insiders are not aligned with the interests of investors (Brav and Gompers, 2003). In this situation, investors benefit if effective monitoring mechanisms are in place, such as an experienced board (Boeh and Southam, 2011; Helbing et al., 2019). Insiders also may demonstrate their incentive alignment with the investors through signals, such as a high fraction of retained shares or a lock-up commitment (Boeh and Southam, 2011; Busaba et al., 2001; Helbing et al., 2019).

We examine the role of various corporate governance and VC financing signals for the withdrawal probability and argue that this role may differ in different market environments. More specifically, we expect that in more risky market environments when investors tend to be more careful, signals become more important than if market conditions are more stable. We test this assumption by interacting an indicator for high post-filing market volatility with the corporate governance and VC characteristics.

For VC financing, however, the effect on the withdrawal probability is not straightforward from a theoretical point of view. On the one hand, VCs may signal the quality of the firm and diminish investor uncertainty, which should reduce the withdrawal probability. On the other hand, VCs' goal is to maximize the exit proceeds, which may be associated with a higher withdrawal probability. To maximize proceeds, VCs may tend to follow a dual-track strategy by filing for an IPO but being involved in M&A negotiations at the same time (Braun et al., 2010). Their portfolio firms may thus be less dependent on the IPO success. VCs may also prefer to postpone the IPO of their portfolio firms if current investor valuations deteriorate (Fan and Yamada, 2020). Our goal is to understand whether the VC signaling effect or the dual-track / postponing strategy prevails and whether there are differences under different market conditions. We also examine how the outcome depends on VC characteristics. Hereby, we focus on three features: syndicated vs. stand-alone VCs, domestic vs. foreign VCs, and VCs with high vs. low reputation. For example, reputable VCs could provide a stronger quality signal than their less reputable counterparts. However, they might also provide their portfolio companies with a broader range of exit options.

Our study provides two main contributions. We first deliver new findings to the literature on signaling in the context of withdrawals. According to the signaling theory, signals of high quality, effective monitoring, and incentive alignment (such as high corporate governance standards or VC backing) may reduce investor uncertainty and increase their valuations (Signori, 2018). We add to the literature by distinguishing between the role of signals in more and less risky market environments. Typically, firms blame deteriorating market conditions after the filing, which lead to decreasing investor valuations, to be the reason for the withdrawal (Braun and Fawcett, 2006). Most studies based on older US data support this view (e.g. Dunbar and Foerster, 2008).¹ Two studies consider explicitly the withdrawal decision during unfavorable market conditions. The first study by Fan and Yamada (2020) examines the relation between the level of retained shares of various types of owners (CEOs and VCs) and the withdrawal probability in Japan. The second study is Latham and Braun (2010) who focus on the link between the CEO ownership and the withdrawal probability by examining US filings after the burst of the high-tech bubble. Both studies focus on the relation between ownership structures and the withdrawal event, while we include various aspects of corporate governance and VC financing. Instead of signaling, which is at the core of our study, these studies rather focus on motivations of existing shareholders when they take a firm public. In addition, Fan and Yamada (2020) only provide descriptive statistics for a relatively small subsample of deals under weak market conditions (between 7 and 13 withdrawn deals) and compare them to the whole sample. Latham and Braun (2010) explicitly consider filings within weak market conditions only by including a time window of 2000–2002. In contrast, we perform a multivariate analysis and consider a long time period that covers varying market conditions.

As our second main contribution, we provide new insights to the controversial discussion on the role of VCs. From the theoretical perspective, arguments in both directions exist. Prior empirical findings on the VC effect on withdrawals are mixed, too. On the one hand, VC investors could serve as a signaling device (e.g. Cumming et al., 2016) that reduces investors uncertainty and should thus be associated with a lower withdrawal probability (Boeh and Southam, 2011; Busaba et al., 2001; Dunbar and Foerster, 2008). On the other hand, Boeh and Southam (2011) or Helbing et al. (2019) demonstrate a positive relation between VC financing and withdrawal probability. VCs may tend to use a dual-track strategy, which may coincide with a higher withdrawal probability (Dunbar and Foerster, 2008). VCs also may decide to postpone the IPO if the prospects deteriorate (Fan and Yamada, 2020). So far, the literature has typically considered the average effect of VC backing. We add to this literature by focusing on VC heterogeneity and analyzing how different VC types differ in the withdrawal probabilities.

More generally, we also contribute to the literature on withdrawal determinants (Boeh and Southam, 2011; Busaba et al., 2001; Dunbar, 1998; Dunbar and Foerster, 2008; Helbing et al., 2019). We include more recent US filings compared to older studies and we cover a longer time period.² This is important since the intensity and patterns of withdrawals change over time (e.g. Busaba et al., 2001). Table 1 shows that the percentage of withdrawn deals varies between 6.1% in 2013 and 60.7% in 2008. In a recent literature review, Helbing et al. (2019) claims that the findings from existing studies are not unanimous and that we still do not fully understand the drivers behind the withdrawal decision. Our study employs a comprehensive set of variables related to firm's reservation value and

¹ While older literature focuses on the US exclusively, recently researchers started to analyze IPO withdrawals in Europe (Helbing et al., 2019) or in Asia (Fan and Yamada, 2020). Recent evidence from European countries (Helbing et al., 2019) suggests that market conditions are not particularly relevant there.

² Busaba et al. (2001) include data from 1984 to 1994, Dunbar and Foerster (2008) use 1985 to 2000, Boeh and Dunbar (2013) have a sample of filings between 1999 and 2004 and, finally, Boeh and Dunbar (2016) employ data between 1998 and 2011.

Table 1
Withdrawn and completed offerings by year.

Filing year	Number of filings	Number completed	Number withdrawn	Percentage completed	Percentage withdrawn
1997	437	373	64	85.35	14.65
1998	312	219	93	70.19	29.81
1999	494	427	67	86.44	13.56
2000	455	237	218	52.09	47.91
2001	72	44	28	61.11	38.89
2002	87	57	30	65.52	34.48
2003	68	63	5	92.65	7.35
2004	178	131	47	73.60	26.40
2005	154	125	29	81.17	18.83
2006	181	129	52	71.27	28.73
2007	184	95	89	51.63	48.37
2008	56	22	34	39.29	60.71
2009	54	37	17	68.52	31.48
2010	137	89	48	64.96	35.04
2011	150	102	48	68.00	32.00
2012	82	57	25	69.51	30.49
2013	163	153	10	93.87	6.13
2014	174	140	34	80.46	19.54
Total	3438	2500	938	72.72	27.28

Number of filings, completed issues and withdrawals from 1997 to 2014. The data stems from Thomson Reuters SDC Platinum.

to investor valuation. We combine variables that have been used in prior studies and add new variables that have not been discussed in the literature so far.

We employ a sample of 3438 US domestic first-time IPO filings between 1997 and 2014. We find that signals of good corporate governance (with the exception of a longer lock-up period) and VC backing are not related to a lower withdrawal probability on average. However, our results from the interaction term analysis confirm that signals through high-quality corporate governance are important in risky market environments, while they do not matter in less risky market environments. In addition, consistently with signaling theories, we find that firms backed by local VCs and by a VC syndicate face a lower withdrawal probability than firms backed by foreign and stand-alone VCs. The VC syndicate effect is particularly pronounced in highly volatile markets. Our results also give support to the conclusion that reputable VCs are more likely to pursue a dual-track strategy or postpone their IPO under riskier than under less risky market conditions.

The remainder of the paper is structured as follows. In Section 2, we discuss our theoretical background. Section 3 describes the data and provides descriptive statistics. We discuss issues related to the methodology in Section 4. In Section 5, we present the empirical results from our analysis. Section 6 concludes.

2. Theoretical background

2.1. IPO withdrawals

Firms that want to go public time their IPOs by exploiting periods in which they expect investor valuations to be relatively high compared to their reservation values (Allen and Faulhaber, 1989). However, at the time of the IPO filing, issuers are uncertain about investor valuations. Busaba et al. (2001 and 2015) and Busaba (2006) argue that filing thus represents a valuable option on a future IPO.³ This option is costly. The filing process is associated not only with direct costs, i.e. expenditures related to the IPO preparation and to the registration process, but also with indirect costs such as management effort devoted to these activities (Ritter, 1987). These costs are sunk if the firm withdraws its offering. In addition, the withdrawal event may send negative information about the firm to the market participants (Bouis, 2009; Lian and Wang, 2009).

To understand why issuers withdraw their offerings, Busaba (2006) addresses the “two-perspective firm valuation” framework: The issuer compares investor valuations, which are revealed after the filing date, to the firm’s reservation value. If investor valuations drop below the firm’s reservation value, the issuer will not exercise the option to go public. Rather, the issuer will withdraw the offering and the firm stays private. This situation may arise either if investor valuations fall below expectations or if firm’s reservation value increases (Busaba, 2006; Busaba et al., 2015).

Investor valuations may drop below firm’s reservation value when negative information about the firm is revealed. This decrease is more likely when ex-ante uncertainty about the firm value is high (Helbing, 2019) or when agency costs are prevalent. The ex-ante uncertainty and the extent of agency costs depend on various characteristics related to the issuer, issue, corporate governance, and intermediaries. Investor valuations will also be affected by the overall market situation and its development after the filing date.

In the following subsections, we provide the theoretical motivation behind the variables we include in our analysis and discuss their

³ Note that we use Busaba et al.’s (2015) definition of the “option” here, that is, the firm’s option to accept a high price and go public. They argue that this option is the complement of the option to reject a low price and withdraw in Busaba et al. (2001) and Busaba (2006).

expected effect on the withdrawal probability. Following Dunbar and Foerster (2008), we divide our variables into the following four categories: issuer and issue characteristics, intermediary characteristics, market characteristics at filing and, finally, market characteristics after filing. Later studies (e.g. Boeh and Southam, 2011; Helbing et al., 2019) point to issuer corporate governance characteristics that may also be related to the likelihood of an IPO withdrawal. We include them as a separate category. In each category, we select the relevant determinants by combining variables that have been used in various prior studies on withdrawals (Bergbrant and Bradley, 2017; Boeh and Southam, 2011; Busaba et al., 2001; Dunbar and Foerster, 2008; Helbing et al., 2019). We also include additional variables that we believe might be relevant. Table A.1 summarize our predictions about the relation between each variable and the probability of a withdrawal.

Among the relevant characteristics, we focus on corporate governance and VC financing and argue that they may serve as potential signals. In addition, VCs (or certain VC types) may also increase firm's chances for an alternative exit to a current IPO. We expect that the role of signals for the withdrawal probability may differ in different market environments. In more risky market environments when investors tend to be more careful, quality signals become more important than if market conditions are more stable.

2.2. Corporate governance characteristics

High-quality corporate governance may provide a signal that reduces agency costs (Boeh and Southam, 2011; Helbing et al., 2019) and, thus, increases investor valuations. Agency costs arise for two main reasons. First, firm insiders may be better informed about the quality of the firm than the new investors. Such information asymmetry gives rise to adverse selection (Latham and Braun, 2010) where investors reduce their valuations because they fear that the issuer may be of a low quality (Akerlof, 1970). In this situation, high-quality corporate governance may signal the underlying quality of the firm to the new investors and thus lead to a higher valuation.

Second, firm insiders may follow their own goals, which do not coincide with the goals new investors have. Such misaligned incentives give rise to a moral hazard problem (Brav and Gompers, 2003). When investors expect such behavior, they reduce their valuations. High-quality corporate governance, which leads to a better monitoring of firm insiders, may be beneficial in reducing the moral hazard problem.

Boeh and Southam (2011) and Helbing et al. (2019) suggest that larger and more experienced boards tend to improve monitoring and mitigate the moral hazard problem. On the opposite, the monitoring is weaker and the potential for moral hazard increases when the CEO also occupies the chair position of the board of directors (CEO duality). Larger and more experienced boards and the separation between the CEO and the chair could also serve as signals of the underlying firm quality and thus reduce adverse selection. We therefore include board size, board experience, and CEO duality in this variable category. In addition, Helbing et al. (2019) argues that the ratio of female board members is another signal that reduces agency costs. More diversified boards combine various perspectives and experiences that may contribute to a better monitoring. We thus add the ratio of female board members. We expect that larger and more experienced boards, a higher ratio of female board members, as well as the separation of CEO and chair are associated with a higher investor valuation and, thus, a lower withdrawal probability.

When insiders commit to a longer lock-up period or when they retain a larger proportion of shares, investors may interpret it as a positive signal of insiders' confidence in the firm and of a better incentive alignment (Boeh and Southam, 2011; Busaba et al., 2001; Helbing et al., 2019). We therefore assume that a longer lock-up period and a greater fraction of retained shares are associated with higher investor valuations. They should thus be negatively related to the withdrawal probability.

We expect that corporate governance characteristics will be particularly relevant in highly volatile market environments when investors are exposed to greater risks and a higher uncertainty. In this situation, they benefit from reliable signals of firm quality, strong monitoring, and aligned incentives, which reduce the agency costs of adverse selection and moral hazard.

2.3. Intermediary characteristics

Helbing et al. (2019) argues that the final decision on the exercising of the withdrawal option resides with the CEO. However, intermediaries may play an important role as well. We account for intermediary characteristics by focusing on VC backing. As firm owners, VCs typically possess strong control rights that give them the option to decide about the exit strategy (e.g. Cumming, 2008).

