The Deregulation of the Private Equity Markets and the Decline in IPOs

Michael Ewens and Joan Farre-Mensa*

March 8, 2018

Abstract

The deregulation of securities laws in the 1990s—and in particular the National Securities Markets Improvement Act of 1996—has facilitated the process of raising capital privately and been a key driver of the decline in U.S. IPOs. Privately-held startups are now able to grow to a size historically available only to their public peers. The IPO decline is not a market failure in the process of going public. Rather, it is the result of founders taking advantage of their increased bargaining power and lower cost of being private to realize their preference for control by choosing to remain private.

Key words: Deregulation, NSMIA, Initial Public Offerings (IPOs), Venture Capital, Private Equity, Founder Equity.

JEL classification: G32; G24; G28.

---

*Ewens: California Institute of Technology (mewens@caltech.edu); Farre-Mensa: Cornerstone Research (jfarre@cornerstone.com). We thank Will Gornall, Peter Iliev, Sungjoung Kwon, Michelle Lowry, Ramana Nanda, Jay Ritter, Berk Sensoy and audiences at UC Berkeley's Finance and Innovation Conference, Caltech, Aalto University, the Finance, Organizations and Markets (FOM) Research Conference, UBC Sauder, the Jackson Hole Finance Conference, and Penn State. We also thank Correlation Ventures and VentureSource for access to data. Ewens is an advisor to and investor in Correlation Ventures. The paper previously circulated under the title "The Evolution of the Private Equity Markets and the Decline in IPOs."

The number of initial public offerings (IPOs) in the United States has experienced a sharp decline since peaking in 1996 (Doidge, Karolyi, and Stulz (2013, 2017); Gao, Ritter, and Zhu (2013)). While the decline in the number of IPOs has garnered considerable attention both in academic and policy circles and in the press,[1] its causes remain unclear. Gao, Ritter, and Zhu (2013) argue that the drop in IPOs follows from technological changes due to which "the advantages of selling out to a larger organization [...] have increased relative to the benefits of operating as an independent firm" (p. 1663). By contrast, Doidge, Karolyi, and Stulz (2017) note that the U.S.-centric nature of the IPO decline suggests that global technological shocks cannot completely explain it. At the same time, both Gao, Ritter, and Zhu (2013) and Doidge et al. (2013; 2017) agree that the Sarbanes-Oxley Act and other early-2000s changes in public firms' regulatory environment did not drive the fall in IPOs.

The going-public decision is likely to be a multi-faceted one that depends on the relative costs of public and private capital. While most prior research has focused on changes in the public equity markets during the IPO decline, this paper studies the contribution of changes in the *private* equity markets to the decline. Our analysis shows that, as hypothesized by de Fontenay (2017), the deregulation of securities laws in the 1990s facilitated the process of raising capital privately and was a key—but by no means the only—driver of the IPO drought and, more generally, of the changes in the going-public versus staying-private trade-off.

One such notable deregulation event was the National Securities Markets Improvement Act (NSMIA), passed in October 1996.[2] NSMIA made it easier for private firms to sell securities to "qualified purchasers" (e.g., institutions or accredited investors) in different states by exempting those private sales from state regulations known as blue-sky laws—public sales have long been exempted from blue-sky laws. Using novel private securities filing data acquired from a SEC Freedom of Information Act (FOIA) request, we show that the use of this new exemption increased significantly immediately after NSMIA's passage. NSMIA also made it easier for

[1]For recent examples see "IPO Drought Scorches Wall Street" (`https://www.wsj.com/articles/ipo-drought-scorches-wall-street-1474634214`) and "Uncuffing capitalism" (`http://www.economist.com/node/21551481`).

[2]Other changes include the SEC's adoption of Rule 144A in 1990 and the several subsequent amendments to Rule 144, as a result of which "Rule 144 now effectively permits the unlimited and unfettered resale of restricted securities [such as private shares] after a six-month or one-year period" (de Fontenay 2017, p. 468), as well as the JOBS Act of 2012.

unregistered funds such as venture capital (VC) and private equity (PE) funds to raise capital; in addition to exempting these funds from blue-sky laws, NSMIA increased the maximum number of investors in an unregistered fund.[3] This increase was particularly important for funds investing in late-stage startups, as these funds tend to be larger and have more investors in order to be able to meet the higher capital needs of mature startups.

To investigate how NSMIA affected startups' access to private capital, we perform several difference-in-differences (diff-in-diff) analyses.[4] Our first diff-in-diff test builds on the notion that the higher capital requirements of late-stage startups imply that they should be more intensely treated by a reduction in the costs of raising large amounts of private capital from multiple investors than their early-stage counterparts. Consistent with NSMIA facilitating private firms' access to a larger set of investors, we show that after the passage of NSMIA, late-stage startups were more likely to raise capital from out-of-state investors than early-stage startups. Moreover, a triple-diff analysis that exploits pre-NSMIA variation in the extent to which different states had coordinated their blue-sky laws shows that startups in states with more unique private securities regulations saw a relatively larger increase in their use of out-of-state investors. Importantly, we also show that after NSMIA, late-stage startups' ability to finance large funding rounds increased more than that of their early-stage counterparts. Taken together, these findings indicate that by uniformizing private securities regulations across all U.S. states, NSMIA improved firms' ability to raise private capital, particularly in large amounts.

Our second diff-in-diff test focuses on identifying the effect of NSMIA in facilitating VC and PE funds' ability to raise large amounts of capital by increasing their maximum number of investors, an effect that should impact the most funds investing in capital-intensive late-stage startups. Consistent with NSMIA being a positive shock to the supply of capital available to VC and PE funds, we find that the size of late-stage funds increased by 40% more than that

[3]Specifically, NSMIA raised the cap on the number of investors a fund can have without registering under the Investment Company Act. Such registration can be burdensome, as it requires the regular disclosure of investment positions and restricts the use of leverage (among other requirements), and so VC and PE funds avoid having to register.

[4]All empirical analyses in the paper focus on VC-backed startups, which have traditionally been a major player in both the IPO market (58% of technology IPOs; Ritter (2017)) and the production of innovation (e.g., Gornall and Strebulaev (2015)), and for which (pre-IPO) financing data are widely available.

of their early-stage counterparts around the passage of NSMIA. In a complementary test that uses foreign funds instead of early-stage funds as control group, we show that the size of U.S. funds increased relatively more than that of foreign funds. Crucially, these findings are robust to excluding information technology (IT) funds, which suggests that they are not driven by the Internet boom in the late 1990s.

Taken together, our diff-in-diff results around the passage of NSMIA suggest that regulatory changes in the private equity markets have helped increase the supply of capital available to late-stage startups that choose to stay private. A series of descriptive results provide further support for this conclusion. We show that the decline in IPOs has been accompanied by an increase in the fraction of startups that stay independent and privately-held long after they first raise capital. In particular, this indicates that IPOs have not been replaced by an increase in the number of firms that rely on capital provided by a public acquirer to fund their growth.

Instead, our analyses suggest that private investors have filled much of the capital gap left by the decline of IPOs. The amount of private capital raised by startups four or more years past their first VC round—an age at which successful firms would traditionally consider an IPO—has grown by a factor of 10 since the passage of NSMIA in 1996, surpassing $30 billion in 2015. Approximately 40% of this growth has been driven by traditional venture capital funds, many of which benefited from the increased ease of raising larger funds following the passage of NSMIA. The remaining 60% of late-stage capital has been fueled by less traditional startup investors such as PE funds, family offices, hedge funds, and mutual funds.[5] These non-VC investors tend to invest in the very firms that our diff-in-diff analyses show experienced the benefits of NSMIA: late-stage startups, often located in a different state.

To be sure, IPOs have never been about financing the average startup—even in 1996, when public listings were at their peak, only the most successful startups went public. Thus, in order to understand the extent to which private investors have filled the gap left by the decline of IPOs, we need to investigate whether private markets are able to finance the growth of the

[5]In contemporaneous work, Chernenko, Lerner, and Zeng (2017) and Kwon, Lowry, and Qian (2017) also find that mutual funds have taken an increased role in funding VC-backed startups. We show that the growth of mutual funds is part of a larger trend that has seen non-VC investments in late-stage startups grow from $1.5 billion in 1996 to $32 billion in 2015; the fraction of these non-VC investments made by mutual funds is relatively small, reaching a maximum of 15% in 2011.

largest startups. Our evidence suggests they are. The majority of startups (83%) whose first funding round was before 1997 and went on to raise more than $150 million over seven years, did so by going public. Since NSMIA came fully into effect in 1997, only 42% of startups reaching that scale have been public, despite the average annual number of startups raising more than $150 million remaining largely unchanged. If we focus instead on employment or sales, a similar picture emerges: In the pre-1997 cohorts, 87% of startups with more than 200 employees and 67% of those with more than $40 million in sales were public; since 1997, these numbers have more than halved, standing at 29% and 30%, respectively. Thus, in the post-NSMIA regulatory environment, startups appear to be able to raise large amounts of capital and grow their employment and sales without going public.

Taken together, our findings suggest that NSMIA and other regulatory changes in the private equity markets now make it possible for late-stage private startups to raise large sums of capital that in the past would have typically been impossible—or too costly—to raise privately. A natural question then follows: Is the decision to stay private a second-best response to public investors' lack of demand for investing in IPOs, or is it actually driving the lack of IPOs? In other words, are late-stage startups raising capital privately because they cannot go public—or, alternatively, is an IPO still an option for these firms, but they choose to remain private instead?

To shed light on this question, consider why a startup may choose to stay private. In their survey of CFOs, Brau and Fawcett (2006) find that the main reason leading the managers of successful firms to stay private is their desire to preserve decision-making control and ownership. Chemmanur and Fulghieri (1999), Boot, Gopalan, and Thakor (2006), and Helwege and Packer (2009), among others, also emphasize founders' desire to maintain control as a key benefit of remaining private. However, founders' desire to stay private (and independent) often conflicts with VCs' desire to go public, as IPOs ensure a timely liquidation of their investment (as do acquisitions) and carry considerable reputational benefits for VCs (e.g., Gompers (1996)).[6]

[6]For a recent example of this conflict, see "Palantir and Investors Spar Over How to Cash In" (*Wall Street Journal*, Dec. 30, 2015), which describes the "deepening rift in Silicon Valley between private companies that want to stay that way and investors who want to unlock at least some of the profits from their most successful investments." See also `https://www.institutionalinvestor.com/article/b14z9vv7hjbt6y/the-new-reality-of-the-14-year-venture-capital-fund` for a discussion of some of the challenges that the longer time it takes VC funds to exit their investments imposes on the funds and their investors.

Consistent with startup founders and their investors having conflicting exit preferences, we find that those founders that are able to retain a larger degree of bargaining power vis-à-vis their investors are less likely to eventually go public (or be acquired). Our instrumental variable identification strategy exploits state-year variation in the supply of venture capital stemming from variation in the assets of state pension funds (Gonzalez-Uribe (2014); Bernstein, Lerner, Sorensen, and Strömberg (2016)). The first stage shows that founders who raise their first VC round in state-years with high pension fund assets retain a persistently higher equity stake in their firms (after controlling for the amount of capital raised). In the second stage, we show that founders use this higher equity stake—which is positively correlated with measures of control such as board seats—to decrease the likelihood that their firms go public or are acquired seven (or ten) years later.[7]

Importantly, we show that the decline in IPOs has coincided with a gradual increase in founder equity—and so in founder bargaining power—over time. The reasons driving the documented increase in founder equity are likely to be several, and a full analysis of these reasons falls beyond the scope of our paper. That said, we note that technological changes decreasing startups' capital requirements early in their lifecycle—when uncertainty is highest and thus capital is most expensive (Ewens, Nanda, and Rhodes-Kropf (Forthcoming))—as well as the increase in the pool of investor types investing in startups have likely played a role.

Our paper makes two contributions. First, the paper enhances our understanding of the causes driving the decline in IPOs. Prior work (Doidge, Karolyi, and Stulz (2013); Gao, Ritter, and Zhu (2013)) has examined whether this decline is explained by changes in the public equity markets and has concluded it is not. In recent work, Doidge, Kahle, Karolyi, and Stulz (2018) point to the increased importance of intangible investments and public markets' disadvantage in supporting young, R&D-intensive firms as having played a role. In this paper, we show that changes in the private equity markets—most notably, the National Securities Markets Improvement Act of 1996—have increased the supply of private capital and reduced the relative cost of being private. These and other changes have increased founders' bargaining

[7]As expected, the OLS partial correlation between founder equity and IPO probability is positive, which is consistent with founder equity (and thus startup valuation) being positively correlated with unobserved firm quality.

power vis-à-vis investors. This increased bargaining power, coupled with the reduction in the relative cost of being private, has made it possible for many founders to realize their preference for control by delaying—or avoiding altogether—an IPO.

Second, we show that the much-debated dearth of IPOs in the U.S. does not appear to have impeded late-stage startups' ability to finance their growth. Of course, ruling out the possibility that the IPO decline has implied an overall reduction in the supply of capital available to startups would require a comparison of startups' ability to fund their investment opportunities today to that of similar startups before the mid-1990s. Such a comparison is unlikely to be feasible. However, our finding that investors—among them some traditional IPO investors like mutual funds—provide an increasing amount of capital to late-stage private startups, allowing them to grow to a size until recently reached by few private firms, suggests that private markets are filling much (if not all) of the IPO gap.

1 Data and Sample

Our sample consists of VC-backed startups. We begin by considering all startups in the VC database VentureSource that raised their first private round of funding after 1992.[8] We observe investments through the end of 2016, and change the end of our sample period according to the data demands of each analysis. Only startups headquartered in the United States that have raised at least one equity financing round from a traditional VC investor (defined as standard fixed-life fund that raised capital from limited partners) are included. For these startups, we collect data on the capital (equity and debt) they raise both from traditional VCs and from other non-VC investors, such as corporations, private equity (PE) funds, or mutual funds (see Section 3.3).[9]

We base our data on the VC and private investment data provided by VentureSource (a division of Dow Jones) and supplement it with information from Correlation Ventures, a quantitative VC fund. This supplemental information (described in detail in Ewens, Nanda, and

[8] We choose 1992 as the starting point because the coverage of VC financings and investors is poor until then.

[9] Most of the analysis considers only equity financings for private firms. This is because data on debt—particularly loans or lines of credit—are difficult to observe and have poor coverage in VentureSource and Pitchbook.

Rhodes-Kropf (Forthcoming)) is particularly useful for analyzing exit valuations, firm failures, and founder equity, which would be impossible relying solely on commercial databases.

We obtain sales and employment information from three data sources. For private firm-years, we use VentureSource and the NETS database. For public firm-years, we use Compustat, which we merge to the VC-backed firms in our sample that go public (we also use Compustat to obtain post-IPO capital-raising data). The combination of these three sources provides a rich time series of employment and sales data for 68% of the VC-backed firms in our sample.

Our focus on VC-backed startups, while admittedly restrictive, offers three key advantages. First, we observe private firm-level and financing-level outcomes that are typically unavailable for non-VC-backed private firms. This gives us a unique window on the changes in the private markets that have accompanied the decline in IPOs. Second, although VC-backed firms make up less than 1% of all privately-held firms (Puri and Zarutskie (2012)), historically they have had a strong influence on the IPO market.[10] This makes them particularly relevant to the analysis of the effects of the IPO decline. Third, VC-backed firms play a prominent role in the production of innovation (Kortum and Lerner (2000)). Understanding the effects of their response to a weakened IPO environment is critical, as these effects are likely to be felt economy-wide.

2 The Deregulation of the Private Capital Markets and the Supply of Capital for Late-Stage Startups

This section examines how regulatory changes in the private equity markets have contributed to the growth in the supply of private capital for late-stage startups.

2.1 Private capital markets and the IPO decision

Traditionally, a major benefit of becoming a listed firm has been the ability to tap a larger pool of capital than is available in private markets. Indeed, in their survey of CFOs, Brau and Fawcett (2006) find that the "need for capital to support growth" (p. 410) is one of the major

[10] Ritter (2017) shows that, over 1980–2016, VC-backed firms accounted for 58% of tech IPOs and 37% of all IPOs.

drivers of the IPO decision. Public markets have also been shown to provide private firms and their investors more liquidity, currency for acquisitions (e.g., Celikyurt, Sevilir, and Shivdasani (2010)), and improved flexibility for employee compensation.

Now, consider a hypothetical, positive shock to the supply of private capital available to startups facing the IPO decision (e.g., late-stage startups). An increased ability to raise private capital from this shock will allow these firms to delay—or altogether postpone—their IPO, while still being able to finance their growth opportunities. Delaying the IPO is valuable as it allows founders to retain control (Brau and Fawcett (2006)) and allows firms to avoid many of the costs of being public. These costs include one-time listing costs as well as the ongoing costs of disclosure, takeover risk (Zingales (1995)), and short-termist pressures and other agency problems (Asker, Farre-Mensa, and Ljungqvist (2014)). In the following section, we detail a major securities deregulation that increased the supply of private capital and changed the composition of investors in the entrepreneurial finance market.

2.2 Regulatory changes affecting the private capital markets

The early 2000s saw a number of major regulatory changes in the public-equity markets—most notably, Regulation Fair Disclosure in 2000, the Sarbanes-Oxley Act of 2002, and the 2003 Global Settlement. Several public commentators have argued that these changes increased the cost of being public, particularly for small- and medium-sized public firms, and were a key driver of the decline in IPOs (see, e.g., Zweig (2010); Weild (2011)). Yet both Gao, Ritter, and Zhu (2013) and Doidge, Karolyi, and Stulz (2013) conclude that such regulatory changes cannot explain the IPO decline. In particular, Doidge et al. write that their "results make it possible to reject the hypothesis that the regulatory changes of the early 2000s caused the decrease in small-firm IPO activity because it became abnormally low before these changes took place" (p. 549).

