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Do Founders Control Start-up Firms that Go Public?

Brian Broughman
Indiana University Maurer School of Law, bbroughm@indiana.edu

Jesse M. Fried
Harvard University Law School

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BRIAN BROUGHMAN* & JESSE M. FRIED**

Black & Gilson (1998) argue that an IPO-welcoming stock market stimulates venture deals by enabling VCs to give founders a valuable "call option on control." We study 18,000 startups to investigate the value of this option. Among firms that reach IPO, 60% of founders are no longer CEO. With little voting power, only half of the others survive three years as CEO. At initial VC financing, the probability of getting real control of a public firm for three years is 0.4%. Our results shed light on control evolution in startups, and cast doubt on the plausibility of the call-option theory linking stock and VC markets.

* Indiana University Maurer School of Law.

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INTRODUCTION

Startup founders, who typically must cede control of their firms to obtain VC[1] financing, are widely believed to regain control in the event of an initial public offering (IPO). This view is reinforced by the media salience of prominent founders such as Facebook's Mark Zuckerberg, Google's Sergey Brin and Larry Page, and Snap's Evan Spiegel. Travis Kalanick's loss of the CEO position before Uber's IPO seems to be the exception that proves the rule.[2]

Indeed, the possibility of founder control-reacquisition via IPO underlies an influential theory for why VC requires a robust stock market.[3] On this theory, an IPO-welcoming stock market makes possible a VC exit that can return control to founders, enabling VCs to implicitly give founders a valuable "call option on control" that they can exercise if successful. VCs' ability to offer this call option, this theory claims, makes VC financing more acceptable to control-loving founders and can thereby spur more founder-VC "deals."[4]

But we know little about the likelihood of founder-control return via IPO, and the extent and duration of any such control. In short, we know little about the ex ante value of this call option on control at the time when founders agree to accept VC financing. Prior work has, in passing, reported the frequency of founders being CEO at IPO.[5] But the samples are small, nonrandom, and old. And because these studies had a different focus, they did not consider the voting power of founder-CEOs at IPO, the extent and duration of founders' control post-IPO, or the ex ante likelihood of founder-control return via IPO.

We investigate the ex ante value of founders' call option on control via IPO by collecting a sample of over 18,000 startups receiving first-round VC funding during 1990–2012 ("financing vintages" 1990–2012), and then investigating, within a random subsample of these firms that conduct an IPO, two measures of founder control: serving as CEO and voting power. For each firm, we measure founder control at three points: upon completion of

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[1] We use the abbreviation "VC" to denote "venture capitalist," "venture capital," or "venture-capital fund."

[2] For Travis Kalanick's (forced) resignation from his position as CEO of Uber, *see* Greg Bensinger, *Uber CEO Travis Kalanick Quits as Investors Revolt*, WALL ST. J. (June 21, 2017), https://www.wsj.com/articles/uber-ceo-travis-kalanick-resigns-1498023559.

[3] *See* Bernard S. Black & Ronald J. Gilson, *Venture Capital and the Structure of Capital Markets: Banks versus Stock Markets*, 47 J. FIN. ECON. 243, 243 (1998) [hereinafter Black & Gilson (1998)]. According to SCOPUS (May 2018), Black & Gilson (1998) is in the top 5% of JFE papers based on citation count.

[4] *See* Section 2.

[5] *See, e.g.*, Malcolm Baker & Paul A. Gompers, *The Determinants of Board Structure at the Initial Public Offering*, 46 J. L. & ECON. 569, 589 (2003); Steven N. Kaplan et al., *Bet on the Jockey or the Horse? Evidence from the Evolution of Firms from Early Business Plans to Public Companies*, 64 J. FIN. 75, 96 (2009).

IPO ("at IPO"), one year after IPO ("IPO+1"), and three years after IPO ("IPO+3").

We start by measuring the frequency of founder-control reacquisition via IPO ex post, that is, conditional on IPO. A founder is considered to have "weak" control if she is CEO ("founder-CEO") and "strong" control if she is CEO and, along with cofounders, has a voting interest of at least 30% ("founder-CEO/blockholder"). At IPO, most founders lack even weak control: the frequency of founder-CEO is only 41%. Even fewer have strong control. At IPO, the frequency of founder-CEO/blockholder is about 7%. Moreover, for either type of control, founders' control generally is not "durable" (lasting at least three years). By IPO+3, the frequency of founder-CEO drops from 41% to 21%, and the frequency of founder-CEO/blockholder drops from about 7% to 2.5%. Even if a startup is successful enough to reach IPO, a founder is unlikely to regain durable control.

We then use the 11,104 firms in financing vintages 1990–2002 to investigate the ex ante likelihood of founders exercising the call option on control. We find that, as of initial VC financing, the likelihood is extremely remote. The main reason: most VC-backed firms—including many of the most successful—exit not via IPO but rather via sale to a buyer (an "M&A exit"). In these financing vintages, only about 6% of founders take their firms to IPO as CEO, and 1% take their firms to IPO as CEO/blockholder. Because of the high frequency of post-IPO control attrition, the ex ante likelihood of obtaining durable control is even lower (3% for founder-CEO and 0.4% for founder-CEO/blockholder).

We also investigate whether control return via IPO is a carrot to reward the most successful founders—those generating the highest returns for VCs. Since IPO exits are on average more profitable for VCs than M&A exits, and only an IPO can return founder-control, founders reacquiring control via IPO likely generate above-average returns for VCs. But the "carrot" hypothesis might also be expected to apply within IPO exits: founders of IPO firms should be more likely to retain control as IPO profitability for VCs increases. Yet, we find no evidence that VC returns are positively correlated with control reacquisition. Indeed, we find the opposite in some models; higher VC returns are associated with a lower frequency of founder control.

Our paper contributes to the literature on founder exit from the CEO position in VC-backed startups. Most prior work focuses on firms where VCs exit via M&A[6] or have not yet exited.[7] This work finds that founders

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[6] *See, e.g.*, Brian Broughman & Jesse M. Fried, *Carrots and Sticks: How VCs Induce Entrepreneurial Teams to Sell Startups*, 98 CORNELL L. REV. 1319, 1323–1325 (2013) [hereinafter Broughman & Fried (2013)].

[7] *See* NOAM WASSERMAN, THE FOUNDER'S DILEMMAS: ANTICIPATING AND AVOIDING THE PITFALLS THAT CAN SINK A STARTUP 11–16 (2012) [hereinafter FOUNDER'S DILEMMAS]; Annamaria Conti & Stuart J. H. Graham, *Valuable Choices: Prominent Venture Capitalists' Influence on Startup CEO Replacements*, MGMT. SCI., 2, 2–3 (2019); Thomas Hellmann & Manju Puri, *Venture Capital and the Professionalization of Start-up Firms: Empirical Evidence*, 57 J. FIN. 169, 195 (2002); Noam Wasserman, *Founder-CEO Succession and the Paradox of En-*

often exit the CEO position,[8] many times involuntarily.[9] Work by Baker and Gompers[10] and by Kaplan, Sensoy and Strömberg[11] reports the frequency of founder-CEO at IPO only in passing, as their focus is not the arc of founder control.[12] Our work is the first to systematically examine founders' propensity to remain CEO in VC-backed firms that are successful enough to go public. Our results suggest that this propensity is surprisingly low. Our paper is also the first to systematically measure founder voting power at and after IPO, which is important for understanding how control of VC-backed firms evolves over time.