From the theoretical perspective, the effect of the intermediary characteristics is unclear. On the one hand, high-quality intermediaries may be associated with a higher withdrawal probability for at least two reasons. Intermediaries are repeated players in the capital markets and high-quality intermediaries fear the loss of their reputation. Consequently, they only complete the IPO if the issue is of high quality. If during the price discovery process a firm turns out to be potentially a low-quality issue, they may force it to withdraw because they fear to lose their reputation if they took a low-quality firm public (Dunbar and Foerster, 2008). Another reason for why high-quality intermediaries may be associated with a higher likelihood of a withdrawal is that their firms have other options than a current IPO. Brau et al. (2010) find that VC backed and prestigious underwritten issues have a higher propensity to follow a

dual-track strategy. These firms file for an IPO, but they also look for potential acquirers (Aktas et al., 2018). If they succeed in finding an acquirer, their reservation price increases. Even if they do not succeed in finding an acquirer, VCs may withdraw their IPOs more often because VC backed firms have better access to capital in general. Dunbar and Foerster (2008) argue that VC financing makes firms less dependent on the IPO success because it improves their chances to find alternative sources of financing, including another VC round. In addition, as investors that aim at maximizing their financial returns from exits, VCs may decide to postpone the IPO if they believe to achieve greater proceeds in a later exit (Fan and Yamada, 2020).

On the other hand, VCs and prestigious underwriters may provide a signal about the quality of their issues (Cumming et al., 2016; Laurie et al., 2001). This signal reduces adverse selection costs, increases valuations and leads to a lower likelihood of withdrawals. Boeh and Southam (2011), Busaba et al. (2001), and Dunbar and Foerster (2008) discuss this argument for VC investors. In addition, VC investors typically retain a large fraction of their shares and exhibit an active involvement in the monitoring of their firms beyond the IPO (Krishnan et al., 2011). This involvement, which reduces the moral hazard problem and aligns the incentives between VCs and new investors, should lead to a lower withdrawal probability.

Prior empirical literature that deals with the relationship between VC backing and the probability that firms withdraw their offerings provides contradictory findings. Dunbar and Foerster (2008) show a negative relation between withdrawal probability and VC backing, while Boeh and Southam (2011) or Helbing et al. (2019) demonstrate a positive relation. Therefore, we delve deeper into the relationship between the withdrawal probability and the VC financing by investigating whether different VC types are associated with differing withdrawal probabilities.

Besides the VC dummy, which reflects whether the issuer has obtained VC financing or not, we focus on three VC related characteristics. The first is VC syndication, which reflects whether the firm has obtained financing from a single stand-alone VC or from a VC syndicate. VC syndicates may provide a stronger signal than a stand-alone investor (Boeh and Southam, 2011; Brander et al., 2002), which may lead to a higher valuation and a lower withdrawal probability. However, as more investors have their reputational capital at stake and as syndicates may improve the chances to find alternative sources of capital (Tian, 2012), syndicated deals could also be associated with a higher withdrawal probability. Our second VC related variable is VC location. We distinguish between domestic and foreign VCs. Here, the direction of the effect is again uncertain as domestic investors may be associated negatively or positively with the withdrawal probability. On the negative side, local VC investors likely provide better monitoring than foreign investors as they are located close to their portfolio firms. On the positive side, local investors may be beneficial in finding alternative sources of capital in the local market. Our third VC related variable is reputation. All arguments discussed above for the VCs in general should be strengthened for reputable VCs: If VC backing provides a quality signal, the VC's level of reputation may amplify this effect (Boeh and Southam, 2011). In addition, Krishnan et al. (2011) demonstrate that reputable VCs are better monitors than less reputable VCs. If VC financing improves the chances to find alternative sources of financing, the chances should increase with VC reputation. Finally, highly reputable VCs are concerned more about reputational losses than less reputable VCs.

Whether VC backed firms behave differently in less risky and more risky markets is an empirical question, too. On the one hand, if VC financing is a positive signal that reduces the withdrawal probability, then this effect should be stronger in more risky markets. On the other hand, withdrawals of VC backed firms may be more likely in risky markets because the dual-track strategy may prove beneficial in particular when public markets deteriorate. In addition, VCs may be able to provide another round of financing in uncertain markets. These investors do not suffer immediately from a market deterioration because they have a guaranteed access to capital through the commitments of their limited partners. All these arguments that apply to the differences between VC backed and non-VC backed firms in more risky markets should be amplified for syndicated, local, and reputable VCs.

Additionally, we control for underwriter characteristics in this variable category. We use the number of underwriters to check whether larger syndicates provide better services and result in a stronger signal (Corwin and Schultz, 2005). To capture lead underwriter quality, we include lead underwriter market share and Carter-Manaster (CM) rank (Carter and Manaster, 1990; Carter et al., 1998; Loughran and Ritter, 2004).

2.4. Other factors

2.4.1. Issuer and issue characteristics

The first three variables in this category are filing size, firm size, and firm age. Firms are easier to value and thus investors face lower risk if filing and firm size are large and if firms are relatively old (Boeh and Southam, 2011; Busaba et al., 2001; Dunbar and Foerster, 2008). In addition, larger issues are associated with higher post-IPO liquidity and are more likely to attract institutional investors who generate information (Busaba et al., 2001). Therefore, greater issues, larger and older firms should be associated with a lower withdrawal probability. We further distinguish between high-tech and low-tech firms. High-tech firms, which typically produce specialized products and are more dependent on human capital specific skills, will be hurt more by negative publicity following a withdrawal decision. This should lead to a lower issuer reservation value and imply a lower probability to withdraw (Busaba et al., 2001; Dunbar and Foerster, 2008).

In order to measure the financial situation of the firm, we add three ratios. The first one is the debt ratio. From a theoretical point of view, the relation between debt ratio and the likelihood of a withdrawal is unclear. On the one hand, a withdrawal may be more likely for firms with higher debt because higher debt ratio is associated with more financial risk (Boeh and Southam, 2011), which may reduce investor valuation. In addition, a higher debt ratio expresses better access to alternative sources of financing (Busaba et al., 2001) and may thus result in a higher reservation price. On the other hand, firms that have high debt ratios may be close to their debt capacity (e.g. Lemmon and Zender, 2010). Due to lack of financing alternatives, their reservation price is lower. From the viewpoint of investors, higher debt level may increase investor valuations because it reduces Jensen's (1986) agency costs of free cash flow (Boeh and Southam, 2011). Our second ratio is the industry book-to-market ratio (BM ratio). Again, it is unclear how BM ratio is related to the withdrawal probability. If a low ratio captures high growth opportunities in the industry, we would expect higher valuations for IPO firms as well and, thus, a lower likelihood of a withdrawal (Dunbar and Foerster, 2008). In contrast, if a low ratio rather captures overvaluation, investors could discover it during the bookbuilding process and bid less, leading to a higher withdrawal probability (Dunbar and Foerster, 2008). As our third ratio, we include asset turnover. We assume that a higher asset turnover is associated with more viable firms, which are easier to value (Busaba et al., 2001). Consequently, it should lead to a lower withdrawal probability.

Finally, we include the binary variable negative news (Helbing et al., 2019). Shi et al. (2016) argue that negative news affect stock market returns. In our context, negative business news could reduce investor valuation. We therefore expect that a withdrawal will be more likely if negative news about the issuer are released.

2.4.2. Market characteristics at and after the filing

Market timing theories consider market characteristics as important determinants of the filing and the withdrawal decisions (Pástor and Veronesi, 2005).

At the time of filing, we consider equity and debt market conditions as well as the competitive situation at the IPO market. Boeh and Dunbar (2014) argue that high equity valuations (we use the current Nasdaq level) reflect high investor demand and that this relation is consistent with irrational and rational explanations: high equity valuations may be related to overoptimistic investors, but also to good investment opportunities (Pástor and Veronesi, 2005). Both explanations suggest that higher valuations lead to a lower withdrawal probability (Boeh and Southam, 2011). We further consider the expected pre-filing stock market volatility, which can be considered as a proxy for the equity risk premium (Pástor and Veronesi, 2005). Increasing risk premium should be associated with a higher withdrawal probability. In addition, Busaba et al. (2015) claim that with increasing volatility the option on the future uncertain public price increases in value. Consequently, we should observe an increase in IPO attempts (see also Boeh and Dunbar, 2014), but an average filing would be of a lower quality, which increases the withdrawal probability. To capture debt market conditions, we employ corporate debt yield spread (BAA-AAA). In periods when corporate debt is expensive, i.e. the yield spread is large, aggregate default risk is high as well so we would assume that withdrawals are more likely due to lower investor valuations (Dunbar and Foerster, 2008). However, at the same time, firms attempting to raise capital in high-spread environments have fewer alternatives so their reservation value decreases. Consequently, they want to pursue an IPO and prevent a withdrawal (Dunbar and Foerster, 2008). Finally, we assume that the likelihood of a withdrawal increases if more filings compete for investor funds around the filing date (Busaba et al., 2001; Dunbar and Foerster, 2008).

We finally add the development of market characteristics after filing. Our first two variables in this category are the Nasdaq return and its standard deviation within the post-filing period. We expect that withdrawals are more common during periods of lower returns (consistent with Boeh and Southam, 2011; Bouis, 2009; Busaba et al., 2001; Edelen and Kadlec, 2005) and higher volatility (Bouis, 2009; Schill, 2004). Besides the changes in equity markets, we consider changes in debt markets. The increase in the corporate yield spread and more severe lending standards (Bergbrant and Bradley, 2017) are associated with higher aggregate default risks, which could lead to lower investor valuations and thus a higher withdrawal probability. However, when debt becomes more expensive and more difficult to obtain, firms may want to prevent withdrawals as they have fewer alternatives to raise capital (Dunbar and Foerster, 2008).

3. Data

3.1. Filings, completed IPOs, and withdrawals

The sample consists of US domestic IPO filings between 1997 and 2014 drawn from Thomson Reuters Securities Data Company (SDC) Platinum. Following IPO literature (e.g. Busaba et al., 2001; Dunbar and Foerster, 2008; Ritter and Welch, 2002) we remove American depositary receipts, convertible issues, unit offerings, closed-end funds, REITs, limited partnerships, small best effort offers, SPACs, and issuers that are not seeking a listing on NYSE, NASDAQ or any other American exchange. We also exclude firms from the financial industry. After these steps, we end up with 5095 filings. We only consider the first attempt of firms to go public. The reason is that firms might have different aims with the first and the second attempts and investors may have different perceptions as well (Boeh and Dunbar, 2013; Chen et al., 2017; Dunbar and Foerster, 2008). Consequently, the probability of a withdrawal will be different for the first-time and the second-time IPOs. This reduces the sample size to 4939 firms. We then check filing dates, IPO dates and withdrawal dates against EDGAR filings and remove observations for which one of these dates differ. Our final sample then consists of 3438 firms. The withdrawal rates and the characteristics of our sample firms are within the range of prior studies, so we believe that that our sample is representative.

Table 1 shows the number of filings in our sample by year. The highest number of filings was reached at the peak of the dotcom bubble in 1999 and 2000 with 494 and 455 filings, the lowest number occurred during the financial crisis with 56 filings in 2008 and

Table 2

Descriptive statistics of completed and withdrawn IPOs.

	Full sample		Completed		Withdrawn		p-values
	Mean	Obs	Mean	Obs	Mean	Obs	
<i>Corporate governance characteristics</i>							
Board size	6.45	3436	6.48	2499	6.35	937	0.13
Board experience	50.51	3426	50.61	2493	50.24	933	0.11
Female board members	0.04	3317	0.05	2416	0.04	901	0.15
CEO duality	0.54	3028	0.54	2202	0.53	826	0.53
Lock-up	0.04	3438	0.04	2500	0.04	938	0.78
Retained shares	0.69	2858	0.69	2415	0.69	443	0.94
<i>Intermediary characteristics</i>							
VC backing	0.43	3399	0.42	2477	0.44	922	0.23
VC syndication ^a	0.83	1401	0.84	1007	0.79	394	0.02**
VC US ^a	0.69	1410	0.70	1013	0.68	397	0.63
VC reputation ^a	0.43	1419	0.44	1019	0.39	400	0.07*
Number of underwriters	1.58	3416	1.64	2486	1.44	930	0.00***
Underwriter market share	0.06	3289	0.06	2382	0.06	907	0.25
CM Rank	7.79	3368	7.82	2460	7.71	908	0.11
<i>Issuer and issue characteristics</i>							
Filing size (bn USD)	0.12	3319	0.12	2393	0.12	926	0.34
Firm size (bn USD)	0.50	3405	0.53	2494	0.42	911	0.13
Firm age	13.50	3233	14.39	2441	10.76	792	0.00***
High-tech	0.58	3416	0.58	2486	0.58	930	0.95
Debt ratio	0.82	3375	0.79	2486	0.92	889	0.00***
BM ratio	0.34	3402	0.33	2481	0.37	921	0.00***
Asset turnover	1.06	3318	1.06	2468	1.08	850	0.58
Negative news	0.27	3438	0.28	2500	0.26	938	0.39
<i>Market characteristics at filing</i>							
Nasdaq	21.51	3438	20.87	2500	23.24	938	0.00***
Implied volatility	0.04	3438	0.03	2500	0.05	938	0.01**
Yield spread	0.83	3438	0.82	2500	0.85	938	0.00***
Number of filings	0.11	3436	0.11	2500	0.11	936	0.47
<i>Market characteristics after filing</i>							
Nasdaq return	0.04	3438	0.07	2500	-0.04	938	0.00***
Nasdaq std. dev.	0.69	3436	0.62	2500	0.88	936	0.00***
Yield spread change	0.01	3436	0.00	2500	0.03	936	0.00***
Lending standard change	6.11	3438	2.85	2500	14.77	938	0.00***

Descriptive statistics for the full sample and the subsamples of completed and withdrawn offerings. The table reports sample means and number of observations. Additionally, it shows the p-values of a t-test for the difference between the subsamples of completed and withdrawn offerings. Variable descriptions and data sources are summarized in Table A.1. Statistics with significance at the 10%, 5%, and 1% level are denoted with *, **, and ***.