Importantly, regulatory changes in the private equity markets—which have received far less attention in the literature—should equally impact the going-public versus staying-private trade-off. We next analyze one such major change.

2.2.1 NSMIA: Deregulating and uniformizing the private capital markets

A few years before the changes affecting public firms mentioned above were adopted, several regulatory changes affecting *private* firms made it easier for the firms and their investors to raise capital. One such major regulatory change was the National Securities Market Improvement Act (NSMIA), signed into law by then-President Clinton on October 11, 1996.[11] NSMIA put an end to an era of often competing and sometimes conflicting federal regulations, on the one hand, and state regulations (the so-called 'blue-sky laws'), on the other hand, affecting the issuance of private securities. Former SEC Chairman J. Armstrong Sinclair presented one particularly negative view of the regulatory environment prior to the passage of NSMIA (Armstrong (1958)):

> The 'blue sky' laws had come to have a special meaning—a meaning full of complexities, surprises, unsuspected liabilities for transactions normal and usual—in short, a crazy-quilt of state regulations no longer significant or meaningful in purpose, and usually stultifying in effect, or just plain useless.

In 1996, then-SEC chairman Arthur Levitt asked Congress to change this patchwork of regulations:[12]

> The current system of dual Federal-State regulation is not the system that Congress—or the [SEC]—would create today if we were designing a new system. While securities markets today are global, issuers and securities firms still must register many securities offerings in 52 separate jurisdictions; satisfy a multitude of separate books and records requirements; and bear the substantial costs of compliance with the overlapping requirements.

NSMIA was Congress's attempt to create security regulation uniformity at the federal level by preempting state regulations and to improve capital access overall. We next summarize its key components.

---

[11] Prior work by legal scholars, and in particular de Fontenay (2017), has emphasized the importance of this law change. See the Internet Appendix section A1 for a brief legislative history of NSMIA.

[12] Securities Investment Promotion Act of 1996: Hearings on S. 1815 Before the Senate Comm. on Banking, Housing and Urban Affairs, 104th Cong. 32 (1996), statement of Arthur Levitt, Chairman U.S. Securities and Exchange Commission. S. 1815 was the Senate companion bill to NSMIA.

Federal preemption of blue-sky laws

Consider a hypothetical private startup seeking outside capital for a new investment. Given the riskiness and uncertainty of the opportunity, it has to raise outside equity financing. Historically, several regulations applied in this setting. In addition to having to comply with federal regulations such as Regulation D, the startup needed to comply with state-level blue-sky laws. As a result, if the startup sought to raise capital from investors in multiple states, it faced additional regulatory complexity from the varying disclosure and registration rules it had to comply with.

NSMIA created certain federal provisions that exempted qualified private security issues from having to comply with the state-level blue-sky laws in each state where the securities were issued.[13] Specifically, the Act "preempts state securities law in certain areas long burdened by duplicative regulation by both federal and state governments" (Denos (1997), p. 101) when private firms issue "covered securities." The "covered securities" that NSMIA exempted from having to comply with blue-sky laws included those sold under Rule 506 of Regulation D. Rule 506, which allows private firms to raise unlimited amounts of capital as long as all investors are "accredited investors" (i.e., institutions, individuals with annual income in excess of $200,000 ($300,000 for couples), or individuals and couples with net worth in excess of $1,000,000 excluding the primary residence), is the most popular exemption used by private issuers (Ivanov and Bauguess (2013))—and it is also used by most VC and PE funds raising capital.

Changes to the Investment Company Act of 1940 (sections 3(c)(1) and 3(c)(7))

NSMIA also changed some key regulations affecting VC and PE funds through changes to the Investment Company Act of 1940. The Investment Company Act regulates companies that "engage primarily in business of investing and reinvesting in securities of other companies" (Loss, Seligman, and Paredes (2017), p. 47-48). The Act mandates that most investment advisors must register with the SEC, regularly disclose their investment positions, and limit their use of leverage, among other requirements. Mutual funds are a well-known example of the

[13]See NSMIA section 102(a), 15 U.S.C - section 77r(a) (West Supp. 1997), amending Securities Act of 1933, section 18.

kind of entities that are required to register under the Investment Company Act and comply with its disclosure requirements. Compliance with the Investment Company Act is particularly costly for VC and PE funds, which have historically relied on the Act's exemptions to avoid having to comply with its registration and disclosure requirements.

In 1996, NSMIA expanded these exemptions by amending and adding sections 3(c)(1) and 3(c)(7) of the Investment Company Act, respectively. Section 3(c)(1) exempts from registration those private funds with 100 or fewer investors, and the NSMIA amendments made it easier for funds to stay below this limit.[14] Furthermore, the addition of Section 3(c)(7) made it possible for exempt private funds to surpass the 100 investor limit as long as all the investors were "qualified purchasers" (institutions or individuals with $5 million or more in investments).[15] The bottom line of the changes introduced by NSMIA to the Investment Company Act was to make it possible for VC and PE funds to raise capital from a larger number of private investors and still be exempt from the reporting requirements of the Act.

2.2.2 NSMIA and the changes in the private capital and IPO markets

The passage of NSMIA implied that both privately-held operating companies as well as VC and PE funds were exempt from complying with state-level blue-sky laws if they sold securities or stakes in their funds to "accredited investors" (among other circumstances). Thus, NSMIA should increase the supply of capital for all private issuers, particularly those seeking to raise large amounts of capital as they could now more easily do so across state lines. In addition, NSMIA's changes to the Investment Company Act made it possible for VC and PE funds to raise funds from a larger set of investors while still being exempt from the disclosure requirements affecting mutual funds and other registered funds. This should make it easier to raise large VC and PE funds, thereby further increasing the supply of capital available to late-stage startups.

[14] Prior to NSMIA, an investing entity that owned 10% or more of a fund was considered one person for purposes of the 100 beneficial owner test only if the value of all of its holdings of Section-3(c)(1)-exempt investment companies did not exceed 10% of the investing entity's assets (Second 10% Test). If the investing entity failed this Second 10% Test, the law required to "look through" the entity to its beneficial owners, each of whom would then be considered a beneficial owner of the fund. NSMIA eliminated the Second 10% Test and counts an owner of any percentage of the fund as one person for purposes of the 100 beneficial owner test, except where the 10% or more owner is itself an investment company.

[15] Until 2012, private funds still needed to stay below the 500 investor limit, which was the universal beneficial ownership trigger for securities registration. The trigger was raised to 2000 owners by the JOBS Act in 2012.

We will test these predictions in the next sections.

Importantly, unlike the early 2000s regulatory changes affecting public firms, NSMIA was signed into law in late 1996, coinciding with the U.S. listing peak (as measured by Doidge, Karolyi, and Stulz (2013, 2017) and Gao, Ritter, and Zhu (2013)). While this fact in no way proves that NSMIA was the one and only cause of the IPO decline—and we do not claim (or believe) it was—the timing of NSMIA's adoption makes it at least possible that it was one of the factors contributing to this decline.

While NSMIA has received little attention among finance scholars, several legal scholars and practitioner-oriented publications have argued that it played a first-order role in facilitating private firms' access to capital (e.g., Denos (1997); Campbell Jr. (1998); Cox (2013); Badway, Horn, McCoy, Reid, and Romaszewski (2016)). Writing of NSMIA and other regulatory changes affecting the private-equity markets, de Fontenay (2017) notes that "the liberalization of the rules for selling and trading private securities is arguably the most significant development in securities regulation of the last thirty years, but the empirical literature on the decline of public equity has largely overlooked it. This is a critical and surprising omission, because the changes to the private side of securities regulation bear directly on a company's decision to go public" (p. 466).

2.3 Identifying the effects of NSMIA's preemption of blue-sky laws

2.3.1 NSMIA and Rule 506 filings

NSMIA preempted states from imposing additional securities regulations for issuers raising private capital under Rule 506 of the SEC's Regulation D.[16] Thus, if conflicting or burdensome state securities regulations restricted capital raising, we should expect more private issuers to rely on Rule 506 to raise capital privately after the passage of NSMIA in October 1996.

To test this prediction, we have obtained the full history of Form D filings for 1992–2008 via a FOIA request to the SEC (private issuers must file what is known as a "Form D" with the SEC when relying on Rule 506 or some other Regulation D exemption to issue securities

[16]Rules 504, 505, and 506 of Regulation D provide exemptions from SEC registration for companies issuing private securities.

privately). These filings are only available on the SEC's EDGAR website beginning in 2002. Figure 1 (a) and (b) show the number of Form D filings that listed Rule 506 [(a)] or 504/505 [(b)] as the exemption from registration from 1992 to 1998. To best isolate private filers' response to NSMIA, we sum the total number of filings for each three month period ending in January, April, July, and October (thus centering the figure around NSMIA's passage in October 1996). Given our focus on private startups, we exclude filings by private funds, REITs, and natural resources companies.

Figure 1 (a) shows that Rule 506 filings increased by 37% in the year after the passage of NSMIA. Importantly, Figure 1 (b) shows that the number of Form D filings that relied on Rules 504 or 505 to avoid SEC registration—to which NSMIA's preemption of state blue-sky laws did not apply—did not experience a similar increase. These findings are consistent with the notion that blue-sky laws burdened private issuers, which could now be exempt from these state laws by raising private capital under Rule 506. We next investigate whether the increased use of Rule 506 filings around the passage of NSMIA coincided with a change in how and from whom VC-backed private firms raised private capital.

2.3.2 NSMIA facilitates raising capital from out-of-state investors

Prior to NSMIA, private firms needed to comply with the blue-sky laws of all the states where at least one of their investors resided. NSMIA made it easier for startups to raise capital from investors located in different states by exempting from state regulations those private firms that relied on Rule 506 to issue unregistered securities. While all private issuers could in principle benefit from this exemption, we expect those with higher capital requirements to be more intensely treated by NSMIA, as they naturally benefited the most from having easier access to investors residing in different states. By contrast, private firms raising small amounts of capital typically rely on nearby investors from their own state (Lerner (1995); Sorenson and Stuart (2001)).

This prediction motivates our diff-in-diff analysis. Late-stage startups (those raising a Series C or greater), whose capital requirements are higher, comprise the treatment group and their

early-stage counterparts serve as control group.[17]

$$Y_{it} = \beta_0 + \beta_1 \text{Late-stage}_{it} \times \text{Post}_t + \beta_2 \text{Late-stage}_{it} + \beta_3 X_{it} + \gamma_t + \epsilon_{it} \quad (1)$$

Table 1 presents the diff-in-diff results of estimating equation (1), where the unit of observation is a financing event. The dependent variable Y_{it} is an indicator set equal to one if the financing event has at least one out-of-state investor. The sample of financings ranges from 1994 to 1998, and the "Post$_t$" indicator identifies all financings that occur in or after the fourth quarter of 1996. All regressions include financing year-quarter (γ_t) as well as startup state and industry fixed effects (in X_{it}). (The financing year-quarter fixed effects subsume the non-interacted "Post$_t$" indicator.)

The results in column 1 support the hypothesis that NSMIA had a positive effect in facilitating late-stage startups' access to out-of-state investors: The coefficient on the interaction term "Post × Late stage" is positive and significant, implying a 4.5 percentage point increase in the relative probability that a late-stage financing includes at least one out-of-state investor after the passage of NSMIA.

Our sample period includes the early years of the Internet boom, during which VC fundraising and investment grew at a fast pace. There is a priori no reason why the Internet boom would have differentially affected late-stage financings, particularly once we control for industry fixed effects. Nonetheless, column 2 shows that the exclusion of information technology (IT) startups leaves our conclusions unchanged. Column 3 shows that our conclusions are also robust to using a continuous version of the late-stage identifier, "Log round #."

2.3.3 Identification

For our control group to be a valid counterfactual, the evolutions of the reliance on out-of-state investors for treated (late-stage) and control (early-stage) firms need to share parallel trends. While the parallel-trends assumption is ultimately untestable, the results of a number of identification tests support its validity. First, our review of NSMIA's legislative history in

[17] Consistent with our definition of the treatment and control groups, late-stage rounds closed prior to NSMIA were 23% more likely to include an out-of-state investor than their early-stage counterparts.

the Internet Appendix shows that the major advocates for the law were outside of the venture capital and private equity industries, thus alleviating reverse causality concerns.

Second, when we allow the effect of the treatment variable to vary over time by interacting it with time fixed effects, Figure 2 shows that the coefficients in the pre-period are indistinguishable from zero and exhibit no upward trend. Finally, Table 2 presents a placebo test where we move the law change date back two years (column 2) or one year (column 3)—for ease of reference, we report the actual diff-in-diff estimates in column 1. As expected, we find no evidence of a placebo treatment effect.

Overall, this collection of evidence supports a causal interpretation of our diff-in-diff estimates in Table 1 as capturing late-stage startups' response to NSMIA.

2.3.4 Cross-state differences in the impact of NSMIA

Prior to the passage of NSMIA, states differed in the extent to which they had tried to uniformize their blue-sky laws. All else equal, we expect the effects of NSMIA to be stronger for startups located in states whose pre-NSMIA blue-sky laws differed the most from those of other states, as such startups would need to comply with an entirely different set of state-level regulations when raising capital from out-of-state investors. (Virtually all startups have at least some shareholders—among them, the founder(s) and other employees—located in their headquarter state.) We can exploit this variation within a triple-diff framework.

Specifically, our analysis makes use of two sets of regulations adopted by some states in the 1980s and early 1990s. The first such set—known as the Uniform Limited Offering Exemption (ULOE)—was proposed in 1983 by the North American Securities Administrators Association (NASAA), an association of state securities administrators, and sought to create some uniformity between the state blue-sky laws and the SEC's Regulation D (see Maynard (1987)).[18] The second set—the Small Corporate Offering Registration (SCOR)—was proposed by the NASAA in 1989 to facilitate the simultaneous registration of some private offerings under Regulation D with the SEC and the preceptive states (see Denos (1997)).[19] We predict that late-stage

[18]The following states adopted ULOE (in some form): Alabama, Georgia, Idaho, Iowa, Kansas, Kentucky, Massachusetts, Michigan, Missouri, Montana, Nebraska, North Carolina, Ohio, South Carolina, Tennessee, Utah, Virginia, West Virginia, and Wisconsin.

[19]SCOR was adopted by Alaska, Arizona, California, Colorado, Idaho, Oregon, Utah, and Washington.

startups in states that had not adopted neither ULOE nor SCOR (identified by the indicator "Non-uniform regs.") should experience a relatively larger increase in their reliance on out-of-state investors after the passage of NSMIA, and so the triple-interaction "Non-uniform regs. × Late-stage × Post" should be positive.

The results in Table 3 support this prediction. Columns 1 and 2 begin by showing that the diff-in-diff findings in Table 1 are driven by those states that had not adopted neither ULOW nor SCOR prior to the passage of NSMIA, while we find no statistical or economic change in the probability of raising late-stage capital from an out-of-state investor in those states that had attempted to uniformize their blue-sky laws by adoption a version of the ULOE or SCOR. These sub-sample differences are confirmed in the triple-diff estimation reported in column 3, where the coefficient on the triple interaction is positive and significant. Thus, our finding that the effects of NSMIA were felt the most in those states with more unique blue-sky laws further supports a causal interpretation of our diff-in-diff results.

2.3.5 NSMIA and the size of late-stage financings

Having shown that NSMIA facilitated startups' access to out-of-state investors, we now seek to provide further evidence that the law resulted in an increase in the amount of private capital available to startups—particularly late-stage ones with large capital needs. To do so, Table 4 presents an analogous diff-in-diff analysis to that in Table 1, where we now ask whether late-stage startups' ability to raise large financing rounds increased after the passage of NSMIA. Thus the dependent variable is now an indicator for whether a financing round is "large," where large is defined as a round that is in the top quartile of (real) round sizes.[20]

Column 1 shows that NSMIA increased late-stage startups' ability to raise large funding rounds by 6.2 percentage points relative to their early-stage counterparts. Columns 2 and 3 show that this result is not driven by the Internet boom or our definition of "late-stage" round, while Figure A1 and Table A1 in the Internet Appendix show that it passes a battery of identification tests similar to those reported for our out-of-state-investor analysis.

[20]The results are robust to defining a large round as one that is in the 80^{th}, 90^{th}, or 95^{th} percentile of real round sizes. We also obtain qualitatively similar but somewhat noisier estimates if we use the (log of) round size as the dependent variable.

Overall, our diff-in-diff results support the hypothesis that NSMIA facilitated late-stage startups' access to out-of-state investors, thereby making it possible for them to raise larger rounds of financing while remaining privately held. We next explore whether NSMIA also increased VC and PE funds' access to capital.

2.4 Identifying the effects of NSMIA on VC and PE funds

Recall that, in addition to facilitating startups'—and private funds'—access to out-of-state investors by preempting state blue-sky laws, NSMIA also amended Section 3(c)(1) of the Investment Company Act and added Section 3(c)(7). An analysis of VC funds' Form ADV filings from the SEC website reveals that, as of August 2017, all active VC funds use either the 3(c)(1) or 3(c)(7) exemption to avoid having to register and comply with the disclosure requirements of the Investment Company Act.[21] Importantly, some 5% of the funds report having more than 100 investors—a number that, before NSMIA's addition of Section 3(c)(7), would have forced them to comply with the Act's disclosure requirements. These funds have an average size of $450 million, compared to $62 million for VC funds with fewer than 100 investors. These findings suggest that by raising the cap on the maximum number of investors allowed for a fund to remain exempt, NSMIA made it possible for VC and PE funds to raise larger amounts of capital without losing their exempt status. We formally test this prediction below.

To that end, we analyze the real fund size of newly raised VC and PE funds closed after 1996.[22] The increase in the investor cap triggering fund registration as well as the lowering of barriers to raise capital across state lines imply that new funds should, all else equal, be larger after NSMIA. However, this increase in size should not hold uniformly across all funds, which again allows us to use a diff-in-diff framework to identify the effects of NSMIA on fund size in the years surrounding the law's passage (1994–1998).