Our paper sheds light on the plausibility of Black & Gilson (1998)'s "call option on control" theory linking VC and stock markets. We show that the ex ante likelihood of founders reacquiring control via IPO is extremely low, especially when we focus on control that is both strong (founders have enough voting power to ensure they remain in the saddle) and durable (control lasts at least three years). Our findings call into question the claim that founders deciding whether to accept VC financing weigh heavily the ex ante value of their call option on control via IPO. Our results therefore suggest that an active IPO market might not be as important for sustaining a venture ecosystem as is generally believed.

The remainder of this paper proceeds as follows. Part I provides the motivation for our study. Part II describes our data. Part III reports the frequency of founder-CEO at and after IPO. Part IV describes the frequency of founder-CEO/blockholder at and after IPO. Part V briefly describes the ex ante probability (as of initial VC financing) that a firm will have an IPO exit with a founder-CEO or founder-CEO/blockholder. Part VI examines the relationship between VC returns and founder control among IPO firms. Part VII discusses limitations of our analysis.

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trepreneurial Success, 14 ORG. SCI. 149, 162–165 (2003). For a notable recent exception, see Michael Ewens & Matt Marx, *Founder Replacement and Startup Performance*, 31 REV. FIN. STUD. 1533, 1563–1564 (2018). They investigate the rate and effect of replacing founders using a large sample of VC-backed startups founded between 1995 and 2008, some of which reach IPO. But their study does not distinguish between founders serving as CEOs and founders serving in other executive roles, or between startups that reach IPO and those with successful M&A exits, as its focus is not on measuring founder-control reacquisition via IPO.

[8] *See, e.g.*, Broughman & Fried (2013), *supra* note 6, at 1323–1325; Brian Broughman, *Investor Opportunism and Governance in Venture Capital, in* VENTURE CAPITAL: INVESTMENT STRATEGIES, STRUCTURES AND POLICIES 355–357 (Douglas Cumming ed., 2010).

[9] *See, e.g.*, FOUNDER'S DILEMMAS, *supra* note 7, at 16 (2012).

[10] *See* Baker & Gompers, *supra* note 5, at 589 (examining several hundred VC-backed IPOs during 1978–1987).

[11] *See* Kaplan et al., *supra* note 5, at 96 (examining a small, non-random sample of IPOs in 2004).

[12] *See also* Bharat A. Jain & Filiz Tabak, *Factors Influencing the Choice between Founder versus Non-Founder CEOs for IPO Firms*, 23 J. BUS. VENTURING 21, 41–42 (2008) (reporting founder-CEO at IPO in several hundred VC-backed IPOs in 1997); Timothy G. Pollock et al., *Dance with the One that Brought You? Venture Capital Firms and the Retention of Founder-CEOs*, 3 STRATEGIC ENTREPRENEURSHIP J. 199, 211–212 (2009) (reporting founder-CEO at IPO in about 190 VC-backed firms during 1995–2000).

I. VENTURE CAPITAL AND STOCK MARKETS

A. The Observed Link between Venture Capital and Stock Markets

The American VC market is widely admired both at home and abroad. Many of the country's largest and most successful companies—such as Apple, Google, Microsoft, and Amazon—began life as startups backed by VCs. VC-backed firms are also believed to play a significant role in supporting innovation across the economy.[13]

Not surprisingly, policy makers around the world have sought to cultivate local VC markets.[14] The academic literature suggests that an important ingredient is an active stock market, particularly one that welcomes small VC-backed companies seeking an IPO.[15] As Armour and Cumming relate, "[t]he principal proposition established in the literature is that venture capital flourishes in countries with deep and liquid stock markets."[16] This belief is reflected in policymaking such as the 2012 JOBS Act,[17] which aims to remove barriers to IPOs to stimulate entrepreneurship.

Casual observation certainly confirms an association between the robustness of VC ecosystems and the depth and liquidity of stock markets. The United States, home to the world's deepest and most liquid stock market, was the first country to develop a VC market.[18] Even as VC has globalized in search of opportunities outside the United States, the United States still has by far the biggest VC market, attracting more than 50% of VC investment worldwide.[19] Notably, other developed economies—such as Japan and

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[13] *See generally* ANDREW METRICK & AYAKO YASUDA, VENTURE CAPITAL AND THE FINANCE OF INNOVATION (2d ed. 2010); Paul Gompers & Josh Lerner, *The Venture Capital Revolution*, 15 J. ECON. PERSP. 145 (2001); Manju Puri & Rebecca Zarutskie, *On the Life Cycle Dynamics of Venture-Capital-and non-Venture-Capital-Financed Firms*, 67 J. FIN. 2247 (2012).

[14] *See generally* Ralf Becker & Thomas Hellmann, *The Genesis of Venture Capital: Lessons from the German Experience* (CESifo Working Paper No. 883, 2003); Ronald J. Gilson, *Engineering a Venture Capital Market: Lessons from the American Experience*, 55 STAN. L. REV. 1067 (2003); Darian M. Ibrahim, *Financing the Next Silicon Valley*, 87 WASH. U. L. REV. 717 (2009).

[15] *See, e.g.*, John Armour & Douglas Cumming, *The Legislative Road to Silicon Valley*, 58 OXFORD ECON. PAPERS 596, 596 (2006); Black & Gilson (1998), *supra* note 3, at 245; Marco Da Rin et al., *Public Policy and the Creation of Active Venture Capital Markets*, 90 J. PUB. ECON. 1699, 1700 (2006); Gilson, *supra* note 14, 1075; Leslie A. Jeng & Philippe C. Wells, *The Determinants of Venture Capital Funding: Evidence across Countries*, 6 J. CORP. FIN. 241, 285 (2000).

[16] *See* Armour & Cumming, *supra* note 15, at 596.

[17] For background on the Jumpstart Our Business Startups (JOBS) Act, *see* U.S. SECURITIES AND EXCHANGE COMMISSION, JUMPSTART OUR BUSINESS STARTUPS (JOBS) ACT (Dec. 9, 2016), https://www.sec.gov/spotlight/jobs-act.shtml.

[18] *See* Andreas Oehler et al., *Venture Capital in Europe: Closing the Gap to the U.S., in* VENTURE CAPITAL IN EUROPE 4 (Greg Gregoriou, Maher Kooli & Roman Kraeussl eds., 2007).

[19] *See* Nenad Marovac, *Europe's Venture Capitalists are Closing the Gap with Silicon Valley*, WORLD ECONOMIC FORUM (Nov. 7, 2017), https://www.weforum.org/agenda/2017/11/europe-venture-capitalists-silicon-valley/.

Germany—lack both a vibrant VC market and an active stock market that welcomes IPOs.[20]

Of course, there may well be noncausal reasons for this cross-country association. A country's robust legal protection of investors might cause both VC markets and stock markets to flourish, even if each could flourish without the other. Similarly, cultures that are more risk-taking, individualistic, and focused on personal wealth creation (for example, the United States) are more likely than other cultures (for example, Japan and Germany) to generate large pools of risk capital and human capital in the form of high-powered financiers and operational talent necessary for both vibrant VC markets and deep, liquid stock markets.

