Where Have All the Public Companies Gone? *

Jae Yung Kim†

September 2020

Abstract

This paper examines why there has been a sharp fall in the number of U.S. listed stocks since 1996. We develop a model of going public where an entrepreneur who has to externally finance an investment can share decision rights with venture capitalists. Comparing the change in firm value of a withdrawn IPO that subsequently gets acquired with that of a completed IPO that subsequently gets acquired, we find evidence to support the predictions of the model that: (i) under a bad business environment for a new firm, the firm prefers to stay private because the firm shows a higher value growth between the IPO filing and the acquisition; and (ii) the withdrawn filer shows a higher value growth when the firm is backed by venture capital. Accounting for the endogeneity of firm's choice to go public, our results provide a causal explanation for why firms that would have once done an IPO no longer actively participate in the public equity market.

JEL Classification: G10, G15, G34
Key Words: Stock market listing, Private firms, IPO, M&A

*For helpful comments, we thank Jay R. Ritter, Mahendrarajah Nimalendran, Andy Naranjo, Jongsub Lee, and Narayanan Jayaraman.

†Contact: Tulane University, A. B. Freeman School of Business, 616 Goldring/Woldenberg Business Complex, New Orleans, LA 70118-7168; Tel: 504-314-2472, E-mail: jkim22@tulane.edu.

1 Introduction

Where have all the publicly traded companies gone? The number of listed operating companies in the U.S. increased by 50% from 1980 to 1996 and then decreased by 50% from 1996 to 2017. In 1996 there were 7,322 domestic companies listed on U.S. stock exchanges. Today there are only 3,618. Figure 1 illustrates the rise and fall in listed companies in the U.S. from 1980 to 2017.

[Insert Figure 1 near here]

Beginning in 2001, Figure 1 also shows that the level of new listings has been fairly constant at a much lower rate than earlier. From 1980 to 2000, on average, about 10% of total listed companies were added each year, primarily through initial public offerings (IPOs) and spin-offs. Since 2001, new listing rate has fallen to about 4%. In comparison, the change in the number of listed firms attributable to a change in the delisting rate has been modest. The proportion of delistings to total stocks has been fairly constant at 9% per year during the entire sample period, although higher in 1998-2001 than before or after. This "phenomenon" has already been pointed out by other studies. Gao, Ritter, and Zhu (2013) focuses on the idea that going public is less beneficial for smaller firms relative to being acquired after the listing peak in 1996. Doidge, Karolyi, and Stulz (2017) documents a higher rate of mergers, as well as a lower listing rate, and calls the drop in the number of listed firms the "U.S. listing gap" since the U.S. market share of global listings has fallen.[1]

Recent studies suggest that venture capital (VC) or private equity (PE) has made an important contribution to the decline in IPOs in the last two decades. Ewens and Farre-Mensa (2017) documents that despite the large drop in the number of IPOs in the United States, privately-held firms backed by venture capital continue to raise capital. They posit that this ability to privately finance and grow at older ages stems from a positive shock

[1]Table 4 of Doidge et al. (2017) reports a delisting rate of 7.29% from 1975-1996 and 9.49% from 1997-2012.

to the supply of private capital to high-growth entrepreneurial firms. According to Doidge, Kahle, Karolyi, and Stulz (2018), since there is an abundant capital available to private firms without going public, they have little incentive to do so until they reach the point in their life cycle where they focus more on payouts than on raising capital.

Yet VC and PE investors need to exit. If IPOs are the only exit option and investors are willing to wait longer, the IPOs should merely be deferred. But VC and PE investors do not necessarily have to defer IPOs because they can also exit by trade sales (i.e., being acquired by another firm in the same industry, or trade). If they get higher returns through trade sales than they do with IPOs, we would predict that a higher proportion of exits will be trade sales rather than IPOs. The prediction is particularly rational in a business environment where it is difficult for new firms to survive as independent firms.

We develop a model that suggests why firms that would have once done an IPO no longer actively participate in the public equity market. Specifically, we describe the contracting problem associated with the entrepreneur who derives private benefits (as distinct from monetary benefits from the venture) from running the firm, based on the framework in Aghion and Bolton (1992). From an entrepreneur side, it may be better to give more decision rights to investors and realize the return through trade sale rather than operating the firm by having all the controls alone as it is expected that it will be difficult to survive as an independent firm in the public equity market.

Following the empirical findings on the structure of VC contracts, we assume that VC financial contracts can separate cash flow rights and decision rights made contingent on observable and verifiable measures of performance (Kaplan and Strömberg (2003); Cumming (2008)). In these contracts, the decision rights may include the right to replace the CEO, as well as various other veto and control rights. Since entrepreneurs are likely to enjoy the private benefits of being the CEO of a listed company (Berglöf (1994); Black and Gilson (1998); Bascha and Walz (2001); Hellmann (2006); De Bettignies (2008)), even if an acquisition is

financially superior to an IPO, an entrepreneur might prefer the IPO because of being able to retain the private benefits.

We also assume that the entrepreneur has limited wealth and needs capital from investors. The existence of wealth constraints hinders the ability of the entrepreneur to make side-payments to the VC investor ex post. Because bargaining to the point where total surplus is maximized is not available (i.e., the first-best is not attainable), we consider three different cases of whoever has control - entrepreneur control, VC control, and contingent control cases. By first-best we mean a situation where the entrepreneur is not wealth-constrained and hence side-payments can be made ex post. We assume a stochastic state of nature of the business environment for new enterprises and present two propositions: 1) Under an unfavorable business environment for newly established enterprises, regardless of whom has the corporate control rights, the firms will not go public (*stay private under unfavorable business environment*) and 2) by giving the VC control in the bad state, the entrepreneur is able to realize a higher return, and this leads to having fewer IPOs when the economy is in the bad state for newly established firms (*the VC control rights hypothesis*).[2]

We then turn to the empirical methodology that tests the above statements. After a firm files to go public, the offer may be withdrawn or the firm may go public. Furthermore, both withdrawn and completed IPO firms may subsequently be acquired. We use an M&A transaction to find out the valuation of withdrawn issuers in the post-filing event. We also leave only IPOs that are acquired by other companies in our sample. In order to understand the behavior of a firm and its effect of not going public, we first consider firms that file an initial registration statement with the Securities and Exchange Commission (SEC) in an attempt to go public, and then withdraw their filing. We then document capital market activities and corporate outcomes of withdrawn U.S. IPOs from 1985 to 2016. Forty-nine

[2]Please note that we do not list the components of what have changed over time to explain the drop in listings. We assume a stochastic time-series state that leads to the specific choice of exit. Recent research suggests that venture capital or private equity involvement influences the probability of withdrawal of an IPO filing (Gill and Walz (2016); and Helbing and Lucey (2018)).

percent of withdrawn issuers are acquired, 14% return to successful IPOs, 13% remain private with no change in control, and 24% file for bankruptcy or are not identified.

Among withdrawn filers nearly half of the issuers are acquired. Furthermore, 70% of these acquired firms are acquired within three years after the filing, so we can measure the difference between the valuation from the post-withdrawal event and the value of the company at the time of the aborted IPO. For withdrawn IPOs, we can determine a firm valuation, computed as the number of shares to be outstanding after the offering multiplied by the average of the high and low filing prices.[3] Of the firms that are acquired, half of them disclose terms sufficient to compute an implied firm value (i.e., where consideration paid and fraction of firm acquired are disclosed). The advantage of this approach is that we can also measure how the equity values differ in each case. For these firms, there is a considerable improvement in firm valuation.

However, this evidence alone cannot explain why the number of IPOs has been low in recent years. This approach using within-firm variation to studying the dynamics of firm outcomes around the IPO filing may produce biased estimates of the effect of the withdrawals. This bias is because companies can *choose* themselves whether to go public depending on market conditions and the terms of other transactions under consideration. In order to overcome this selection bias, we incorporate firms that went public into our sample and use them as a control group in the inference. The comparison of the two groups helps to infer the impact of withdrawing the filing (or going public) on the corporate outcomes, since they both take into account the possibility of listing or not.

Comparing completed IPO filings with withdrawn ones is not sufficient to mitigate the selection bias. The decision whether or not to go public is driven partly by the firm's success during the book building phase, the period[4] immediately following the IPO filing. If, during

[3]For the withdrawn filers that do not disclose a price range, we use information from the pro-forma balance sheet to compute an implied firm value. If we can't find either of the price range and implied firm value (due to a missing balance sheet), we exclude such observations.

[4]This is also known as the registration period. The bookbuilding period doesn't start until about 2 weeks before the anticipated IPO date.

this time, the firm receives sufficient investor interest at prices acceptable to the issuing firm, the IPO is more likely to be completed. This probability will depend on both the quality of the IPO firm and the overall performance of the market during this period (Busaba, Benveniste, and Guo (2001); Benveniste, Ljungqvist, Wilhelm, and Yu (2003); Edelen and Kadlec (2005); Dunbar and Foerster (2008); and Bernstein (2015)).

Therefore, we follow an instrumental variable approach as in Bernstein (2015) to make sure that the results of IPO completion do not reflect endogenous enterprise quality. We use Nasdaq stock market returns in the 60 trading day window immediately following the IPO filing date to instrument for IPO completion.[5] Lower Nasdaq returns are associated with a significant decrease in the probability of IPO success. Admittedly, market returns can predict valuation changes in the M&A market due to the correlation between returns and the value of peer firms as a benchmark, but we only use returns in the short post-IPO filing window as the instrument. We can also control for returns more generally using year fixed effects. There is no clear reason for the return in a short window to affect future firm valuations after controlling for returns over the year. We also test this assumption directly by performing a placebo test using a 90 day Nasdaq return before IPO filing. We find in this window that returns cannot predict IPO success or future firm valuation.

As we use an M&A transaction to find out the valuation of withdrawn issuers in the post-filing event, we also leave only IPOs that are acquired by other companies in our sample. Since M&A transactions between companies are voluntary in many cases, we need to mitigate the selection bias. A control premium relates to the price that an acquiring company is willing to pay to purchase control over a target company's decision making and cash flow. This premium equals the difference between a control-based purchase and a minority (noncontrol) purchase of shares. In many acquisitions, the acquirer is willing to pay a higher price than the current market price for a public company based on consideration of

[5]After April 2012, Emerging Growth Companies (EGCs) can file confidentially. Because we collect information based on publicly available observations, we are not able to use confidential IPO filings.

both expected synergies and a control premium. The price that a bidding firm offers for a target is generally the outcome of a negotiation with the target's board. Given the possible gap between a public firm's market value and M&A price, we can more accurately estimate the outcome variables by limiting the sample to acquired ones.

Using an instrumental variable approach, we find that withdrawing an IPO has a significant impact on firm valuation: withdrawing a filing causes a 50.6% increase in firm value, compared to the company completing a filing. The change in the market value of pre-offering equity also shows a similar pattern. This result holds with industry, IPO filing year, M&A year, and IPO-M&A cohorts fixed effects. The IV results suggest a causal interpretation of the first proposition: under an unfavorable business environment for a newly established enterprise, regardless of who has the corporate control rights, firms will not go public (*stay private under unfavorable business environment*). IPO activity is not as active as before because the value of companies and stocks is higher when they are bought in a trade sale without being listed, given the unfavorable business environment for small and young firms since 1996.[6]

We then turn to test the second proposition: By giving the VC control in the bad state, the entrepreneur is able to realize a higher return, and this leads to having fewer IPOs when the economy is in the bad state for newly established firms (*the VC control rights hypothesis*). Specifically we test whether VC or PE financing plays an important role to explain the 17 to 20 years of lower IPO activity and increase in firm value for withdrawn issuers (Gornall and Strebulaev (2015); Chernenko, Lerner, and Zeng (2017); Ewens and Farre-Mensa (2017); Kwon, Lowry, and Qian (2017)). To test the *VC control rights hypothesis*, we set up the third difference term *VC/PE-backed* by classifying firms on the basis of whether or not they include venture capital or private equity funds as investors when they file the initial registration statements with the SEC. As VC/PE has become one of the most important investors in

[6]Please note that this is the assumption we make. Gao et al. (2013) provides the stylized facts that justify the assumption. Because we control for firm's listing status and its size, we cover private and public; small and large firms at the same time.