First, the increase should be limited to U.S. funds—foreign funds should not be affected by NSMIA. To test this prediction, we use Pitchbook and Preqin to collect data on non-U.S.-

[21] Exempt private fund advisers are still required to file annual reports using (a truncated version of) Form ADV.

[22] NSMIA's changes to the Investment Company Act came into effect in 1997.

headquartered VC and PE funds, which we use as our first control group.[23]

Second, U.S. funds investing in early-stage startups, whose capital requirements tend to be lower, were less likely to be constrained by the pre-NSMIA 100 investor cap and had little need to raise capital in several states. By contrast, funds investing in startups seeking larger, late-stage investments were more likely to benefit from the changes induced by NSMIA.[24] Motivated by these predictions, our second treatment group is made up of late-stage U.S. funds, and we use U.S. funds with an early-stage focus as our second control group.[25]

Table 5 presents the results of our two diff-in-diff tests. Controls in all columns include vintage year fixed effects (which subsume the "Post" indicator) as well as industry and fund sequence (i.e. number) fixed effects. We begin by comparing the log of real fund size of U.S. and non-U.S. funds, ignoring for the time being the funds' investment focus. Column 1 shows that U.S.-based funds grew at a relatively faster rate after the passage of NSMIA than foreign funds.

In column 2, we test our second diff-in-diff test, which focuses only on U.S.-based funds and compares late-stage funds to their early-stage counterparts. The interaction term "Post $\times$ Late stage" has the expected positive sign, implying a 43% increase in fund size for late-stage funds relative to their early-stage counterparts after the passage of NSMIA.

As in Table 1, a potential concern is that our results might be partially driven by the Internet boom. However, this is unlikely to be the case, as there is no obvious reason why the boom should have disproportionately affected U.S.-based or late-stage funds. Further alleviating this concern, the exclusion of IT funds in column 3 leaves our conclusions in column 2 unchanged (the same is true if we exclude IT funds in column 1).

In column 4, we report the results of a placebo test where we repeat the analysis of column 2 using the sample of non-U.S. funds. As expected, we find no economic or statistically significant

[23]These 142 funds are from Canada, Germany, and the U.K. We have found no evidence of major security regulation changes in these countries during our sample period.

[24]Coordination problems imply that it is easier for late-stage startups to raise large sums from a few funds than small sums from many funds.

[25]We identify a fund's investment focus using either the labels provided by VentureSource, Preqin, or Pitchbook, when available, or its history of *non-follow-on* investments. Consistent with our definition of the treatment and control groups, late-stage funds tend to be larger than their early-stage peers: Prior to NSMIA, the average size of late-stage funds was $131 million, versus $77 million for early-stage funds.

change in fund sizes. Finally, column 5 shows that our results in column 2 are robust to using a continuous version of the late-stage dummy.

Overall, the passage of NSMIA appears to have allowed VC and PE funds investing in late-stage startups—i.e., those startups that might be considering an IPO—to raise larger amounts of capital. When combined with our findings in Tables 1 and 4 showing that NSMIA facilitated late-stage startups' access to out-of-state investors and allowed them to raise larger VC rounds, the evidence in this section indicates that NSMIA represented a positive shock to the supply of private capital.

3 The Financing of Late-Stage Startups and the IPO Decline

The diff-in-diff results around the passage of NSMIA suggest that regulatory changes in the private markets have helped increase the supply of capital to late-stage startups that choose to remain private. We now examine how the financing behavior of VC-backed startups has evolved since (approximately) 1996, the year that NSMIA was passed and listings peaked in the U.S. While the results in this section are descriptive in nature ("single-diff" instead of "diff-in-diff"), they leave little doubt that, consistent with the private capital supply shock identified in Section 2, private investors play an increasing role in financing even the largest startups.

3.1 Has the IPO decline been made up by an increase in acquisitions?

If those startups that used to go public were now being acquired by public firms, they would still be able to raise capital from public investors—albeit not as independent firms. To investigate this possibility, Figure 3 shows the evolution of the exit rates of VC-backed startups over our sample period. Specifically, for startups that raised their first financing round in 1992–2009, the figure shows the (stacked) fraction of firms that (1) went public, (2) were acquired, (3) failed, or (4) remained private in the seven years following that first round.

Consistent with Doidge, Karolyi, and Stulz (2013) and Gao, Ritter, and Zhu (2013), we find that IPO exits started to decline for firms first financed around 1993 and have been extremely rare for those first financed after 1999. Importantly, the decline in IPOs has not been replaced

by an increase in acquisitions, which have remained mostly flat throughout our sample period.[26] Instead, Figure 3 shows that the IPO decline has been made up by an increase in the fraction of startups that remain private—and independent—for at least seven years after their first funding round.[27] We next investigate whether the private equity markets have been able to finance these startups' growth and fill the gap left by the decline of IPOs.

3.2 Are private markets able to fund the growth of large startups?

Historically, only large and successful startups have gone public (e.g., Chemmanur, He, and Nandy (2009)). To understand the extent to which private investors have filled the IPO gap, we assess their ability to finance the largest startups.

3.2.1 Raising large amounts of capital as a private firm

We begin by studying startups' ability to raise large amounts of capital while remaining private. For each startup in our sample, we compute the total net capital (both equity and debt) raised from both public and private sources during the seven years following the firm's first financing round. Specifically, for firms that did not go public during these seven years, our measure of capital includes only capital raised from private investors; for firms that did go public, both pre-IPO capital raised from private investors and net capital raised at the IPO, as well as any subsequent follow-on offerings from public investors, are included.

Figure 4 shows that, among startups whose first funding round was before NSMIA came into full effect in 1997, 83% of those that went on to raise over $150 million over seven years went public.[28] The ability to raise large amounts of public capital appears to have been a key driver of these firms' decision to go public: Untabulated results reveal that 83% of the total

[26] If we condition the analysis on firms that exit, then, consistent with Figure 2 in Gao, Ritter, and Zhu (2013), we find that the IPO decline has led to a sharp decline in the fraction of exits that are via IPO and a symmetric increase in the fraction of exits via acquisition. The difference with our Figure 3 is that we do *not* condition on exits.

[27] Figure A2 in the Internet Appendix performs a similar analysis measuring exits in the 10 years following the first financing round. Our conclusions remain unchanged.

[28] Fewer than 6.5% of our sample firms go on to raise $150 million in the seven years following their first round of funding, thus making $150 million a natural (if necessarily arbitrary) threshold to identify "large" amounts of capital. Our conclusions are robust to using other thresholds, or to not using a binary threshold at all (see Figure 5).

capital they raised was from public investors at or after the IPO. This finding is consistent with the notion that before the IPO decline, most successful startups that raised large amounts of capital did so by going public.

By contrast, the figure shows that of those startups whose first funding round was in or after 1997 and that also went on to raise over $150 million, only 42% relied on the public markets to do so. Importantly, the total number of firms raising over $150 million in the mid-2000s cohorts was similar to that of one decade earlier—although lower that during the peak in the late 1990s. The evidence in Figure 4 thus suggests that private markets have been able to fill at least a substantial part of the gap left by the IPO decline.

This conclusion is reinforced by Figure 5, which provides a multivariate and continuous version of Figure 4. Specifically, Figure 5 examines whether the relationship between the net amount of capital raised by a firm during the seven years following its first funding round and the likelihood that the firm is public has changed over time. To do so, we plot the annual coefficients β_t (for $t \in [1992, 2009]$) from the following regression:

$$Y_{7it} = \beta_t \times \ln K_{7it} + \gamma_t + \eta_s + \theta_j + \varepsilon_{it} \tag{2}$$

where i indexes firms and t indexes the year the firm raised its first funding round. Y_7 is an indicator equal to one if the firm went public during the seven years following its first funding round; K_7 is the net amount of capital raised by the firm during these seven years; and γ_t, η_s, and θ_j capture first-funding year, state, and industry fixed effects, respectively.

The figure shows that for firms in the pre-1997 (i.e., pre-NSMIA) cohorts, there was a strong partial correlation between the (log) amount of capital the firms raised and their likelihood of being public. Since 1996, this partial correlation has decreased by 75%, thus indicating that raising a large amount of capital has become a much weaker predictor of whether a firm is public than it was for the pre-NSMIA cohorts. Thus, the growing ability of private investors to fund large and successful startups with considerable sums of money has made it much less reliable to use a firm's fundraising activity to predict its listing status.

3.2.2 Achieving scale as a private firm: employment and sales

In addition to being able to raise large amounts of capital, are those startups that remain private able to reach a large scale as measured by real variables such as employment or sales? To shed light on this question, Figures 6 and 7 present analogous versions of Figures 4 and 5 focusing on employment instead of capital raised; Figures A3 and A4 in the Internet Appendix do the same for sales.

Figure 6 shows that the post-NSMIA decline in IPOs has been accompanied by a marked decline in the fraction of startups with over 200 employees that are public—but not in the total number of startups that reach this size, which rebounded strongly after the 2001 recession. Similarly, Figure 7 shows that the partial correlation between the (log) number of employees and the likelihood that the firm is public was cut in four for the 2000s cohorts relative to the pre-1997 cohorts. Figures A3 and A4 in the Appendix show similar results for sales.

Doidge, Karolyi, and Stulz (2013) note that while the low IPO rate is "consistent with the view that U.S. financial markets became less hospitable for young, small firms, direct tests of this view, while needed, are beyond the scope" of their study (p. 571). While we cannot rule out the possibility that the decline in IPOs has made it harder for some startups to fund their growth, the evidence in this section suggests that successful private startups are now able to reach a scale historically all but reserved to their public peers. We next study who are the private investors financing late-stage startups in the post-NSMIA regulatory environment.

3.3 Who are the private investors funding late-stage startups?

Consistent with our findings in the previous section, Figure 8 shows a large increase in the amount of private capital going to late-stage startups, increasing from an average $1 billion per year in 1992–1996 to an average $20.4 billion in 2012–2016. Traditionally, VC investors have been a key player in the entrepreneurial finance market, particularly in funding the kind of high-growth startups that become IPO candidates (e.g., Kortum and Lerner (2000); Puri and Zarutskie (2012)). However, Figure 8 shows that non-VC investors play an increasingly important role in financing late-stage startups.

Figure 9 breaks these non-VC investors into four categories: diversified private equity (PE) funds, corporations making minority investments in startups, mutual funds, and a fourth cat-

egory that combines hedge funds and investment banks.[29]

PE funds are the largest non-VC investor in late-stage startups, with their investments increasing by a factor of 20 from the pre-NSMIA years 1992–1996 through 2012–2016—recall that Section 2.4 shows that both VC and PE funds were positively affected by NSMIA. Thus, the post-NSMIA IPO decline has been accompanied by a gradual diversification of PE investors' traditional focus on leveraged buyouts and an increase in the capital they allocate to so-called "growth equity" investments in late-stage startups.

Figure 9 shows that PE funds are followed in order of importance by corporations, with mutual funds and the combined hedge fund/investment bank category playing a more modest but increasing role. The growth in investments by mutual funds and hedge funds/investment banks has been particularly stark since the second half of the 2000s, peaking at a combined $3.3 billion in 2015. This rise of mutual funds as investors in private startups is the focus of recent studies by Chernenko, Lerner, and Zeng (2017) and Kwon, Lowry, and Qian (2017).

Notably, mutual and hedge funds have historically been active IPO investors. The fact that they are increasingly willing to invest in VC-backed startups while they are still private suggests that they would also invest in these same firms if they went public—if anything, to the extent that the firms' securities would be more liquid, they should be *more* willing to do so. This evidence is thus hard to reconcile with the notion that the IPO decline has been driven by public investors' unwillingness to bear the risks associated with investing in IPOs.

3.3.1 Do VC and non-VC investors invest differently?

Figures 8 and 9 show that non-traditional startup investors such as PE funds and mutual funds have greatly increased their investments in late-stage startups. Are these investors equally likely to invest in early-stage startups, or are they concentrating their investments in the kind of late-stage startups that some years ago may have been considering and IPO?

To shed light on this question, Table 6 examines the relationship between the presence of non-VC investors in a financing round and the age of the startup being financed. Specifically,

[29]The figure does not show non-VC investors that VentureSource identifies as "Other," a catch-all category that includes individuals, family offices, and sovereign wealth funds, among others. (These investors are included in Figure 8.)

the unit of observation is the first investment by an investor in a startup, and the dependent variable is the startup's (log) age at financing. The results in column 1 show that non-VC investors tend to invest in startups whose age is up to 33% older than the average startup's age when VC investors first invest in it (of course, this analysis is purely descriptive). Column 2 shows that this finding is robust to controlling for the size of the financing round and of the investment syndicate.

Some of these non-VCs, in particular mutual funds and hedge funds, are used to making arm's length investment in public companies that are not in their geographical proximity. Do non-VCs follow a similar strategy when investing in (late-stage) startups? Columns 3 and 4 in Table 6 investigate this question. The unit of observation continues to be an investor's first-time investment in a startup, but in this case the dependent variable is an indicator for whether the investor is located in the same state as the startup.

Column 3 shows that non-VC investors are 8.9 percentage points more likely to invest in a startup located outside of their own state than traditional VCs. Importantly, this analysis includes round number fixed effects, and so it does not simply reflect the fact that non-VCs tend to invest in more mature startups that require less close monitoring. Column 4 shows that our conclusions are robust to controlling for the size of both the financing round and the investment syndicate and to including investor state fixed effects. In unreported results, we also find that the distance in miles between non-VC investors and the startups they invest in is larger than the distance between VCs and their portfolio companies. (All these conclusions are robust to considering only pre-NSMIA financings.)

The evidence in Table 6 indicates that the increasing role that non-traditional startup investors play in funding late-stage startups is not part of a broader phenomenon whereupon these investors have now become major investors in startups of all ages. Rather, non-VCs appear to be concentrating their investments in the kind of late-stage startups that would have been prime candidates to go public before the IPO decline. In turn, non-VCs willingness to invest in distant startups in other states suggests that they were uniquely positioned to take advantage of the fact that by preempting state blue-sky laws, NSMIA made it easier for startups to raise capital from out-of-state investors.

4 Are Firms Staying Private Because They Cannot Go Public—Or Because They Choose Not To?

The evidence presented so far points to the emergence of a new equilibrium in the entrepreneurial finance market, where private capital going to late-stage startups—both from traditional and from new startup investors—has filled much of the gap left by the decline of IPOs. In this section, we use two complementary analysis to investigate whether this development stems from a lack of demand from public markets for investing in IPOs, or whether late-stage startups could go public but are in fact choosing to stay private.

4.1 The effect of founder equity on the exit decision

The literature has long recognized that staying private allows founders to retain control of their firms (e.g., Boehmer and Ljungqvist (2004); Boot, Gopalan, and Thakor (2006); Helwege and Packer (2009)), which leads many founders to prefer delaying or avoiding an IPO. Indeed, Brau and Fawcett (2006) survey of CFOs shows that the main reason why firms stay private is their managers' desire to preserve control.

By contrast, investors' preferences, particularly in the case of VCs, are often quite different. VC funds have a fixed lifecycle (typically, 10 years) at the end of which the funds must be liquidated and the proceeds paid back to investors—ideally in cash or liquid securities. In addition, VCs enjoy considerable reputational benefits from taking their portfolio firms public (e.g., Gompers (1996)), which can help them attract new investors—and fees—to their next fund. As a result, VC investors often have a preference for taking their successful portfolio companies public.

If founders and VC investors differ in their exit preferences, then this conflict should ultimately be resolved in favor of the party with decision-making control when an IPO becomes a possibility. In order to test this prediction, Table 7 examines how a founder's initial equity stake affects her startup's eventual exit probability. By measuring founder equity early in the startup's life, we avoid capturing a mechanical correlation between the startup's financing and exit decisions, and the equity owned by the founders later in the firm's life. Of course, founder equity still remains endogenous even when measured years before an IPO becomes a possibility;

we will address this endogeneity using an instrumental variable (IV) approach.

Before discussing our findings in Table 7, it is important to ensure that a founder's early equity stake is positively correlated with her degree of control of the startup's major decisions, such as exits—an assumption that is implicit in our Table 7 analysis. To do so, we use data from VentureSource, VC Experts and Pitchbook. We find that a founder's equity stake as of its first funding round is negatively correlated with standard measures of investor control, such as the number of non-managerial board members 2 or 3 years later ($\rho = -.22$ and $-.26$, respectively). A founder's early stake is also negatively correlated with the likelihood that VC investors have redemption rights, which give investors the right to sell their shares back to the company, often forcing an exit ($\rho = -.11$; all three reported correlations are statistically significant).

Table 7 investigates the relationship between founder control and startup exit decisions. The dependent variable in Panel A is equal to one if the startup had an IPO within 7 years of its first financing. The sample consists of those startups that had an exit (IPO or acquisition) or were still private by the end of the seven year window; we thus exclude all firms that failed within 7 years of their first financing. The control variable "Founder's equity stake" is one minus the fraction of (as-if-common) equity sold to investors in the first financing round. Controls include the log of total capital raised through year seven as well as state, year founded, and industry fixed effects.[30]

Column 1 begins by showing that the OLS partial correlation between founder equity and a startup's probability of going public is positive. The coefficient estimate indicates that a one standard deviation (19%) increase in initial founder equity results in a 0.7 percentage point increase in the probability of an IPO (this represents an 8% increase relative to the mean IPO probability). This finding is not surprising, as founder equity is likely to be positively correlated with unobserved startup quality and higher-quality startups are more likely to have a successful exit, all else equal. We rely on an instrumental variable identification strategy to address this endogeneity.

Our instrumental variable exploits state-year variation in the supply of venture capital

[30] All our conclusions are robust to excluding the log of total capital raised from the set of control variables.

stemming from variation in the assets of state pension funds when startups raise their first financing round (Gonzalez-Uribe (2014); Bernstein, Lerner, Sorensen, and Strömberg (2016)). The instrument is motivated by the following two facts: state pension funds are an important source of capital for VC investors, and they exhibit substantial home-state bias (Hochberg and Rauh (2012)).