But the association between VC and stock markets might be driven, at least in part, by causal factors. One possibility: the stock market boosts the VC market by providing a "thicker exit" for VCs. VCs seek to generate financial returns by purchasing shares in private firms and then later selling them at a much higher price, either to an acquirer in an M&A exit or to public investors in an IPO.[21] The availability of IPO exit as an alternative to sale can increase VCs' expected financial returns (thereby boosting VC investment) by increasing the number of "bidders" for VC-backed firms.[22]

B. The Control-Reacquisition Theory

In an influential paper, Black and Gilson[23] dismissed (without elaboration) the thicker-exit explanation for why the United States had an active VC market and Germany and Japan did not, offering instead their call-option theory, concisely summarized in subsequent work:

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[20] *See* Bernard S. Black & Ronald J. Gilson, *Does Venture Capital Require an Active Stock Market?*, 11 J. APPLIED CORP. FIN. 36 (1999) [hereinafter Black & Gilson (1999)]. For Germany and Japan, little appears to have changed in this respect since the mid-1990s. *See* MCKINSEY & COMPANY GLOBAL INSTITUTE, THE FUTURE OF JAPAN: REIGNITING PRODUCTIVITY AND GROWTH (2015); Georg Metzger & Albrecht Bauer, *Germany's Private Equity Market Lacks Venture Capital,* 98 FOCUS ON ECON. 1 (2015).

[21] A third potential exit option is to have the startup repurchase the VCs' equity stake. But startups generally do not have sufficient capital to cash out VCs. *See* Black & Gilson (1998), *supra* note 3, at 274.

[22] A stock market can boost VCs' expected returns for a variety of reasons. First, public investors may assign a higher valuation to a VC-backed firm than the most interested acquirer. Public investors might assign a higher valuation than the acquirer for any number of reasons, including the possibility that the firm will be worth more as a standalone public firm than as the wholly owned subsidiary of a public or private firm (think Google, Amazon, or Facebook). Second, the possibility of exit via an IPO gives additional leverage to VCs negotiating with a potential acquirer, especially when there is only a single such buyer. Indeed, many IPOs are part of an IPO-to-M&A strategy where VCs intending to sell a firm first take it public to set a floor on the valuation. For either or both of these reasons, the possibility of IPO exit may encourage VC investment ex ante by increasing expected returns. For evidence of a link between stock market performance and fluctuations in VC activity, *see generally* Marco Da Rin et al., *supra* note 15; Jeng & Wells, *supra* note 15.

[23] *See* Black & Gilson (1998), *supra* note 3.

> The United States has both an active venture capital industry and well-developed stock markets. Japan and Germany have neither. We argue here that this is no accident—that venture capital can flourish especially—and perhaps *only*—if the venture capitalist can exit from a successful portfolio company through an initial public offering (IPO), which requires an active stock market. Understanding the link between the stock market and the venture capital market requires understanding the contractual arrangements between entrepreneurs and venture capital providers especially the importance of exit by venture capitalists and the opportunity, present only if IPO exit is possible, for the venture capitalist and the entrepreneur to enter into an implicit contract over control, in which a successful entrepreneur can reacquire control from the venture capitalist by using an IPO as the means of exit.[24]

According to Black and Gilson, "the prospect of an IPO exit gives the entrepreneur something of a call option on control, contingent on the firm's success."[25]

The "call option on control" theory linking the stock and VC markets is quite plausible, requiring only three noncontroversial assumptions:

Many Founders Value Control. While control can always provide financial private benefits,[26] non-pecuniary private benefits (for example, the satisfaction of bringing new products to market) are likely to be just as—or even more—valuable to the founders of a startup. And a founder's non-pecuniary interest in her firm is vulnerable if she is forced to give up control to an equity investor that focuses solely on monetary returns.[27]

Founders Must Cede Control to Obtain VC Financing. VCs will not invest in a startup without receiving substantial control rights at a founder's expense, including the ability to replace the founder as CEO[28] and block transactions they dislike.[29] Thus, VCs typically provide funding in stages as a means to obtain leverage between financing rounds;[30] negotiate for preferred shares with substantial blocking rights;[31] and typically ensure that

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[24] *See* Black & Gilson (1999), *supra* note 20, at 36.

[25] *See* Black & Gilson (1998), *supra* note 3, at 261.

[26] *See* Michael C. Jensen & William H. Meckling, *Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure*, 3 J. FIN. ECON. 305, 312 (1976).

[27] *See* Philippe Aghion & Patrick Bolton, *An Incomplete Contracts Approach to Financial Contracting*, 59 REV. ECON. STUD. 473, 473 (1992).

[28] *See* Broughman & Fried (2013), *supra* note 6, at 1347.

[29] *See* Ola Bengtsson, *Covenants in Venture Capital Contracts*, 57 MAN. SCI. 1926, 1928 (2011). For evidence that VCs' removal of founders from executive positions can improve startup outcomes, *see* Ewens & Marx, *supra* note 7.

[30] *See* Paul A. Gompers, *Optimal Investment, Monitoring, and the Staging of Venture Capital*, 50 J. FIN. 1461, 1464 (1995).

[31] *See* Jesse M. Fried & Mira Ganor, *Agency Costs of Venture Capitalist Control in Startups*, 81 NYU L. REV. 967, 987 (2006); Steven N. Kaplan & Per Strömberg, *Financial Contracting Theory Meets the Real World: An Empirical Analysis of Venture Capital Contracts*, 70 REV. ECON. STUD. 281, 313 (2003).

VCs and independent directors have enough board seats to replace the CEO.[32] The fact that founders are frequently involuntarily removed from the CEO position[33] indicates that they have lost control.

An IPO, Unlike an M&A Exit, Can Restore Founder Control. An IPO exit can, in theory, return control to a control-valuing founder, as an IPO requires VCs to give up their blocking rights and convert their preferred shares into common stock.[34] Following the standard 180-day lockup period, VCs begin selling these common shares.[35] And, as the firm transitions to a public company, VC directors will start leaving the board.[36] In short, an IPO replaces the VCs—who have concentrated positions and substantial control rights—with relatively dispersed and generally more passive public investors.[37] By contrast, an M&A exit never returns control to the founder.[38] Rather, the sale consolidates control in the hands of the acquirer, for which the founder can now work as a hired manager.

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Obviously, Black & Gilson (1998)'s "call option on control" theory and the thicker-exit causal explanation are not mutually exclusive. A vibrant stock market might lead to a more dynamic VC market both because VCs earn higher returns when IPOs provide an alternative to M&A and because founders are more willing to cede control to VCs if there is a prospect of an IPO.[39] And neither of these causal explanations is mutually exclusive with the noncausal cultural and legal explanations for the observed association between VC and stock markets.

The question we seek to address is whether the prospect of control-reacquisition by founders in the event of IPO is likely to affect the VC

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[32] Brian Broughman & Jesse Fried, *Renegotiation of Cash Flow Rights in the Sale of VC-Backed Firms*, 95 J. FIN. ECON. 384, 386 (2010); Broughman, *supra* note 8, at 347.

[33] *See, e.g.*, FOUNDER'S DILEMMAS, *supra* note 7, at 158.

[34] *See* Broughman & Fried (2013), *supra* note 6, at 1323.