IPO and M&A markets in recent two decades, we find strong evidence that VC/PE-backed transactions give a higher payoff to the pre-IPO financial sponsors for withdrawn IPO filers.[7]

There are at least two more potential channels that might be able to explain the prolonged drought in IPOs. First, costs of being public have risen, driven in part by increased regulation. Costs are both financial, including listing fees and the expenses associated with mandatory disclosures and other regulatory requirements, and less tangible, such as the perceived burden of quarterly earnings releases, the risk of being targeted by activist investors or plaintiff lawyers, and the higher visibility that can result in political or competitive pressure. The Sarbanes-Oxley Act of 2002 (SOX), particularly Section 404, imposed additional compliance costs on publicly traded firms (Iliev (2010); Badertscher, Jorgensen, Katz, and Kinney (2014)). Following Gao et al. (2013), we term this hypothesis the *regulatory overreach hypothesis*. Using difference-in-difference-in-differences (DDD) estimation, we find little evidence that supports this hypothesis in that there is no significant difference in the pattern of changes in firm value and equity value between two groups before and after 2002. Given that there are many regulatory considerations in M&A deals as well, we suggest that the results are not surprising.[8]

[7]Please note that here we focus on the cross-sectional heterogeneity in withdrawn and completed filers. Although the estimate supports the *VC control rights hypothesis*, the estimate alone does not provide the evidence of VC-backed financing *causing* the phenomenon. Following Sørensen (2007), we admit that *screening* and *influence* channels both matter to estimate the firm outcome of VC financing. Because firm quality is unobserved, the influence of investor could be biased upwards. However, we posit that this selection bias might not be a serious issue in our local setting. Since whether the issuer is backed by VC/PE is pre-determined prior to the M&A transactions and is common to both withdrawn and IPO firms, the interaction term with the withdrawn filer and the VC/PE indicator is sufficient to mitigate the selection bias. Table 2 also shows that VC-funding is well balanced between two groups and other observed firm characteristics, which are candidates of a proxy of firm quality, are also well balanced. Using sub-sample analysis, we also find the same result that the coefficients for VC/PE-backed groups are economically and statistically significant.

[8]Companies and their legal and investment banking advisors must analyze the regulatory approvals that are necessary to complete an M&A transaction, focusing on local, regional, national, and international regulators. Approvals required to close a transaction depend on the size of the deal, the location of major businesses, the industry, and the industry regulatory body (if one exists). In the United States, most public M&A transactions require a Hart-Scott-Rodino (HSR) filing with the Federal Trade Commission (FTC) and the Department of Justice (DOJ). Upon filing, there is a 30-day waiting period during which the FTC and the DOJ may request further information. If there are international operations, the companies might also need to file with the European Commission (EC) or with antitrust regulators in other relevant countries. Other U.S. regulatory considerations include filing a merger proxy or a financing registration statement with

The second potential channel is also introduced by Gao et al. (2013), which they term the *economies of scope hypothesis*. Their argument is that there is an ongoing change in the economy that has reduced the profitability of small companies. They contend that many small firms can create greater operating profits by selling out in a trade sale rather than operating as an independent firm and relying on organic (i.e., internal) growth. We test this hypothesis using the DDD estimation and set the third difference term as a *strategic merger* where the first 3-digits of the SIC code are the same for a target and a buyer.[9] As a result of the test, we find that this hypothesis could partially explain our findings. For the subsample of *strategic merger*, we find a significant value improvement for the withdrawn IPO filers. The *strategic merger* term and its interaction with the withdrawn IPO dummy variable, however, are not significant throughout several specifications. The result implies that the target company's value improvement for strategic merger is the same whether it is private or public.[10]

Since our empirical strategy depends on IV estimation including withdrawn and completed IPO issuers, there may be criticism that the conclusions drawn from the tests cannot be generally applied. For example, the exclusion restriction could be violated. To address this issue, we look at the relation between changes in firm and equity values and Nasdaq returns using the 3-month window *before* the IPO filing. We validate our assumption that there is no direct relationship between pre-filing Nasdaq returns and firm values after controlling for filing year fixed effects. Another possible example of criticism is that investors who previously considered an IPO as a possible exit strategy may not be considering the

the SEC, determining whether a report should be filed with the Pension Benefit Guaranty Corporation (if the transaction impacts company pension plans) and, potentially, filing with tax agencies, such as the IRS.

[9] According to this method, about 48% of transactions are classified as this type. When using the first 2-digits of SIC code, approximately 55% of transactions correspond to this type. When using the first digit of SIC code, approximately 61% of transactions are of this type. In untabulated regressions, we test this hypothesis using the first 2-digits and 1-digit of the SIC code to classify transactions as trade sales. We also test this hypothesis using the Fama-French 30 industry code to classify transactions as trade sales. We find that the qualitative conclusions are not changed.

[10] Again we acknowledge that this third difference and its interaction and with the withdrawn dummy variable might not be sufficiently exogenous. In other words, we only report the cross-sectional heterogeneity in withdrawn and completed issuers.

IPO at all, so instead of submitting filings, they may directly find the buyer in the M&A market. To address this concern about external validity, we construct an alternative sample that includes firms with sufficient value information when they are privately-held firms, while providing exit values as well when they finally exit via either IPOs or trade sales. Because of a systematic difference between these two exit groups, we are not certain that we have a sufficiently exogenous indicator of treatment. Along with this possible bias in the OLS regression, we do not find significant value improvements for the firms that exit via M&A.

Our work makes several contributions. First, we extend the findings of the existing literature addressing why IPOs and the number of listed U.S. companies have decreased (Gao et al. (2013); Doidge et al. (2017); Kahle and Stulz (2017)). Extending the previous findings, we propose a causal interpretation using valid control and treatment groups. Second, we find another important impact of VC/PE on the financial markets (Bernstein, Lerner, Sorensen, and Strömberg (2016b); Bernstein, Giroud, and Townsend (2016a); Ewens and Farre-Mensa (2017)). Our paper suggests why VC/PE-backed newly established firms do not take IPOs as their principal exit strategies in recent years. Third, we explain the new impact of going public (and thus not going public) on corporate outcomes (Bernstein (2015); Bird, Karolyi, and Ruchti (2017); Babina, Ouimet, and Zarutskie (2018);). While the existing literature focuses primarily on the *results* of going public, our work explores the *motivation* of why companies are hesitating to become listed companies in recent years. Finally, our paper seeks to analyze the interactions of IPOs and M&As, where the previous articles focus on the trade-off between two transactions with the emphasis on firm-specific and macroeconomic determinants of the exit routes (Bayar and Chemmanur (2011); Chemmanur and He (2011)); Arikan and Stulz (2016)). We discuss the current prolonged drought of IPOs by directly estimating the returns of pre-IPO investors and describe another feature of the interaction between IPOs and M&As.

The rest of this chapter is structured as follows. Section 2 provides a simple model explaining the relationship between firm outcomes and firm's listing status. Section 3 describes

the data and presents summary statistics and Section 4 presents the empirical strategy. Section 5 provides the main results and Section 6 discusses potential channels. Section 7 reports the robustness test results and Section 8 concludes.

2 A Simple Model

We model a relationship between a firm's post-filing outcomes and the firm's listing decision by incorporating VC investments following Aghion and Bolton (1992). The model analyzes the contracting problem associated with the entrepreneur who derives private benefits (as distinct from monetary benefits from the venture) from running the firm.

2.1 Basic Setup

Suppose there is only one asset, A, and only one entrepreneur E, who works with this asset. An expenditure of K is required to construct the asset and the entrepreneur has no wealth of his own. The entrepreneur approaches a venture capitalist V for the funds at $t = 0$. The investor should expect to get back at least K from her investment (participation constraint).[11] At $t = 1$, there is a realization of the state of nature $\theta \in \{\theta_g, \theta_b\}$ that happens with probability q and $1-q$, respectively. Suppose that future action, denoted by $a \in \{a_g, a_b\}$, has to be taken with regard to the project, and this action is sufficiently complicated that it cannot be specified in an initial contract. Hence this action will be chosen by the project owner (who may be the entrepreneur or the VC investor). At $t = 2$, there is realization of the net return of the project $r \in \{0, 1\}$. We denote the expected return in state θ_i and given action a_j as: $y_j^i = Prob(r = 1|\theta = \theta_i, a = a_j)$. The risk neutral venture capitalist gets utility only from her share of the return: $U_V(r) = r$. The risk neutral entrepreneur also gets a private benefit: $U_E(r, a) = r + l(a, \theta)$. We denote the private benefit in state θ_i and given

[11] In other words, we assume a zero required net return, for simplicity.

action a_j as l^i_j.

Ownership is important because there is a conflict of interest in the choice of action a. Moreover, because entrepreneurs have financial constraints, renegotiation does not necessarily resolve this conflict; in other words, it would not be possible for an entrepreneur to bribe an investor to make an surplus-maximizing choice of a. The choice set, for example, includes the choice of an agent with corporate control who will decide whether to go public or go for a trade sale. Examples of private benefits might be an entrepreneur's desire to keep a family-owned business going or being the CEO of a publicly listed firm (Berglöf (1994); Black and Gilson (1998); Bascha and Walz (2001); Hellmann (2006)). Even though it is not very profitable, the entrepreneur's consumption of perks, or the entrepreneur's disutility from dismissing long-standing employees, are examples of private benefits.

We focus on three possibilities: Entrepreneur control, VC control, and contingent control (depends on θ). We simplify matters by supposing that the contract allocates all the monetary return y to the venture capitalist (that is, venture capitalist is allocated all the 'dividends' from the project).[12] The entrepreneur receives private benefits l. Fixed payment t can be made to meet participation constraint (only from investor to entrepreneur).[13] The technological characteristics of this project are described in the time-line shown in Figure 2.

[Insert Figure 2 near here]

[12]Please note that this assumption is not necessary. In the paper Aghion and Bolton (1992), the entrepreneur also receives the monetary return y and this leads to replacing the equation (1) with $a_E = \text{argmax}_{a\in\{a_g,a_b\}}\, y(a,\theta) + l(a,\theta)$. The conclusion of the model does not change by replacing the objective function. For the simplicity and emphasizing the feature of the VC financial contracts that separately allocate cash flow and control rights, we separate each benefit to respective agents in the model.

[13]This is a simplification of the model which assumes that θ is not verifiable and control depends on a signal s which is correlated with θ, and also allows a payment $t(s,r)$ that helps align incentives.

2.2 First-best Actions and Comonotonic Benefits

We start by considering the first-best solution. The model assumes that the first-best action in θ_g is a_g, and the first-best action in θ_b is a_b:

$$\begin{aligned} y_g^g + l_g^g &> y_b^g + l_b^g, \\ y_b^b + l_b^b &> y_g^b + l_g^b. \end{aligned}$$

Also, the first-best actions are feasible:

$$qy_g^g + (1-q)y_b^b > K.$$

Now Suppose that $l_g^g > l_b^g$, $l_b^b > l_g^b$. That is, private benefits are comonotonic. Then, giving control to the entrepreneur can achieve first best. The entrepreneur chooses action a_g in θ_g and action a_b in θ_b. By first-best we mean a situation where E is not wealth-constrained and hence arbitrary side-payments can be made *ex-post*. Thus, the payment t is set to meet the participation constraint of the venture capitalist: $qy_g^g + (1-q)y_b^b - t = K$. Similarly, when $y_g^g > y_b^g$ (i.e., monetary benefits are comonotnonic), giving control to the investor can achieve first best.

The interesting case arises when neither the entrepreneur nor the investor have incentives that are perfectly aligned with efficiency. Suppose that $l_g^g > l_b^g$, $l_g^b > l_b^b$, $y_b^g > y_g^g$, and $y_b^b > y_g^b$. This means that each one wants to do the efficient thing only in one state. In our context, a_g represents going public and θ_g represents good market state for venture enterprise. Going public is efficient only in good state, whereas entrepreneur always want to go public and VC never wants to. We turn next to the second-best, where entrepreneur has no wealth. Consider first what happens if the entrepreneur owns and controls the project.

2.3 Entrepreneur Control

Entrepreneur control corresponds to the case where the entrepreneur has voting equity and the venture capitalist has non-voting equity (and all the dividends). Without renegotiation, the entrepreneur would solve the following problem:

$$a_E = \underset{a \in \{a_g, a_b\}}{\operatorname{argmax}} \, l(a, \theta) \tag{1}$$

assuming the unique solution. Then the VC's payoff in the absence of renegotiation is

$$U_V = y(a_E).$$

The entrepreneur wants to choose a_g in θ_b. However, renegotiation will take place. This is because with *ex-post* renegotiation, first-best can be restored. Specifically, when θ_b is realized, entrepreneur has incentive to renegotiate. To simplify matters, suppose that entrepreneur has all the bargaining power, both *ex-post* and *ex-ante* when the contract is written.[14] Then entrepreneur will offer to choose the first-best action a_b in return for a payment of $y_b^b - y_g^b$ from venture capitalist. Note that this payment is non-negative since $l_b^b + y_b^b > l_g^b + y_g^b$ and $l_g^b > l_b^b$, from which it follow that $y_b^b > y_g^b$. The two parties' payoffs will be

$$\begin{aligned} U_V &= y_g^b, \\ U_E &= l_b^b + y_b^b - y_g^b > l_g^b. \end{aligned}$$

Clearly, if $y_g^b \geq K$, entrepreneur control achieves the first-best since venture capitalist breaks even and an efficient action is chosen.[15] Similarly, if $y_g^b > K$, venture capitalist will make an initial lump-sum payment of $y_g^b - K$ to entrepreneur. Entrepreneur captures the total

[14] Given that a scarce resource in an economy is good ideas from a few entrepreneurs while capital for projects can be financed by many investors, we admit that this is a reasonable assumption.