Satisfying the exclusion restriction requires that the level of pension fund assets in a startup's state at the time of its first financing round only impacts the startup's IPO probability through its effect on founder equity and control. The fact that the level of state pension fund assets reflects the funds' *past* net contributions and investment performance—as opposed to their current or future investment opportunities—is consistent with the exclusion restriction. Two additional factors reinforce the exclusion restriction: There is typically a large time lag between a pension fund's first-round investment decision and the startup exit decision, and the investment decisions of state pension funds are often politically motivated rather than being driven by investment opportunities (Andonov, Hochberg, and Rauh (2017)).[31]

Column 2 of Table 7 shows the reduced form relationship between the instrument and our dependent variable. The negative sign goes in the direction of our hypothesis: More capital available to startups increases founder bargaining power and leads to fewer IPOs.

Column 3 presents the first stage results. We find that startup founders that raise their first VC round in state-years with high pension fund assets retain a higher equity stake in their firms (after controlling for the capital raised). The instrument is strong, with an F-statistic equal to 17. Thus, as predicted, the fact that some major investors in VC funds have more available capital creates a "money chasing deals" (e.g., Gompers and Lerner (2000)) situation that results in higher valuations and thus control for startup founders.

Column 4 of Table 7 shows the second stage estimates. In contrast to our OLS results in column 1, the instrumented founder equity stake has a negative effect on the likelihood of going public. The 2SLS estimate indicates that a 1% increase in founder equity at the time of a startup's first financing leads to an economically meaningful 1.8 percentage points decrease

[31]By restricting our analysis to firms that are still alive seven years after their first VC round, we mitigate the concern that our findings might be driven by the possibility that in state-years with high pension fund assets, more ultimately failed firms may be funded.

in the probability that the startup goes public seven years later.

Panel B of Table 7 is analogous to Panel A but the dependent variable equals one if the startup had an IPO or a successful acquisition within seven years (defined as an acquisition at a price that at least doubles the total capital invested in the startup). Our conclusions are unchanged.[32]

Taken together, our cross-sectional IV evidence suggests that investors and founders often have conflicting exit preferences that are resolved in favor of the party with decision-making control when exiting becomes a possibility.

4.2 Has the decline in IPOs coincided with an increase in founder control?

The evidence in Section 4.1 opens the door to the possibility that the decline in IPOs over the last two decades may have been driven, at least in part, by a concurrent increase in founder control. Indeed, if more founders are in a position to influence their firms' exit decisions, we should see fewer firms going public as founders use their control to stay private—particularly if private markets are able to finance their startups' growth while private.

Figure 10 suggests that founder bargaining power has indeed increased since the early 1990s. The figure reports the average fraction of equity held by founders one year after their first round of financing across all startups with available data. Average founder equity increased from 50% to 55% during the 1990s, and then dropped significantly in the post-dot-com 2001–2003 years (likely due to a more challenging fundraising environment during those years). By 2007, the average equity position had returned to the year 2000 level, and it has continued to increase since then, approaching 70% for firms first financed in 2015. Figure A5 in the Internet Appendix shows a similar pattern for founder equity 3 years after the first financing event, thus suggesting that this proxy for founder control is highly persistent.

Figure 11 further reinforces the notion that founders' control over exit decisions has increased over time. The figure shows that the presence of redemption features in first-round financing rounds, which can be used by investors to eventually force an exit—or, at least, to force startups to buy them out—has experienced a sharp decline since the early 2000s, and in

[32] Our results also robust to defining as successful any acquisition for a price of at least $25 million.

2016 stood at just 15%.

The reasons driving the documented increase in founders' bargaining power are likely to be several, and a full analysis of these reasons falls beyond the scope of our paper. For one, the entry of new investors in the entrepreneurial finance market facilitated by NSMIA and other deregulations has likely increased founders' bargaining power when negotiating with investors. In addition, technological changes decreasing startups' capital requirements early in their lifecycle—when uncertainty is highest and thus capital is most expensive (Ewens, Nanda, and Rhodes-Kropf (Forthcoming))—have likely allowed founders to minimize the dilution they face in early rounds.

Taken together, the time trends in founder bargaining power in Figures 10 and 11, combined with Table 7's finding that founders with the most control are in fact the most likely to stay private, suggest that founders are using their increased control and supply of private capital to keep their firms private—as opposed to them wanting to but being unable to take them public.

5 Conclusion

At the JOBS Act signing (2012), President Obama said:

> For business owners who want to take their companies to the next level, this bill will make it easier for you to go public. And that's a big deal because going public is a major step towards expanding and hiring more workers. It's a big deal for investors as well, because public companies operate with greater oversight and greater transparency.[33]

We show that the first "big deal" (going public is a major step toward expanding and hiring) may not be as big a deal as anticipated—at least not anymore. The deregulatory changes in the private equity markets—and in particular the National Securities Markets Improvement Act (NSMIA) of 1996—have made it possible for both private firms and the funds investing in them to raise large sums of capital privately. This, plus the growing presence of new investors such as PE funds or mutual funds in the entrepreneurial finance market, allow late-stage private startups to reach levels of sales or employment historically only available to their public counterparts.

[33]Remarks by President Obama at the JOBS Act signing ceremony, April 5th, 2012.

We emphasize that our results should not be interpreted as implying that NSMIA is the one and only driver of the decline of U.S. IPOs. The IPO decision is a multi-faceted one that is impacted by a number of supply and demand forces in the public and private equity markets. Thus, other factors—such as technological changes that decrease capital requirements for early-stage startups and make it easier for firms and investors to find each other outside of centralized exchanges—are sure to have helped fuel the IPO decline. But our results do indicate that the deregulation of private markets has played a significant role in bringing about a new equilibrium where fewer high-growth startups go public. Importantly, our results strongly point to the fact that this new equilibrium has not come about by some unfortunate freeze of the IPO market. Rather, many firms are choosing to stay private longer, and they appear to be thriving.

Whether their investors are also thriving—particularly early-stage ones that are now taking longer to exit their investments—remains an open question. That said, our evidence does suggest that the link between the venture capital and the stock market in the U.S. (Black and Gilson (1998)) appears to have weakened.

The second "big deal" highlighted by President Obama (public companies operate with greater oversight and greater transparency) does remain a big deal. The new equilibrium in the IPO market implies that a growing number of the largest and most successful firms in the U.S. economy are private and so are largely exempt from much-debated regulations such as the Sarbanes-Oxley Act and the Dodd-Frank Act. It also implies that many ordinary stock-market investors—particularly those that invest via index funds—do not hold in their portfolios an increasing number of the fastest growing firms in the economy. We leave the investigation of these and other related implications of the IPO decline for future research.

References

Andonov, Aleksandar, Yael V Hochberg, and Joshua D Rauh, 2017, Political representation and governance: Evidence from the investment decisions of public pension funds, *Working paper*.

Armstrong, J Sinclair, 1958, The blue sky laws, *Virginia Law Review* 44, 713.

Asker, John, Joan Farre-Mensa, and Alexander Ljungqvist, 2014, Corporate investment and stock market listing: a puzzle?, *The Review of Financial Studies* 28, 342–390.

Badway, Ernest E., Joshua Horn, Benjamin H. McCoy, Sean F. Reid, and Sandra A. Romaszewski, 2016, Private equity and hedge funds: Regulatory analysis and structural overview, *White paper*.

Bernstein, Shai, Josh Lerner, Morten Sorensen, and Per Strömberg, 2016, Private equity and industry performance, *Management Science* 63, 1198–1213.

Black, Bernard S, and Ronald J Gilson, 1998, Venture capital and the structure of capital markets: banks versus stock markets, *Journal of financial economics* 47, 243–277.

Boehmer, Ekkehart, and Alexander Ljungqvist, 2004, On the decision to go public: Evidence from privately-held firms, *Working paper*.

Boot, Arnoud WA, Radhakrishnan Gopalan, and Anjan V Thakor, 2006, The entrepreneur's choice between private and public ownership, *The Journal of Finance* 61, 803–836.

Brau, James C, and Stanley E Fawcett, 2006, Initial public offerings: An analysis of theory and practice, *The Journal of Finance* 61, 399–436.

Campbell Jr., Rutheford B, 1998, The impact of NSMIA on small issuers, *The Business Lawyer* pp. 575–589.

Celikyurt, Ugur, Merih Sevilir, and Anil Shivdasani, 2010, Going public to acquire? The acquisition motive in IPOs, *Journal of Financial Economics* 96, 345–363.

Chemmanur, Thomas J, and Paolo Fulghieri, 1999, A theory of the going-public decision, *The Review of Financial Studies* 12, 249–279.

Chemmanur, Thomas J, Shan He, and Debarshi K Nandy, 2009, The going-public decision and the product market, *The Review of Financial Studies* 23, 1855–1908.

Chernenko, Sergey, Josh Lerner, and Yao Zeng, 2017, Mutual funds as venture capitalists? Evidence from unicorns, *Working paper*.

Cox, James D, 2013, Who can't raise capital-The Scylla and Charybdis of capital formation, *Kentucky Law Journal* 102, 849.

de Fontenay, Elisabeth, 2017, The deregulation of private capital and the decline of the public company, *Hastings Law Journal* 68, 445.

Denos, Kenneth I, 1997, Blue and gray skies: The National Securities Markets Improvement Act of 1996 makes the case for uniformity in state securities law, *Utah L. Rev.* p. 101.

Doidge, Craig, Kathleen M Kahle, G Andrew Karolyi, and René M Stulz, 2018, Eclipse of the public corporation or eclipse of the public markets?, Discussion paper, National Bureau of Economic Research.

Doidge, Craig, G Andrew Karolyi, and René M Stulz, 2013, The us left behind? Financial globalization and the rise of IPOs outside the U.S., *Journal of Financial Economics* 110, 546–573.

——— , 2017, The U.S. listing gap, *Journal of Financial Economics* 123, 464–487.

Ewens, Michael, Ramana Nanda, and Matthew Rhodes-Kropf, Forthcoming, Cost of experimentation and the evolution of venture capital, *Journal of Financial Economics*.

Gao, Xiaohui, Jay R Ritter, and Zhongyan Zhu, 2013, Where have all the IPOs gone?, *Journal of Financial and Quantitative Analysis* 48, 1663–1692.

Gompers, Paul, and Josh Lerner, 2000, Money chasing deals? The impact of fund inflows on private equity valuation, *Journal of financial economics* 55, 281–325.

Gompers, Paul A, 1996, Grandstanding in the venture capital industry, *Journal of Financial economics* 42, 133–156.

Gonzalez-Uribe, Juanita, 2014, Venture capital and the diffusion of knowledge, *Working Paper*.

Gornall, Will, and Ilya A Strebulaev, 2015, The economic impact of venture capital: Evidence from public companies, *Working paper*.

Helwege, Jean, and Frank Packer, 2009, Private matters, *Journal of Financial Intermediation* 18, 362–383.

Hochberg, Yael V, and Joshua D Rauh, 2012, Local overweighting and underperformance: Evidence from limited partner private equity investments, *The Review of Financial Studies* 26, 403–451.

Ivanov, Vladimir, and Scott Bauguess, 2013, Capital raising in the U.S.: An analysis of unregistered offerings using the Regulation D exemption, 2009-2012, *US Securities and Exchange Commission White Paper*.

Kortum, Samuel, and Josh Lerner, 2000, Assessing the contribution of venture capital to innovation, *RAND Journal of Economics* 31, 674–692.

Kwon, Sungjoung, Michelle Lowry, and Yiming Qian, 2017, Mutual fund investments in private firms, *Working paper*.

Lerner, Josh, 1995, Venture capitalists and the oversight of private firms, *the Journal of Finance* 50, 301–318.

Loss, Louis, Joel Seligman, and Troy Paredes, 2017, *Fundamentals of securities regulation* (Wolters Kluwer).

Maynard, Therese H, 1987, Uniform limited offering exemption: How uniform is uniform–An evaluation and critique of the ULOE, *Emory Law Journal* 36, 357.

Puri, Manju, and Rebecca Zarutskie, 2012, On the life cycle dynamics of venture-capital-and non-venture-capital-financed firms, *The Journal of Finance* 67, 2247–2293.

Ritter, Jay, 2017, Initial public offerings: Updated statistics, *University of Florida*.

Sorenson, Olav, and Toby E Stuart, 2001, Syndication networks and the spatial distribution of venture capital investments, *American journal of sociology* 106, 1546–1588.

Weild, David, 2011, How to revive small-cap IPOs, *Wall Street Journal*.

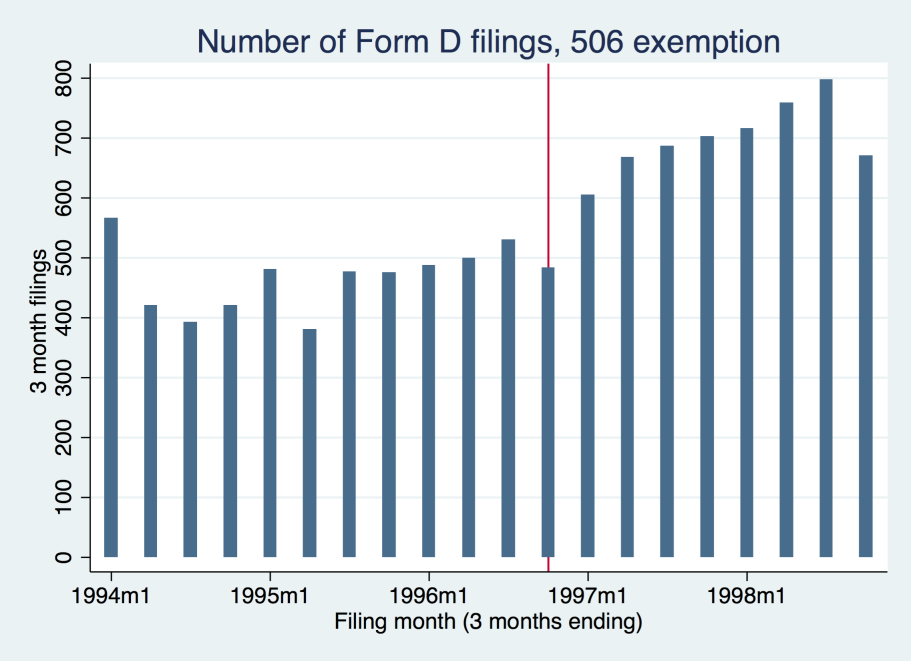
Zingales, Luigi, 1995, Insider ownership and the decision to go public, *The review of economic studies* 62, 425–448.

Zweig, Jason, 2010, The demise of the IPO–and ideas on how to revive it, *Wall Street Journal*.

Figure 1: Form D filings around the passage of NSMIA (1a and 1b)

The figure reports the number of Rule 506 (a) and Rule 504/5 (b) Form D filings from 1992 to 1998 for all non-fund and non-natural resource filers. Because the data acquired from the SEC using FOIA lacked identifiers for such issuers, we used words found in issuer names to filter them out (e.g. "fund", "II", "acquisition", "investments", "mining", "oil", "REIT", etc.) For each time period, the figure reports the total filings over the previous three months where quarters end in January, April, July and October (so that we can center the counts around the passage of NSMIA). The vertical line represents October 1996, the month that NSMIA was passed. NSMIA changed section 4(2) of the Securities Act and in turn allowed firms that used 506 exemptions to follow only SEC (rather than state) securities regulations. Part (b) shows the filings for the exemption types whose value did not change after NSMIA.

(a) Exemption type 506



(b) Exemption type 504 and 505

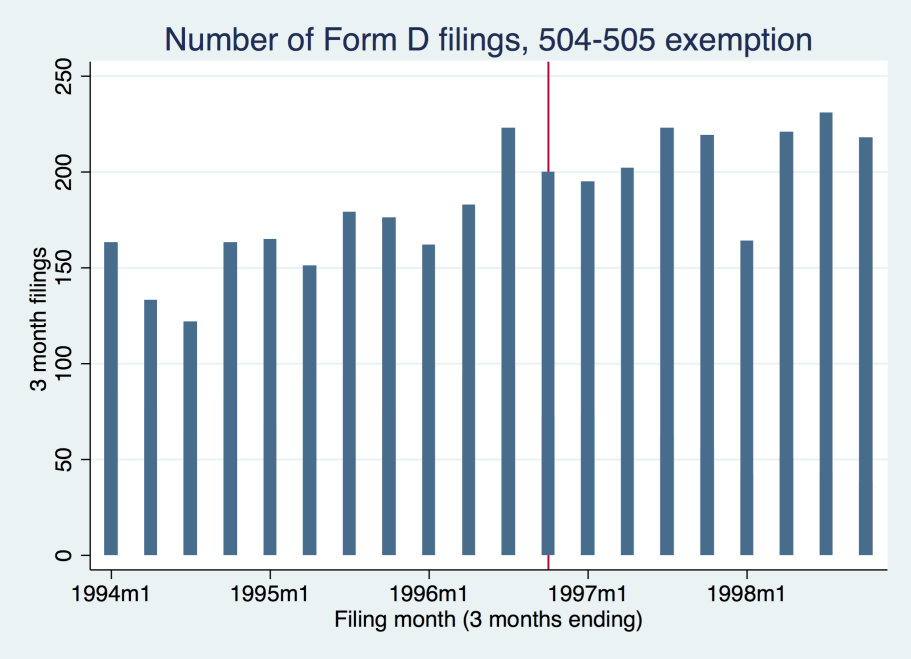


Figure 2: Probability of an out-of-state investor: late-stage vs. early-stage financings

The figure reports the coefficient estimates from the difference-in-difference estimator in Section 2. The dependent variable is an indicator that is equal to one if the startups financing had at least one out-of-state investor. The treatment variable is an indicator that is one if the financing is late-stage. The coefficients presented here are the interactions between this treatment variable that the time dummies for six month intervals from 1994 to 1998. The plot presents the point estimates and 95% confidence intervals where the standard errors are clustered at the startup level.