^a VC-backed sample only

54 filings in 2009.⁴ Table 2 also provides descriptive statistics about the number and percentage of filings in our sample that were completed or withdrawn, respectively. The withdrawal rate is 27.28% on average, varying between 6.13% in 2013 and 60.71% in 2008.

3.2. Descriptive statistics

We provide a list of all variables, which contains their detailed descriptions and sources, in Table A.1. Furthermore, we show descriptive statistics for the full sample and for the subsamples of completed and withdrawn offerings in Table 2 and perform a univariate t-test of our predictions. Table A.2 shows the correlations among all pairs of variables.

We first focus on corporate governance characteristics. We hand-collect board characteristics (size, experience, share of female members, CEO duality) and lock-up period information from EDGAR filings. As most firms in the data set have a lock-up period of 180 days, we construct a dummy that equals one if the lock-up period is larger than 180 days and zero otherwise. Data on retained shares is from EDGAR filings, S&P Capital IQ, and Bloomberg. Unfortunately, for approximately half of the withdrawn issues, this variable is missing, mostly because the information on retained shares was not published in the preliminary prospectus (and also not available from S&P Capital IQ or Bloomberg). We therefore do not include this variable in our main regressions but consider its effect in a separate regression. In Table 2 we observe only minor differences in corporate governance characteristics between completed and withdrawn offerings. The t-test for the differences between these two subsamples shows that none of these differences is statistically

⁴ In the empirical analysis below, we provide a robustness check where we exclude these years to see whether issues in these periods drive our results.

significant. These results do not support the view that high-quality corporate governance provides a signal that reduces agency costs during the post-filing period.

In our next category, we consider intermediary characteristics. The information on VC backing and VC location is gathered from EDGAR filings, S&P Capital IQ, and Crunchbase. For the measure of VC reputation, we rely on the Lee-Pollock-Jin VC Reputation Index (Lee et al., 2011). We do not observe a significant difference between the share of VC backed firms in the subsample of completed and withdrawn offerings in Table 2. However, we find significant differences in the share of syndicated deals and deals by reputable VCs, which are more common in the subsample of completed than in the subsample of withdrawn deals. These differences are consistent with signaling effects through VC syndication and VC reputation. The data on underwriter market share stems from Thomson Reuters Securities Data Company (SDC) Platinum. Annual data on CM rank comes from Jay Ritter's website. Our descriptive statistics suggest that larger underwriter syndicates are associated with a higher probability of completion. This is consistent with the conjecture that larger syndicates tend to deliver more valuable services (Corwin and Schultz, 2005). Underwriter quality (CM rank and market share) does not differ in both subsamples.

To obtain issuer and issue characteristics, we rely on Compustat and Thomson Reuters Securities Data Company (SDC) Platinum. Because data on firms that withdraw their offerings is scarce there, we hand-collect further information from EDGAR filings. We complement these data sources with S&P Capital IQ, Jay Ritter's website, Kenneth R. French's Data Library, and LexisNexis. Consistently with Boeh and Southam (2011), we find that older firms tend to withdraw their offerings less often than younger firms. Withdrawn issues have significantly higher debt ratios. This is consistent with the argumentation that higher debt leads to more financial risk and lower investor valuations (Boeh and Southam, 2011) and/or that these issues have a better access to alternative sources of financing so that the issuer reservation value is higher (Busaba et al., 2001). BM ratio is larger for withdrawn than for completed deals. This finding provides support for the conjecture that high BM ratio captures low growth opportunities in the industry (Dunbar and Foerster, 2008). We do not observe significant differences in firm and filing size, the proportion of high-tech firms, asset turnover or the frequency of negative news between withdrawn and completed issues.

As to the market characteristics at filing, we obtain the Nasdaq composite index from FRED. In contrast to our expectations, the descriptive statistics show that the Nasdaq composite index at the filing date is higher in the subsample of withdrawn offerings than in the subsample of completed IPOs. A possible explanation is that when the index is at a high level, it is likely that it will grow at a slower pace or even decrease. Table A.2 indeed shows a negative correlation between the Nasdaq level at the filing date and the post-filing Nasdaq return. The pre-filing increase in expected volatility is based on the VXO measure, which we collect from CBOE. In line with Boeh and Dunbar (2014) and Busaba et al. (2015), the expected volatility is positively associated with the likelihood of a withdrawal. The BAA-AAA yield spread, which is also taken from FRED, is higher in the subsample of withdrawn offerings supporting the view that higher yields increase the default risks and thus lead to lower investor valuations (Dunbar and Foerster, 2008). We retrieve the number of filings around the filing date from Thomson Reuters Securities Data Company (SDC) Platinum. We do not find any differences in the number of concurrent filings between completed and withdrawn issues.

The differences in characteristics capturing post-filing market developments between the withdrawn and completed offerings are all significant. To measure these characteristics, we consider the period between the filing date and 30 days after this date. We rely on FRED data to obtain the Nasdaq return and its standard deviation. The descriptive statistics confirm the findings from prior studies. Withdrawals are more likely when post-filing stock market returns are low (see e.g. Busaba et al., 2001). In addition, higher uncertainty, reflected in higher Nasdaq volatility, is associated with a higher probability of a withdrawal (e.g. Bouis, 2009; Schill, 2004). The yield spread change, based on FRED data, is significantly larger in the subsample of withdrawn offerings than in the subsample of completed IPOs. We proxy for the change in lending standards by using the Federal Reserve Board's Senior Loan Officer Opinion Survey on Bank Lending Practices (SLOOS) (Bergbrant et al., 2017). The results suggest that lending standards are tightened more in the subsample of withdrawn offerings than in the subsample of completed offerings. Our two debt-related variables support the conjecture that outside investors fear defaults and reduce their valuations when debt becomes more expensive (Dunbar and Foerster, 2008) and lending standards tighten.

4. Methodology

4.1. Timing

When assessing the market characteristics after filing, we face the challenge to choose an appropriate time horizon. The choice of this time horizon is important not only for the construction of the variables that capture post-filing market developments. It is also relevant when we create our indicator of high post-filing market volatility.

Ideally, we would consider the market development between the filing date and the date on which the firm decides whether to go public or to withdraw. For IPOs, we can proxy the latter date with the IPO date. The IPO date follows soon after the end of the bookbuilding process, when the firm has solicited investor demand for its shares and, based on this information, taken the final decision to complete the IPO (Busaba, 2006). For withdrawn issues, the situation is more complicated. From official sources (SEC, S&P Capital IQ, etc.), we can obtain the date when the firm submits the official Request to Withdraw Registration Statement to the SEC. However, firms that decide to withdraw their offerings may submit this document with a substantial time lag. Therefore, we have searched for press releases or news about the announcement of the withdrawal decision (using Factiva and Google) to obtain a more realistic date. Unfortunately, we have found such information for less than 50% of the withdrawn issues from our sample only. Among these cases, the date we have found almost always (more than 90%) corresponds to the official SEC date.

We consider three alternative approaches to deal with this issue. In the first approach, we employ a fixed period that has the same

length for all sample firms (IPOs and withdrawals). We set the length at 30 days after the filing date, in line with [Busaba et al. \(2001\)](#). The second approach is to apply the period between the filing and the outcome for IPOs and use an estimate for the withdrawn issues. As an estimate for the period length between the filing and the withdrawal, we employ a fixed number of 118 days, which corresponds to the average period length between the filing and the IPO in our sample. In the third approach, we rely on the outcome dates reported by the SEC, i.e. the realized IPO date and the date of the official Request to Withdraw Registration Statement to the SEC; this procedure has been applied, among others, by [Boeh and Dunbar \(2013\)](#). In our main specifications, we consider the first approach and we provide a robustness check with the two other approaches.

4.2. Baseline regressions

In our baseline regressions, we examine how each of the five variable categories described above is related to the withdrawal probability in a multivariate setting. As our dependent variable withdrawal is binary, we run a non-linear probit model, which was used in prior studies on withdrawals ([Busaba et al., 2001](#); [Helbing et al., 2019](#)). Our dependent variable equals one for withdrawn issues and zero for completed issues.

We calculate marginal effects at the mean (MEM) because the coefficients in non-linear models do not have a meaningful interpretation. We run several specifications to check the robustness of our results. The main aim is to examine whether our variables of interest change when we add further variables or alter variable definitions. We start by five specifications, in which we include the five variable categories one after the other. We first include issuer and issue controls. We then add corporate governance characteristics to examine whether these characteristics are related to the withdrawal probability while controlling for other issuer and issue variables. In the next specification, we add intermediary characteristics to the second specification and focus on the effect of the VC dummy. As next, we additionally include our fourth category of variables: market characteristics at filing. Finally, we run a full specification, in which we examine all five categories of characteristics. We thus add variables that reflect the market development 30 days after the filing date. We then alter the definition of the variables from the last category by employing alternative time horizons for their measurement. In a separate subsection, we add VC related characteristics to the full specification.

In all specifications, we control for major regulatory changes, which may have affected the likelihood of withdrawals and may be correlated to some of our variables of interest. Without these controls, our results could suffer from an omitted variable bias and reflect spurious correlations. We include period-related dummies (for a detailed description see [Table A.1](#)) that consider the following regulatory events (in line with [Busaba et al. \(2015\)](#)):

- The amendment of Rule 477 and the adoption of the safe harbor Rule 155 in March 2001, which increase issuers' possibilities to withdraw an offering and switch to a private offering.
- Sarbanes-Oxley Act (SOX) in July 2002, which essentially increases the costs of being public, particularly for young firms.
- JOBS Act in April 2012, which allows emerging growth firms to solicit indications from institutional investors prior to the official filing (Section 105(c)). These firms also get the opportunity to submit draft registration statements to the SEC for confidential review, which is not subject to filing fees and does not require consent of auditors or other experts (Section 106(a)). "Testing the Waters" prior to official filing may reduce the withdrawal probability because some of the withdrawal candidates might decide against the filing when they are disappointed by the test results.

We also consider the effects of the recent financial crisis.

4.3. Regressions with interaction terms

To examine whether corporate governance and VC characteristics turn to be more relevant when markets become highly volatile, we interact corporate governance and VC characteristics with an indicator of highly volatile stock markets. To construct the indicator of highly volatile stock markets, we divide the sample into three subsamples, depending on the 30-day post-filing Nasdaq return volatility. We define a binary variable high volatility that equals one for those issues for which the Nasdaq return volatility in the post-filing period is in the top tertile. The indicator equals zero if the volatility is in the bottom or the medium tertile. For the interaction effect analysis, we rely on the full specification, which includes all five categories of variables. We add the interaction terms between the indicator of highly volatile markets and the corporate governance characteristics one-by-one. For our six corporate governance variables we thus run six different specifications. For the VC characteristics, we run four different specifications, by adding interaction terms between the high volatility indicator and the VC dummy as well as the dummies for VC syndication, US VCs and VCs with high reputation.