[15] The same conclusion is derived when θ_g is realized.

surplus from the efficient action. The interesting case is where the first-best is not feasible:

$$qy_g^g + (1-q)y_b^g < K < qy_g^g + (1-q)y_b^b.$$

Under these conditions, it may be necessary to give venture capitalist control.

2.4 VC Control

VC control corresponds to the case where venture capital has all the voting equity. Without renegotiation, venture capitalist would solve the following problem:

$$a_V = \underset{a \in \{a_g, a_b\}}{\operatorname{argmax}} y(a, \theta)$$

assuming the unique solution. Then VC's payoff in the absence of renegotiation is

$$U_V = y(a_V),$$

and entrepreneur's is

$$U_E = l(a_V).$$

With VC control, there will not even be any renegotiation. The reason is that any other action by definition yields a lower value of y than does a_V. The VC chooses a_b in θ_g and first-best is not achieved. This leaves unexploited surplus of $y_g^g + l_g^g - y_b^g - l_b^g$. In principle, the entrepreneur could pay $y_b^g - y_g^g$ to the investor and make her take action a_g. Yet, the entrepreneur cannot do it because he has no wealth and l is not a monetary benefit. The VC chooses a_b in θ_b as long as the participation constraint is met. Now we present the proposition that tells why firms remain in private market under unfavorable venture environment.

Proposition 1 (Stay private under unfavorable business environment)**.** *Under an unfavorable business environment for a newly established venture enterprise, regardless of whom the*

corporate control is, the firms will not go public.

Proof. For entrepreneur control case, we prove this in Section 2.3. For VC control case, please see above.

□

From now on, we assume

$$y(a_V) \geq K. \tag{2}$$

If (2) is not satisfied, the project would not be undertaken at all.

2.5 Contingent Control

The interesting case is where (2) holds strictly. Under these conditions, it may be optimal to give entrepreneur and VC each control with positive probability. Because we assume entrepreneur and VC are risk-neutral, entrepreneur will own the project with probability σ and VC will own it with probability $1-\sigma$, where σ is chosen so that VC breaks even on average:

$$\sigma y(a_E) + (1-\sigma)y(a_V) = K.$$

Assume further that

$$y(a,\theta) = \alpha(\theta)z(a) + \beta(\theta),$$

where $\alpha > 0$, $\alpha' < 0$, $z > 0$. Then it is not difficult to show that optimal contract has the following form. There is a cut-off θ^* such that entrepreneur has control when $\theta > \theta^*$. The cut-off is chosen so that VC breaks even on average. The intuition behind the cut-off is that, given $\alpha' < 0$, high θ states are those where the choice of action has relatively little effect on y (and so entrepreneur should control action) and the low θ states are those where the choice of action has a relatively large effect on y (and so VC should control action).

In other words, conditioning the control on the state of the world can achieve first-best

when both unilateral control allocations fail to do so. Clearly, here, the first-best is achieved if control is given to the investor in lower θ (or more simply, θ_b) and to the entrepreneur in higher θ (or more simply, θ_g). Note that, if $\alpha^{'}(\theta)z(a)+\beta^{'}>0$ for all $a \in A$, high θ states are high-profit states, i.e., entrepreneur receives control when profits are high. We now present the second proposition.

Proposition 2 (VC Control Rights Hypothesis)**.** *By giving the VC control in the bad state, the entrepreneur is able to guarantee him a higher return, and this leads to having fewer IPOs when the economy is in the bad state for newly established firms.*

Proof. Higher return for the entrepreneur is guaranteed from the above explanation. Because VC's payoff (and overall payment to all agents) is higher when choosing a_b in bad states, this leads to having fewer IPOs when the economy is unfavorable to newly venture enterprise. □

3 Data

The data in this analysis includes information on IPO filings, M&A transactions, hand-collected financial information and information on other company characteristics.

3.1 IPO Filings and M&A Transactions

We use the Thomson Reuters New Issues database to identify all IPO filings between 1985 and 2016 and determine whether the IPO was successfully completed or later withdrawn. Throughout, we generally limit our definition of IPO filings to the exclusion of non-operating entities, thereby excluding closed-end funds, real estate investment companies (REITs) and special purpose vehicles (SPACs). In addition, we filter out IPO filings with an offer price less than $5 per share, unit offers, small best-effort offerings, bank and savings and loan (S&L) IPOs, and natural resource limited partnerships. For IPO firms, we exclude companies not

listed in the Center for Research in Security Pricing (CRSP) stock return files within 6 months of the IPO date. Finally, we filter out IPO filings of foreign companies that use American Depositary Receipts (ADRs).

The SDC record is particularly incomplete for withdrawn deals, which requires manual collection of missing data from SEC filings. Since a single data source is not sufficient and/or is inaccurate, we try to use multiple sources for each data item. We collect information on firm exits, that is, events in which a firm is acquired, goes public in a second attempt, or files for bankruptcy. We use CapitalIQ to look for acquisitions and bankruptcies, and the SDC database to identify second IPOs of withdrawn firms. We conduct extensive reviews to validate the nature of private firms' exits using the Lexis-Nexis, Factiva, and web searches.

Using these criteria, we identify 6,361 complete IPOs and 1,901 withdrawn IPO filings during this period. Table 1 summarizes the outcomes of post-filing for withdrawn issuers and complete issuers. The figures in columns (1) and (3) of Panel A show the numbers of privately held firms and publicly listed firms after filing respectively. Figures in column (2) and (4) in Panel A show the numbers of privately held firms and publicly listed firms acquired by other companies after filing, respectively. The figures in column (3) of Panel A show the number of privately held firms that have stopped their business for reasons such as bankruptcy or went public in a second attempt. Finally figures in column (6) of Panel A show the numbers of publicly listed firms that have stopped their businesses since filing. Panel B reports the same information in percentages.

[Insert Table 1 near here]

Figure 3 shows a graphical illustration of the information provided in Table 1. Many firms are acquired by other firms in the first three years. In terms of the number of observations, a similar number of complete and withdrawn issuers are acquired within the first three years. Since there are more complete filers, this fact indicates that the withdrawn filers with a fairly high proportion are acquired within the first three years. Specifically, about 37% of

withdrawal filers were acquired by other companies within the first three years. The fact that so many privately-held firms were acquired in a relatively short period of time is a great help in our research to understand the decisions of private firms because information on entrepreneurial companies are only observed occasionally (Korteweg and Sorensen (2010)). In other words, by comparing the hypothetical payoff when the firm would have obtained if they had gone public and the payoff when the firm was acquired, it is possible to understand withdrawn issuers' going public decision. To causally address the behavior of IPO filers, we compare the changes in values calculated in the withdrawn group with the changes in values of the actual IPO group. The details of empirical methodologies are provided in the Section 4.

[Insert Figure 3 near here]

Data on M&A characteristics come form Thomson Reuters SDC Platinum and CapitalIQ. The bids are by U.S. or foreign bidders for a IPO filer target announced between 1996 to 2017. The reason for starting the analysis since 1996 is that financial information of IPO filers is available on SEC from that point on. The deal can be clearly classified as successfully completed and the date of bid completion is available. The acquirer seeks to acquire more than 50 percent of target shares in order to gain control of the firm and holds less than 50 percent of target shares beforehand. Following the Betton, Eckbo, and Thorburn (2008), the deal is a merger, not a tender offer or a block trade. The payment method and transaction amount are available, and the target have sufficient valuation data covered by SEC (S-1 Prospectuses) for computing their market values and announcement returns between IPO filings and M&A events. Our final sample includes 796 filing and bid pairs.

For various M&A transaction characteristics, we consider the payment method (cash merger or stock merger), percentage of cash used in transaction, buyout type (strategic merger or financial buyout), transaction value, implied enterprise value, consideration to shareholders, and implied equity value. Because the nature of the transaction varies depend-

ing on what the payment method is, we include the percentage of cash used in the transaction in our control variables. Similarly, the type of merger is also an important factor that determines the nature of the transaction, so we control it. Specifically, if the acquirer and target have the same first three digits of SIC codes, the transaction is defined as strategic merger. All other variables contribute to constructing our dependent variables Δ*Pay off to Existing Shareholders* and Δ*Firm Value*. Definitions of specific variables are covered in the Section 4.

3.2 Financial Information and other Firm Characteristics

As already mentioned, the analysis of private companies is complicated due to data limitations. Standardized financial databases do not provide financial information to withdrawn filers. To overcome this limitation, we follow Bernstein (2015) and collect the financial information of withdrawn companies from the initial registration documents by downloading Form S-1 filings from the SEC's EDGAR database, which is available from 1996. We collect financial information for IPO firms from Form 424B filings which they submit shortly after they are listed. Through this, we can obtain financial information for both IPO firms and withdrawn firms at the time of planning the IPO.

We obtain data on venture capital (VC) and private equity (PE) funding from Jay Ritter's database and registration statements. In the principal shareholder part of the SEC filings, we search various investors with a stake of more than five percentage to find out if VC and PE are participating as pre-issuers. We supplement these data with information on which firm is VC/PE backed from CapitalIQ by searching who participates as sellers of the transactions when the firm was finally acquired. Finally, we search the business description from CapitalIQ to confirm that the investor is VC/PE, and approve it through web search if necessary.

For the financial characteristics of IPO firms and withdrawn firms, we collect firm size,

cash to assets ratio, leverage ratio, and net income to assets ratio. Firm size is measured by the log of firm assets. Cash to assets ratio is cash, cash equivalents and marketable securities divided by total assets. Leverage ratio is total liabilities over total assets. Net income to assets ratio is the ratio of net income or loss and total assets. All continuous financial information is winsorized at 1st and 99th percentile and based on the information at the time of filing.

We collect IPO proceeds and shares offered information. In particular, we classify the number of shares offered by the company and the shares offered by the selling stakeholders to accurately calculate the payoff to existing shareholders when the IPO was made. Specifically, a payoff to an existing shareholder at the time of filing is defined as the following: the offering price multiplied by the difference between post-IPO outstanding number of shares and the shares assigned to the new shareholders. This dilution percentage is then used to calculate the payoff of the existing shareholders at the time of acquisition by multiplying this figure by the consideration to shareholder in future M&A transactions.

Finally, we obtain Nasdaq daily returns from Datastream. In particular, we follow Bernstein (2015) and use the Nasdaq fluctuations in the two months following the IPO filing date as an instrument for closing the IPO, relying on the filer's sensitivity to stock market movements during the book-building phase. We also use Nasdaq returns in the three months prior to the IPO filing to control possible effect of pre-filing returns on changes in firm value and payoff to existing shareholders. As a part of robustness tests, we also use the Nasdaq returns in the three month window prior to the IPO filing to look at the relationship between outcome variables and going public decision.

4 Empirical Methodologies

In order to causally explain the effect of firms remaining in private markets, it is better to have well-balanced observable characteristics between withdrawn and complete IPO filers.

Table 2 reports summary statistics for our primary sample. We explore firm characteristics mentioned in Section 3. In the first two columns we report mean and median values of withdrawn filer's characteristics. In the third and fourth columns we provide mean and median values of IPO firm's characteristics. The fifth to seventh column we examine the statistical differences between two groups.

[Insert Table 2 near here]

The first four variables are related to firm's financial characteristics. We find no significant differences in firm size, cash to assets ratio, leverage ratio, and net income or loss to assets ratio. The next three variables explain the feature of IPO flings. Proceeds amount, the ratio of VC/PE backed filers, and the percentage of shares offered to total outstanding shares after the offering are not significantly different between two groups. Following two variables explain characteristics of M&A transactions. Percentage of cash used as the acquisition currency and the ratio of strategic merger are statistically not different between two groups.

However, there are large differences in Nasdaq returns experienced by companies after IPO filing. In particular, IPO companies experience a 6% increase in the two-month Nasdaq returns after the filings, while companies that withdraw their filings, on average, experience a sharp decline of 3% over the same period. However, the differences in Nasdaq returns over the three months prior to IPO filing are relatively small (8% increase for companies that ultimately remain private versus 5% for those that go public). These results are in line with a number of previous studies that document the role of market returns in IPO completion choices (Busaba et al. (2001); Benveniste et al. (2003); Edelen and Kadlec (2005); Dunbar and Foerster (2008); and Bernstein (2015)).

To find out why firms remain private, we have to choose the right groups to compare. Simply including an average private company can lead to biased estimates as most private companies are fundamentally different and never go public. To address these concerns, we focus on those companies that file an initial registration statement with the SEC in an

attempt to go public. We compare the changes in firm value and changes in payoff to existing shareholders of firms that go public with firms that withdraw their filing and remain private. Because firm's going public decision and acquisition rate is highly associated with firm's life cycle (Arikan and Stulz (2016)), this setup is appealing as it allows for comparison of the post-IPO outcomes of firms that go public with that of private firms at a similar stage in their life cycle. We examine the relationship between changes in values and going public decision using the following specification:

$$Y_i = \beta_0 + \beta_1 \, Withdrawn_i + \boldsymbol{\delta}' \boldsymbol{X}_i + \mu_t + \nu_k + \epsilon_i \tag{3}$$

where Y_i measure the changes in enterprise value between the time of filing and the time of being acquired and the changes in payoff to the shareholders between the time of filing and the time of being acquired. Firm value at the time of filing is calculated by multiplying the number of actual shares outstanding by the offer price and then by adding the cost of convertible securities, plus short-term debt, straight debt, and preferred equity minus cash and marketable securities from the time of filing. Firm value at the time of being acquired is defined similarly. Thus, the difference between the two terms is one of our dependent variables, $\Delta Firm\ Value_i$. Pay off to shareholders at the time of filing is calculated by multiplying the number of outstanding shares after the offering by the offer price from the time of filing. Pay off to shareholders at the time of being acquired is defined similarly. Thus, the other dependent variable in our analysis is defined as the difference between the two terms, $\Delta Equity\ Value_i$.