[35] *See* Laura Casares Field & Gordon Hanka, *The Expiration of IPO Share Lockups*, 56 J. FIN. 471, 471 (2001); Douglas J. Cumming & Jeffrey G. MacIntosh, *A Cross-Country Comparison of Full and Partial Venture Capital Exits*, 27 J. BANKING & FIN. 511, 513 (2003).

[36] *See, e.g.*, FOUNDER'S DILEMMAS, *supra* note 7. This transition allows the VC investors to redeploy their human capital (and financial capital) into new ventures. *See, e.g.*, Black & Gilson (1998), *supra* note 3, at 261; Claudio Michelacci & Javier Suarez, *Business Creation and the Stock Market*, 71 REV. ECON. STUD. 459, 459 (2004).

[37] Because of the increased availability of financing for late-stage private firms, some founders may seek to postpone an M&A exit or IPO exit by remaining private longer. *See* Michael Ewens & Joan Farre-Mensa, *The Deregulation of the Private Equity Market and the Decline in IPOs* 1 (Working Paper, 2019). But the VCs must exit at some point.

[38] *See* Broughman & Fried (2013), *supra* note 6, at 1323.

[39] One potential critique of the control-reacquisition theory for why the United States has an active VC market and Japan and Germany do not (which would also apply to the thicker-exit explanation) is that VC-backed firms in Japan and Germany could go public in the U.S. *See* Edward B. Rock, *Greenhorns, Yankees, and Cosmopolitans: Venture Capital, IPOs, Foreign Firms, and U.S. Markets*, 2 THEORETICAL INQUIRIES L. 711, 717 (2001) (noting the stock market that returns control to founders need not be domestic and that, in fact, VC-backed Israeli firms frequently go public on Nasdaq rather than on the Tel Aviv Stock Exchange). However, cultural, legal, or other barriers might make such a cross-border IPO difficult.

ecosystem by inducing founders to cede control to VCs in exchange for funding. In other words, how valuable is the call option on control at the time of initial VC funding? The option's value will depend in large part on the likelihood that a founder will reacquire control in the event of IPO (as well as the extent and duration of control) and the ex ante likelihood of IPO, all of which we investigate.

II. Database of VC-Backed Firms

We construct a database of VC-backed startups, a subset of which eventually conduct an IPO. The remainder of this Part explains how we assembled and collected data (Part II.A) and provides descriptive statistics for these firms (Part II.B).

A. Constructing a Sample of VC-Backed Firms

Using the VentureXpert (VX) database, we identify a population of VC-backed startup firms: U.S.-based firms that receive their first round of VC funding between January 1, 1990 and December 31, 2012 ("financing vintages" 1990–2012). We limit our analysis to firms that are private at the time of initial VC investment, and we exclude firms that receive less than $5 million in aggregate VC funding.[40] These criteria yield a population of 18,809 VC-backed firms (the "VC-backed population").

We then identify firms in the VC-backed population that conducted an IPO during 1990–2012 ("IPO vintages" 1990–2012). There were 1961 such firms—10.4% of the VC-backed population—which we call the "full IPO subgroup." To obtain information on founder control at IPO, we randomly select 700 IPO firms—about 35% of the full IPO subgroup—and hand-collect data from SEC filings.[41] We obtain data for 652 of these 700 firms.[42] We refer to this group of 652 firms as the "IPO research sample." For the IPO research sample, we record two variables: (1) whether the CEO is a founder ("founder-CEO") and (2) aggregate equity voting rights of each firm's founder(s) ("founder voting power").

Black & Gilson (1998)'s[43] "call option on control" theory assumes that founders value the prospect of reacquiring control in the event of IPO. Pre-

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[40] The $5 million funding threshold may bias our sample towards larger and more successful startup firms, as firms that fail to obtain $5 million in funding are unlikely to be successful enough to IPO. Thus, our findings overstate the probability that any given startup (or even one receiving VC financing) will IPO.

[41] As data collection from SEC filings is labor intensive, we did not collect data for each firm in the full IPO subgroup.

[42] Most of the SEC filings used in this project are available online via the SEC's EDGAR website. *See* U.S. Securities and Exchange Commission, EDGAR Company Filings, https://www.sec.gov/edgar/searchedgar/companysearch.html (last visited Jan. 31, 2019). Pre-1996 filings were pulled from microfiche files.

[43] *See* Black & Gilson (1998), *supra* note 3.

sumably, founders would expect to enjoy control not only right after IPO but also for a reasonable duration thereafter. However, many VC-backed firms that conduct an IPO remain independent and public only for a brief period, because the firms are either acquired or otherwise forced to delist.[44] Even if a firm remains public, a founder-CEO at IPO may be replaced as CEO shortly after IPO. To the extent the control reacquired via IPO is expected to be short lived (say, one year), its ex ante value is likely to be lower than if such control were longer lived. To determine duration of founder control post-IPO, we measure founder-CEO and founder voting power not only at IPO, but also at two subsequent dates: IPO+1 (one year after IPO) and IPO+3 (three years after IPO).[45] We measure these variables at IPO by using the final IPO prospectus filing[46] and at IPO+1 and IPO+3 by using annual proxy statement filings.[47]

There is potential truncation in our analysis, as some of the VC-backed population may have an (unobserved) IPO after 2012. Given the ten-year duration of VC funds, VC-backed startups are generally expected to reach exit within five to seven years of initial financing. Thus, truncation is primarily a concern for later financing vintages. By contrast, the truncation concern is fairly minimal for firms with pre-2003 financing vintages, as such firms have had more than ten years to reach an exit event.[48] We thus limit the ex ante portion of our analysis and corresponding regression models to startups from pre-2003 financing vintages.

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[44] *See* Andrej Gill & Uwe Walz, *Going Public—Going Private: The Case of VC-Backed Firms* 1 (Center for Financial Studies, Working Paper No. 2012/02, 2012) (finding that 80% of all VC-backed firms that entered the public market during 1975–2010 delisted within ten years, versus 37% of other IPO firms).

[45] If a Founder-CEO at IPO is no longer a public-company CEO at IPO+1 or IPO+3, it is likely to be for one of the following three reasons. First, the founder voluntarily left the CEO position (or sold the firm), even though she could have remained CEO of a public company. Such a decision would suggest, *contra* Black & Gilson (1998), that the founder does not place such a high value on being CEO of a public company. Second, the founder preferred to remain CEO of a public company, but was involuntarily replaced. Such a move would suggest, also *contra* Black & Gilson (1998), that being the CEO does not, in fact, give the founder control (or sufficiently "broad discretion"). Third, business setbacks forced the Founder-CEO to sell the firm to an acquirer or caused the firm to file for bankruptcy.

To the extent founders accepting first round financing from VCs anticipate *any* of these post-IPO outcomes, each of which causes the founders to cease being CEO of a public company, the possibility of a control-restoring IPO will have less effect on their decision to cede control to VCs ex ante. That is, a founder who anticipates losing control post-IPO will place less value ex ante on the prospect of an IPO exit, and the existence or nonexistence of an IPO market will have less impact on their decision to take VC financing. Thus, to examine the plausibility of the control-reacquisition theory, we must look not only at whether the founder is CEO at IPO, but also at whether she remains CEO for some time thereafter.

[46] We use the 424b4 SEC filing on the IPO date, as it includes better price data than the S-1 filing prior to IPO.