If we want to understand whether during highly volatile markets good corporate governance and VC financing (or some types thereof) become more important to prevent a withdrawal, we have to quantify the marginal effects on the interaction terms because the coefficients in non-linear models do not have a meaningful interpretation. [Ai and Norton \(2003\)](#) show that the interaction effect in

Table 3
 Probit analysis of the decision to withdraw an offering, baseline specifications.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM
<i>Corporate governance characteristics</i>								
Board size		0.0007 [0.0039]	0.0000 [0.0041]	0.0007 [0.0039]	−0.0003 [0.0040]	0.0008 [0.0041]	0.0025 [0.0036]	−0.0013 [0.0027]
Board experience		0.0002 [0.0012]	−0.0005 [0.0010]	−0.0003 [0.0009]	0.0001 [0.0008]	−0.0014 [0.0014]	−0.0015 [0.0010]	0.0007 [0.0008]
Female board members		−0.0009 [0.0782]	0.0131 [0.0796]	0.0311 [0.0792]	0.0073 [0.0766]	0.0075 [0.0735]	0.0108 [0.0735]	0.0918* [0.0472]
CEO duality		−0.0163 [0.0197]	−0.0178 [0.0214]	−0.011 [0.0219]	−0.0137 [0.0246]	−0.0111 [0.0237]	−0.0142 [0.0240]	−0.0081 [0.0157]
Lock-up		−0.1895*** [0.0353]	−0.1803*** [0.0514]	−0.1670*** [0.0503]	−0.1602*** [0.0495]	−0.1382** [0.0558]	−0.1563*** [0.0504]	−0.0942*** [0.0304]
Retained shares								−0.0156 [0.0261]
<i>Intermediary characteristics</i>								
VC backing			0.0277** [0.0133]	0.0023 [0.0132]	0.0115 [0.0126]	0.0072 [0.0141]	−0.0055 [0.0191]	0.0078 [0.0150]
Number of underwriters			−0.0166** [0.0071]	−0.0283*** [0.0082]	−0.0134 [0.0108]	−0.0193* [0.0101]	−0.0132* [0.0079]	0.0037 [0.0081]
Underwriter market share			−0.1126 [0.2082]	−0.1944 [0.1919]	−0.2593 [0.1749]	−0.3124* [0.1772]	−0.1752 [0.2439]	−0.3545* [0.1839]
CM Rank			−0.0011 [0.0073]	−0.0044 [0.0069]	−0.0058 [0.0074]	−0.0026 [0.0071]	−0.002 [0.0087]	−0.0120** [0.0057]
<i>Issuer and issue characteristics</i>								
Filing size (bn USD)	−0.0772 [0.1008]	−0.1091 [0.0996]	−0.0977 [0.1051]	−0.1672 [0.1149]	−0.135 [0.1127]	−0.1837 [0.1258]	−0.1533 [0.1373]	−0.1098 [0.0830]
Firm size (bn USD)	−0.0103 [0.0298]	−0.0033 [0.0286]	0.0128 [0.0325]	0.0231 [0.0335]	0.0076 [0.0360]	0.0274 [0.0344]	0.001 [0.0378]	−0.0228 [0.0234]
Firm age	−0.0284** [0.0115]	−0.0279*** [0.0106]	−0.0258** [0.0114]	−0.0268*** [0.0102]	−0.0253*** [0.0097]	−0.0235** [0.0099]	−0.0274** [0.0132]	−0.0189 [0.0121]
High-tech	0.0398** [0.0161]	0.0432** [0.0187]	0.0343 [0.0234]	−0.0087 [0.0229]	−0.0145 [0.0211]	−0.0109 [0.0182]	0.0073 [0.0165]	−0.0152 [0.0173]
Debt ratio	0.0255*** [0.0097]	0.0313** [0.0148]	0.0365** [0.0168]	0.0332* [0.0173]	0.0351** [0.0161]	0.0380** [0.0172]	0.0373** [0.0178]	0.0208** [0.0095]
BM ratio	0.2734*** [0.1014]	0.2802*** [0.1011]	0.3130*** [0.1048]	0.2023** [0.0960]	0.2106** [0.0880]	0.1715** [0.0798]	0.1297 [0.0863]	0.1188** [0.0580]
Asset turnover	0.0051 [0.0062]	0.0056 [0.0065]	0.0072 [0.0064]	0.0114 [0.0071]	0.0100* [0.0055]	0.0063 [0.0056]	−0.0007 [0.0049]	0.0051 [0.0056]
Negative news	0.0150 [0.0129]	0.0079 [0.0093]	0.0084 [0.0112]	0.0093 [0.0112]	0.0136 [0.0110]	0.0061 [0.0116]	0.0152 [0.0156]	0.0076 [0.0111]
<i>Market characteristics at filing</i>								
Nasdaq				0.0103*** [0.0013]	0.0059*** [0.0017]	0.0026 [0.0019]	−0.0070*** [0.0017]	0.0024** [0.0010]
Implied volatility				0.1309*** [0.0210]	0.0716** [0.0298]	0.0896*** [0.0271]	0.0808*** [0.0252]	−0.0109 [0.0303]
Yield spread				0.0397 [0.0345]	0.0215 [0.0519]	0.1852** [0.0731]	0.2344*** [0.0703]	−0.0388 [0.0287]
Number of filings				−0.7272*** [0.1682]	−0.5731*** [0.0986]	−0.2351** [0.1030]	−0.2832*** [0.1073]	0.0128 [0.1424]
<i>Market characteristics after filing</i>								
Nasdaq return					−0.0697** [0.0333]	−0.2623*** [0.0453]	−0.3378*** [0.0300]	−0.0164 [0.0213]
Nasdaq std. dev.					−0.0289 [0.0308]	0.0006 [0.0110]	0.1038*** [0.0116]	−0.018 [0.0253]
Yield spread change					0.3115*** [0.1059]	0.2887*** [0.0826]	0.3131*** [0.0655]	0.1998*** [0.0645]
Lending standard change					0.0038*** [0.0038]	0.0023*** [0.0023]	−0.0003 [0.0003]	0.0024*** [0.0024]

(continued on next page)

Table 3 (continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM
Regulation 1	−0.0328 [0.0359]	−0.0386 [0.0390]	−0.0447 [0.0415]	−0.0213 [0.0556]	[0.0005] −0.0287 [0.0532]	[0.0006] −0.0573 [0.0552]	[0.0006] −0.0428 [0.0492]	[0.0004] −0.007 [0.0371]
Regulation 2	0.0651 [0.1447]	0.0181 [0.1567]	0.0459 [0.1804]	0.0117 [0.1582]	−0.2997 [0.1921]	−0.4559*** [0.1266]	−0.3562** [0.1432]	−0.0756 [0.1380]
Regulation 3	−0.1284*** [0.0253]	−0.1401*** [0.0219]	−0.1389*** [0.0267]	−0.2960*** [0.0275]	−0.1711*** [0.0224]	−0.1243*** [0.0269]	0.0331 [0.0355]	−0.1244*** [0.0209]
Obs.	2996	2588	2470	2468	2468	2461	2460	2145
Pseudo R-Squared	0.0254	0.0301	0.0346	0.0693	0.1029	0.1288	0.2238	0.0973

Probit model in which the dependent variable equals one for withdrawn offerings and zero for completed offerings. Descriptions of the variables and data sources are depicted in Table A.1. Marginal effects at the mean (MEM) are reported. Variable categories are added one by one in specifications (1)–(5). Specifications (6) and (7) employ alternative definitions of the post-filing period. Specification (8) adds the variable retained shares. Pseudo R-squared corresponds to McFadden's pseudo R-squared. Standard errors clustered at industry level are in parentheses. Statistics with significance at the 10%, 5%, and 1% level are denoted with *, **, and ***.

non-linear models is conditional on the values of all independent variables. It is even possible that the sign of the interaction effect changes when we vary the value of other independent variables. This has also direct implications for testing the statistical significance of the interaction effect because it cannot be tested with a simple *t*-test on the estimated interaction effect as in a linear model. As the coefficients on the interaction cannot be interpreted in a meaningful way and their test statistics are not correct, we apply the method suggested by Ai and Norton (2003) and Norton et al. (2004) to calculate the magnitudes of the interaction effects and to test their significance. In their method the interaction effects are calculated by computing cross-partial derivatives.

As the marginal effect is different for each observation, the most straightforward way to report these effects and their corresponding *z*-statistic (for continuous variables) is to plot them against the predicted probabilities. Besides these figures, we also provide summary statistics of the marginal effects in a table to obtain an overview. For continuous variables, we exhibit the MEMs and their corresponding *z*-statistics. In order to check whether the binary variables are more significant in highly volatile than in less volatile markets, we evaluate their effects (of a change between zero and one) separately at both values of the high volatility indicator.

5. Results

5.1. Baseline results

We exhibit the outcomes from the multivariate analysis in Table 3. The results in specification (1) are mostly consistent with the findings from the univariate analysis. The only exception is the high-tech dummy, but this variable turns insignificant in later specifications. We add our corporate governance characteristics in specification (2) and observe that, with one exception, none of them is statistically significant. Only the lock-up dummy has a statistically significant effect. This effect is negative, suggesting that longer lock-up periods tend to serve as a signaling device to outside investors. This result is consistent with findings in Boeh and Southam (2011) and Helbing et al. (2019). However, it must be interpreted with caution because the variation in this variable is very low. Only 3.7% of the sample observations have a lock-up period that exceeds 180 days (for which the binary variable equals 1). In specification (3), we find a positive effect of the VC backing, suggesting that VCs are associated with a higher withdrawal probability. VC dummy is significant only in this specification. Once we control for market characteristics, VC dummy loses its significance. For the underwriter characteristics, the results are consistent with the univariate results. The marginal effects of the issue, issuer, and corporate governance characteristics do not change much compared to the first and second specifications.

In specification (4), the Nasdaq level and the expected volatility are positively associated with the likelihood of a withdrawal, which is in line with the descriptive statistics. Yield spread has a positive and statistically significant effect, too. The number of filings, which was not significantly different in the subsample of withdrawn and completed issues, has a negative and significant effect, which contradicts our expectations. This finding suggests that in hot markets, the completion rates are higher. The signs and statistical significance levels of the other effects do not change much compared to the first three specifications. In specification (5), our full specification, we find a highly statistically significant negative effect of the post-filing Nasdaq return, which is consistent with the univariate results. The development on the debt market seems to be important as well. An increase in the yield spread is related to a higher withdrawal probability, which supports the view that increased default risk reduces investor appetite for new firms (Dunbar and Foerster, 2008). The tightening in lending standards is also related to a higher probability to withdraw. All in all, we conclude that negative equity and debt market developments 30 days after the filing, reflected in low levels of market returns, yield spread and tightening of lending standards, are associated with higher withdrawal rates. Withdrawals are more likely when market conditions become more challenging. This is consistent with what issuers themselves claim (Boeh and Dunbar, 2013).

In specifications (6) and (7), we perform regressions with an alternative definition of the post-filing period. For the IPOs, we consider the development in the period between the filing and the listing. For the withdrawals, we employ first a fixed period, common to all withdrawals (average of the filing-to-outcome period for IPOs) and, second, a period between the filing and the date of the official

Table 4

Interactions of corporate governance characteristics with high volatility indicator.

Panel A: Continuous variables		Obs	Mean	Std Dev	Min	Max
Board size	Interaction term	2468	−0.02***	0.01	−0.03	0.00
	Z-value	2468	−2.63	0.49	−4.78	−0.70
Board experience	Interaction term	2468	−0.01***	0.00	−0.01	0.00
	Z-value	2468	−3.60	0.73	−5.52	−0.77
Female board members	Interaction term	2468	0.22*	0.08	0.04	0.34
	Z-value	2468	1.74	0.11	0.71	2.04
Retained shares	Interaction term	2145	−0.12	0.06	−0.27	0.00
	Z-value	2145	−1.38	0.20	−2.25	−0.48
Panel B: Dummy variables		At high volatility = 0		At high volatility = 1		
CEO duality		−0.0432		0.0281		
		[0.0377]		[0.0190]		
Lock-up		−0.2081***		0.0592		
		[0.0243]		[0.0737]		

In Panel A, summary statistics of the marginal effects of the interaction terms from the models in Table A.4 are reported for all continuous variables. Marginal effects and their z-statistics are calculated using the method by Ai and Norton (2003) and Norton et al. (2004). Details on marginal effects and their z-statistics are depicted in Figs. A.1–A.4. In Panel B, we evaluate the effect of the dummy variables at both values of the high volatility variable. Descriptions of the variables and data sources are depicted in Table A.1. Statistics with significance at the 10%, 5%, and 1% level are denoted with *, **, and ***.

withdrawal letter for each individual observation. The results from columns (5) and (6) are similar, in column (7) the Nasdaq standard deviation turns positive suggesting that withdrawals are more likely in volatile environments. Lending standard change becomes insignificant. The choice of the post-filing period does not have any important effects on the variables from the other four categories. Importantly, the choice of the post-filing period does not affect the results on our variables of interest (corporate governance characteristics and VC backing). Finally, specification (8) adds the variable retained shares, which we have not included in the other specifications because it reduces the number of observations, particularly for the withdrawn issues, due to its missing values. The effect of this corporate governance variable is not statistically significant.

We perform two robustness checks for our main results. First, in order to examine whether individual industries drive our results, we perform the full specification while leaving out observations from one industry.⁵ We run this regression twelve times for each of the Fama French 12 industries. As another robustness check, we exclude the filings during the dotcom bubble and the recent financial crisis. We display the results from these robustness checks in Table A.3. We see only minor differences to the main results. Most of the variables keep their sign and significance.

5.2. Corporate governance characteristics in risky market environments

Our results so far have not supported the view that corporate governance characteristics provide signals that affect the withdrawal probability. In this section, we examine whether signaling through corporate governance characteristics turns to be relevant when markets become highly volatile and investors thus face higher risks and uncertainties.

To this aim, we interact our high volatility indicator with corporate governance characteristics and show an overview of the marginal effects on these interaction terms in Table 4. (For a detailed overview, we exhibit the coefficients on all variables included in these models in Table A.4.) Panel A covers the continuous corporate governance variables: board size, board experience, female board members, and retained shares. The results suggest that larger and more experienced boards are associated with a lower withdrawal probability in highly volatile environments. Both interaction terms are highly statistically significant at the 1% level. These findings support the view that signaling through good corporate governance, which does not seem to be important on average, turns relevant when investors face greater risks and uncertainties. Larger and more experienced boards may signal good quality of the firms and mitigate agency costs resulting from adverse selection. They may also provide a signal of good monitoring that reduces agency costs of moral hazard.

Boards with a higher share of females are associated with a higher withdrawal probability in volatile markets. This effect is significant at the 10% level only. We thus do not find support for our prediction that more diverse teams would provide a better monitoring and thus deliver a positive signal towards the investors. A potential explanation for this finding could be that more heterogeneous boards are more difficult to manage and less likely to reach an agreement when markets become more volatile. Finally, the sign of the interaction term on retained shares is negative, in line with the expectation that incentive alignment signals are more

⁵ It was not possible to perform an industry specific analysis since our models do not converge for several individual industries due to the small number of observations.