$Withdrawn_i$ is the dummy variable of interest, indicating whether a filer remains private or go public. Under the null hypothesis that remaining private has no effect on changes in value of enterprise and shareholder payoff, β_1 should not be statistically different from zero. $\boldsymbol{X}_i$ is a vector of control variables including firm size, cash to assets ratio, leverage ratio, net income or loss to assets ratio, offering amount, VC/PE backed dummy variable, percentage

of offered shares out of total shares outstanding, percentage of cash used as an acquisition currency, indicator of strategic merger, and pre-filing Nasdaq returns (90 days). ν_k are Fama-French 12-industry fixed effects and μ_t are various year fixed effects including IPO filing year, M&A transaction year, and IPO×M&A cohort year fixed effects. We occasionally include IPO filing year× industry fixed effects to further mitigate the concern of unobserved heterogeneity. ϵ_i is the error term. We measure observations at the firm level and use robust standard errors to estimate the significance of coefficients.

If the decision to withdraw an IPO filing is related to unobserved value changing opportunities (captured in the error term), then β_1 may be biased. Therefore, we instrument for the withdrawing filing decision using Nasdaq returns in the first two months of the book-building phase. Admittedly, market returns can predict valuation in M&A market due to the correlation between returns and value of peer firms as a benchmark, but we only use returns in the short post-IPO filing window as the instrument. We can also control returns more generally using year fixed effects. There is no clear reason for the return on short window to affect future firm valuations after controlling for one-year return. To implement the instrumental variables approach, we estimate the following first-stage regression:

$$Withdrawn_i = \beta_0 + \beta_1 NSDQ_i + \boldsymbol{\delta}' \boldsymbol{X}_i + \mu_t + \nu_k + \epsilon_i \tag{4}$$

where $NSDQ_i$ is the instrumental variable. The second-stage equation estimates the impact of remaining private on changes in firm value and payoff to shareholders:

$$Y_i = \beta_0 + \beta_1 \widehat{Withdrawn}_i + \boldsymbol{\delta}' \boldsymbol{X}_i + \mu_t + \nu_k + \epsilon_i \tag{5}$$

where $\widehat{Withdrawn}$ are the predicted values from (4). If the conditions for a valid instrumental variable are met, β_1 captures the causal effect of an IPO on firm value outcomes. We implement the instrumental variable estimator using two-stage least squares (2SLS).

We need to note why we should look at the changes in *equity value* while estimating the difference in enterprise value. Comparable companies should also be analyzed based on their enterprise value, which represents the total cost of acquiring a company. Enterprise value is equal to the current market value of equity plus net debt (and minority interests, if they exist). Net debt is comprised of sum of short-term debt, long-term debt, capitalized leases, and preferred stock minus cash and cash equivalents. Net debt is included in enterprise value because the acquirer of a company's stock has the eventual obligation to pay off debt (and related obligations) and assumes cash on hand will be used in the first case to retire debt, leaving net debt as an addition to equity market value. Therefore, when the enterprise values of withdrawn IPO filers have increased, it is important to look at which factors increase the firm value.

Unfortunately, not all component values are given when a firm is filing an IPO and when it is acquired by another firm. For example, if we give a lower value to a firm that has made an IPO in the M&A market, we need to look at whether it is due to debt financing made possible after the listing, or because it has more cash since the listing. We do not know whether the two factors will increase or decrease, but fortunately we can see the market capitalization of firms. Therefore, if the increase/decrease of this factor shows magnitude and direction similar to the increase/decrease of the enterprise value, we can infer that the change of the firm value is driven from this factor. We illustrate an example of estimation window of completed and withdrawn filers in Figure 4.

[Insert Figure 4 near here]

To understand the underlying economic channel of the effect of maintaining the status of a privately held firm on enterprise value and equity value, we estimate the following

specification:

$$\begin{aligned} Withdrawn_i = \beta_0 \quad &+ \quad \beta_1 NSDQ_i + \beta_2 NSDQ_i \times InteractionTerms_i \\ &+ \quad \beta_3 InteractionTerms_i + \boldsymbol{\delta}' \boldsymbol{X}_i + \mu_t + \nu_k + \epsilon_i \end{aligned} \tag{6}$$

$$\begin{aligned} Y_i = \beta_0 \quad &+ \quad \beta_1 \widehat{Withdrawn}_i + \beta_2 \widehat{Withdrawn}_i \times InteractionTerms_i \\ &+ \quad \beta_3 InteractionTerms_i + \boldsymbol{\delta}' \boldsymbol{X}_i + \mu_t + \nu_k + \epsilon_i. \end{aligned} \tag{7}$$

As equation (6) shows, the instruments in the first stage are Nasdaq 60-days return and Nasdaq 60-days return interacted with the relevant interaction variables: *SOX*, *Strategic Merger*, and *VC/PE-backed* presented in the Section 6. Each interaction variable corresponds to the hypothesis associated with the channel presented in the Introduction. The coefficient (β_2) on interaction term in the equation (7) allows us to easily test the null hypothesis that the firm's going public decision does not depend on the relevant economic channels. For example, the positive and significant estimate on the interaction term *VC/PE-backed* implies that firms with a venture capital financing have a higher value improvement when they withdraw the IPO filing.

5 Results

In this section, we report results from regressing the changes in firm value and equity value on a firm's going public decision. We first report results using an OLS methodology. We follow with results using an instrumental variables 2SLS methodology.

5.1 OLS Results

In Table 3, we explore the relationship between changes in firm and equity value and a firm's going public decision. Column 1 to 4 report an economically large and statistically signif-

icant coefficient on *Withdrawn*, indicating significant relationship between changes in firm value and firm's going public decision. Column 5 to 8 report the similar results, indicating significant relationship between changes in equity value and firm's going public decisions. Column 1 and 5 include filing year fixed effects. Column 2 and 6 include Fama-French 30 industry fixed effects. Column 3 and 7 include IPO filing and M&A cohort fixed effects. Column 4 and 8 include IPO filing year times industry fixed effects. The inclusion of two-way fixed effects has little impact on the coefficient on *Withdrawn*. All specifications include time varying firm level controls. We control for firm size, cash to asset ratio, leverage ratio, net income to asset ratio, proceeds of IPO, percentage of cash usage in M&A transaction, strategic merger dummy variable, VC/PE backed IPO dummy variable, and 90-day Nasdaq return prior to filing.

[Insert Table 3 near here]

In all specifications, the coefficient of *withdrawn* exhibits statistically significant positive values, but the results can still be interpreted in two possible ways. A withdrawn IPO filing may indeed have an impact on changes in firm value and payoff to the shareholders. Alternatively, a withdrawn IPO filing may have no impact on changes in firm and equity value, however, differences between firms with successful and unsuccessful IPOs also impact dependent variables, counteracting the effect of the withdrawn IPO filing. In the following section, we instrument for the firm's going public decision allowing us to distinguish between these two interpretations.

5.2 IV Results

Table 4 reports the results of the first-stage regression in equation (4). In column 1, we have IPO filing year fixed effects. Column 2 includes industry fixed effects. Column 3 includes IPO filing-M&A transaction year cohort fixed effects. Column 4 contains industry times IPO

filing year fixed effects. All specifications include firm-level controls. In all four regression specifications, there is a strong and negative relationship between Nasdaq 60 days returns and whether or not the issuer withdraw the IPO filing. An increase of one standard deviation in the Nasdaq return translates into a 7% decrease in the probability of an IPO withdrawal. Moreover, the F-value varies from 11-41, where the threshold value of $F = 10$ is exceeded and it is suggested that the instrument is strong and probably not biased in the direction of the OLS estimates (Bound, Jaeger, and Baker (1995); Staiger, Stock, et al. (1997)).

[Insert Table 4 near here]

To be a valid instrument, the IV must also satisfy the exclusion restriction condition. In the case of our specification, we have to assert that 60-day Nasdaq returns do not directly affect changes in firm and equity values except through the IPO withdrawing channel. Although Nasdaq returns might predict future firm or equity values, we include year fixed effects that we control for this correlation between macroeconomic trends and future value changes. Our identification is based on the fact that it is the market return during a short window immediately after the IPO filing, which specifically predict the likelihood of IPO withdrawal. It is unlikely that the market return during this short window will directly predict future firm or equity value, except through the channel of broader macroeconomic trends which are controlled in our analysis with year fixed effects. However, we further validate this assumption in Section 7 by using a placebo test. We show that returns over a similar short period of time, but a window that precedes IPO filing, do not predict either IPO withdrawal or future firm and equity values, after controlling for year fixed effects.

We report results of the causal impact of IPO withdrawal on changes in firm and equity values in Table 5. Column 1 to 4 report a positive and statistically significant coefficient on instrumented $\widehat{Withdrawn}$, indicating significant relationship between changes in firm value and firm's going public decision. Column 5 to 8 report the similar results, indicating significant relationship between changes in equity value and firm's going public decisions. Column

1 and 5 include IPO filing year fixed effects. Columns 2 and 6 include Fama-French 30 industry fixed effects. Columns 3 and 7 contain IPO filing-M&A transaction cohort fixed effects. Finally, column 4 and 8 include industry times filing year fixed effects. The inclusion of two-way fixed effects has little influence on the coefficient on $\widehat{Withdrawn}$. All specifications include time-varying controls at firm level.

[Insert Table 5 near here]

The estimates in Table 5 show not only a statistically significant causal relationship between the withdrawal of the IPO and the changes in firm and equity values, but also an economically significant relationship. The coefficient on $\widehat{Withdrawn}$ measures the average difference in changes in enterprise and equity values between a withdrawn filer and completed issuer, given the same levels of time-varying firm-level controls and a set of fixed effects. The value of coefficients varies from 0.506 to 2.212, which implies that if we take a withdrawn filer and a completed issuer with the same levels of controls and given a set of fixed effects, the withdrawn filer gains, on average, 50.6% more firm value than the completed issuer.

These results are different from the OLS results in Table 3. For example, in column 2 specification, including industry fixed effects, the estimate rises from 0.295 to 0.506. The difference between two results *suggests* that the selection bias associated with the decision to complete the IPO filing is positive, and on average more value-gaining firms in M&A transactions after filings are more likely to complete the IPO filing. This correlation between the endogenous choice of firms to go public and the future value improvement obscures the causal relationship between the IPO success/withdrawal and the future value changes in the OLS regression, which can only be observed with IV settings.

Although we show important economic quantities, a little more attention needs to be paid to interpreting the estimate of IV. As our regression of instrumental variables is measured on those companies whose decision to complete or withdraw the IPO is subject to Nasdaq's performance on the stock market during the bookbuilding period, it is estimating the local

average treatment effect. If our instrument shifts the behavior of a subgroup of firms for whom the value improvement by remaining in private market are larger than average, IV estimates will be larger than OLS estimates because of heterogeneity in the population. In next Section 6, we study possible channels that can explain these estimates.

5.3 The VC Control Rights Hypothesis

Recent studies suggest that VC/PE has made an important contribution to the decline in IPOs in last two decades. Ewens and Farre-Mensa (2017) presents that despite the large drop in the number of IPOs in the US, privately-held firms backed by venture capital continue to raise capital and this ability to finance and grow at older ages stems from a positive shock to the supply of private capital to high-growth entrepreneurial firms. According to Doidge et al. (2018), since there is abundant capital available to private firms without going public, they have little incentive to do so until they reach the point in their life cycle where they focus more on payouts than on raising capital.

However, these arguments on the demand side probably provide only a partial explanation on the recent decline in IPOs. If VCs earn a higher return by listing their invested firms, the increased financing from VCs does not necessarily decrease the number of firms going public. Since the going public is still an available exit option to the pre-issuer, we need to estimate how the VC-backed group and the non VC-backed group will show the difference in the payoff when the going public treatment is sufficiently randomized.

Given the successful exits (IPO or acqusitions), Cumming (2008) presents that strong VC control rights are associated with a higher probability of acquisitions and a lower probability of IPOs and write-offs. Following the arguments in the Section 2, if the entrepreneur has control and has pledged monetary benefits to investors, he has an incentive to act so as to maximize private benefits. Since investors have deep pockets, they can always negotiate with the entrepreneur into taking the efficient action; however, the opposite is not true. We

explain the hypotheses that the model predicts in more detail based on actual practices as following.