[47] For IPO+1, we use the firm's first definitive proxy statement (DEF 14A) filed at least twelve months after IPO (which could be filed as late as twenty-four months after IPO). For IPO+3, we use the first DEF 14A filed at least thirty-six months after IPO (which could be filed as late as forty-eight months after IPO).

[48] We limit data collection to firms that IPO before 2013 so we can observe founder control at IPO+1 and IPO+3.

B. Description of Sample Firms

Table 1 compares the IPO research sample (n=652) to the full IPO subgroup (n=1961) and the VC-backed population (n=18,809). In the VC-backed population, firms receive on average $50 million in VC financing (before any IPO) by the end of 2012. We denote this amount as "total VC financing" even though some of these firms may receive additional VC financing after 2012. IPO firms receive on average approximately twice as much total VC financing ($98.7 million for the full IPO subgroup and $94.1 million for the IPO research sample).[49]

Table 1, Panel A sorts results by financing vintage (1990–2012). Reflecting the effect of the dotcom bubble, Panel A shows a steep increase in firms receiving initial VC financing during 1994–2000, followed by a sharp drop-off in 2001.

Figure 1 shows IPO frequency. Panel A sorts IPOs by IPO vintage. Reflecting the dotcom bubble, there is a surge in IPOs in 1999 and 2000, followed by a large decline in 2001. Panel B reports similar data, but sorted by financing vintage rather than by IPO vintage. Firms in the VC-backed population with pre-1995 financing vintage have a 30%–40% likelihood of IPO. By contrast, the IPO likelihood for later financing vintages is much lower: less than 10% for most vintages. To be sure, the low rate of IPOs on the right side of the graph (Panel B) may be partially explained by truncation (unobserved future IPOs). Other research, however, suggests the decline is not due simply to truncation of IPO events, but rather reflects a fundamental change in the IPO market: a decline in small-firm IPOs that began before the collapse of the dotcom bubble.[50]

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[49] For all three groups, however, there is a wide gap between mean and median amounts of total VC financing.

[50] *See* Robert P. Bartlett et al., *The Small IPO and the Investing Preferences of Mutual Funds*, 47 J. CORP. FIN. 151, 171 (2017); Ning Gao & Bharat A. Jain, *Founder Management and the Market for Corporate Control for IPO Firms: The Moderating Effect of the Power Structure of the Firm*, 27 J. BUSINESS VENTURING 112 (2012).

TABLE 1: COMPARISON: VC-BACKED POPULATION, FULL IPO SUBGROUP, AND IPO RESEARCH SAMPLE

This table reports data for 18,809 U.S.-based VC-backed firms that received initial VC financing during the period 1990–2012 ("financing vintages" 1990–2012) and received at least $5 million in total VC financing (the VC-backed population). Data are reported separately for 1961 of these firms that had an IPO (the full IPO subgroup) before 2013, and for 652 firms in the full IPO subgroup for which we have more detailed information (the IPO research sample). Data are sorted by year of initial VC investment (Panel A), business sector (Panel B), and headquarters state (Panel C). Columns report mean and median amounts of total VC financing separately for the VC-backed population (n=18,809), the full IPO subgroup (n=1961), and the IPO research sample (n=652).

Panel A: Sorted by Financing Vintage

	VC-Backed Population			*Full IPO Subgroup*				*IPO Research Sample*		
		VC Funding ($M)			Percent of	VC Funding ($M)			VC Funding ($M)	
Year	# of Firms	Mean	Median	# of Firms	Population	Mean	Median	# of Firms	Mean	Median
1990	202	47.8	13.2	63	31.2%	112.2	24.9	18	54.7	31.4
1991	169	35.8	13.5	70	41.4%	42.6	17.1	29	29.6	17.4
1992	267	47.7	20.2	112	41.9%	68.2	26.7	35	35.4	29.0
1993	257	56.9	19.5	86	33.5%	66.2	23.0	37	54.7	28.2
1994	342	64.7	21.8	119	34.8%	112.0	26.3	47	63.3	41.1
1995	673	46.0	22.0	202	30.0%	74.4	47.1	81	84.6	49.6
1996	944	45.8	24.7	252	26.7%	67.8	40.2	83	70.5	48.5
1997	1,023	47.9	27.1	180	17.6%	84.8	48.6	65	85.5	46.9
1998	1,205	59.5	31.4	160	13.3%	111.5	57.5	44	105.3	54.6
1999	2,064	50.0	27.0	155	7.5%	108.3	60.0	48	98.9	70.2
2000	2,488	41.6	20.0	112	4.5%	158.4	74.3	36	121.9	69.4
2001	831	40.4	21.9	55	6.6%	94.4	64.9	21	105.4	64.9
2002	639	50.2	26.0	61	9.5%	146.8	89.8	22	136.7	100
2003	634	51.1	25.1	37	5.8%	142.9	106.8	11	189.5	97.3
2004	775	45.4	23.4	64	8.3%	120.0	83.5	17	143.6	85.6
2005	842	53.4	24.7	37	4.4%	252.1	103.8	10	200.4	101.4
2006	913	51.0	22.5	48	5.3%	121.6	103.3	14	115.1	47.5
2007	958	57.3	22.0	51	5.3%	188.6	98.2	11	246.2	93.2
2008	827	59.4	19.3	31	3.7%	136.6	120.0	7	134.2	119.6
2009	543	72.7	24.1	19	3.5%	233.5	124.1	4	354.6	295.3
2010	694	75.6	22.3	28	4.0%	170.1	105.4	7	298.4	93.2
2011	762	47.1	22.0	10	1.3%	222.7	103.2	3	180.7	163
2012	757	37.6	18.4	9	1.2%	142.9	94.0	3	76.2	90.8
All Years	**18,809**	**50.6**	**23.3**	**1,961**	**10.4%**	**98.7**	**55.6**	**652**	**94.1**	**51.8**