Table 5

Probit analysis of the decision to withdraw an offering, full specification with VC characteristics.

	(1)	(2)	(3)
	MEM	MEM	MEM
<i>Corporate governance characteristics</i>			
Board size	−0.001 [0.0042]	−0.0016 [0.0042]	−0.0012 [0.0042]
Board experience	0.000 [0.0009]	0.000 [0.0009]	0.0001 [0.0009]
Female board members	0.0047 [0.0779]	0.0063 [0.0775]	0.0031 [0.0777]
CEO duality	−0.0139 [0.0234]	−0.0122 [0.0246]	−0.0141 [0.0245]
Lock up	−0.1548*** [0.0510]	−0.1591*** [0.0521]	−0.1541*** [0.0512]
<i>Intermediary characteristics</i>			
Non-VC	−0.0555* [0.0286]	−0.0494** [0.0220]	−0.0175 [0.0123]
VC syndication	−0.0520* [0.0310]		
VC US		−0.0467* [0.0260]	
VC reputation			−0.0114 [0.0162]
Number of underwriters	−0.0128 [0.0114]	−0.0131 [0.0113]	−0.0126 [0.0112]
Underwriter market share	−0.2493 [0.1768]	−0.2553 [0.1784]	−0.2613 [0.1753]
CM Rank	−0.0062 [0.0074]	−0.0062 [0.0074]	−0.0054 [0.0074]
<i>Issuer and issue characteristics</i>			
Filing size (bn USD)	−0.1385 [0.1147]	−0.1339 [0.1131]	−0.1314 [0.1127]
Firm size (bn USD)	0.011 [0.0365]	0.0121 [0.0364]	0.0087 [0.0361]
Firm age	−0.0242** [0.0097]	−0.0245** [0.0097]	−0.0244** [0.0097]
High-tech	−0.0112 [0.0206]	−0.0143 [0.0207]	−0.0116 [0.0211]
Debt ratio	0.0323* [0.0181]	0.0338* [0.0186]	0.0328* [0.0183]
BM ratio	0.2065** [0.0870]	0.2128** [0.0876]	0.2139** [0.0883]
Asset turnover	0.0104** [0.0053]	0.0115** [0.0053]	0.0103* [0.0053]
Negative news	0.0098 [0.0117]	0.0079 [0.0111]	0.0103 [0.0109]
<i>Market characteristics at filing</i>			
Nasdaq	0.0058*** [0.0016]	0.0055*** [0.0016]	0.0056*** [0.0016]
Implied volatility	0.0741** [0.0297]	0.0704** [0.0330]	0.0718** [0.0306]
Yield spread	0.0132 [0.0512]	0.0111 [0.0515]	0.0169 [0.0515]
Number of filings	−0.6028*** [0.1020]	−0.5991*** [0.0950]	−0.5758*** [0.0958]
<i>Market characteristics after filing</i>			
Nasdaq return	−0.0729** [0.0323]	−0.0721** [0.0304]	−0.0696** [0.0322]
Nasdaq std. dev.	−0.0249 [0.0296]	−0.0228 [0.0304]	−0.0245 [0.0300]
Yield spread change	0.3044*** [0.1010]	0.3152*** [0.1024]	0.3135*** [0.1033]
Lending standard change	0.0038*** [0.0005]	0.0038*** [0.0005]	0.0038*** [0.0005]
Regulation 1	−0.026 [0.0526]	−0.0273 [0.0512]	−0.0269 [0.0529]
Regulation 2	−0.2919	−0.2949	−0.2972

(continued on next page)

Table 5 (continued)

	(1)	(2)	(3)
	MEM	MEM	MEM
Regulation 3	[0.1953] −0.1687***	[0.1955] −0.1633***	[0.1944] −0.1649***
Obs.	[0.0209] 2435	[0.0210] 2438	[0.0220] 2442
Pseudo R-Squared	0.1027	0.1038	0.1022

Probit model in which the dependent variable equals one for withdrawn offerings and zero for completed offerings. Specification (5) of Table 3 is taken as baseline specification and VC dummy is replaced by different VC characteristics one-by-one. Descriptions of the variables and data sources are depicted in Table A.1. Marginal effects at the mean (MEM) are reported. Pseudo R-squared corresponds to McFadden's pseudo R-squared. Standard errors clustered at industry level are in parentheses. Statistics with significance at the 10%, 5%, and 1% level are denoted with *, **, and ***.

Table 6
Interactions of VC characteristics with high volatility indicator.

	At high volatility = 0	At high volatility = 1
VC backing	0.034 [0.024]	−0.017 [0.021]
VC syndication	−0.024 [0.042]	−0.074** [0.035]
VC US	−0.052 [0.053]	−0.027 [0.022]
VC reputation	−0.036** [0.015]	0.014 [0.020]

We evaluate the effect of the dummy variables at both values of the high volatility variable. Descriptions of the variables and data sources are depicted in Table A.1. Statistics with significance at the 10%, 5%, and 1% level are denoted with *, **, and ***.

important in highly volatile markets, but the effect is not statistically significant. Figs. A.1-A.4 in the appendix exhibit the marginal effects in detail.⁶

Table 4, Panel B exhibits the interaction effects between the high volatility indicator and the two corporate governance dummy variables CEO duality and lock-up. For the CEO duality, we observe a positive sign under volatile markets, which is in line with the signaling effect, but this effect is not statistically significant. The only corporate governance variable, which has been significant in the baseline regressions, is the lock-up dummy. In line with the signaling theories, we have observed that longer lock-up periods are associated with lower withdrawal probabilities. The results in Table 4, Panel B suggest that, surprisingly, this effect is driven by observations in less volatile market environments. As indicated above, the lock-up results must be interpreted carefully because the variance of this variable is very low.

To sum up, we find that corporate governance characteristics, such as larger and more experienced boards, which were insignificant in the baseline regressions, are highly statistically significant in highly volatile environments. We thus conclude that signaling through high-quality corporate governance seems to matter in risky and uncertain market environments.

5.3. VCs and withdrawals

The role of VCs in IPO withdrawals has been discussed controversially. On the one hand, VCs could provide a signal of a higher quality and a better monitoring and thus increase investor valuations. On the other hand, they may raise firm's reservation value by following a dual-track strategy or by postponing the IPO. In our full specification from Table 3, the VC dummy was insignificant.

In a more detailed analysis, we want to delve into the effects of VC characteristics to understand whether a particular outcome is associated with a particular VC type more often. Table 5 exhibits the MEMs from baseline regressions, which are based on the full specification from Table 3, but consider VC characteristics instead of a VC dummy. In each of the three specifications, we include two

⁶ All figures show a similar pattern, where the interaction effect is nearly zero and insignificant for predicted probabilities at $y = 0$ and reaches its maximum or minimum value at about $y = 0.5$. This is reasonable, since if the predicted probability of a withdrawal is $y = 0$, which means that the outcome is clear, then the influence of the considered variable is negligible in volatile market conditions. In contrast, the considered variable is important volatile market conditions if the predicted probability is around $y = 0.5$ and the outcome is not clear due to other covariates.

VC related dummies. The first dummy equals one for non-VC backed firms and zero otherwise. The second dummy equals one for VC syndication (specification (1)), for US VCs (specification (2)), and for reputable VCs (specification (3)), respectively. We thus compare syndicated to non-syndicated deals, deals of US VCs to deals of foreign VCs and deals of reputable VCs to deals of less reputable VCs, respectively.

The negative marginal effect on the VC syndication dummy in specification (1) suggests that firms backed by a VC syndicate face a lower withdrawal probability than firms backed by stand-alone VCs. This result is in line with the signaling and value-adding effects through multiple VCs compared to stand-alone VCs (Boeh and Southam, 2011; Brander et al., 2002). From specification (2) we learn that US VCs tend to be associated with a lower withdrawal probability compared to non-US VCs. This finding is consistent with the signaling theories because domestic VCs may signal to the investors that the company will be more strongly monitored than with more distant foreign VCs. The effect of reputation is insignificant. A possible explanation is that two effects work in the opposite direction. On the one hand, firms backed by reputable VCs may more often postpone their IPOs. They also could be associated more frequently with a dual-track strategy, which increases their reservation value and, in turn, the probability of their withdrawal. On the other hand, reputable VCs may provide a stronger signal to potential investors, which raises investor valuations and should lead to a lower withdrawal probability.

In the next step, we want to examine the VC effects under more and less risky market environments. To this aim, we run regressions with interaction terms of VC variables and the indicator of highly volatile markets. To find out whether the VC (binary) variables are more or less significant in highly volatile markets, we evaluate their effects (of a change between zero and one) separately at both values of the high volatility variable. We show the results in Table 6.

The overall VC effect, which was insignificant in the baseline regressions, remains insignificant in highly volatile and in less volatile environments. From the analysis of VC characteristics, we conclude that the syndicate effect, which we have found in baseline regressions, is present in highly volatile, but not in less volatile environments. VC syndicates thus seem to provide a better signaling device than stand-alone VCs when investors face greater risks and uncertainties. In the baseline analysis, VC reputation was insignificant. When we distinguish between less volatile and highly volatile markets, we find that reputable VCs are associated with lower withdrawal rates only in less volatile and not in highly volatile environments. This result does not support the signaling explanation. Rather, it suggests that reputable VCs are more likely to follow a dual-track strategy or postpone their IPOs when market conditions get more risky.

6. Conclusions

This paper contributes to a better understanding of the withdrawal phenomenon. We demonstrate that corporate governance characteristics may become important when markets get highly volatile. In risky environments, investors seem to rely on signals of high quality and strong monitoring that result from large and experienced boards. VCs seem to be an important force behind the withdrawal decision, too, but the VC effect varies with the VC heterogeneity. While in volatile markets, VC syndication may serve as a positive signal that is associated with a lower withdrawal probability, reputable VCs may more likely be seeking for alternatives to a current IPO.

This study raises some interesting questions for further research. First, our paper and most other studies deal with US data. Recently, researchers have started to analyze withdrawals in other regions, such as Europe (Helbing et al., 2019) or Asia (Fan and Yamada, 2020). More evidence is needed because the withdrawal determinants seem to differ in different regions (Helbing et al., 2019). As corporate governance and VC financing are very heterogeneous across US, Europe and Asia, it would be interesting to see whether and how these heterogeneities relate to the differences in withdrawal probabilities. Second, our conjecture that the differences in the IPO outcome for reputable VCs in highly volatile and less volatile markets may be associated with the dual-track strategy deserves a deeper investigation. Further research might examine, for example, the characteristics of firms that follow the dual-track strategy and analyze its outcomes as well as implications for the various market participants (issuers, intermediaries, potential IPO investors, and potential acquirers).

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Table A.1

Variable descriptions and data sources.

Variable	Description	Source	Expected effect
Dependent variable			
Withdrawal	Dummy variable that equals one if the filing is withdrawn and zero if the filing is completed.	Thomson Reuters Securities Data Company (SDC) Platinum	
Independent variables			
<i>Corporate governance characteristics</i>			
Board size	Absolute number of board members	EDGAR filings	–
Board experience	Average age of all board members	EDGAR filings	–
Female board members	Ratio of number of female board members to total number of board members.	EDGAR filings	–
CEO duality	Dummy that equals one if both the role of CEO and the role of chairman reside with the CEO of the company and zero otherwise.	EDGAR filings	+
Lock-up	Dummy that equals one if the lock-up period that is reported in EDGAR filings is larger than 180 and zero otherwise.	EDGAR filings	–
Retained shares	Proportion of shares held by insiders post offering. (Shares outstanding post offering - (primary shares + secondary shares))/shares outstanding post offering	Own calculation based on data stemming from S&P Capital IQ, Bloomberg and EDGAR filings	–
<i>Intermediary characteristics</i>			
VC backing	Dummy indicating whether the firm is backed by a venture capital investor at the time of the filing. Equals one if firm is backed by venture capital and zero otherwise.	S&P Capital IQ, EDGAR filings, Crunchbase	+/-
Non-VC	Dummy that equals one if firm is not backed by venture capital and zero otherwise.	S&P Capital IQ, EDGAR filings, Crunchbase	
VC syndication	Dummy that equals one if the firm is backed by venture capital and the VC deal is syndicated and zero otherwise.	S&P Capital IQ, EDGAR filings, Crunchbase	+/-
VC US	Dummy that equals one if the firm is backed by venture capital and all VCs that are involved in the deal are located in the US and zero otherwise.	S&P Capital IQ, EDGAR filings, Crunchbase	+/-
VC reputation	Dummy variable that equals one if the firm is backed by high reputable VCs and zero otherwise. A VC deal is considered to be reputable if the VC with the highest rank is among the top 100 according to the reputation index provided by Lee et al. (2011). The index ends in 2010. Thus, we use the ranking of 2010 for all years after 2010.	S&P Capital IQ, EDGAR filings, Crunchbase. VC reputation index provided by Lee et al. (2011) (http://www.timothypollock.com/vc_reputation.htm)	+/-
Number of underwriters	Number of underwriters involved in the issue.	Thomson Reuters Securities Data Company (SDC) Platinum	+/-
Underwriter market share	Market share of lead underwriter in filing year. The amount of a transaction is divided by the total number of bookrunners on the transaction. Each bookrunner will receive that amount as credit for the transaction.	Lead Tables of Thomson Reuters Securities Data Company (SDC) Platinum, EDGAR filings	+/-
CM Rank	Carter - Manaster Rank of lead underwriter in filing year. It ranges from 0 to 9.	Jay Ritter's website (https://site.warrington.ufl.edu/ritter/ipo-data/). Originally developed by Carter and Manaster (1990), updated by Carter, Dark, and Singh (1998) and by Loughran and Ritter (2004).	+/-
<i>Issuer and issue characteristics</i>			
Filing size (bn USD)	Filing size in bn USD. Calculated as the product of original global shares filed and original mid filing price.	Thomson Reuters Securities Data Company (SDC) Platinum	–
Firm size (bn USD)	Total assets in bn USD in most recent financial period before outcome.	Data primarily taken from Compustat. Supplemented with and checked against data stemming from S&P Capital IQ and EDGAR filings.	–
Firm age	Firm age at outcome date in years (outcome date – founding date)	Founding and outcome date primarily taken from Thomson Reuters Securities Data Company (SDC) Platinum. Supplemented with and checked against data stemming from Jay Ritter's website (https://site.warrington.ufl.edu/ritter/ipo-data/) and S&P Capital IQ.	–
High-tech	Dummy indicating high tech industry. Equals one if primary industry of the firm is high-tech industry according to the SDC definition and zero otherwise.	Thomson Reuters Securities Data Company (SDC) Platinum	–
Debt ratio	Ratio of total liabilities to total assets in most recent financial period before outcome.		+/-