In the VC setting, Berglöf (1994); Black and Gilson (1998); Bascha and Walz (2001); Hellmann (2006); De Bettignies (2008); and others assume that the private benefit of entrepreneurs is higher when the company went public than when it is acquired. VC control rights are relevant in the acquisition and IPO exit decision because of the private benefits that the entrepreneur enjoys, which may go beyond the financial benefits he receives from managing the venture. Entrepreneurs are likely to get private benefits from an IPO through the rewards associated with being the CEO of a publicly listed company. In contrast, VCs are not likely to enjoy private benefits. VCs are less active in participating in invested company that has been taken public, and they exit within six months to two years and/or they transfer their shares to their institutional limited partners (Gompers and Lerner (2004)). In an acquisition exit, both the VC and the entrepreneur sell their shares to the acquiring company and the entrepreneur is no longer the CEO. Therefore, the size of the private benefits of an entrepreneur in an acquisition exit is likely to be smaller than if the company had exited through an IPO.

Therefore, as venture firms become more difficult to manage as independent entities, VCs are more likely to take control, and startups are more likely to be traded in M&A market rather than going public. Table 6 tests the "VC control rights hypothesis" that we present in the Introduction and Section 2. Column (1) presents whether withdrawn issuers obtain more improvement in firm values for the subsample of non-VC/PE backed group. The figure is small and not significant. Column (2) shows whether or not withdrawn filers get higher firm value for the subsample of VC/PE-backed group. For this subsample group, the withdrawn filers show significant value improvement. For the whole sample, we find positive and significant coefficients for the both VC/PE-backed indicator and withdrawn $\times$ VC/PE-backed interaction term. For the changes in equity values, we find the similar patterns (columns (4)-(6)).

[Insert Table 6 near here]

6 Potential Channels

Exploring the cross-sectional heterogeneity of the effect provides important insights into the underlying economic channels of firm's behavior that not doing IPO in recent years. Specifically, we test three possible channels that can explain our main result. We term three channels as following hypothese: 1) the regulatory overreach hypothesis, 2) the economies of scope hypothesis, and 3) the private equity group payoff hypothesis.

6.1 The Regulatory Overreach Hypothesis

The conventional wisdom about why the IPO has decreased significantly is that the regulation is too strong. These claims are (still) largely supported by practitioners, and the main points of the assertion can be found in the contributions of leading economic circles.[16] The gist of the claim is as follows. The Sarbanes-Oxley Act of 2002 (SOX), particularly Section 404, imposed additional compliance costs on publicly traded firms. As a percentage of revenue, these costs have been especially onerous for small firms. Consistent with the SOX explanation for the decline in IPO activity, the decline in IPOs has been most pronounced among small firms.

We split the sample into filings before July 1, 2002 and later ones. If regulation is the decisive reason for this prolonged drought in IPOs, we can expect that the withdrawn-completed differential in value changes would be significantly different for filings before and after SOX. Specifically, higher value gains can be expected for filings since the introduction of the reg-

[16] If you search the title of this article on Google, the following three articles will be listed as top search: Rasmussen, Caroline. "Where Have All the Public Companies Gone?" *CNBC.com*, 25 Oct. 2017. Web. 15 Dec. 2017. Accessed; Thomas, Jason M. "Where Have All the Public Companies Gone?" *The Wall Street Journal*, 16 Nov. 2017. Web. 15 Dec. 2017. Accessed; Ritholtz, Barry. "Where Have All the Public Companies Gone?" *Bloomberg*, 24 Jun. 2015. Web. 15 Dec. 2017. Accessed. These three articles all point to strong regulation as the most important reason for the recent phenomenon.

ulation. We also split the sample into firms with less than $50 million in inflation-adjusted annual sales as of the filing and firms with more than $50 million sales. If the regulation is one of main driving forces, the withdrawn-completed differential in value changes would be significantly different for small and large firms. In particular, higher value gains can be expected from smaller firms.

Table 7 tests this "regulatory overreach hypothesis" that we term after Gao et al. (2013). For Panel A and B, we test the hypothesis with event dummy variables and their interactions. In column 1, we test the hypothesis with full sample. Sub-samples with various time periods of 3-year span are presented from column 2 to column 6. For each column, we compare the filings after July 1 of the mid-year with the filings before the event. In the full sample we do not find a significantly larger value gain in filings after July 1, 2002. Most of the value gains are estimated to occur from 2006 onwards, after considerable time has passed since regulation was introduced. In Panel C, we test the hypothesis with the sales dummy variable of firms with less than $50 million annual sales and its interaction with *Withdrawn*. We find no significant differential value changes for small and large firms. Not significant but we need to note the direction of the estimates. Regardless of firm size, withdrawn filers show a higher value change than IPO firms, and this difference seems to be dominated by larger firms.

[Insert Table 7 near here]

6.2 The Economies of Scope Hypothesis

This hypothesis is presented by Gao et al. (2013) and the background is as follows: There is an ongoing change in the economy that has reduced the profitability of small companies, whether public or private. Many small firms can create greater operating profits by selling out in a trade sale (being acquired by a firm in the same or a related industry) rather than operating as an independent firm and relying on organic (i.e., internal) growth. Earnings

will be higher as part of a larger organization that can realize economies of scope and bring new technology to market faster. The authors posit that the importance of getting big fast has increased over time due to an increase in the speed of technological innovation in many industries, with profitable growth opportunities potentially lost if they are not quickly seized.

We split the sample into deals with being acquired by a firm in the same or a related industry and others. Specifically, we define a *strategic merger* indicator variable equal to one if the first 3-digits of SIC codes of a target and a buyer are the same. Following the argument, we can expect the filer's withdrawn-completed differential in value changes would be significantly different for trade sales between strategic and non-strategic ones. In particular, higher value gains can be expected from strategic mergers.

Table 8 tests this "economies of scope hypothesis". Column 1-3 estimate the changes in firm value. Column 4-6 present the changes in equity value. Column 1 and 4 test the hypothesis with non-strategic mergers. We find no significant value changes for this subgroup. Column 2 and 5 test the hypothesis with strategic mergers. We find significant value gain in firm value for strategic mergers. In the full sample, there is an issue where testing power is weakened due to the interaction term, so we are not able to find the marginal value gain in the strategic merger group.

[Insert Table 8 near here]

7 Robustness Check

7.1 Placebo Test

First, we check if the exclusion restriction is violated. We look at the relationship between changes in firm and equity values and Nasdaq returns using the 3-month window before IPO filing for the same company sample. We argue that pre-IPO returns should have no impact

on firm and equity values after controlling for annual returns by using year fixed effects. This is confirmed in table 9.

[Insert Table 9 near here]

Column 1 reports the first stage results. There is no significant relationship between Nasdaq returns prior to the IPO filing and withdrawn decision. Columns 2 and 3 report second stage results where the dependent variable is the changes in firm value between IPO-filing and post-acquisition and the changes in equity value between IPO-filing and post-acquisitions, respectively. All Columns include IPO filing year×industry fixed effects as well as additional firm characteristics as controls. After instrumenting for listing decision with Nasdaq returns prior to the IPO filing, we find no statistical relationship between *Withdrawn* and future changes in firm values. In contrast to the Nasdaq returns following the IPO filing, outside the book-building window they are not correlated with changes in firm and equity value. These findings are consistent with the notion that short-run Nasdaq returns affect long-run firm and equity value only through their impact on firms' ownership choice. With these results, we validate our assumption that there is no direct relationship between pre-filing Nasdaq returns and firm and equity values, after controlling for annual returns.

7.2 Alternative Sample

One possible concern with our testing is that companies that would have done IPOs or at least IPO filings would not come into our treatment and control groups anymore by not trying IPO itself.[17] However, there is at least one problem that makes the firm a research

[17] As the listing process has become more streamlined since the JOBS Act passed, the percentage of issuers that are eligible for scaled disclosure increases from approximately 11% of issuers before the Act to 87% of issuers after the Act, effectively granting reduced reporting requirements to the vast majority of all IPO issuers (Chaplinsky, Hanley, and Moon (2017)). Consequently, we do not expect that eligible firms did not prepare IPO at all, even if they did not complete to file the registration statement with the SEC. However, since it is also true that a firm that does not complete the filing cannot enter our sample, we address this issue in this section.

subject that has not even filed registration statements (Korteweg and Sorensen (2010)). As we demonstrate in Introduction, we cannot observe their fair market value.

To overcome this issue, we limit our sample to the firms that provide sufficient information on firm and equity values when they are privately-held firms, while providing exit values as well when they finally exit via IPOs or trade sales. Figure 6 illustrates an example of estimation window of this new sample. Specifically, we collect all firms that have both pre-money and post-money valuations as they receives funding from the VC. We then collect the exit values of the firms that 1) exit through M&A directly, without even filing the IPO, and the exit values of firms that 2) file the prospectus with the SEC, or 3) actually do the IPO. In order to measure the changes in firm value to the greatest extent possible, we exclude all of the firms if information on the post-money valuation is not available in the last stage financing. Note that the number of the observation in the final sample is 236, which is small, since it is not often the case that the post-money valuation is available in the last-stage financing while still having all of the relevant exit values through M&A or IPO at the same time.

[Insert Figure 6 near here]

Table 10 presents the results of comparison test between two groups and OLS results. Panel A reports a systematic difference between IPO firms and their matched always-private counterparts. This difference is equally confirmed in another study using a more comprehensive sample from the Census Bureau (Maksimovic, Phillips, and Yang (2017)). To be specific, IPO exit group receives more rounds for staged finances, takes less time to exit from the last stage, raises more amount until the last stage, shows larger values at the last stage, and accordingly shows larger exit firm values. However, this difference is reversed in terms of *changes* in firm values between two groups. M&A Exit groups show 24% of net return between timing of last stages and exits. On the other hand, there is no big difference for the IPO exit group. Of course, we cannot claim that the firm's choice of exit itself causes

the distinct outcomes because of the systematic ex-ante difference between the two groups, which implies the selection and possible omitted variable biases. We present the OLS results in Panel B which do not report significant difference in changes in firm values between two groups.

[Insert Table 10 near here]

8 Conclusion

This paper examines why there has been a sharp fall in the number of U.S. listed stocks since 1996. We develop a framework that analyzes the contracting problem associated with the wealth constrained entrepreneur who derives private benefits (as distinct from monetary benefits from the venture) from running the firm. Considering the contingent state of nature of good or bad business environment for new enterprises, we present the next two propositions: 1) Under an unfavorable business environment for start-ups, regardless of whom has the corporate control rights, the firms will not go public (*stay private under unfavorable business environment*) and 2) by giving the VC control in the bad state, the entrepreneur is able to realize a higher return, and this leads to having fewer IPOs when the economy is in the bad state for newly established firms (*the VC control rights hypothesis*). The model assumes that value is created by selling out in both states, and that there are private benefits of control.

We provide empirical methodologies that causally test the above two hypotheses. Accounting for the endogeneity of a firm's choice to go public, we find strong evidence that staying private induces higher post-filing value improvement when filers are acquired: withdrawing a filing causes a 50.6% increase in firm value. Considering the cross-sectional heterogeneity of withdrawn and completed filers, we find venture capital plays an important role in explaining the firm value improvement for withdrawn issuers. Our results suggest that the

negative management environment for new ventures to operate as an independent entity via the IPO, which has been dominant since 1996, has brought the situation where the investor obtains control mainly with the expansion of the private capital market. Therefore, the exit through trade sales rather than IPOs becomes more prominent in recent years. We test two potential channels that might increase firm value for withdrawn issuers: the 1) regulation overreach hypothesis, and the 2) economies of scope hypothesis. We find that the economies of scope hypothesis can partially explain the recent prolonged in IPO activity.

Since our empirical strategy depends on IV estimation including withdrawn and completed IPO issuers, there may be criticism that the conclusions drawn from the tests cannot be generally applied. For example, investors who previously considered an IPO as a possible exit strategy may not be considering the IPO at all, so instead of submitting filings, they may directly find the buyer in the M&A market. To address this concern about external validity, we construct an alternative sample that includes firms with sufficient value information when they are privately-held firms, while providing exit values as well when they finally exit via either IPOs or trade sales. Because of a systematic difference between these two exit groups, we are not certain that we have a sufficiently exogenous indicator of treatment. Along with this possible bias in the OLS regression, we are not able to find significant value improvements for M&A exit using this alternative sample.

References

Aghion, P., Bolton, P., 1992. An incomplete contracts approach to financial contracting. The review of economic Studies 59 (3), 473–494.

Arikan, A. M., Stulz, R. M., 2016. Corporate acquisitions, diversification, and the firm's life cycle. Journal of Finance 71 (1), 139–194.

Babina, T., Ouimet, P. P., Zarutskie, R., 2018. Going entrepreneurial? IPOs and new firm creation. Unpublished Working Paper.

Badertscher, B., Jorgensen, B., Katz, S., Kinney, W., 2014. Public equity and audit pricing in the united states. Journal of Accounting Research 52 (2), 303–339.

Bascha, A., Walz, U., 2001. Convertible securities and optimal exit decisions in venture capital finance. Journal of Corporate Finance 7 (3), 285–306.