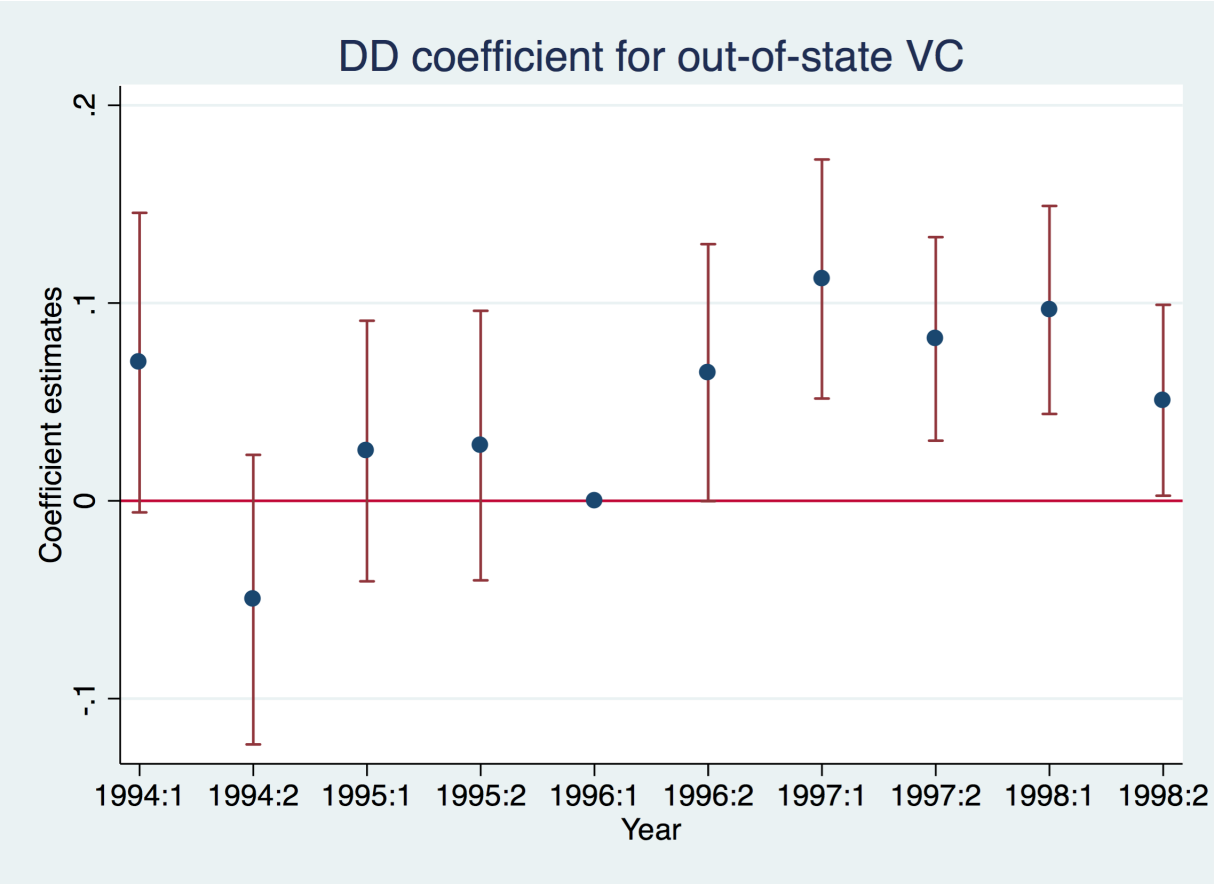


Figure 3: Exit status by year of first VC financing

For startups that raised their first financing round in 1992-2009, the figure shows the (stacked) fraction of startups that (1) went public, (2) were acquired, (3) failed, or (4) remained private during the seven years after their first financing. (E.g., for firms that raised their first financing round in 2000, we measure exits as of 2007. We observe exits through 2016, so ending the sample of first financing rounds in 2009 allows us to observe seven full years of exits for all firms.) We ensure those startups we identify as "Still Private" have not failed by using VentureSource's failure information, complemented with manual searches; in addition, we conservatively code as failed any startup that has not raised capital in five years. The sample includes all VC-backed startups described in Section 1.

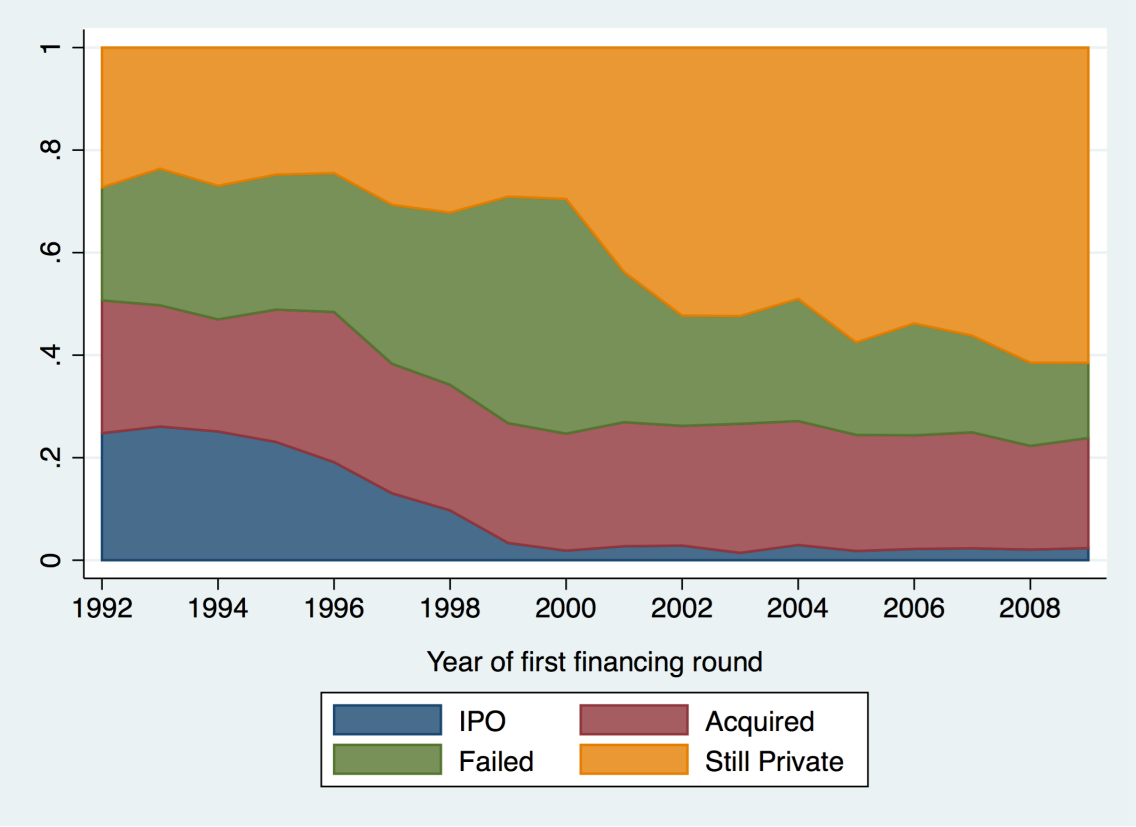


Figure 4: Raising large amounts of capital as a private firm

The figure reports the number of startups that raised at least $150m (in real 2009 USD) seven years after their first round of financing, split into two groups. "Private" is the count of firms that satisfy this criteria that were still private (i.e. no IPO, failure or acquisition) seven years after their first financing. "Public" are the set of firms that went public within seven years of their first financing event. The capital is a cumulation of both that raised as a private firm (here, from private equity investors) and post-IPO offerings for those firms that went public. Data from VentureSource and Compustat are used to aggregate the capital raised.

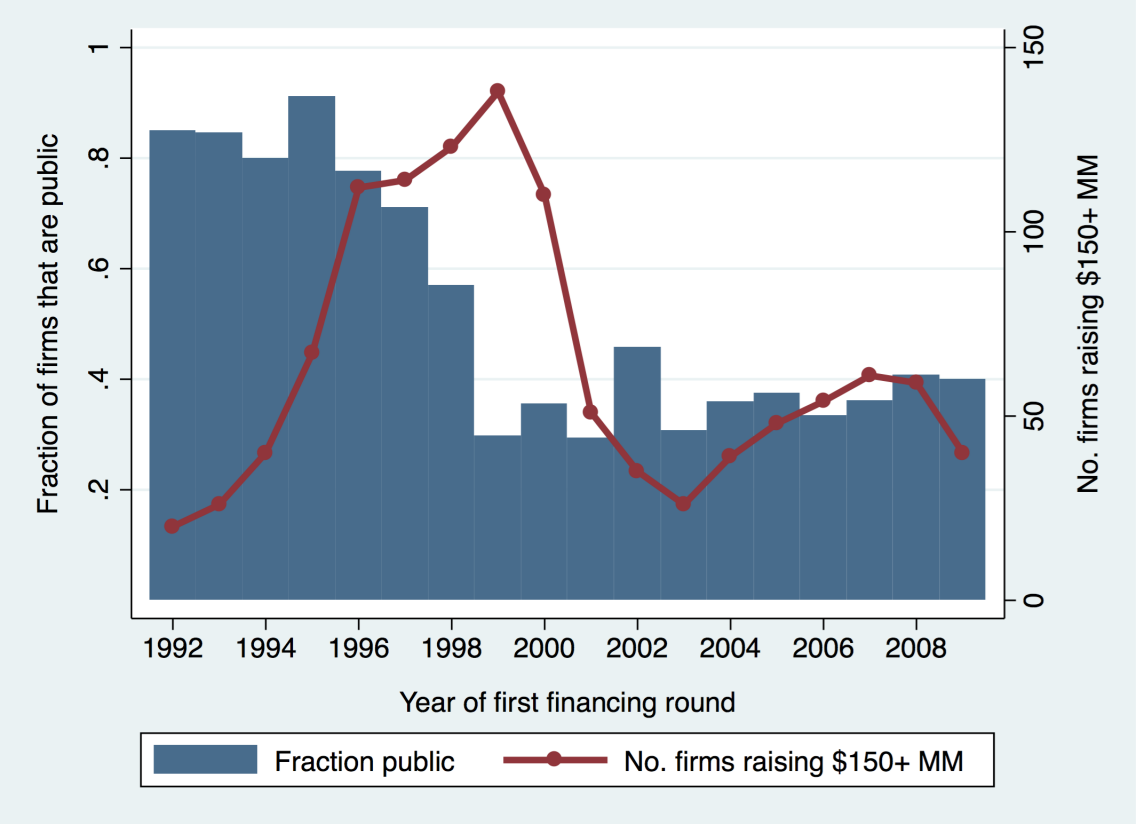


Figure 5: Year fixed effect estimates for relationship between capital raised in seven years and IPO probability

The figure plots the coefficient estimates (and their 95% confidence intervals) from the follow regression:

$$Y_{7it} = \beta_t \times \ln K_{7it} + \gamma_t + \eta_s + \theta_j + \varepsilon_{it}$$

where i indexes firms and t indexes the year the firm raised its first funding round. Y_7 is an indicator equal to one if the firm went public during the seven years following its first funding round; K_7 is the net amount of capital raised by the firm during these seven years; and γ_t, η_s, and θ_j capture first-funding year, state, and industry fixed effects, respectively. The dependent variable is one if the startup had an IPO within 7 years of its first financing event. Robust standard errors are used to construct the 95% confidence intervals.

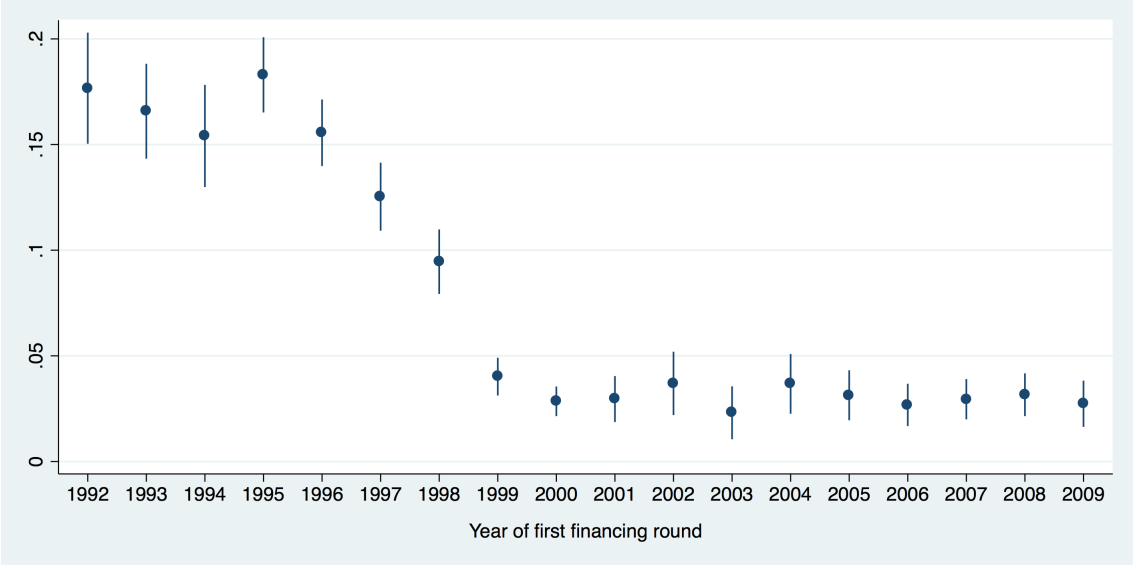


Figure 6: Number of firms raising with at least 200 employees seven years after first financing: public vs. private

The figure reports the number of startups that had at least 200 employees seven years after their first round of financing (measured using VentureSource, NETs and Compustat), split into two groups. "Private" is the count of firms that satisfy this criteria that were still private (i.e. no IPO, failure or acquisition) seven years after their first financing. "Public" are the set of firms that went public within seven years of their first financing event. The employee count is measured either as a private firm or public firm, seven years after first financing.

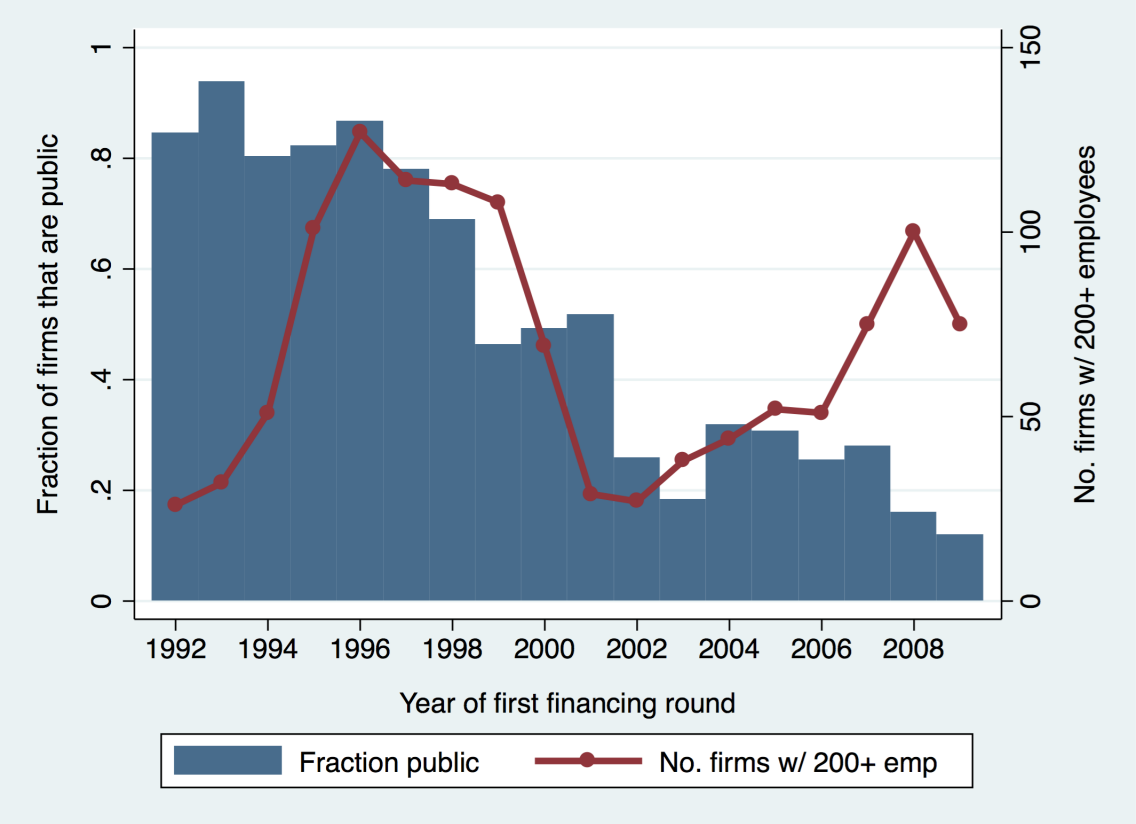


Figure 7: Year fixed effect estimates for number of firms with at least 200 employees seven years after first financing: public vs. private

The figure plots the coefficient estimates (and their 95% confidence intervals) from the follow regression:

$$Y_{7it} = \beta_t \times \ln E_{7it} + \gamma_t + \eta_s + \theta_j + \varepsilon_{it}$$

Here, the dependent variable is one if the startup had an IPO within 7 years of its first financing event. The coefficients of interest are the γ_s on the interaction of year first financing and the $\ln E_{7i}$ log of total employees as of seven years since first capital raised. s_i and I_i are state and industry fixed effects respectively and the ρ_t are fixed effects for the year of first financing. Robust standard errors.