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Table A.1 (continued)

Variable	Description	Source	Expected effect
BM ratio	Book-to-market ratio for firms in the issuer's Fama-French industry (49) in the year before filing.	Data primarily taken from Compustat. Supplemented with and checked against data stemming from S&P Capital IQ and EDGAR filings.	+/-
Asset turnover	Ratio of total revenues to total assets in most recent financial period before outcome.	Kenneth R. French's Data Library (Kenneth R. French's website http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html).	-
Negative news	Dummy that equals one if the LexisNexis Negative News Search delivers that negative business news were reported about the firm one year prior to the outcome date and zero otherwise.	Data primarily taken from Compustat. Supplemented with and checked against data stemming from S&P Capital IQ and EDGAR filings. LexisNexis	+
<i>Market characteristics at filing</i>			
Nasdaq (index / 100)	Nasdaq composite index (scaled by 100)	FRED, website of Federal Reserve Bank of St. Louis (https://research.stlouisfed.org/)	-
Implied volatility	Based on CBOE S&P 100 volatility index (VXO). It measures the expected volatility over the next 30 days. We choose VXO instead of VIX because it is continuously available over the whole sample period. The calculation of VIX changes in 2003. For our implied volatility measure we calculate: VXO at filing date - VXO one month before filing date / VXO one month before filing date.	CBOE (http://www.cboe.com/products/vix-index-volatility/vix-options-and-futures/vix-index/vix-historical-data)	+
Yield spread	BAA-AAA yield spread at filing date. Difference between the Moody's BAA-rated corporate bonds and the AAA-rated bond.	FRED, website of Federal Reserve Bank of St. Louis (https://research.stlouisfed.org/)	-
Number of filings	Number of new filings +/- 21 days around the filing date (per day)	Own calculations based on data from Thomson Reuters Securities Data Company (SDC) Platinum	+
<i>Market characteristics after filing</i>			
Nasdaq return (daily)	Compounded daily Nasdaq returns after filing.	own calculations based on on FRED data (https://research.stlouisfed.org/)	-
Nasdaq std. dev.	Standard deviation of Nasdaq returns after filing (scaled by 100).	own calculations based on on FRED data (https://research.stlouisfed.org/)	+
Yield spread change	Change in BAA-AAA yield spread after filing.	own calculations based on on FRED data (https://research.stlouisfed.org/)	+/-
Lending standard change	Change in bank lending standard around the filing date. Based on the quarterly Federal Reserve Board's Senior Loan Officer Opinion Survey on Bank Lending Practices. The particular question was "over the past three months, how have your bank's credit standards for approving applications for C&I loans or credit lines - other than those to be used to finance mergers and acquisitions - to large and middle-market firms and to small firms changed". The response options range from (1) "Tightened considerable" to (5) "Eased considerable". The lending standard measure is then calculated as the difference between the number of loan officers reporting tightening lending standards and the number of officers reporting easing standards divided by the total number of reporting times 100. Thus, a positive value implies that lending standards have tightened and a negative value implies that the lending standards have eased. We employ the nearest quarter after the filing date.	Federal Reserve Board's Senior Loan Officer Opinion Survey on Bank Lending Practices (SLOOS) (https://www.federalreserve.gov/data/sloos.htm)	+/-
High volatility	Dummy that equals one if the Nasdaq std. dev. is in the top tertile, zero otherwise.	own calculations based on on FRED data (https://research.stlouisfed.org/)	+
<i>Time dummies</i>			
Regulation 1	Dummy that equals one between April 2001 and September 2004 and zero otherwise. It starts the month following the amendment of Rule 477 and the adoption of Rule 155.	Cf. Busaba et al. (2015)	+
Regulation 2	Dummy that equals one during the financial crisis (between August 2008 and May 2009) and zero otherwise	Cf. Busaba et al. (2015)	+
Regulation 3	Dummy that equals one after the Jumpstart our Business Startups (JOBS) Act (since May 2012) until the end of the sample period and zero otherwise	Cf. Busaba et al. (2015)	-

Note: Firm age, debt ratio, firm size, asset turnover, filing size, board size and board experience are winsorized at the 1% level in each tail

Table A.2
Correlation table.

	Filing size	Firm size	Firm age	High-tech	Debt ratio	BM ratio	Asset turnover	Negative news	Board size	Board experience
Filing size	1.00									
Firm size	0.47***	1.00								
Firm age	0.22***	0.34***	1.00							
High-tech	-0.18***	-0.21***	-0.28***	1.00						
Debt ratio	-0.05***	-0.02	0.01	0.01	1.00					
BM ratio	0.25***	0.24***	0.15***	-0.50***	0.00	1.00				
Asset turnover	-0.07***	-0.10***	0.09***	-0.13***	0.16***	-0.05***	1.00			
Negative news	0.07***	0.08***	0.01	0.11***	-0.04**	-0.03*	-0.07***	1.00		
Board size	0.05***	0.15***	0.11***	0.04**	-0.03*	0.04**	-0.14**	0.11***	1.00	
Board experience	0.06***	0.14***	0.18***	-0.16***	0.06***	0.21***	-0.02	0.00	0.17***	1.00
Female board members	-0.02	0.05***	0.04**	-0.02	0.00	0.00	-0.03	0.01	0.07***	-0.01
CEO duality	-0.04*	-0.03*	-0.04**	-0.01	-0.03*	-0.02	0.02	-0.01	-0.11***	-0.10***
Lock-up	-0.11***	-0.04**	-0.04**	-0.05***	0.12***	-0.03*	0.11***	-0.07***	-0.10***	-0.01
Retained shares	-0.09***	0.01	-0.10***	0.21***	-0.09***	-0.17***	-0.08***	0.06***	0.11***	-0.09***
VC backing	-0.13***	-0.16***	-0.25***	0.36***	-0.07***	-0.20***	-0.21***	0.11***	0.13***	-0.10***
VC syndication	-0.06**	-0.02	-0.06**	0.17***	-0.06**	-0.07***	-0.06**	0.03	0.05*	-0.06**
VC US	0.05*	0.08***	0.02	-0.10***	0.03	0.05*	0.11***	-0.05*	-0.06**	-0.05*
VC reputation	-0.07**	-0.04	-0.04	0.20***	-0.13***	-0.10***	-0.10***	0.01	0.00	-0.05*
Number of underwriters	0.38***	0.35***	0.13***	-0.18***	-0.01	0.26***	-0.07***	0.06***	0.07***	0.13***
Underwriter market share	0.32***	0.20***	0.08***	0.00	-0.13***	0.10***	-0.08***	0.14***	0.08***	-0.07***
CM Rank	0.28***	0.14***	0.08***	0.08***	-0.22***	0.04**	-0.10***	0.16***	0.16***	-0.08***
Nasdaq	0.02	0.00	-0.12***	0.23***	-0.04**	-0.03**	-0.19***	0.06***	0.06***	-0.04**
Implied volatility	0.01	0.03	-0.01	-0.01	-0.01	0.01	0.00	0.02	-0.03*	0.00
Yield spread	0.18***	0.07***	0.05***	-0.08***	0.06***	0.32***	0.00**	0.04**	0.05***	0.15***
Number of filings	-0.20***	-0.14***	-0.13***	0.22***	-0.09***	-0.32***	-0.04**	-0.01	-0.04**	-0.29***
Nasdaq return	-0.02	-0.02	-0.06***	0.02	0.01	-0.06***	0.00	0.03*	-0.02	-0.03*
Nasdaq std. dev.	-0.05***	-0.06***	-0.12***	0.23***	-0.06***	-0.12***	-0.11***	0.03*	0.01	-0.19***
Yield spread change	0.02	0.01	-0.01	0.04***	-0.01	0.03	-0.02	-0.04**	0.00	-0.02
Lending standard change	-0.04**	-0.04**	-0.10***	0.18***	-0.05***	-0.08***	-0.06***	0.03*	0.01	-0.18***

	Female board members	CEO duality	Lock-up	Retained shares	VC backing	VC syndication	VC US	VC reputation	Number of underwriters	Underwriter market share
Female board members	1.00									
CEO duality	-0.02	1.00								
Lock-up	-0.03	0.04**	1.00							
Retained shares	0.01	0.00	-0.07***	1.00						
VC backing	0.02	-0.05**	-0.11***	0.19***	1.00					
VC syndication	0.00	-0.04	-0.02	0.05*		1.00				
VC US	-0.01	0.11***	0.00	0.02		-0.17***	1.00			

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Table A.2 (continued)

	Female board members	CEO duality	Lock-up	Retained shares	VC backing	VC syndication	VC US	VC reputation	Number of underwriters	Underwriter market share
VC reputation	0.05**	−0.02	−0.04	0.12***		0.34***	−0.03	1.00		
Number of underwriters	0.01	−0.07***	−0.09***	−0.03	−0.07***	−0.03	0.00	0.00	1.00	
Underwriter market share	−0.03	−0.03*	−0.15***	0.08***	0.08***	0.05*	0.02	0.16***	0.13***	1.00
CM Rank	0.01	−0.07***	−0.40***	0.11***	0.19***	0.04	0.00	0.13***	0.20***	0.55***
Nasdaq	0.01	−0.05***	−0.10***	0.18***	0.23***	0.11***	−0.08***	0.09***	0.17***	0.08***
Implied volatility	0.02	−0.01	−0.01	−0.02	0.00	0.01	−0.02	0.00	0.00	0.00
Yield spread	0.02	−0.06***	−0.04*	−0.04*	0.01	0.00	0.02	0.00	0.22***	0.15***
Number of filings	−0.04**	0.09***	0.01	0.15***	0.08***	0.02	0.00	0.05*	−0.35***	−0.04**
Nasdaq return	0.01	−0.01	0.04**	0.02	0.02	−0.02	0.02	0.00	0.01	−0.02
Nasdaq std. dev.	−0.02	0.04**	−0.05***	0.18***	0.17***	0.07*	−0.04*	0.04	−0.15***	0.07***
Yield spread change	−0.03*	0.01	−0.04**	0.01	0.03	0.03	0.00	−0.03	−0.01	0.03*
Lending standard change	−0.01	0.03	−0.03	0.17***	0.09***	0.06**	0.01	0.02	−0.24***	0.11***

	CM Rank	Nasdaq	Implied volatility	Yield spread	Number of filings	Nasdaq return	Nasdaq std. dev.	Yield spread change	Lending standard change
CM Rank	1.00								
Nasdaq	0.19***	1.00							
Implied volatility	0.02	−0.03	1.00						
Yield spread	0.08***	−0.07***	−0.03**	1.00					
Number of filings	0.02	0.29***	0.05***	−0.50***	1.00				
Nasdaq return	−0.02	−0.07***	0.02	−0.04**	−0.09***	1.00			
Nasdaq std. dev.	0.12***	0.68***	0.03*	−0.12***	0.52***	−0.19***	1.00		
Yield spread change	0.04**	0.16***	0.25***	−0.12***	0.14***	−0.23***	0.22***	1.00	
Lending standard change	0.11***	0.33***	0.08***	0.10***	0.26***	−0.16***	0.57***	0.19***	1.00

Table A.3

Industry- and time-specific analysis.