Panel B: Sorted by Sector

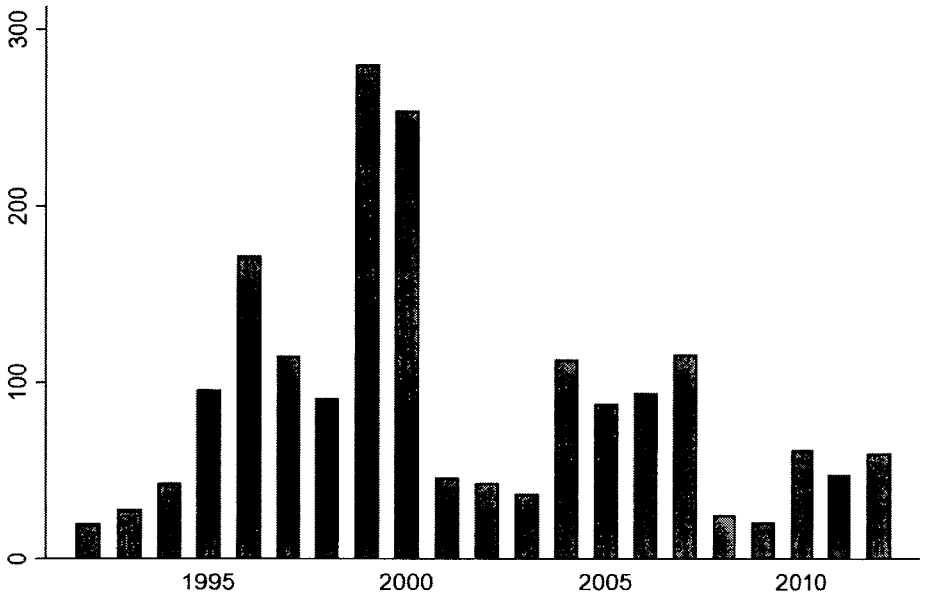
	VC-Backed Population			*Full IPO Subgroup*				*IPO Research Sample*		
		VC Funding ($M)			Percent of	VC Funding ($M)			VC Funding ($M)	
Sector	# of Firms	Mean	Median	# of Firms	Population	Mean	Median	# of Firms	Mean	Median
Biotechnology	1201	63.6	38.9	290	24.1%	103.5	93.8	95	100.8	81.7
Communications	1587	60.2	27	191	12.0%	117.2	54.4	54	120.3	49.7
Computer Hardware	622	38.3	20.4	62	10.0%	57.9	35.9	19	36.9	27.3
Computer Software	4407	42.1	21	318	7.2%	84.6	34.1	94	70.1	29
Consumer Related	860	50.9	18.6	110	12.8%	144.1	39	36	72.0	42.2
Industrial/Energy	830	60.2	22.3	82	9.9%	155.9	57.5	22	214.1	66.8
Internet Specific	4424	44.1	21.6	359	8.1%	112.5	50.4	117	96.0	54
Medical/Health	1945	47.8	26.7	295	15.2%	77.8	49.9	117	80.5	53
Other Products	1478	70.5	18.6	135	9.1%	194.3	50	36	132.7	64.9
Semiconductors	1082	46.9	28.1	107	9.9%	73.7	42.1	38	84.4	46.5
All Firms	**18,809**	**50.6**	**23.3**	**1,961**	**10.4%**	**98.7**	**55.6**	**652**	**94.1**	**51.8**

Panel C: Sorted by State of Headquarters

	VC-Backed Population			*Full IPO Subgroup*				*IPO Research Sample*		
		VC Funding ($M)			Percent of	VC Funding ($M)			VC Funding ($M)	
Sector	# of Firms	Mean	Median	# of Firms	Population	Mean	Median	# of Firms	Mean	Median
California	6981	51.3	26.2	734	10.5%	93.3	54.8	260	80.9	52.3
Massachusetts	1870	42.9	25.3	185	9.9%	84.2	61.2	69	76.3	45
Texas	1089	52.2	24.7	107	9.8%	112.0	47.9	28	89.7	50.2
New York	1284	44.2	20.4	114	8.9%	93.4	42.6	26	130.1	57.3
Other	7579	52.7	20.8	878	11.6%	134.2	48.1	269	108.5	53.8
All Firms	**18,809**	**50.6**	**23.3**	**1,961**	**10.4%**	**98.7**	**55.6**	**652**	**94.1**	**51.8**

FIGURE 1: NUMBER AND FREQUENCY OF IPO EXITS IN THE VC-BACKED POPULATION

Panel A: Number of IPOs Among Sample Firms, Sorted by IPO Vintage



Panel B: Frequency of IPO Exit Among Sample Firms, Sorted by Financing Vintage

Table 1, Panel B sorts firms by business sector. VC-backed firms are typically in high-tech sectors; software, internet, and communications-related businesses are particularly common. Among these sectors, however, there is considerable variance in IPO likelihood. For example, Panel B shows that of the 1201 biotechnology firms in the VC-backed population, nearly a quarter (24.1%) had an IPO exit by the end of 2012, while the rate is less than 10% for software (7.2%) and internet (8.1%).

Panel C presents the same data sorted by location (the state in which the firm is headquartered). VC is geographically clustered in entrepreneurial enclaves. Approximately 40% of the VC-backed population is headquartered in California and another 10% is in Massachusetts. The only other states that exceed 5% are New York and Texas. Firm location, however, does not appear to materially affect IPO likelihood.

Table 2 provides summary statistics for the IPO research sample. In this sample, firms average five separate rounds of VC financing, with investments from eight different VC firms. Firms that reach IPO typically do so quickly. We find that the average length of time from initial VC financing to IPO is a little over four years. The average amount of pre-IPO VC financing is $94.1 million and the average market cap at IPO is $443 million. Consistent with Bartlett et al.,[51] we find that firms with post-1998 financing vintage years receive more VC financing before IPO and have larger IPOs.

Consistent with prior research, the vast majority of firms incorporate in Delaware.[52] California is the only other domicile to exceed 5% of total incorporations, and its use has declined sharply over time.

[51] *See* Bartlett et al., *supra* note 50.

[52] *See generally* Brian Broughman et al., *Delaware Law as Lingua Franca: Theory and Evidence*, 57 J. L. & ECON. 865 (2014).

TABLE 2: DESCRIPTIVE STATISTICS FOR IPO RESEARCH SAMPLE

This table reports descriptive statistics for 652 U.S.-based VC-backed IPO firms with initial VC financings during the period 1990–2012.

	All Years			*Split by Year of First VC Financing*				
	Mean	Med	SD	1990-1994	1995-1999	Mean 2000-2004	2005-2009	2010-2012
Number of observations	652			166	320	107	46	13
Number of VC investors	8.6	8	5.3	8.7	8.8	8.2	7.6	6.9
Number of financing rounds	5.6	5	3.3	5.9	5.3	5.5	7.1	4
Years from first VC financing to IPO	4.2	3.7	2.9	4.2	4.2	5.1	2.5	.23
Amount of financing received ($M)	94.1	51.8	134.7	48.7	86.3	132.1	188.7	219.9
Market cap at IPO ($M)	495	252	1,240	208	564	493	1,150	594
Dual class (%)	5.2%			3.6%	5.3	1.9	15.2	15.4
Financed by top VC firm (%)	24.3%			38.5%	19.7	15.1	31.8	7.6
State of Incorporation								
--Delaware	79.4%			67.5%	83.7	89.7	65.2	92.3
--California	8.3%			18.1%	6.9	1.9	0	0
--Other State	12.3%			14.4%	9.4	8.4	34.8	7.7

Table 2 also shows that approximately 5% of the firms in the IPO research sample went public with a dual-class structure.[53] Dual-class IPOs are relevant for our study, as they can be used to increase a founder's post-IPO voting power and in some cases secure long-term control. Indeed, this strategy was famously used in several high-profile VC-backed IPOs (including Google, Facebook, and Snap). Consistent with the view that dual-class IPOs are increasingly common, we find that approximately 15% of firms in the IPO research sample with financing vintages 2005–2012 go public with a dual-class structure. For most of the years that we study, however, VC-backed firms have been less likely than other firms to have a dual-class structure immediately following their IPO.[54]

III. Do Founders Become (and Remain) CEO of a Public Company?

The "call option on control" theory linking IPO and VC markets assumes the founders can regain control at IPO. But what does "control" mean? In this section, we consider a "weak" version of control: a founder becomes CEO of a public company, even if she does not have enough voting power to thwart replacement.[55] While the CEO of a public company does have power, she can be replaced by directors (and thus, indirectly, by the shareholders who elect them), constraining her room to maneuver. At best, the CEO position provides conditional control: as long as the CEO keeps directors and shareholders satisfied, she can do whatever she wants. In the next Part, we consider a "strong" version of control: the founder is CEO and has enough voting power to remain CEO.