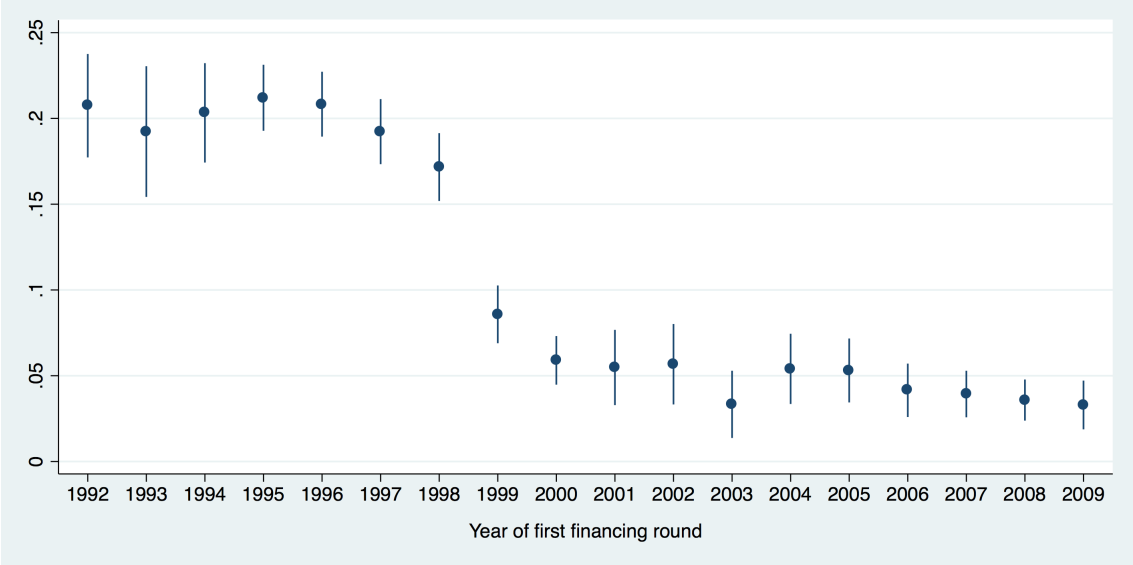


Figure 8: Capital provided by venture capital and non-venture capital investors to startups four years and older

The figure presents the sum of total capital raised in each financing year (in 2009 dollars) for startups at least four years old, measured since their first financing. The dashed line aggregates the capital invested by traditional VC investors. The green bars present the difference between the VC contributions and total capital invested, which is capital contributed by non-traditional investors. Capital in a financing is split as using the disaggregated data for individual syndicate members available in VentureSource. If this is missing, then the lead investor is assigned half of the total financings, with the remaining capital split equally among the rest of the syndicate.

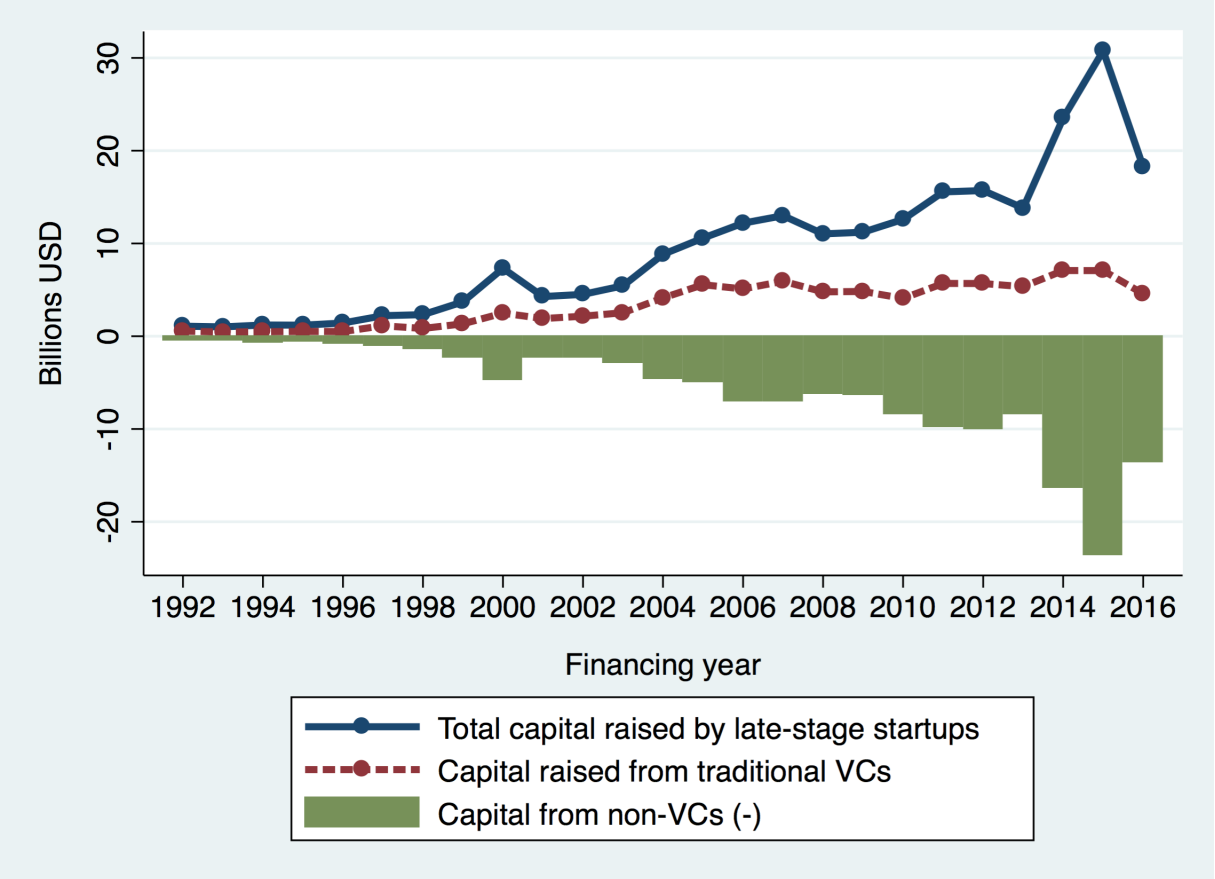


Figure 9: Breaking down non-VC investors in late-stage startups

The figure breaks down the capital numbers provided in Figure 8 by each category of non-VC investor. "Corp." are either corporations making direct investors or their venture capital arms. "Div. PE" include a wide assortment of growth equity funds, mezzanine and traditional private equity investors. "Hedge/Inv. bank" include hedge funds and investment banks. The excluded group here is "Other," which is a catchall from VentureSource that include LPs, family offices, sovereign wealth funds and individuals. All dollars in 2009 dollars.

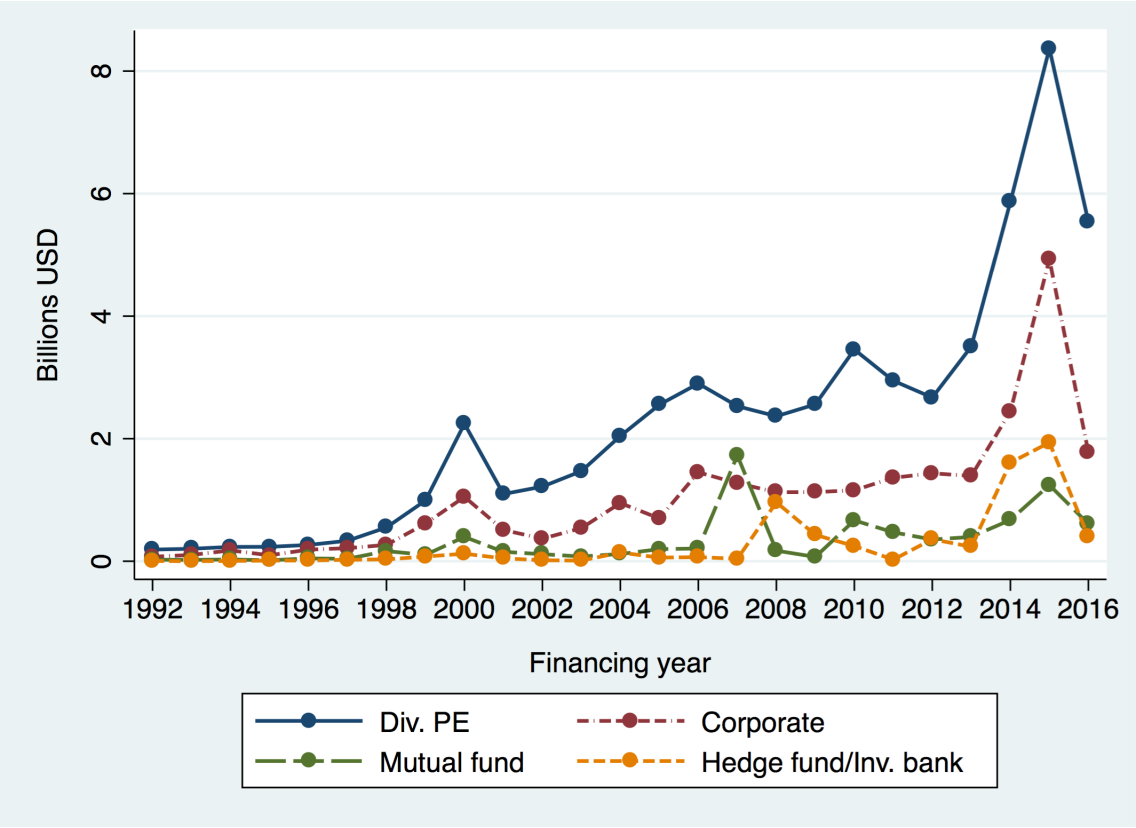


Figure 10: Founder equity in first financing

The figure reports the average equity stakes held by non-investors—founders and holders of options—one year after the first round of VC financing (which is why the sample here ends in 2015, one year before the end of our sample period). To compute this equity stake, we require the pre-money valuation V and capital raised K in the financing. The founders are assumed to have $1 - \frac{K}{K+V}$ after the financing. As is typical in these calculations, we assume common equity so this is an upper bound on the founders' equity position.

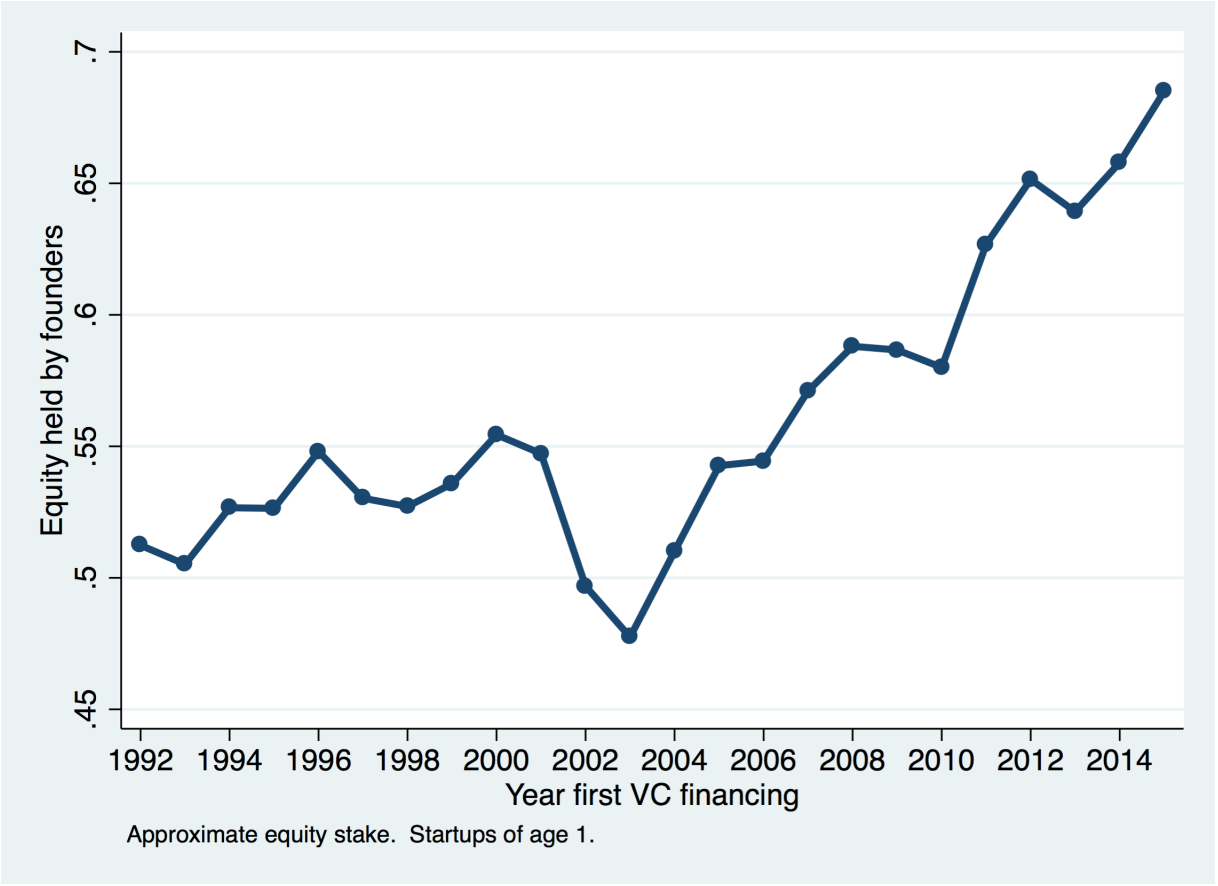


Figure 11: First round contract features over time: redemption rights

The figure reports the fraction of first round financings that have redemption rights. Redemption provides investors what amounts to a time-dependent put option on the startup. This control right can be used by investors to eventually force an exit—or, at least, to force startups to buy them out investor.

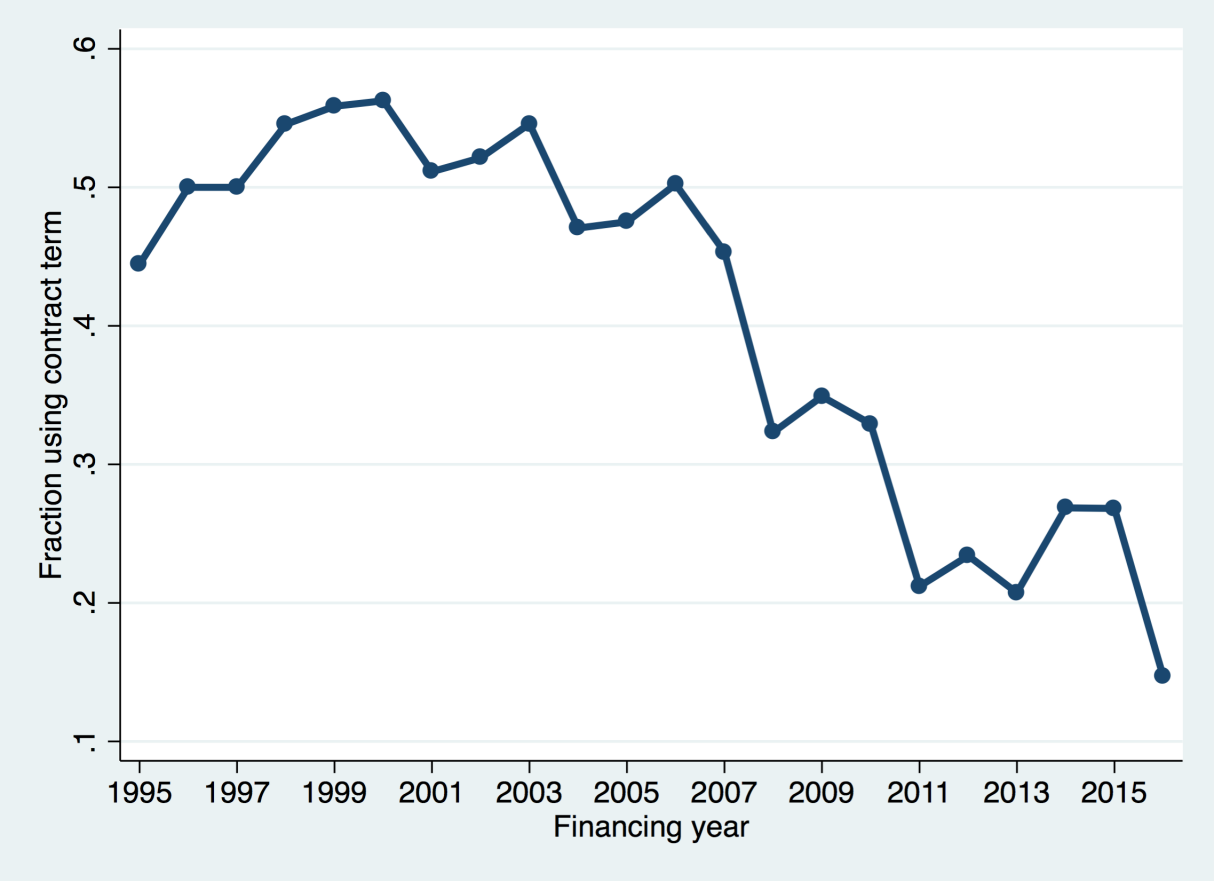


Table 1: Propensity for out of state investor around NSMIA law change

The table reports OLS regression estimates of the propensity for startups to raise capital from investors from outside their state. The unit of observation is a financing event and the dependent variable in is a dummy variable equal to one if at least one syndicate member in a financing is from outside the startup's state. All models are linear probability. The sample includes all closed financings from 1994–1998 around the passage of NSMIA. Column (2) considers the subsample of financings not including startups in the information technology industry (i.e., industries "Software," those with "Services" in the name, "Media/Content/Info.," "Communications and Networking," "Travel and Leisure" (primarily websites) and "Retailers" (primarily websites). The treatment variable is "Late stage" for columns (1)-(2). It is a dummy variable that is one if the financing event is a Series C or greater (typically after the second financing). For the last column, we use the log of the financing round number as a continuous equivalent to this treatment variable. "Post" is one if the financing occurred after the third quarter of 1996. "State FE" are fixed effects for the entrepreneurial firm's state and "Industry FE" are industry fixed effects. "Year quarter FE" are fixed effects for the year-quarter of the financing. Standard errors clustered at the startup level are reported in parentheses. Significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