Bayar, O., Chemmanur, T. J., 2011. IPOs versus acquisitions and the valuation premium puzzle: a theory of exit choice by entrepreneurs and venture capitalists. Journal of Financial and Quantitative Analysis 46 (6), 1755–1793.

Benveniste, L. M., Ljungqvist, A., Wilhelm, W. J., Yu, X., 2003. Evidence of information spillovers in the production of investment banking services. Journal of Finance 58 (2), 577–608.

Berglöf, E., 1994. A control theory of venture capital finance. Journal of Law, Economics, & Organization, 247–267.

Bernstein, S., 2015. Does going public affect innovation? Journal of Finance 70 (4), 1365–1403.

Bernstein, S., Giroud, X., Townsend, R. R., 2016a. The impact of venture capital monitoring. Journal of Finance 71 (4), 1591–1622.

Bernstein, S., Lerner, J., Sorensen, M., Strömberg, P., 2016b. Private equity and industry performance. Management Science 63 (4), 1198–1213.

Betton, S., Eckbo, B. E., Thorburn, K. S., 2008. Corporate takeovers. Handbook of corporate finance: Empirical corporate finance 2, 291–430.

Bird, A., Karolyi, S. A., Ruchti, T. G., 2017. The burden of being public: Evidence from local labor markets. Unpublished Working Paper.

Black, B. S., Gilson, R. J., 1998. Venture capital and the structure of capital markets: banks versus stock markets. Journal of Financial Economics 47 (3), 243–277.

Bound, J., Jaeger, D. A., Baker, R. M., 1995. Problems with instrumental variables estimation when the correlation between the instruments and the endogenous explanatory variable is weak. Journal of the American statistical association 90 (430), 443–450.

Busaba, W. Y., Benveniste, L. M., Guo, R.-J., 2001. The option to withdraw IPOs during the premarket: empirical analysis. Journal of Financial Economics 60 (1), 73–102.

Chaplinsky, S., Hanley, K. W., Moon, S. K., 2017. The JOBS Act and the costs of going public. Journal of Accounting Research 55 (4), 795–836.

Chemmanur, T. J., He, J., 2011. IPO waves, product market competition, and the going public decision: Theory and evidence. Journal of Financial Economics 101 (2), 382–412.

Chernenko, S., Lerner, J., Zeng, Y., 2017. Mutual funds as venture capitalists? evidence from unicorns. Unpublished Working Paper.

Cumming, D., 2008. Contracts and exits in venture capital finance. The Review of Financial Studies 21 (5), 1947–1982.

De Bettignies, J.-E., 2008. Financing the entrepreneurial venture. Management Science 54 (1), 151–166.

Doidge, C., Kahle, K. M., Karolyi, G. A., Stulz, R. M., 2018. Do Public Firms Respond to Investment Opportunities More than Private Firms? Unpublished Working Paper.

Doidge, C., Karolyi, G. A., Stulz, R. M., 2017. The U.S. listing gap. Journal of Financial Economics 123 (3), 464–487.

Dunbar, C. G., Foerster, S. R., 2008. Second time lucky? withdrawn IPOs that return to the market. Journal of Financial Economics 87 (3), 610–635.

Edelen, R. M., Kadlec, G. B., 2005. Issuer surplus and the partial adjustment of IPO prices to public information. Journal of Financial Economics 77 (2), 347–373.

Ewens, M., Farre-Mensa, J., 2017. The evolution of the private equity market and the decline in IPOs. Unpublished Working Paper.

Gao, X., Ritter, J. R., Zhu, Z., 2013. Where have all the IPOs gone? Journal of Financial and Quantitative Analysis 48 (6), 1663–1692.

Gill, A., Walz, U., 2016. Are VC-backed IPOs delayed trade sales? Journal of Corporate Finance 37, 356–374.

Gompers, P. A., Lerner, J., 2004. The venture capital cycle. MIT press.

Gornall, W., Strebulaev, I. A., 2015. The economic impact of venture capital: Evidence from public companies. Unpublished Working Paper.

Helbing, P., Lucey, B. M., 2018. The determinants of ipo withdrawal: Evidence from Europe. Unpublished Working Paper.

Hellmann, T., 2006. Ipos, acquisitions, and the use of convertible securities in venture capital. Journal of Financial Economics 81 (3), 649–679.

Iliev, P., 2010. The effect of SOX section 404: Costs, earnings quality, and stock prices. Journal of Finance 65 (3), 1163–1196.

Kahle, K. M., Stulz, R. M., 2017. Is the US public corporation in trouble? Journal of Economic Perspectives 31 (3), 67–88.

Kaplan, S. N., Strömberg, P., 2003. Financial contracting theory meets the real world: An empirical analysis of venture capital contracts. The Review of Economic Studies 70 (2), 281–315.

Korteweg, A., Sorensen, M., 2010. Risk and return characteristics of venture capital-backed entrepreneurial companies. The Review of Financial Studies 23 (10), 3738–3772.

Kwon, S., Lowry, M., Qian, Y., 2017. Mutual fund investments in private firms. Unpublished Working Paper.

Maksimovic, V., Phillips, G. M., Yang, L., 2017. Do public firms respond to investment opportunities more than private firms? The impact of initial firm quality. Unpublished Working Paper.

Sørensen, M., 2007. How smart is smart money? a two-sided matching model of venture capital. The Journal of Finance 62 (6), 2725–2762.

Staiger, D., Stock, J. H., et al., 1997. Instrumental variables regression with weak instruments. Econometrica 65 (3), 557–586.

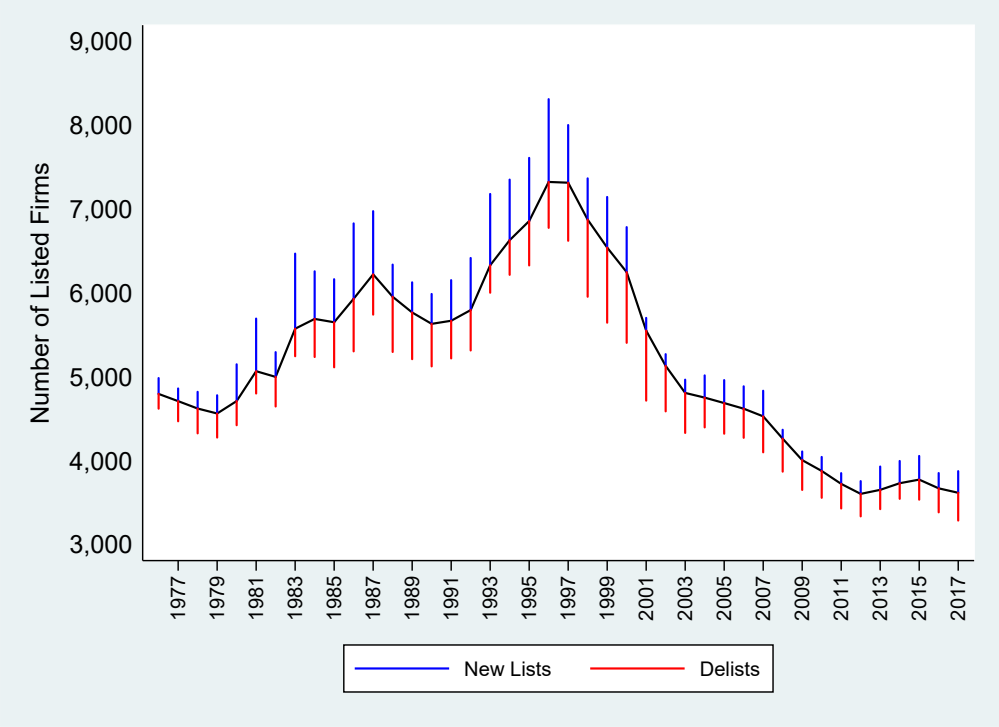

Figure 1: Additions and Subtractions to Listed Companies, 1976-2017

The Figure shows the rise and fall in listed companies in the U.S. from 1976 to 2017. Because new lists heavily outnumbered delists, especially in the late 1980s and 1990s, more than 2,500 companies were added from 1976 through 1996. The pattern reverses after 1996, as delists outstrip new lists and the population of listed companies falls by 3,618 companies. The pattern holds for stocks listed on the New York Stock Exchange and the Nasdaq Stock Market.

Figure 2: Illustration of Model Time-line

The Figure illustrates the timeline of the model in the Section 2.

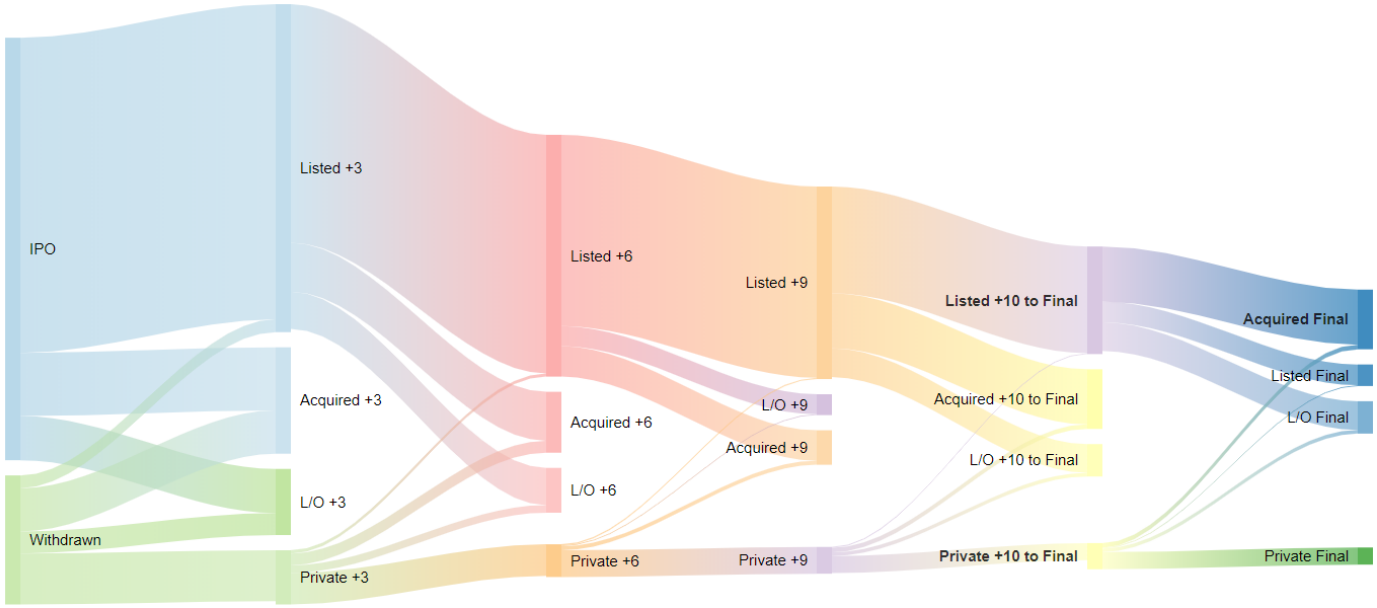

Figure 3: Actual Outcomes of Going Public and Remaining in Private: Sankey Diagram

This figure shows the Sankey diagram of withdrawn and completed IPO filers. We classify the outcomes of the filing into three different categories: 1) firms that keep the current status, 2) firms that are acquired, and 3) firms that goes bankrupt and others.

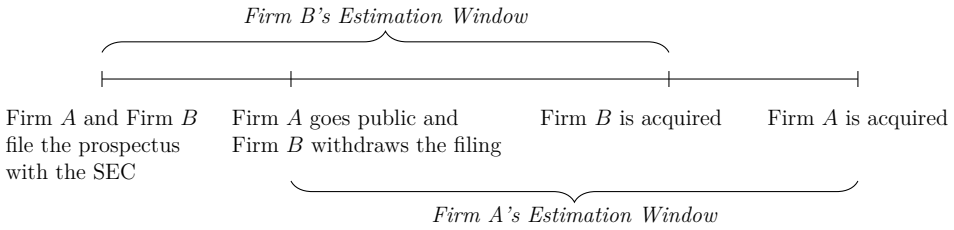

Figure 4: Illustration of Estimation Window

The figure illustrates an estimation window for withdrawn and completed filers in the Section 5.