	Industry-specific analysis						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	MEM	MEM	MEM	MEM	MEM	MEM	MEM
<i>Corporate governance characteristics</i>							
Board size	0.0001 [0.0043]	−0.0013 [0.0041]	−0.0004 [0.0042]	0.0006 [0.0043]	−0.0001 [0.0041]	−0.0034 [0.0034]	−0.0007 [0.0043]
Board experience	0.0002 [0.0008]	−0.0002 [0.0008]	0.0000 [0.0008]	−0.0002 [0.0009]	0.0001 [0.0008]	−0.0009 [0.0008]	0.0003 [0.0009]
Female board members	−0.0134 [0.0884]	0.0106 [0.0772]	0.0231 [0.0752]	0.0095 [0.0772]	0.0063 [0.0788]	0.0172 [0.0931]	0.0079 [0.0789]
CEO duality	−0.017 [0.0244]	−0.0202 [0.0226]	−0.0174 [0.0243]	−0.0197 [0.0230]	−0.0131 [0.0252]	0.0188 [0.0200]	−0.0162 [0.0246]
Lock-up	−0.1673*** [0.0618]	−0.1522*** [0.0495]	−0.1559*** [0.0546]	−0.1586*** [0.0489]	−0.1853*** [0.0482]	−0.1211*** [0.0393]	−0.1480*** [0.0501]
<i>Intermediary characteristics</i>							
VC backing	0.0112 [0.0130]	0.0158 [0.0127]	0.0055 [0.0106]	0.0062 [0.0106]	0.0114 [0.0127]	0.0236 [0.0165]	0.0094 [0.0128]
Number of underwriters	−0.0146 [0.0113]	−0.012 [0.0109]	−0.0113 [0.0110]	−0.009 [0.0102]	−0.0141 [0.0111]	−0.0228** [0.0102]	−0.0146 [0.0111]
Underwriter market share	−0.215 [0.1813]	−0.3034* [0.1627]	−0.2667 [0.1776]	−0.2386 [0.1856]	−0.2458 [0.1787]	−0.086 [0.2047]	−0.3307** [0.1602]
CM Rank	−0.0063 [0.0075]	−0.0052 [0.0076]	−0.006 [0.0079]	−0.0051 [0.0079]	−0.0059 [0.0075]	−0.006 [0.0098]	−0.0038 [0.0073]
<i>Issuer and issue characteristics</i>							
Filing size (bn USD)	−0.1452 [0.1222]	−0.1328 [0.1212]	−0.1221 [0.1136]	−0.2308*** [0.0730]	−0.1436 [0.1168]	−0.1452 [0.1420]	−0.1379 [0.1225]
Firm size (bn USD)	0.0105 [0.0377]	−0.0031 [0.0367]	−0.0032 [0.0341]	0.0175 [0.0364]	0.006 [0.0367]	0.0156 [0.0407]	0.0161 [0.0384]
Firm age	−0.0233** [0.0100]	−0.0237** [0.0097]	−0.0251** [0.0106]	−0.0251** [0.0105]	−0.0264*** [0.0101]	−0.0231* [0.0126]	−0.0242** [0.0101]
High-tech	−0.0118 [0.0210]	−0.0041 [0.0198]	−0.0155 [0.0229]	−0.013 [0.0222]	−0.0111 [0.0218]	−0.0204 [0.0275]	−0.0121 [0.0211]
Debt ratio	0.0359** [0.0168]	0.0311* [0.0160]	0.0344** [0.0164]	0.0343** [0.0161]	0.0367** [0.0166]	0.0238 [0.0154]	0.0342** [0.0163]
BM ratio	0.2226** [0.0897]	0.2420*** [0.0835]	0.2379*** [0.0911]	0.2091** [0.0910]	0.2180** [0.0877]	0.132 [0.0819]	0.1837* [0.1003]
Asset turnover	0.0119** [0.0053]	0.0099* [0.0054]	0.0105* [0.0056]	0.01 [0.0062]	0.0118** [0.0052]	0.007 [0.0060]	0.0085 [0.0055]
Negative news	0.0143 [0.0118]	0.0109 [0.0106]	0.0154 [0.0116]	0.0138 [0.0116]	0.0132 [0.0111]	0.0073 [0.0139]	0.0112 [0.0114]
<i>Market characteristics at filing</i>							
Nasdaq	0.0062*** [0.0017]	0.0053*** [0.0016]	0.0058*** [0.0018]	0.0060*** [0.0017]	0.0062*** [0.0017]	0.0077*** [0.0020]	0.0063*** [0.0017]
Implied volatility	0.0710** [0.0306]	0.0851*** [0.0256]	0.0575* [0.0300]	0.0675** [0.0317]	0.0700** [0.0306]	0.0671 [0.0466]	0.0730** [0.0300]
Yield spread	0.0163 [0.0524]	0.0094 [0.0523]	0.0183 [0.0555]	0.0014 [0.0485]	0.0142 [0.0506]	0.0672 [0.0494]	0.0415 [0.0521]
Number of filings	−0.6138*** [0.0904]	−0.5318*** [0.0906]	−0.5982*** [0.0957]	−0.5898*** [0.1018]	−0.6024*** [0.0953]	−0.5643*** [0.1609]	−0.5272*** [0.0948]
<i>Market characteristics after filing</i>							
Nasdaq return	−0.0805*** [0.0306]	−0.0700** [0.0330]	−0.0712** [0.0346]	−0.0707** [0.0337]	−0.0714** [0.0333]	−0.0365 [0.0389]	−0.0690* [0.0355]
Nasdaq std. dev.	−0.0308 [0.0319]	−0.0286 [0.0306]	−0.0242 [0.0314]	−0.0291 [0.0317]	−0.0295 [0.0308]	−0.0599 [0.0448]	−0.0406 [0.0321]
Yield spread change	0.3124*** [0.1095]	0.2969*** [0.1046]	0.3317*** [0.1095]	0.3175*** [0.1107]	0.2996*** [0.1066]	0.4265*** [0.1375]	0.3002*** [0.1046]
Lending standard change	0.0037*** [0.0005]	0.0039*** [0.0004]	0.0038*** [0.0005]	0.0038*** [0.0005]	0.0037*** [0.0005]	0.0037*** [0.0007]	0.0038*** [0.0005]
Regulation 1	−0.0369 [0.0549]	−0.0332 [0.0565]	−0.0359 [0.0553]	−0.0263 [0.0566]	−0.0295 [0.0539]	−0.076 [0.0496]	−0.0292 [0.0546]
Regulation 2	−0.3085 [0.1935]	−0.2942 [0.1932]	−0.3610* [0.2071]	−0.2808 [0.1986]	−0.2893 [0.1933]	−0.0847 [0.1986]	−0.3016 [0.1916]
Regulation 3	−0.1766*** [0.0216]	−0.1588*** [0.0206]	−0.1759*** [0.0232]	−0.1781*** [0.0225]	−0.1729*** [0.0234]	−0.1790*** [0.0338]	−0.1746*** [0.0223]
Obs.	2401	2428	2380	2388	2438	1616	2358
Pseudo R-Squared	0.1052	0.1046	0.1072	0.1046	0.105	0.0962	0.0978

Industry-specific analysis					Time-specific analysis		
(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM
<i>Corporate governance characteristics</i>							
−0.0012	0.0011	−0.0005	0.0034	−0.0004	−0.002	0.0007	−0.0004
[0.0041]	[0.0040]	[0.0042]	[0.0035]	[0.0047]	[0.0030]	[0.0041]	[0.0031]
0.0002	0.0002	0.0001	0.0004	0.0005	−0.0005	0.0003	−0.0002
[0.0008]	[0.0009]	[0.0012]	[0.0008]	[0.0008]	[0.0018]	[0.0009]	[0.0020]
0.0166	−0.0613	−0.0107	0.048	0.0227	0.0486	0.0274	0.0678
[0.0783]	[0.0561]	[0.0890]	[0.0733]	[0.0878]	[0.0823]	[0.0744]	[0.0822]
−0.016	−0.0102	−0.0185	−0.0072	−0.0162	−0.0281	−0.0177	−0.0334
[0.0245]	[0.0276]	[0.0266]	[0.0281]	[0.0274]	[0.0348]	[0.0236]	[0.0322]
−0.1578***	−0.1707***	−0.1783***	−0.1786***	−0.1538***	−0.1431**	−0.1529***	−0.1377**
[0.0488]	[0.0558]	[0.0612]	[0.0481]	[0.0542]	[0.0643]	[0.0529]	[0.0682]
<i>Intermediary characteristics</i>							
0.0108	0.0142	0.0094	0.0146	0.009	0.0126	0.0044	0.0052
[0.0131]	[0.0135]	[0.0146]	[0.0141]	[0.0146]	[0.0166]	[0.0125]	[0.0191]
−0.0105	−0.0151	−0.0141	−0.0202*	−0.0084	−0.0387***	−0.0072	−0.0316***
[0.0111]	[0.0119]	[0.0127]	[0.0117]	[0.0101]	[0.0095]	[0.0111]	[0.0103]
−0.268	−0.1858	−0.2909*	−0.3589**	−0.3078*	−0.1839	−0.2773	−0.1884
[0.1809]	[0.1855]	[0.1752]	[0.1684]	[0.1867]	[0.1864]	[0.1894]	[0.1929]
−0.0058	−0.0082	0.002	−0.0096	−0.0067	−0.0081	−0.0025	−0.0051
[0.0075]	[0.0076]	[0.0060]	[0.0066]	[0.0084]	[0.0054]	[0.0075]	[0.0056]
<i>Issuer and issue characteristics</i>							
−0.1519	−0.1194	−0.0963	−0.1737	−0.0763	−0.0552	−0.1345	−0.0484
[0.1138]	[0.1283]	[0.1119]	[0.1407]	[0.1048]	[0.1268]	[0.1278]	[0.1468]
0.0121	−0.0196	0.0132	0.044	0.0068	0.0265	0.0056	0.0242
[0.0383]	[0.0234]	[0.0352]	[0.0482]	[0.0388]	[0.0405]	[0.0371]	[0.0429]
−0.0278***	−0.0195**	−0.0298***	−0.0240**	−0.0308***	−0.0270***	−0.0245**	−0.0244**
[0.0096]	[0.0089]	[0.0096]	[0.0108]	[0.0100]	[0.0098]	[0.0104]	[0.0099]
−0.0134	−0.0085	−0.0316	−0.0209	−0.0115	−0.0329*	−0.0116	−0.0268
[0.0214]	[0.0243]	[0.0277]	[0.0212]	[0.0227]	[0.0179]	[0.0208]	[0.0197]
0.0342**	0.0339**	0.0532***	0.0368**	0.0342*	0.0292*	0.0322**	0.0257*
[0.0162]	[0.0170]	[0.0101]	[0.0184]	[0.0177]	[0.0154]	[0.0160]	[0.0149]
0.2225**	0.2163**	0.1857**	0.2700***	0.1824*	0.0144	0.2041**	0.0208
[0.0896]	[0.0890]	[0.0852]	[0.0938]	[0.1020]	[0.0436]	[0.0850]	[0.0386]
0.0102*	0.0114**	0.0110*	0.0056	0.0114*	0.009	0.0120**	0.0114
[0.0057]	[0.0057]	[0.0063]	[0.0058]	[0.0067]	[0.0071]	[0.0053]	[0.0078]
0.0114	0.0119	0.0133	0.0155	0.0229***	0.0431**	0.0136	0.0440**
[0.0110]	[0.0116]	[0.0130]	[0.0121]	[0.0077]	[0.0185]	[0.0109]	[0.0191]
<i>Market characteristics at filing</i>							
0.0061***	0.0054***	0.0059***	0.0059***	0.0050***	0.0214***	0.0055***	0.0200***
[0.0017]	[0.0017]	[0.0019]	[0.0017]	[0.0014]	[0.0019]	[0.0016]	[0.0019]
0.0759**	0.0784**	0.0524	0.0799**	0.0831***	0.0899***	0.0695**	0.0806***
[0.0301]	[0.0305]	[0.0333]	[0.0328]	[0.0291]	[0.0262]	[0.0305]	[0.0242]
0.0236	0.021	0.0329	0.0196	0.0028	0.1104***	0.008	0.1265
[0.0554]	[0.0577]	[0.0657]	[0.0546]	[0.0571]	[0.0417]	[0.0824]	[0.0789]
−0.5622***	−0.6003***	−0.4955***	−0.5717***	−0.5820***	0.2299	−0.5359***	0.2997
[0.1035]	[0.1074]	[0.1194]	[0.1007]	[0.1116]	[0.1881]	[0.1048]	[0.2089]
<i>Market characteristics after filing</i>							
−0.0698**	−0.0861***	−0.0493	−0.0732**	−0.0758**	−0.0346	−0.0665*	−0.0294
[0.0335]	[0.0279]	[0.0395]	[0.0353]	[0.0371]	[0.0323]	[0.0354]	[0.0351]
−0.0286	−0.0279	−0.0026	−0.0269	−0.0305	−0.1491**	−0.0244	−0.1488***
[0.0310]	[0.0337]	[0.0147]	[0.0314]	[0.0363]	[0.0636]	[0.0315]	[0.0529]
0.3133***	0.2665***	0.3420**	0.3170***	0.2547***	0.1414	0.3346***	0.1723
[0.1029]	[0.0979]	[0.1421]	[0.1108]	[0.0848]	[0.1277]	[0.0989]	[0.1180]
0.0038***	0.0039***	0.0034***	0.0038***	0.0040***	0.0046***	0.0037***	0.0047***
[0.0005]	[0.0004]	[0.0005]	[0.0005]	[0.0005]	[0.0006]	[0.0006]	[0.0006]
−0.0278	−0.0279	0.0126	−0.0189	−0.0179	−0.0036	−0.0216	−0.0044
[0.0531]	[0.0609]	[0.0377]	[0.0569]	[0.0613]	[0.0473]	[0.0587]	[0.0520]
−0.4476**	−0.3101*	−0.2654	−0.3348*	−0.2973	−0.2538*	0.0000	0.0000
[0.1823]	[0.1831]	[0.2028]	[0.1954]	[0.2597]	[0.1443]	[.]	[.]
−0.1740***	−0.1598***	−0.1753***	−0.1594***	−0.1758***	−0.4031***	−0.1659***	−0.3777***
[0.0228]	[0.0215]	[0.0291]	[0.0225]	[0.0250]	[0.0382]	[0.0247]	[0.0367]
2445	2247	2058	2283	2106	1748	2391	1671
0.1048	0.1093	0.1112	0.1063	0.0991	0.1151	0.0949	0.1016

Table A.4
Corporate governance and high volatility.