	Has out of state inv.?		
	(1)	(2)	(3)
		Non-IT	
Late stage X Post	0.045**	0.072*	
	(0.023)	(0.037)	
Late stage round	0.171***	0.142***	
	(0.018)	(0.028)	
Log round # X Post			0.051***
			(0.018)
Log round #			0.166***
			(0.013)
Constant	0.317***	0.328***	0.250**
	(0.116)	(0.109)	(0.112)
Financings	8199	3099	8199
R^2	0.098	0.087	0.125
State FE?	Y	Y	Y
Industry FE?	Y	Y	Y
Year-quarter FE?	Y	Y	Y

Table 2: Placebo tests for out-of-state investors post-NSMIA

Notes: The table repeats the main out-of-state NSMIA results in Table 1 (Column (1)) after moving the "treatment" quarter back two years (Columns 2) and back one year (Column 3). Specifications are otherwise identical to that reported in Column (1) of Table 1. Column (2) here reports the four year window 1992–1996 rather than the 1994–1998 in the original specification (the sample is 1993–1997 for Column 3). "FE" are all those defined in Table 1. Standard errors clustered at the startup level are reported in parentheses. Significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

	Has out-of-state investor?		
	Original	Post > Oct. 1994	Post > Oct. 1993
	(1)	(2)	(3)
Late stage X Post	0.045**		
	(0.023)		
Post (Oct. 1994) X Late-stage		-0.005	
		(0.026)	
Post (Oct. 1993) X Late-stage			0.031
			(0.029)
Late stage round	0.171***	0.192***	0.171***
	(0.018)	(0.042)	(0.036)
Constant	0.317***	0.621***	0.624***
	(0.116)	(0.025)	(0.023)
Financings	8199	5468	4634
R^2	0.098	0.106	0.101
Sample	1994–1998	1992–1996	1993–1997
FE?	Y	Y	Y

Table 3: The effect of NSMIA by pre-law change state regulations

The table reports the main regressions from Table 1 for different sub-samples and a triple interaction model. Columns (1) and (2) split the U.S. states into those that had passed the one of two security laws. The first is the Uniform Limited Offering Exemption rule, which was an attempt to create uniformity between the SEC's Regulation D and the state-level private securities rules. States with ULOE likely had weaker regulations around private security offerings. The second is the Small Corporate Offering Registration that gave state issuers the ability to use exemption forms much like those required by the SEC for the non-506 filings. Issuers in states with this provision in their regulations faced lower fixed costs of selling private securities. Column (1) "Uniform regs." considers states with either of these laws on the books as of Oct. 1996. Column (2) "Non-uniform regs." considers the sample of all other states (i.e. those with neither law in place). The final column presents a triple interaction estimation on the full sample where "Non-uniform regs." is equal to one if the state has neither ULOE or SCOR in place as of Oct. 1996. All controls are as defined in Table 1. Standard errors clustered at the state level are reported in parentheses. Significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

	Has out-of-state investor?		
	Uniform regs.	Non-uniform regs.	All
	(1)	(2)	(3)
Late stage X Post	0.032	0.127***	0.036***
	(0.024)	(0.028)	(0.012)
Late stage round	0.184***	0.078*	0.184***
	(0.019)	(0.040)	(0.026)
Non-uniform regs. X Late-stage X Post			0.058*
			(0.030)
Non-uniform regs. X Late-stage			-0.087*
			(0.047)
Constant	0.291**	0.464***	0.315**
	(0.148)	(0.037)	(0.121)
Financings	7078	1121	8199
R^2	0.101	0.084	0.099
State FE?	Y	Y	Y
Industry FE?	Y	Y	Y
Year-quarter FE?	Y	Y	Y

Table 4: Probability of a large financing round around NSMIA law change

The table reports OLS regression estimates of the probability for startups to raise a large financing round around the passage of NSMIA. A large financing round is one that is in the top quartile of financing round sizes (in real 2009 dollars) prior to the end of our sample period in 1998. The unit of observation is a startup financing event. All models are linear probability. The sample includes all closed financings from 1994–1998 around the passage of NSMIA. Column (2) considers the subsample of financings not including startups in the information technology industry (i.e., industries "Software," those with "Services" in the name, "Media/Content/Info.," "Communications and Networking," "Travel and Leisure" (primarily websites) and "Retailers" (primarily websites). The treatment variable is "Late stage" for columns (1)-(2), which is a dummy variable that is one if the financing event is a Series C or greater (typically after the second financing.) For the last column, we use the log of the financing round number as a continuous equivalent to this treatment variable. "Post" is one if the financing occurred after the third quarter of 1996. "State FE" are fixed effects for the entrepreneurial firm's state and "Industry FE" are industry fixed effects. "Year quarter FE" are fixed effects for the year-quarter of the financing. Standard errors clustered at the startup level are reported in parentheses. Significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

	Large financing round?		
	(1)	(2)	(3)
		Non-IT	
Late stage X Post	0.062**	0.072*	
	(0.026)	(0.040)	
Late stage round	0.155***	0.174***	
	(0.020)	(0.029)	
Log round # X Post			0.073***
			(0.017)
Log round #			0.123***
			(0.013)
Constant	0.392**	0.332	0.333*
	(0.195)	(0.217)	(0.196)
Financings	8006	3028	8006
R^2	0.079	0.069	0.093
State FE?	Y	Y	Y
Industry FE?	Y	Y	Y
Year-quarter FE?	Y	Y	Y

Table 5: Changes in venture capital and private equity fund size after NSMIA passage

The table reports OLS regressions of fund size on a series of controls. The dependent variable is the log of VC fund size in 2009 dollars. The date of fund close is identified using the first official close date of the fund. Includes all funds with vintage years 1994–1998 (two years on each side of the law change). "Late stage fund" is a dummy variable equal to one if the fund has an above sample median fraction of initial (i.e., non-follow-on) investments in the Series C or later round, or is explicitly listed as a late stage or buyout fund by VentureSource, Preqin, or Pitchbook. That is, we take the fraction of a funds first investments in each startup and create a variable that is one if that first financing is a Series C or above. If a large fraction of the fund's investments – compared to the average fund – are in these later round financing, then we assume it is a late-stage investor. "U.S. fund" is one of the fund is headquartered in the US. Column (1) compares all U.S. funds to non-U.S. funds. Column (2) considers the sample of U.S. early and late-stage funds, while Column (3) considers the same sample excluding funds investing in information technology. Column (4) repeats the estimation of Column (2) for the non-U.S. sample (i.e. a placebo). The last column replaces the dummy variable for late stage with its underlying continuous counterpart. "Vintage Year FE" are fixed effects for the fund's vintage year (thus we exclude the "Post" variable). "Industry FE" are identified either by the fund's classification in the original data source, when available, or by the most popular industry in which it invested. Industries are "Business/Consumer/Retail", "Healthcare", "Information Technology," and "Other." "Fund seq. FE" are fixed effects for the fund sequence (e.g. 1st or 4th fund). Robust standard errors are reported in parentheses. Significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

	Log of fund size (m, 2009 dollars)				
		Late vs. early	Non-IT		
	All	U.S.	U.S.	Non-US	U.S.
	(1)	(2)	(3)	(4)	(5)
Post X U.S. fund	0.402*				
	(0.241)				
Post X late stage fund		0.357**	0.458*	-0.025	
		(0.179)	(0.260)	(0.423)	
Late stage fund		0.514***	0.668***	0.815**	
		(0.138)	(0.195)	(0.360)	
Post X % Post Series B					0.682***
					(0.163)
% late stage					0.583***
					(0.205)
US fund	-0.132				
	(0.206)				
Constant	3.859***	3.545***	3.654***	3.135***	3.749***
	(0.161)	(0.191)	(0.184)	(0.368)	(0.151)
Observations	918	714	390	152	714
R^2	0.06	0.17	0.15	0.11	0.15
Avg. late-stage fund size		173.14	195.10	145.69	
Avg. non-late fund size		81.69	85.91	60.84	
Vintage Year FE	Y	Y	Y	Y	Y
Fund industry FE	Y	Y	Y	Y	Y
Fund seq. FE	Y	Y	Y	Y	Y

Table 6: Investment activity of non-VC investors

The table presents OLS regressions where the unit of observation is the first investment in a startup made by an investor. In columns (1) and (2), the dependent variable is the log of the startups age (in years) at the time of this first investment. The control "Non-VC investor" is an dummy variable equal to one if the investor is a non-traditional investor as defined in Section 3.3. The second two columns present regression estimates for the same specification as in (1) and (2), but where the dependent variable is a dummy equal to one if the VC investor and startup are located in a different state. This variable is as described in Section 2.3.2 and is defined at the investor-startup pair. "Log raised ($m)" is the log of total capital raised in the financing (in 2009 dollars) and "Log syndicate size" is the log of the number of investors in the financing. "Year FE" are fixed effects for the financing year, "Round # FE" are fixed effects for the financing round number (i.e. stage), "Industry FE" are fixed effects for the startup's industry and "Startup state FE" are fixed effects for the startup's headquarter state (US only). "Inv. state FE" are fixed effects for the investor's headquarters state. Robust standard errors clustered at the investor level are reported in parentheses. Significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

	Log of startup age (yrs.)		Startup outside investors state?	
	(1)	(2)	(3)	(4)
Non-VC investor	0.264***	0.169***	0.089***	0.100***
	(0.022)	(0.050)	(0.003)	(0.003)
Log raised ($)		0.136***		0.057***
		(0.007)		(0.002)
Log syndicate size		0.156***		-0.008**
		(0.033)		(0.003)
Constant	0.151***	-0.148***	0.612***	0.929***
	(0.038)	(0.056)	(0.042)	(0.053)
Observations	99619	95621	99619	83647
R^2	0.057	0.189	0.087	0.242
Year FE	Y	Y	Y	Y
Round # FE?	N	N	Y	Y
Industry FE	Y	Y	Y	Y
Startup state FE	Y	Y	Y	Y
Inv. state FE	N	N	Y	Y

Table 7: Effect of founder equity on exit outcomes: instrumental variables

The table reports OLS and 2SLS regression estimates of the relationship between startup exits and early-stage founder equity. Panel A considers the dependent variable that is equal to one if the startup had an IPO within seven years of its first VC financing event. The sample of startups includes those that did not fail or have a bankruptcy within 7 years of their first VC financing. Thus, the possible outcomes for startups in the sample are an IPO, an acquisition or the firm is still private. "Founder's equity stake" is the first round equity stake (defined in Figure 10). "Total pension assets (t)" are the startup's state pension assets in the year of the firm's first financing event (in trillions USD, 2009 dollars). "Total capital raised (log, m)" is the total capital raised by the startup within seven years of first financing. Column (1) and (2) present OLS regression estimates, while column (3) presents the first stage estimates of a regression of founder equity on the pension assets instrument. The final column presents the IV estimates or second stage. Panel B considers the alternative dependent variable that is one if the startup had either an IPO or a successful acquisition (sold for at least $2X$ capital invested) within seven years of its first VC financing. "Firm founding year FE" are fixed effects for the startup's founding year and all other fixed effects as defined in Table 6. Standard errors clustered at the state level are reported in parentheses. Significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

	Panel A:IPO in 7 years			
	(1)	(2)	(3)	(4)
	IPO in 7	IPO in 7	Founder %	IPO in 7
	OLS	OLS	First stage	2SLS
Founder's equity stake	0.038*			-1.823***
	(0.021)			(0.678)
Total pension assets (t)		-0.218***	0.120***	
		(0.051)	(0.028)	
Total capital raised (log, m)	0.056***	0.053***	-0.096***	-0.123*
	(0.006)	(0.004)	(0.004)	(0.069)
Constant	-0.132***	-0.012	0.887***	2.046**
	(0.018)	(0.020)	(0.025)	(0.805)
Observations	10440	10440	10440	10440
R^2	0.203	0.205	0.329	.
1st stage F-stat				17.73
	(1)	(2)	(3)	(4)
	Panel B:IPO or quality Acq. in 7 years			
	IPO/Acq. in 7	IPO/Acq. in 7	Founder %	IPO/Acq. in 7
	OLS	OLS	First stage	2SLS
Founder's equity stake	0.049**			-1.478**
	(0.020)			(0.717)
Total pension assets (t)		-0.177***	0.120***	
		(0.062)	(0.028)	
Total capital raised (log, m)	0.055***	0.050***	-0.096***	-0.092
	(0.006)	(0.005)	(0.004)	(0.072)
Constant	-0.144***	-0.029	0.887***	1.613*
	(0.020)	(0.021)	(0.025)	(0.848)
Observations	10440	10440	10440	10440
R^2	0.173	0.174	0.329	.
1st stage F-stat				17.73
State FE?	Y	Y	Y	Y
Firm founding year FE?	Y	Y	Y	Y
Financing year FE?	Y	Y	Y	Y
Industry FE?	Y	Y	Y	Y

Internet Appendix for "The Deregulation of the Private Equity Markets and the Decline in IPOs"

Michael Ewens and Joan Farre-Mensa*

March 8, 2018

*Ewens: California Institute of Technology (mewens@caltech.edu); Farre-Mensa: Cornerstone Research (jfarre@cornerstone.com).

A1 Brief Legislative history of NSMIA

The passage of a federal law is rarely a surprise, particular to those agents most affected. Thus, one concern about our identification strategy using the passage of the National Security Markets Improvement Act (NSMIA) as a "shock" is that the timing was anticipated by the agents in our analysis or in response to market trends. Anticipation could lead to delayed or sped-up actions by firms and funds, confounding the parallel trends assumption. This section addresses this concern by describing the time-line of NSMIA's passage.

The changes made by NSMIA in 1996 were part of the deregulation discussion beginning as far back as 1958. In that year, SEC chairman J. Armstrong Sinclair publicly highlighted the negative consequences of the "blue sky laws" that NSMIA eventually addressed. The first public discussion about specific components of NSMIA emerged in a 1992 SEC report titled "Protecting Investors: A Half Century of Investment Company Regulation." This report proposes changes to the Investment Company Act that closely mirror the eventual Title II of NSMIA. The Act became a bill only after major political change in the U.S. capitol. In 1994, the Republican Party won a majority in both the Senate and House of Representatives, bringing with them a new deregulation agenda. In March of 1995, a subcommittee of the Commerce Committee in the house chaired by Rep. Mark Fields (R, TX) held a series of three hearings on two laws: Capital Markets Deregulation (H.R. 2131) and Investment Company Amendment Acts (H.R. 1495). During these hearings, congressional representatives, SEC leadership and invited industry speakers each mention the long time that it had taken to get these laws to the floor of the House.[1] During these hearings, the committee chairman Rep. Fields predicted that H.R. 2131 would be on the president's desk by the end of 1995. Instead, both bills failed to leave committee that year.

In early 1996, a new bill emerged in the same committee: NSMIA. Two of its major sections – Titles II and III – have many overlapping features of the previous H.R. 1495 and H.R. 2131, suggesting that the committee repackaged it into a new bill. In 1996, NSMIA passed relatively quickly through the House and Senate by large majorities. Comments by the bill's architect show that passage was nonetheless challenging. During its passage on the House floor, Tom Billey (R, VA) noted that the legislation was "the result of a long and difficult process", while its sponsor Rep. Fields recalled that its passage "was a long process."[2] Overall, NSMIA's emergence as a law mirrored the histories of other

[1] See Committee on Commerce (1995b) and Committee on Commerce (1995a)

[2] Rep. Tom Billey (VA) and Rep. Mark Fields (TX). "National Securities Market Act." Congressional Record 142:137 (September 28, 1996) p. H12037-12047

major federal regulations: multiple iterations over several years. Similarly, we found no evidence that the late 1996 passage was a response to any changes in the private equity or venture capital markets. Instead, the industry sources for testimony and politicians references to beneficiaries suggest that the mutual fund industry was a major advocate for change.[3] Overall, the timing of NSMIA's passage does not appear to have been driven by the startups or their investors, while the specific date of its passage was relatively random within the narrow window of our study.

[3]In fact, our review of the congressional hearings in 1995 – Committee on Commerce (1995b) – found no evidence that lobbyists tied to either industry played an open role in crafting of NSMIA.

References

Committee on Commerce, 1995a, *Capital Markets Deregulation and Liberalization Act of 1995 : hearings before the Subcommittee on Telecommunications and Finance of the Committee on Commerce, House of Representatives, One Hundred Fourth Congres, first session, on H.R. 2131, November 14, 1995* (U.S. G.P.O.).

——— , 1995b, *The Investment Company Act Amendments of 1995 hearing before the Subcommittee on Telecommunications and Finance of the Committee on Commerce, House of Representatives, One Hundred Fourth Congress, first session, on H.R. 1495, October 31, 1995* (U.S. G.P.O.).

A2 Figures and Tables

Figure A1: Probability of large financing round: late-stage vs. early-stage financings

The figure reports the coefficient estimates from the difference-in-difference estimator in Section 2. The dependent variable is an indicator that is equal to one if the startups financing is in the top quartile of size (real, 2009 dollars). The treatment variable is an indicator that is one if the financing is late-stage. The coefficients presented here are the interactions between this treatment variable that the time dummies for six month intervals from 1994 to 1998. The plot presents the point estimates and 95% confidence intervals where the standard errors are clustered at the startup.