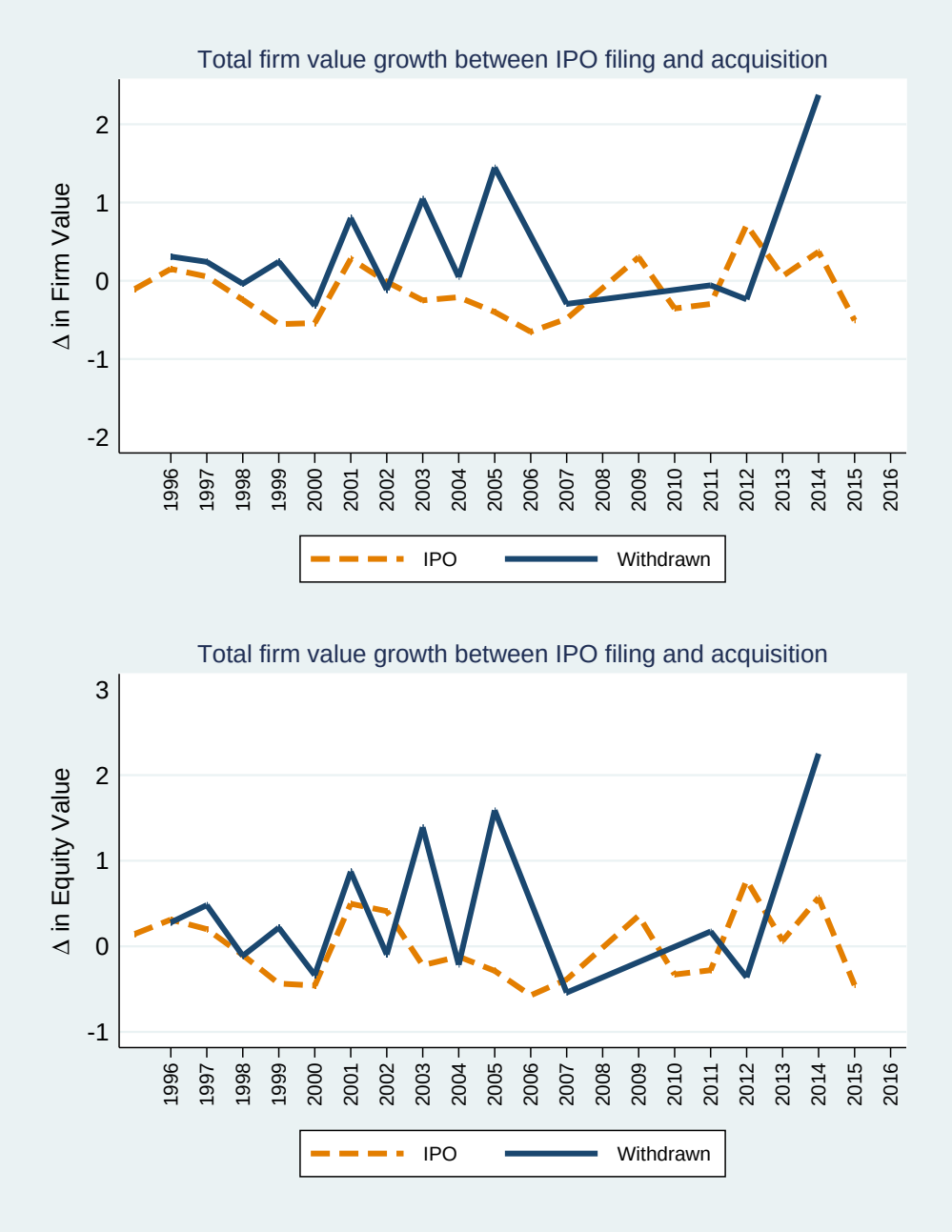

Figure 5: Changes in Shareholder Payoff and Firm Value: 1996-2016

This figure shows the time variation in firm and equity value of completed and withdrawn IPO filers from year 1996 to 2016. Panel A shows the changes in the firm value. Panel B shows the changes in the equity value.

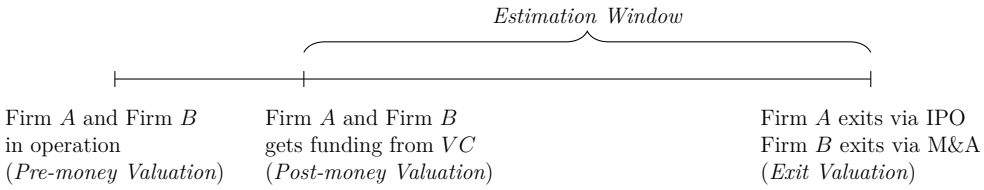

Figure 6: Illustration of Estimation Window, Alternative Sample

The Figure illustrates an estimation window for withdrawn and completed filers in the Section 7.2.

Table 1: Actual Outcomes of all Withdrawn Filers and IPOs from 1985-2016

The table records outcome events that occurred in the 15 years following the withdrawal (1,901) and completion (6,361) of every IPO filing registered with the U.S. SEC. Events that may have occurred after filing include the sale of an intended issuer or a bankruptcy filing and others. Events data are obtained from SEC filings, press releases, and Thomson Financial SDC database. Column (1) and (4) represent the number of sample firms that of the end of the year have not yet been acquired or ceased existence due to bankruptcy or other reasons.

	Withdrawn Filers			Completed Filers		
Years from Filings	Withdrawn (1)	Acquired (2)	Others (3)	IPOs (4)	Acquired (5)	Others (6)
Panel A: # of Firms						
0	1,729	155	17	6,335	17	9
1	1,341	200	188	6,023	203	109
2	981	144	216	5,407	352	264
3	753	132	96	4,804	347	256
4	620	82	51	4,312	279	213
5	532	61	27	3,879	244	189
6	480	31	21	3,535	192	152
7	440	20	20	3,252	159	124
8	408	21	11	3,033	139	80
9	382	15	11	2,804	146	83
10	349	16	17	2,623	119	62
11	330	12	7	2,458	105	60
12	319	7	4	2,299	96	63
13	309	5	5	2,178	77	44
14	299	6	4	2,079	64	35
15	287	8	4	1,984	54	41
Panel B: % of Firms						
0	90%	9%	1%	100%	0%	0%
1	68%	12%	11%	95%	3%	2%
2	47%	8%	12%	85%	7%	4%
3	34%	8%	6%	76%	7%	4%
4	26%	5%	3%	68%	6%	3%
5	21%	4%	2%	61%	6%	3%
6	18%	2%	1%	56%	5%	2%
7	16%	1%	1%	51%	5%	2%
8	14%	1%	1%	48%	5%	1%
9	12%	1%	1%	44%	5%	1%
10	10%	1%	1%	41%	5%	1%
11	9%	1%	0%	39%	4%	1%
12	9%	0%	0%	36%	4%	1%
13	8%	0%	0%	34%	4%	1%
14	7%	0%	0%	33%	3%	1%
15	7%	0%	0%	31%	3%	1%

Table 2: Summary Statistics

This table provides key summary statistics, comparing firms that go public with firms that withdraw IPO filing and remain private for firms from 1996-2016 that are subsequently acquired prior to Dec 31, 2016. All variables are defined in the Appendix. Financial information and IPO characteristics are at the time of the IPO filing. *, **, and *** indicate that differences in means are statistically significant at the 10%, 5%, and 1% level, respectively.

	Withdrawn		Completed		Diff	t stat	p-value
	Mean	Median	Mean	Median			
	(1)	(2)	(3)	(4)	(1)−(3)	(5)	(6)
Financial Information at IPO Filing							
ln(assets) ($M)	3.45	3.29	3.50	3.29	-0.05	-0.33	0.74
Cash/Assets	0.19	0.09	0.22	0.05	-0.04	-0.93	0.36
Leverage	0.57	0.59	0.57	0.59	-0.00	-0.06	0.96
Net Income/Assets	-0.21	-0.02	-0.17	0.00	-0.04	-0.65	0.51
IPO Characteristics							
Proceeds ($M)	76.10	56.35	63.43	45.20	12.67	1.62	0.11
VC/PE Backed	0.58	1.00	0.61	1.00	-0.04	-0.54	0.59
Shares Offered (%)	28.50	27.33	26.96	24.56	1.55	1.17	0.24
M&A Characteristics							
% of Cash in Merger	66.40	100.00	64.17	100.00	2.23	0.45	0.65
Strategic Merger	0.39	0.00	0.48	0.00	-0.09	-1.57	0.12
Nasdaq Returns							
60-day Postfiling Nasdaq returns	-0.03	-0.03	0.06	0.06	-0.09***	-6.80	0.00
90-day Prefiling Nasdaq returns	0.08	0.07	0.05	0.04	0.03***	3.24	0.00
Observations	295		501				

Table 3: OLS Results for the Effect of Withdrawing an IPO

This table reports results of OLS regressions of the changes in firm or equity values on whether or not the firm withdrew or completed an IPO. The dependent variable is the change in firm or equity values between the timing of the IPO filing and post filing acquisitions. In columns 1-4, we estimate the effect of staying in the private market on changes in firm value. In columns 5-8, we estimate the effect of withdrawing IPO filing on changes in equity value. All variables are defined in the Appendix A1. The sample includes all withdrawn and completed IPO filers that are acquired by other entities between 1996 to 2016. Robust standard errors are reported in parentheses. *, **, and *** indicate that differences in means are statistically significant at the 10%, 5%, and 1% level, respectively.

	Δ *Firm Value*				Δ *Equity Value*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Withdrawn	0.414***	0.295***	0.442***	0.484***	0.338**	0.201*	0.388**	0.394***
	(0.125)	(0.106)	(0.146)	(0.127)	(0.139)	(0.117)	(0.166)	(0.140)
Filing Year Fixed Effects	✓				✓			
Industry Fixed Effect		✓				✓		
Cohorts Fixed Effects			✓				✓	
Industry × Filing Year Fixed Effects				✓				✓
Control Variables	✓	✓	✓	✓	✓	✓	✓	✓
Observations	796	796	796	796	796	796	796	796
R-Squared	0.225	0.126	0.442	0.360	0.207	0.099	0.427	0.337
p-value	0.001	0.006	0.003	0.000	0.015	0.088	0.020	0.005

Table 4: Instrumental Variable Regressions: First-Stage

This table reports results of IV regression (first-stage, OLS). The dependent variable is whether or not the firm withdrew an IPO. The instrumental variable is the Nasdaq return in the 60 day window following the IPO filing. All variables are defined in Appendix A1. The sample includes all withdrawn and completed IPO filers that are acquired by other entities between 1996 to 2016. Robust standard errors are reported in parentheses. *, **, and *** indicate that differences in means are statistically significant at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)
Nasdaq returns	-0.583***	-0.868***	-0.617***	-0.643***
	(0.135)	(0.150)	(0.139)	(0.200)
Filing Year Fixed Effects	✓			
Industry Fixed Effect		✓		
Cohorts Fixed Effects			✓	
Industry × Filing Year Fixed Effects				✓
Control Variables	✓	✓	✓	✓
Observations	796	796	796	796
R-Squared	0.393	0.132	0.513	0.333
F-Statistics	14.79	41.06	11.37	14.24
p-value	0.000	0.000	0.000	0.001

Table 5: Instrumental Variable Regressions: Second-Stage

This table reports results of IV regressions of the changes in firm and equity values on whether or not the firm withdrew an IPO. The dependent variable is the changes in firm and equity values between the timing of IPO filing and post-acquisitions that is instrumented from the first-stage. In columns 1-4, we estimate the effect of staying in the private market on changes in firm value. In columns 5-8, we estimate the effect of withdrawing IPO filing on changes in equity value. All variables are defined in the Appendix A1. The sample includes all withdrawn and completed IPO filers that are acquired by other entities between 1996 to 2016. Robust standard errors are reported in parentheses. *, **, and *** indicate that differences in means are statistically significant at the 10%, 5%, and 1% level, respectively.

	Δ *Firm Value*				Δ *Equity Value*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Withdrawn	1.113*	0.506*	2.001*	2.212**	1.193*	0.508*	2.163*	2.329*
	(0.594)	(0.267)	(1.062)	(1.120)	(0.686)	(0.300)	(1.214)	(1.253)
Filing Year Fixed Effects	✓				✓			
Industry Fixed Effect		✓				✓		
Cohorts Fixed Effects			✓				✓	
Industry × Filing Year Fixed Effects				✓				✓
Control Variables	✓	✓	✓	✓	✓	✓	✓	✓
Observations	796	796	796	796	796	796	796	796
R-Squared	0.094	0.124	0.241	0.234	0.054	0.098	0.211	0.218
p-value	0.061	0.059	0.060	0.048	0.082	0.091	0.075	0.063

Table 6: The VC Control Rights Hypothesis

This table presents estimates of the cross-sectional heterogeneity of the effect of a firm's listing decisions on changes in firm and equity values. We interact *Withdrawn* indicator with the *VC/PE-backed* group dummy variable. The dependent variable is the changes in firm and equity values between the timing of IPO filing and post-acquisitions. In columns 1-3, we estimate the effect of staying in private market on changes in firm value. In columns 4-6, we estimate the effect of withdrawing IPO filing on changes in equity value. All variables are defined in the Appendix A1. The sample includes all withdrawn and completed IPO filers that are acquired by other entities between 1996 to 2016. Robust standard errors are reported in parentheses. *, **, and *** indicate that differences in means are statistically significant at the 10%, 5%, and 1% level, respectively.