	(1)	(2)	(3)	(4)	(5)	(6)
<i>Corporate governance characteristics</i>						
Board size	0.0201 [0.0157]	−0.004 [0.0134]	−0.0016 [0.0138]	−0.0022 [0.0137]	−0.0014 [0.0137]	−0.0083 [0.0152]
Board experience	−0.0008 [0.0030]	0.0124** [0.0052]	−0.0005 [0.0029]	−0.0005 [0.0028]	−0.0009 [0.0028]	0.0034 [0.0045]
Female board members	0.0247 [0.2585]	0.0506 [0.2610]	−0.323 [0.3488]	0.0438 [0.2614]	0.0296 [0.2694]	0.4674* [0.2502]
CEO duality	−0.0495 [0.0847]	−0.0476 [0.0839]	−0.047 [0.0862]	−0.1418 [0.1255]	−0.0528 [0.0852]	−0.0468 [0.0864]
Lock-up	−0.5527*** [0.1784]	−0.5158*** [0.1825]	−0.5382*** [0.1880]	−0.5552*** [0.1853]	−1.1533*** [0.1974]	−0.5070*** [0.1904]
Retained shares						0.1374 [0.1532]
<i>Intermediary characteristics</i>						
VC backing	0.045 [0.0420]	0.0478 [0.0408]	0.0448 [0.0421]	0.0479 [0.0406]	0.0455 [0.0417]	0.0451 [0.0771]
Number of underwriters	−0.0535 [0.0360]	−0.0487 [0.0352]	−0.0517 [0.0351]	−0.0491 [0.0352]	−0.0521 [0.0357]	0.0149 [0.0459]
Underwriter market share	−0.8881 [0.6171]	−0.8943 [0.6100]	−0.8847 [0.6157]	−0.8992 [0.6206]	−0.8123 [0.6085]	−1.9413* [1.0308]
CM Rank	−0.0197 [0.0252]	−0.0158 [0.0242]	−0.0176 [0.0255]	−0.0196 [0.0254]	−0.0204 [0.0250]	−0.0640** [0.0259]
<i>Issuer and issue characteristics</i>						
Filing size (bn USD)	−0.4187 [0.3707]	−0.4494 [0.3578]	−0.4993 [0.3749]	−0.4705 [0.3709]	−0.4747 [0.3709]	−0.6054 [0.4288]
Firm size (bn USD)	0.0292 [0.1191]	0.0532 [0.1174]	0.0476 [0.1206]	0.0479 [0.1209]	0.0424 [0.1209]	−0.1134 [0.1241]
Firm age	−0.0921*** [0.0331]	−0.0919*** [0.0321]	−0.0933*** [0.0316]	−0.0927*** [0.0330]	−0.0958*** [0.0312]	−0.1095 [0.0694]
High-tech	−0.0591 [0.0713]	−0.0601 [0.0726]	−0.0521 [0.0699]	−0.0574 [0.0702]	−0.0551 [0.0696]	−0.0867 [0.0945]
Debt ratio	0.1236** [0.0587]	0.1208** [0.0584]	0.1216** [0.0575]	0.1228** [0.0603]	0.1275** [0.0600]	0.1116* [0.0592]
BM ratio	0.7034** [0.2851]	0.6662** [0.2791]	0.6923** [0.2851]	0.6810** [0.2785]	0.7144*** [0.2730]	0.6259** [0.2936]
Asset turnover	0.0333 [0.0204]	0.0366* [0.0209]	0.0365* [0.0190]	0.0377* [0.0205]	0.0402** [0.0181]	0.0281 [0.0314]
Negative news	0.0463 [0.0392]	0.0313 [0.0365]	0.0461 [0.0382]	0.0463 [0.0402]	0.0473 [0.0385]	0.0423 [0.0576]
<i>Market characteristics at filing</i>						
Nasdaq	0.0207*** [0.0052]	0.0190*** [0.0052]	0.0209*** [0.0052]	0.0202*** [0.0053]	0.0212*** [0.0049]	0.0134*** [0.0039]
Implied volatility	0.2652*** [0.0958]	0.2712** [0.1065]	0.2566** [0.1012]	0.2496** [0.0969]	0.2682*** [0.1012]	−0.0499 [0.1632]
Yield spread	0.0185 [0.1828]	0.0003 [0.1843]	0.0377 [0.1876]	0.0286 [0.1825]	0.0059 [0.1767]	−0.2674 [0.1749]
Number of filings	−2.2391*** [0.4333]	−2.3021*** [0.4160]	−2.2390*** [0.4170]	−2.2416*** [0.4125]	−2.2398*** [0.4084]	−0.1959 [0.8738]
<i>Market characteristics after filing</i>						
Nasdaq return	−0.1974* [0.1084]	−0.2164** [0.1059]	−0.1978* [0.1078]	−0.2008* [0.1074]	−0.2061** [0.1046]	−0.0346 [0.0935]
high volatility	0.2402 [0.1840]	1.5409*** [0.3890]	−0.2440*** [0.0668]	−0.3328*** [0.1014]	−0.2413*** [0.0824]	0.2942 [0.3577]
Yield spread change	1.1075*** [0.3594]	1.1005*** [0.3785]	1.0927*** [0.3490]	1.1010*** [0.3607]	1.0962*** [0.3529]	1.0807*** [0.2991]
Lending standard change	0.0139*** [0.0018]	0.0140*** [0.0017]	0.0138*** [0.0018]	0.0139*** [0.0018]	0.0141*** [0.0018]	0.0136*** [0.0013]
Regulation 1	−0.103 [0.1920]	−0.101 [0.1926]	−0.1051 [0.1934]	−0.1021 [0.1925]	−0.1028 [0.1880]	−0.0384 [0.2121]
Regulation 2	−0.8705 [0.6664]	−0.9057 [0.6488]	−0.9643 [0.6574]	−0.9421 [0.6293]	−0.8759 [0.6739]	−0.3243 [0.7539]
Regulation 3	−0.5978*** [0.0929]	−0.5866*** [0.0968]	−0.5931*** [0.0940]	−0.5949*** [0.0960]	−0.5994*** [0.0934]	−0.6910*** [0.1964]
Board size	−0.0682*** [0.0236]					
* high volatility						
Board experience		−0.0348***				

(continued on next page)

Table A.4 (continued)

	(1)	(2)	(3)	(4)	(5)	(6)
* high volatility		[0.0081]				
Female board members			0.8501*			
* high volatility			[0.4580]			
CEO duality				0.2515**		
* high volatility				[0.1098]		
Lock-up					1.3653***	
* high volatility					[0.3627]	
Retained shares						−0.6674
* high volatility						[0.4357]
Obs.	2468	2468	2468	2468	2468	2145
Pseudo R-Squared	0.1061	0.1079	0.1048	0.1057	0.1072	0.0992

Probit model with interaction terms of high volatility and corporate governance characteristics. The dependent variable equals one for withdrawn offerings and zero for completed offerings. High volatility is a binary variable that equals one if the Nasdaq return volatility in the post-filing period is in its highest tertile and zero otherwise. Descriptions of the other variables and data sources are depicted in Table A.1. Apart from the interaction effects, the model corresponds to the model estimated in Table 3 specification (5). Coefficients are reported. Pseudo R-squared corresponds to McFadden's pseudo R-squared. Standard errors clustered at industry level are in parentheses. Statistics with significance at the 10%, 5%, and 1% level are denoted with *, **, and ***.

Table A.5

VC characteristics and high volatility.

	(1)	(2)	(3)	(4)
<i>Corporate governance characteristics</i>				
Board size	−0.0019 [0.0135]	−0.0048 [0.0139]	−0.0067 [0.0137]	−0.0063 [0.0147]
Board experience	−0.0004 [0.0029]	−0.0006 [0.0031]	−0.0007 [0.0032]	0.0027 [0.0027]
Female board members	0.0093 [0.2698]	−0.0005 [0.2768]	0.0051 [0.2733]	−0.0338 [0.2603]
CEO duality	−0.0508 [0.0859]	−0.0488 [0.0812]	−0.0448 [0.0849]	−0.0716 [0.0834]
Lock-up	−0.5413*** [0.1778]	−0.5272*** [0.1844]	−0.5426*** [0.1896]	−0.5547*** [0.1694]
<i>Intermediary characteristics</i>				
VC backing	0.1106 [0.0772]			
Non-VC		−0.1788 [0.1537]	−0.2446* [0.1322]	−0.2168*** [0.0712]
VC syndication		−0.0782 [0.1370]		
VC US			−0.1725 [0.1916]	
VC reputation				−0.0919* [0.0534]
Number of underwriters	−0.0509 [0.0350]	−0.0499 [0.0371]	−0.0502 [0.0369]	0.003 [0.0265]
Underwriter market share	−0.8655 [0.6085]	−0.8378 [0.6192]	−0.8545 [0.6369]	−0.7848 [0.6241]
CM Rank	−0.019 [0.0255]	−0.0207 [0.0255]	−0.0207 [0.0256]	−0.0206 [0.0264]
<i>Issuer and issue characteristics</i>				
Filing size (bn USD)	−0.4737 [0.3758]	−0.4935 [0.3883]	−0.4725 [0.3808]	−0.2962 [0.3644]
Firm size (bn USD)	0.0458 [0.1229]	0.0603 [0.1254]	0.0615 [0.1240]	0.009 [0.1171]
Firm age	−0.0933*** [0.0328]	−0.0893*** [0.0331]	−0.0900*** [0.0332]	−0.0735*** [0.0346]
High-tech	−0.0629 [0.0704]	−0.0557 [0.0692]	−0.0634 [0.0696]	−0.0065 [0.0652]
Debt ratio	0.1202** [0.0579]	0.1123* [0.0660]	0.1154* [0.0660]	0.1199* [0.0640]
BM ratio	0.6916** [0.2839]	0.6743** [0.2811]	0.6995** [0.2846]	0.9263*** [0.2808]
Asset turnover	0.0344* [0.0195]	0.0354* [0.0188]	0.0394** [0.0189]	0.0341** [0.0174]

(continued on next page)

Table A.5 (continued)

	(1)	(2)	(3)	(4)
Negative news	0.0427 [0.0398]	0.0301 [0.0437]	0.0242 [0.0408]	0.0312 [0.0416]
<i>Market characteristics at filing</i>				
Nasdaq	0.0207*** [0.0053]	0.0208*** [0.0052]	0.0199*** [0.0052]	
Implied volatility	0.2526** [0.1027]	0.2637*** [0.1018]	0.2499** [0.1116]	
Yield spread	0.018 [0.1883]	−0.0075 [0.1848]	−0.0131 [0.1865]	
Number of filings	−2.1927*** [0.4012]	−2.2773*** [0.4032]	−2.2325*** [0.3973]	
<i>Market characteristics after filing</i>				
Nasdaq return	−0.1896* [0.1108]	−0.2077* [0.1081]	−0.2028** [0.1000]	−0.1703* [0.1034]
high volatility	−0.125 [0.0969]	−0.1132 [0.2331]	−0.3195** [0.1454]	−0.2657** [0.1324]
Yield spread change	1.1017*** [0.3601]	1.0798*** [0.3460]	1.1156*** [0.3461]	1.2468*** [0.2955]
Lending standard change	0.0140*** [0.0018]	0.0140*** [0.0019]	0.0141*** [0.0018]	0.0163*** [0.0016]
Regulation 1	−0.0987 [0.1888]	−0.0895 [0.1850]	−0.0913 [0.1817]	−0.0558 [0.1665]
Regulation 2	−0.9789 [0.6402]	−0.954 [0.6484]	−0.9631 [0.6517]	−1.1251 [0.7777]
Regulation 3	−0.5985*** [0.0937]	−0.5987*** [0.0937]	−0.5817*** [0.0943]	−0.2196*** [0.0747]
VC-backing	−0.1753 [0.1391]			
* high volatility				
Non-VC		−0.0107 [0.2470]	0.204 [0.1593]	0.2718** [0.1262]
* high volatility				
VC syndication		−0.2154 [0.1866]		
* high volatility				
VC US			0.0498 [0.2491]	
* high volatility				
VC reputation				0.1398* [0.0794]
* high volatility				
Obs.	2468	2435	2438	2442
Pseudo R-Squared	0.1049	0.105	0.1058	0.0951

Probit model with interaction terms of high volatility and VC characteristics. The dependent variable equals one for withdrawn offerings and zero for completed offerings. High volatility is a binary variable that equals one if the Nasdaq return volatility in the post-filing period is in its highest tertile and zero otherwise. Descriptions of the other variables and data sources are depicted in Table A.1. Apart from the interaction effects, the model corresponds to the model estimated in Table 3 specification (5). Coefficients are reported. Pseudo R-squared corresponds to McFadden's pseudo R-squared. Standard errors clustered at industry level are in parentheses. Statistics with significance at the 10%, 5%, and 1% level are denoted with *, **, and ***.

Fig. A.1. Interaction effect of board size and high volatility.

Fig. A.2. Interaction effect of board experience and high volatility.

Fig. A.3. Interaction effect of female board members and high volatility.

Fig. A.4. Interaction effect of retained shares and high volatility.

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