To investigate whether founders acquire weak control in the event of IPO, we examine the 652 firms in the IPO research sample to check for founder-CEO right after IPO. We then determine whether the firm remains public and the founder continues to be CEO at IPO+1 and IPO+3.[56] If the founder remains in the CEO position through IPO+3, we deem the founder's (weak) control to be "durable."

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[53] By "dual-class structure," we mean the firm has at least two classes of common stock. To identify these firms, we use Jay Ritter's list of IPOs—from 1980 to 2015—with multiple share classes outstanding. *See* Jay R. Ritter, *IPO Data*, Warrington College of Business, https://site.warrington.ufl.edu/ritter/ipo-data/ (last visited Jan. 31, 2019). This classification is described in Tim Loughran & Jay Ritter, *Why Has IPO Underpricing Changed over Time?*, 33 Fin. Man. 5, 33–34 (2004).

[54] *See generally* Laura Casares Field & Michelle Lowry, *Bucking the Trend: Why Do IPOs Choose Controversial Governance Structures and Why Do Investors Let Them* (Working Paper, 2019). We confirm their results by comparing the baseline rate of dual-class IPOs for all IPOs to the rate for VC-backed IPOs, using data from Jay R. Ritter, *supra* note 53.

[55] Black & Gilson (1998), which put forward the control-reacquisition theory, appears to use this founder-CEO definition of control: "Control becomes vested in the entrepreneur, who often retains a controlling stock interest and, even if not, retains the usual broad discretion enjoyed by chief executives of companies without a controlling shareholder." *See* Black & Gilson (1998), *supra* note 3, at 261.

[56] Henceforth, we use the term "CEO" to mean "CEO of the public incarnation of the startup."

A. Founder-CEO at IPO?

To check for founder-CEO at IPO, we review the CEO's biography in the management section of the IPO prospectus and classify the CEO as a founder if she is described as a founder, a cofounder, or a person employed by the firm since formation. Table 3, Panel A shows that 269 (41.2%) of the 652 firms in the IPO research sample had a founder-CEO at IPO.[57] This rate is lower than that reported in other studies.[58]

We investigate the correlates of founder-CEO at IPO. Consistent with Baker & Gompers,[59] the frequency of founder-CEO at IPO is higher if duration to IPO is shorter and pre-IPO VC financing is lower (Table 3, Panel B). We also sort by the presence of elite VCs.[60] Consistent with Baker & Gompers,[61] their presence is associated with a lower probability of founder-CEO at IPO.[62]

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[57] In another twenty firms, the founder group had at least 30% of the equity voting power but a nonfounder served as CEO. *Compare* Table 5, Panel B, *with* Table 5, Panel C. In such firms, a founder might have been able to remain CEO had he or she so chosen.

[58] *See* Kaplan et al., *supra* note 5, at 110 (reporting a 51% frequency of founder-CEO in a sample of 106 VC-backed IPOs in 2004); Pollock et al., *supra* note 12, at 209 (reporting a frequency of 60% in a sample of 193 VC-backed IPOs during 1995–2000); Jain & Tabak, *supra* note 12, at 32 (reporting a frequency of 58% in a sample of several hundred VC-backed IPOs in 1997); Baker & Gompers, *supra* note 5, at 574 (reporting a rate of 55% for several hundred VC-backed IPOs during 1978–1987).

[59] *See* Baker & Gompers, *supra* note 5, at 590.

[60] We identify startups funded by an elite (top ten) VC firm using rankings of VC firms prepared by CB Insights based on a poll of VC general partners conducted with the New York Times. *See Venture Capital Power Rankings: VCs Rate VCs*, CB INSIGHTS (Apr. 7, 2016), https://www.cbinsights.com/blog/venture-capital-peer-rankings/. The top-ten ranked VC firms were: Sequoia, Benchmark, Accel Partners, Greylock Partners, Andreessen Horowitz, Union Square Ventures, First Round, Bessemer Venture Partners, KPCB, and NEA.

[61] *See generally* Baker & Gompers, *supra* note 5.

[62] A study of still-private VC-backed firms finds that the presence of an elite VC is associated with a higher likelihood of founder replacement in such firms as well. *See* Conti & Graham, *supra* note 7, at 2.

TABLE 3: FOUNDER CONTROL AT IPO

For 652 U.S.-based VC-backed IPO firms that receive initial VC financing during the period 1990–2012, this table reports data on measures of founder control right after ("at") IPO (Panel A) and difference-of-means tests correlating founder control with various firm characteristics (Panel B).

Panel A

	All Years	*Sorted by Year of First VC Financing*				
		1990-1994	1995-1999	2000-2004	2005-2009	2010-2012
Founder-CEO at IPO	41.2%	44.5%	44.4%	31.8%	32.6%	30.8%
Founder voting power (%) at IPO	11.1%	10.3%	12.4%	8.3%	12.7%	4.8%

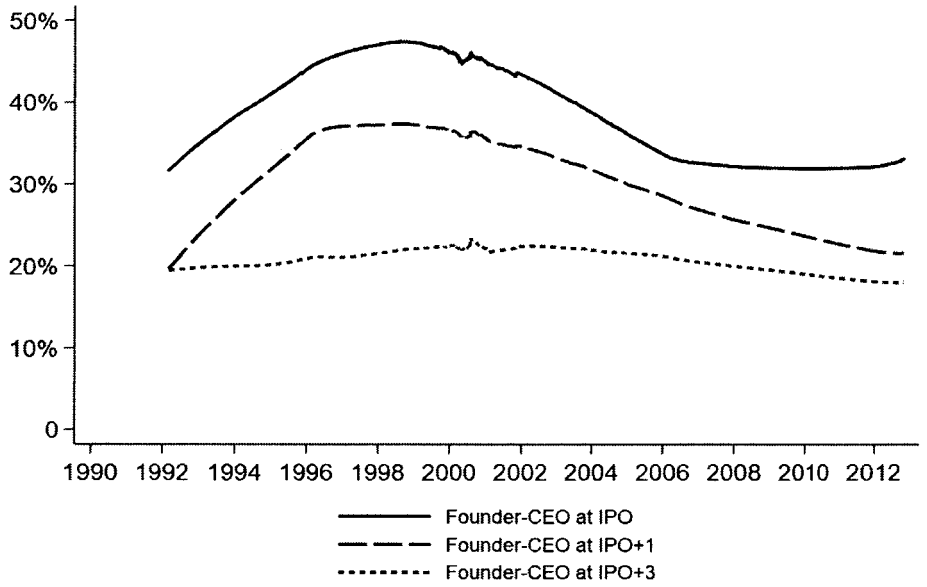
Panel B

	Obs.	Founder-CEO	Founder Voting Power
Amount of Pre-IPO Financing			
- Above Median ($51.8m)	326	37.7%	8.9%
- Below Median	326	44.7%	13.1%
Difference of Means		-.070*	-.042***
Number of Financing Rounds			
- > 5	287	39.4%	8.3%
- ≤ 5	365	42.7%	13.4%
Difference of Means		-.033	-.051***
Years from First Financing to IPO			
- Above Median (3.7 years)	315	36.8%	7.8%
- Below Median	337	45.4%	14.3%
Difference of Means		-.086**	-.065***
Dual-Class IPO			
- Yes	34	41.2%	24.1%
- No	618	41.2%	10.4%
Difference of Means		.000	.137***
Financed by Top-Ten VC Firm			
- Yes	158	36.1%	11.4%
- No	491	42.9%	10.9%
Difference of Means		-.068	.005