	Δ *Firm Value*			Δ *Equity Value*		
	Non-VC/PE	VC/PE-backed	Full	Non-VC/PE	VC/PE-backed	Full
	(1)	(2)	(3)	(4)	(5)	(6)
Withdrawn	0.367	1.170*	-0.618	0.063	1.233*	-0.786
	(2.395)	(0.665)	(0.705)	(2.592)	(0.733)	(0.750)
VC/PE-backed			-0.312**			-0.350**
			(0.148)			(0.161)
Withdrawn× *VC/PE-backed*			1.557**			1.634**
			(0.668)			(0.721)
Filing Year Fixed Effects	✓	✓	✓	✓	✓	✓
Industry Fixed Effect	✓	✓	✓	✓	✓	✓
Control Variables	✓	✓	✓	✓	✓	✓
Observations	351	445	796	351	445	796
R-Squared	0.298	0.304	0.369	0.306	0.291	0.369

Table 7: Potential Channel: The Regulation Overreach Hypothesis

This table presents estimates of the time-series variation of the effect of firm's listing decisions on changes in firm and equity values. We interact *Withdrawn* indicator with the *SOX* dummy variable. The dependent variable is the changes in firm and equity values between the timing of IPO filing and post-acquisitions. In columns 1-6, we estimate the effect of staying in private market on changes in firm value. In columns 7-12, we estimate the effect of withdrawing IPO filing on changes in equity value. In columns 13-18, we estimate the effect of withdrawing IPO filing with the interactions between *Withdrawn* and *SOX*, which now subdivides the firms into two different categories in terms of annual sales thresholds of $50 millions. All variables are defined in the Appendix A1. The sample includes all withdrawn and completed IPO filers that are acquired by other entities between 1996 to 2016. Robust standard errors are reported in parentheses. *, **, and *** indicate that differences in means are statistically significant at the 10%, 5%, and 1% level, respectively.

	Δ *Firm Value*					
	Full Sample	2001-2003	1999-2001	2003-2005	2005-2007	2007-2016
	(1)	(2)	(3)	(4)	(5)	(6)
Withdrawn	0.843	-1.738	1.186***	-1.618	-5.539	-0.978
	(0.622)	(1.564)	(0.430)	(3.954)	(12.176)	(5.109)
SOX	-2.267	0.718	1.590**	0.443	-1.863	0.268
	(5.971)	(1.874)	(0.784)	(2.403)	(3.192)	(1.569)
Withdrawn×*SOX*	4.843	-2.331	-3.055**	-7.668	8.315	3.858
	(8.984)	(3.896)	(1.351)	(27.440)	(19.273)	(7.509)
Filing Year Fixed Effects	✓					✓
Industry Fixed Effect	✓	✓	✓	✓	✓	✓
Control Variables	✓	✓	✓	✓	✓	✓
Observations	796	66	210	67	65	65

	Δ *Equity Value*					
	Full Sample	2001-2003	1999-2001	2003-2005	2005-2007	2007-2016
	(7)	(8)	(9)	(10)	(11)	(12)
Withdrawn	0.903	-0.906	1.125**	-1.785	-4.493	1.919
	(0.695)	(1.449)	(0.448)	(2.271)	(12.112)	(4.786)
SOX	-1.720	1.213	1.313**	-0.093	-1.792	-0.659
	(6.155)	(1.936)	(0.667)	(1.274)	(3.141)	(1.435)
Withdrawn×*SOX*	4.748	-2.299	-2.523**	-1.797	7.634	0.668
	(9.235)	(4.247)	(1.162)	(13.895)	(19.039)	(6.631)
Filing Year Fixed Effects	✓					✓
Industry Fixed Effect	✓	✓	✓	✓	✓	✓
Control Variables	✓	✓	✓	✓	✓	✓
Observations	796	66	210	67	65	65

Table 7: Potential Channel: The Regulation Overreach Hypothesis (Continued)

	Δ *Firm Value*			Δ *Equity Value*		
	Sales>$50M	Sales<$50M	Full	Sales>$50M	Sales<$50M	Full
	(13)	(14)	(15)	(16)	(17)	(18)
Withdrawn	1.753	0.419	1.342	1.720	0.381	1.672
	(3.011)	(0.503)	(1.070)	(3.907)	(0.539)	(1.411)
SOX			-0.067			0.014
			(0.227)			(0.296)
Withdrawn×*SOX*			-0.551			-0.929
			(0.895)			(1.181)
Filing Year Fixed Effects	✓	✓	✓	✓	✓	✓
Industry Fixed Effect	✓	✓	✓	✓	✓	✓
Control Variables	✓	✓	✓	✓	✓	✓
Observations	244	551	796	244	551	796
R-Squared	0.362	0.277	0.205	0.306	0.275	0.172

Table 8: Potential Channel: The Economies of Scope Hypothesis

This table presents estimates of the cross-sectional heterogeneity of the effect of firm's listing decisions on changes in firm and equity values. We interact *Withdrawn* indicator with the *strategic merger* group dummy variable. The dependent variable is the changes in firm and equity values between the timing of IPO filing and post-acquisitions. In columns 1-3, we estimate the effect of staying in private market on changes in firm value. In columns 4-6, we estimate the effect of withdrawing IPO filing on changes in equity value. All variables are defined in the Appendix A1. The sample includes all withdrawn and completed IPO filers that are acquired by other entities between 1996 to 2016. Robust standard errors are reported in parentheses. *, **, and *** indicate that differences in means are statistically significant at the 10%, 5%, and 1% level, respectively.

	Δ *Firm Value*			Δ *Equity Value*		
	Non-Strategic	Strategic	Full	Non-Strategic	Strategic	Full
	(1)	(2)	(3)	(4)	(5)	(6)
Withdrawn	0.180	1.489*	0.548	0.390	1.423	0.501
	(0.859)	(0.864)	(0.623)	(0.967)	(0.919)	(0.681)
Strategic Merger			0.042			0.056
			(0.114)			(0.125)
Withdrawn×*Strategic Merger*			0.016			-0.178
			(0.511)			(0.547)
Filing Year Fixed Effects	✓	✓	✓	✓	✓	✓
Industry Fixed Effect	✓	✓	✓	✓	✓	✓
Control Variables	✓	✓	✓	✓	✓	✓
Observations	369	427	796	369	427	796
R-Squared	0.272	0.184	0.394	0.295	0.171	0.390

Table 9: Robustness Check: Placebo IV Regressions

This table reports first and second stage results of IV regressions of the changes in firm and equity values on whether or not the firm withdrew an IPO and other controls. Column 1 reports first-stage results. Column 2 and 3 report second-stage results. *Withdrawn* is instrumented by the returns on Nasdaq in the 90 day window prior to the IPO filing. The dependent variable is the changes in firm and equity values between the timing of IPO filing and post-acquisitions. In column 2, we estimate the effect of staying in private market on changes in firm value. In column 3, we estimate the effect of withdrawing IPO filing on changes in equity value. All variables are defined in the Appendix A1. The sample includes all withdrawn and completed IPO filers that are acquired by other entities between 1996 to 2016. Robust standard errors are reported in parentheses. *, **, and *** indicate that differences in means are statistically significant at the 10%, 5%, and 1% level, respectively.

	First-Stage	Δ *Firm Value*	Δ *Equity Value*
	(1)	(2)	(3)
Nasdaq returns (-90 days)	0.115		
	(0.154)		
Withdrawn		0.434	1.295
		(1.964)	(2.450)
Industry × Filing Year Fixed Effects	✓	✓	✓
Control Variables	✓	✓	✓
Observations	796	796	796
R-Squared	0.490	0.395	0.328
F-Statistics	1.03		
p-value	0.455		

Table 10: Robustness Check: Alternative Sample

This table reports the summary statistics and OLS regression of the alternative sample. The Panel A provides key summary statistics, comparing firms that go public with firms that exit via trade sales. All dollar amount variables are defined in millions. Panel B reports results of OLS regressions of the changes in firm values on whether or not the firm exits via trade sales. The dependent variable is the changes in firm values between the timing of last stage post-money valuation and exits (either M&As or IPOs). In columns 1-4, we estimate the effect of exiting via M&As on changes in firm value. All variables are defined in the Appendix A1. The sample includes all privately-held firms that both have last-stage post-money valuation and exit values (the firm values at the timing of going public or M&A transaction values) between 1996 to 2016. Robust standard errors are reported in parentheses. *, **, and *** indicate that differences in means are statistically significant at the 10%, 5%, and 1% level, respectively.

Panel A: Comparison Between Two Exits: M&As and IPOs

	M&As		IPOs		Diff	t stat	p-value
	Mean	Median	Mean	Median			
	(1)	(2)	(3)	(4)	(1)−(3)	(5)	(6)
Number of Rounds	2.67	2.00	3.93	4.00	-1.26	-4.19	0.00
Years to Exit	3.28	2.00	2.04	1.00	1.23	2.56	0.01
Total Amount Raised	43.48	27.32	90.89	90.33	-47.41	-6.12	0.00
Last Stage Firm Value	166.60	62.00	493.26	313.00	-326.66	-6.43	0.00
Exit Firm Value	206.84	61.71	488.33	206.85	-281.48	-5.46	0.00
Exit Equity Value	190.15	50.00	433.79	330.59	-243.63	-4.91	0.00
Observations	195		41				

Panel B: OLS Results

	Δ *Firm Value*			
	(1)	(2)	(3)	(4)
M&A Exits	1.245	1.749	1.298	1.310
	(2.085)	(3.047)	(0.968)	(1.224)
Exit Year Fixed Effects	✓			
Industry Fixed Effect		✓		
Year × Industry Fixed Effect			✓	
Last Stage × Exit Year Fixed Effect				✓
Control Variables	✓	✓	✓	✓
Observations	236	236	236	236
R-Squared	0.251	0.416	0.230	0.453

Table A1: Variable Definitions

All accounting information is winsorized at 1st and 99th percentiles. Financial information and IPO characteristics are measured at the time of the IPO filing. Control variables include ln(Assets), Cash/Assets, Leverage, Net Income/Assets, Proceeds ($M), VC/PE-Backed, % of Cash in Merger, and Strategic Merger

Variable	Definition
Financial Information at IPO filing	
ln(Assets)	The log of the inflation-adjusted total assets (Year 1996, $M)
Cash/Assets	The ratio of cash holdings to book value of assets
Leverage	The total debt over book value of assets
Net Income/Assets	The ratio of annual net income to book value of assets
IPO Characteristics	
Proceeds ($M)	The gross proceeds of the IPO filing
VC/PE-Backed	An indicator equal to one if the firm was funded by a venture capital firm or private equity fund at the time of the IPO filing
Shares Offered (%)	The shares offered by company over the shares outstanding (post-offering)
M&A Characteristics	
% of Cash in Merger	The ratio of cash used in total transaction of trade sales
Strategic Merger	An indicator of one if the target and acquiring company has the same 3-digit SIC code for companies that merge
Nasdaq Returns	
Post-filing Nasdaq Returns	The 60 trading day Nasdaq returns calculated from the day of the IPO filing
Pre-filing Nasdaq Returns	The 90 trading day Nasdaq returns preceding the IPO filing date
Dependent Variable	
Δ Firm Value	Changes in firm value between IPO filing and acquisition. Firm value at the IPO filing is defined as the sum of market equity value and liabilities. Firm value at the timing of acquisition is the sum of considerations to shareholders divided by % of sought and net assumed liabilities.
Δ Equity Value	Changes in equity value between IPO filing and acquisition. Equity value at the IPO filing is defined as the market equity value. Equity value at the timing of acquisition is the considerations to shareholders divided by % of sought.
Others	
Withdrawn	An indicator of one if the IPO filing is withdrawn
Industry	Fama-French 30 Industry Code
Cohort	A group that has the same IPO filing and acquisition year

Table A2: Actual Outcomes of all Withdrawn Filers and IPOs from 1985-2016

The table records changes in firm and equity values in the 7 years following the withdrawal (295) and completion (501) of every IPO filing and acquisition pair from registration with the US SEC. Withdrawn and completed offerings include all intended issuers that are acquired after the filings from 1996-2016. Events data were obtained from SEC filings, press releases, and Thomson Financial SDC database.

	Observations		Δ *in Values*			
Acquired Years from Filings	Withdrawn (1)	Completed (2)	Withdrawn (3)	Completed (4)	Difference (5)	p-values (6)
Panel A: Δ *Firm Value*						
0	48	3	0.19	-0.64	0.83	0.12
1	74	61	0.01	-0.21	0.21	0.17
2	52	92	-0.04	-0.23	0.18	0.32
3	24	81	0.09	-0.13	0.22	0.47
4	12	54	-0.20	-0.28	-0.08	0.82
5	19	41	0.89	-0.37	1.25	0.00
6	14	34	-0.12	0.17	0.91	0.66
7+	52	135	0.32	0.09	0.24	0.35
Total	295	501	0.13	-0.15	0.28	0.00
Panel B: Δ *Equity Value*						
0	16%	1%	0.10	-0.77	0.87	0.12
1	25%	12%	-0.02	-0.05	0.03	0.84
2	18%	18%	-0.08	-0.12	0.05	0.80
3	8%	16%	0.11	0.04	0.07	0.84
4	4%	11%	-0.16	-0.13	-0.02	0.97
5	6%	8%	0.97	-0.29	1.26	0.00
6	5%	7%	0.12	-0.11	0.23	0.62
7+	18%	27%	0.43	0.23	0.21	0.46
Total	100%	100%	0.13	-0.15	0.28	0.00