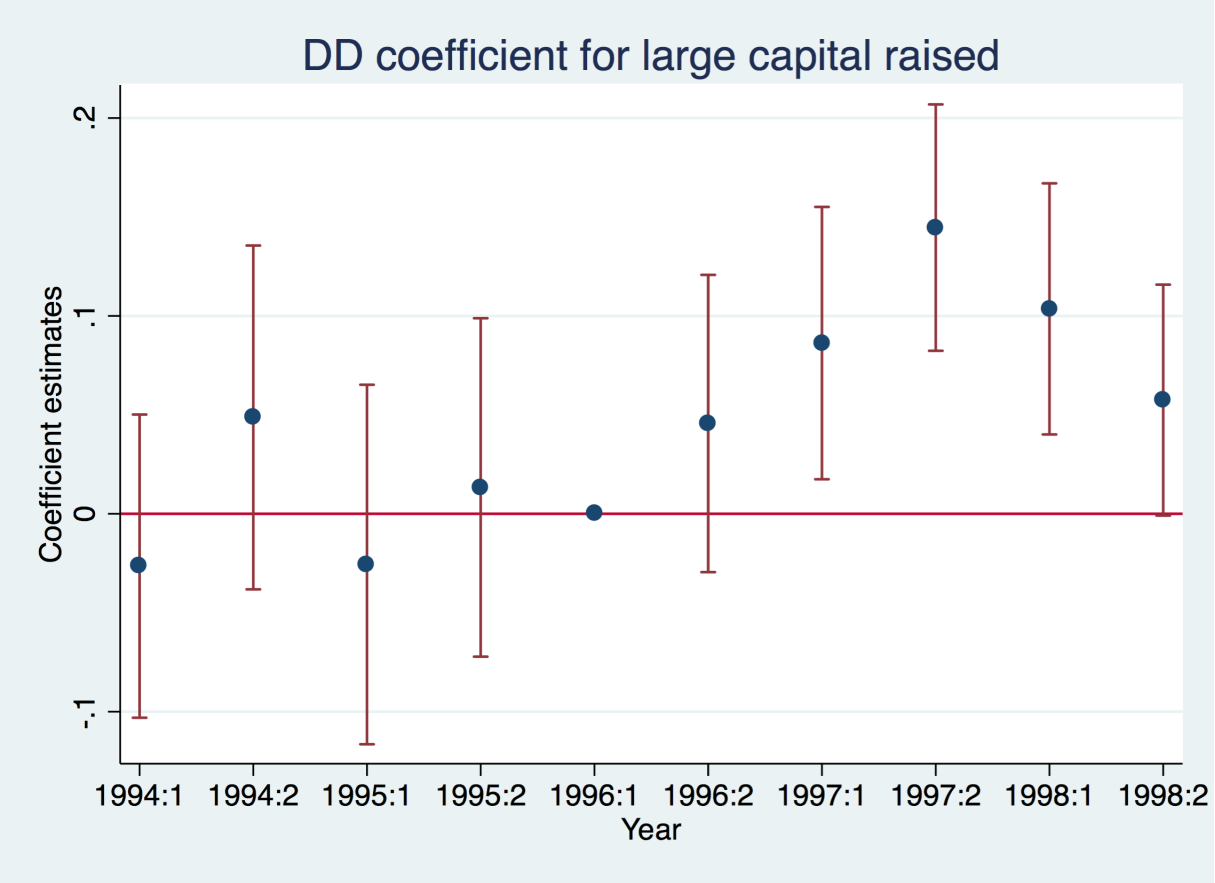


Figure A2: Exit status by first VC financing year, 10 years after first financing: IPO, acquisitions, failures and still private

The figure reports the fraction of firms that have exited or remain private for each first financing year cohort. Startups that fail to raise a new round of capital five years after their last observed financing (as of 2016Q4) are set to failures. The exit state is measured here ten years after the firm's first financing event for each cohort (e.g. for 1998 firms, we ask what fraction exited in what way in 2008). Sample includes all startups described in Section 1.

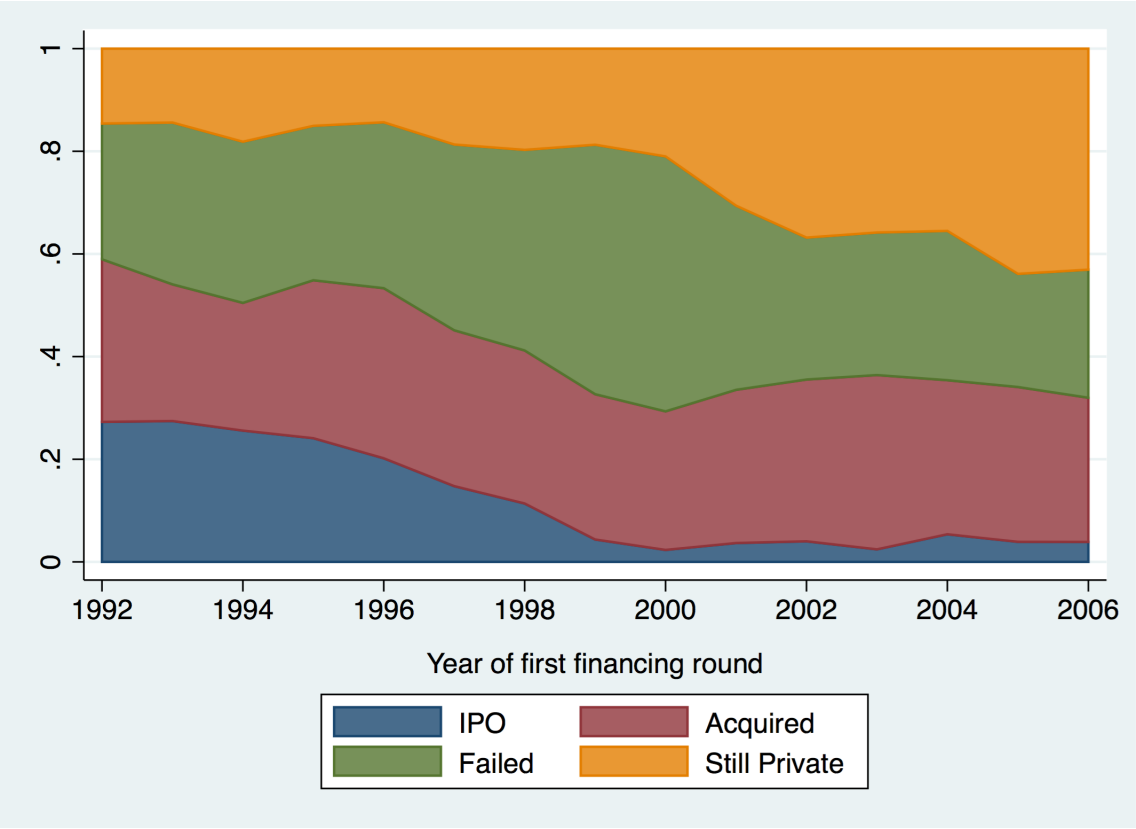


Figure A3: Number of firms raising with at least $100m in sales seven years after first financing: public vs. private

The figure reports the number of startups that had at least $100m in sales seven years after their first round of financing (measured using VentureSource, NETs and Compustat), split into two groups. "Private" is the count of firms that satisfy this criteria that were still private (i.e. no IPO, failure or acquisition) seven years after their first financing. "Public" are the set of firms that went public within seven years of their first financing event. Sales are measured either as a private firm or public firm, seven years after first financing.

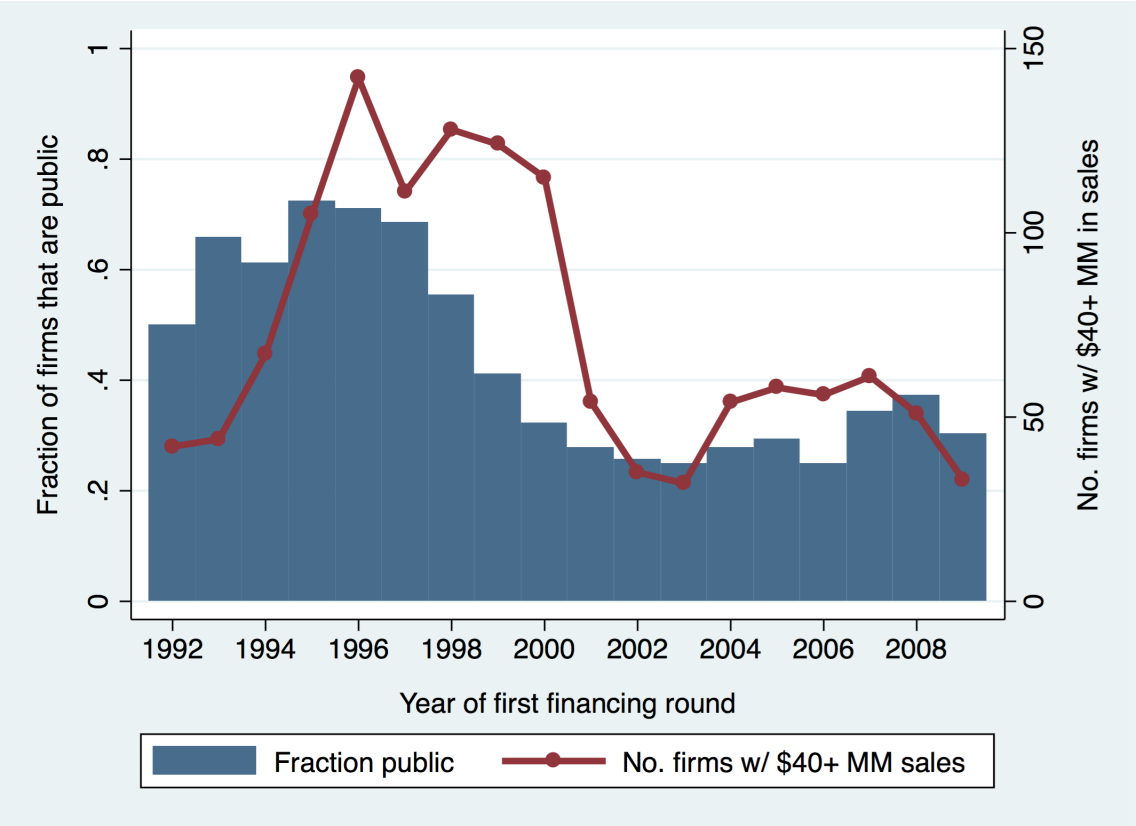


Figure A4: Year fixed effect estimates for relationship between seven year total sales and IPO probability

The figure plots the coefficient estimates (and their 95% confidence intervals) from the follow regression:

$$Y_{7it} = \beta_t \times \ln S_{7it} + \gamma_t + \eta_s + \theta_j + \varepsilon_{it}$$

where i indexes firms and t indexes the year the firm raised its first funding round. Y_7 is an indicator equal to one if the firm went public during the seven years following its first funding round; S_7 is log of total sales for the firm during these seven years; and γ_t, η_s, and θ_j capture first-funding year, state, and industry fixed effects, respectively. The dependent variable is one if the startup had an IPO within 7 years of its first financing event. Robust standard errors are used to construct the 95% confidence intervals.

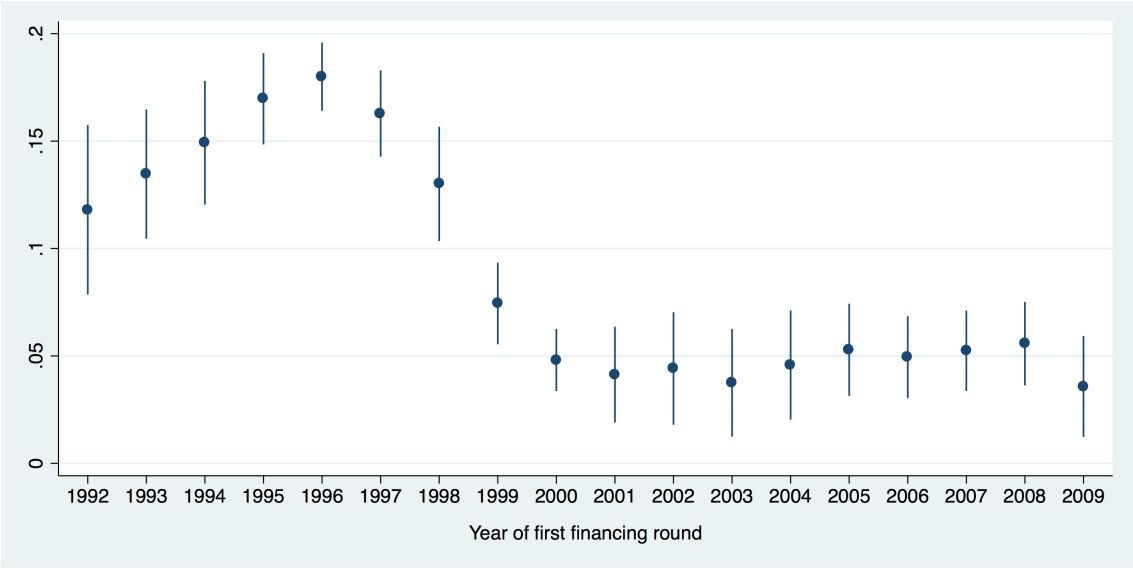


Figure A5: Founder equity three years after first financing

The figure reports the average equity stakes held by non-investors – founders and holders of options – three years after the first round of VC financing. To compute this equity stake, we require the premoney valuation V and capital raised K in the financing. The founders are assumed to have $1 - \frac{K}{K+V}$ after the financing, where each new financing event dilutes their equity stake. As is typical in these calculations, we assume common equity so this is an upper bound on the founders' equity position.

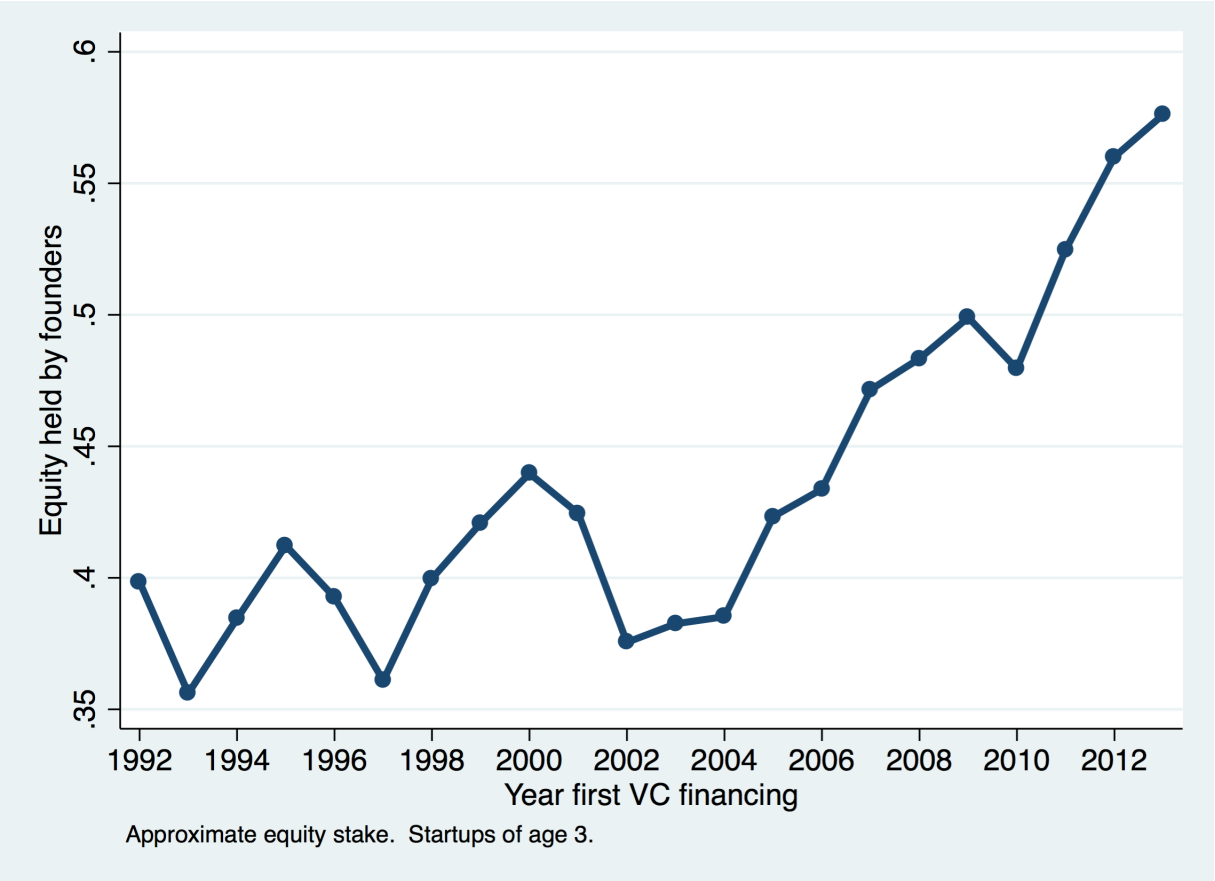


Table A1: Placebo tests for large financing probabilities post-NSMIA

Notes: The table repeats the main "big financing round" (Table 4) after moving the "treatment" quarter back two years (Columns 2) and back one year (Column 3). Specifications are otherwise identical to that reported in Column 1 of Table 4. Column 2 here reports the four year window 1992–1996 rather than the 1994–1998 in the original specification (the sample os 1993–1997 for Column 3). Standard errors clustered at the startup are reported in parentheses. "FE" are all the fixed effects reported in Table 4. Significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

	Big financing rounds?		
	Original	Post > Oct. 1994	Post > Oct. 1993
	(1)	(2)	(3)
Late stage X Post	0.062**		
	(0.026)		
Post (Oct. 1994) X Late-stage		0.028	
		(0.024)	
Post (Oct. 1993) X Late-stage			0.017
			(0.032)
Late stage round	0.155***	0.147***	0.157***
	(0.020)	(0.026)	(0.026)
Constant	0.392**	0.262***	0.267***
	(0.195)	(0.028)	(0.031)
Financings	8006	5373	4555
R^2	0.079	0.052	0.050
Sample	1994–1998	1992–1996	1993–1997
FE?	Y	Y	Y