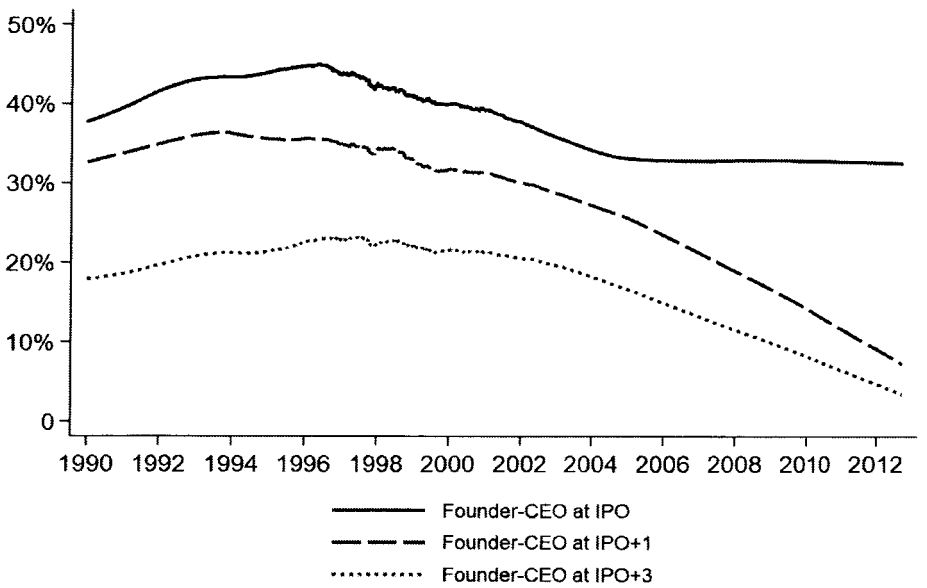
FIGURE 2: EX POST LIKELIHOOD OF FOUNDER-CEO AT AND AFTER IPO

Using data from a sample of 652 U.S.-based VC-backed IPO firms, the figures below plot Lowess curves illustrating the likelihood a sample firm has a founder-CEO at IPO, IPO+1, and IPO+3. Data are separately displayed based on IPO vintage (Panel A) and financing vintage (Panel B).

Panel A: Likelihood of Founder-CEO Sorted by IPO Vintage



Panel B: Likelihood of Founder-CEO Sorted by Financing Vintage



For the 652 firms in the IPO research sample, Figure 2 illustrates time trends in the likelihood of founder-CEO at IPO. In each graph the solid black curve reports founder-CEO likelihood at IPO. Panel A reports results based on IPO vintage (that is, year of IPO). We observe that the likelihood of a founder-CEO at IPO peaks around 45% at the height of the dotcom bubble in the late 1990s (Figure 2, Panel A), around the time when Black and Gilson put forward their "call option on control" theory. Research on IPO grandstanding[63] suggests many VC-backed firms in the late 1990s were taken public early—after minimal financing—so VCs seeking to raise new funds could tout their achievements. Because a founder is more likely to be replaced as CEO as time goes on, grandstanding could account for the higher frequency of IPO firms with founder-CEO during the dotcom bubble. Panel B reports the same data sorted by financing vintage rather than by IPO vintage.

B. Founder-CEO after IPO?

Figure 2 also plots the likelihood that a founder continues to be CEO at IPO+1 and IPO+3. Of the 269 founder-CEOs at IPO, sixty are no longer CEO at IPO+1 (Table 4, Panel A) and 131 are no longer CEO at IPO+3. Thus, of the 269 founder-CEOs at IPO, only 138 had durable control. In the IPO research sample, moving from IPO to IPO+3 reduces the frequency of founder-CEO from 41.2% to 21.2%.

Figure 2 illustrates the likelihood of founder-CEO at IPO+1 with a dashed line, and at IPO+3 with a dotted line. While the likelihood of founder-CEO at IPO peaks in the late 1990s, the likelihood of founder-CEO at IPO+3, based on IPO vintage, is stable at around 20% over the entire sample period (Figure 2, Panel A). Founder-CEOs who took their company public in the late 1990s had a high attrition rate, as illustrated by the large gap between the curves for IPO and IPO+3 during this time period.

Table 4 highlights two factors that cause founders to lose the CEO position after IPO. First, consistent with Gill & Walz,[64] many IPO firms do not remain public. Panel B shows that by IPO+3 approximately 36% (235 out of 652) of firms in the IPO research sample were no longer public, with many (124) acquired shortly after IPO.

Panel C focuses on the subgroup of 269 firms with founder-CEO at IPO. We find that 197 (or 73%) of these firms remain public at IPO+3. Thus, seventy firms with founder-CEO at IPO were delisted within three years. Of these seventy firms, we can determine that thirty-two were ac-

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[63] *See* Paul A. Gompers, *Grandstanding in the Venture Capital Industry*, 42 J. FIN. ECON. 133 (1996); Peggy M. Lee & Sunil Wahal, *Grandstanding, Certification and the Underpricing of Venture Capital Backed IPOs*, 73 J. FIN. ECON. 375 (2004).

[64] *See* Andrej Gill & Uwe Walz, *Going Public—Going Private: The Case of VC-Backed Firms* (Working Paper, 2012).

quired.[65] The remaining thirty-eight firms were delisted for other reasons (such as bankruptcy).[66] Whatever the reason for delisting, the result is that IPO exits that create a public company for the long term (in which a founder might enjoy control) are even less common than suggested by the rate of IPOs reported in Table 1.

Second, even if a firm in the IPO research sample does remain public for three years after IPO, many founders exit the CEO position before the three-year mark. Table 4, Panel A shows that even for surviving firms, the frequency of founder-CEO drops from 41.2% at IPO to 33.1% at IPO+3. The fact that approximately 25% of founder-CEOs exit the CEO position while the firm remains public suggests, contrary to the "call option on control" theory, that the founder either did not have sufficient control to keep herself in the CEO position or, if the exit was voluntary, the founder did not value whatever control she enjoyed as CEO.[67]

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[65] To identify such firms, we matched firm names from the non-surviving group with public targets in the SDC Platinum mergers and acquisitions database. An inability to match names might have led to some omissions.

[66] Our sample thus appears similar to that of an earlier study. *See* Kaplan et al., *supra* note 5, at 81 (finding in a sample of fifty VC-firms conducting an IPO that, within three years, eight were acquired and three filed for bankruptcy).

[67] Our results are similar to that of Kaplan et al., *supra* note 5, at 96 (finding in a sample of fifty VC-backed IPOs that 58% have a founder-CEO at the IPO, but that of the thirty-two firms that remained public for three years (and for which data could be obtained) only 38% had a founder-CEO at IPO+3).

TABLE 4: FIRM AND FOUNDER-CEO SURVIVAL AT AND AFTER IPO

For 652 U.S.-based VC-backed IPO firms that received initial VC financing during 1990-2012, this table reports firm and founder-CEO survival for one and three years post IPO.

Panel A: CEO Survival

	IPO	IPO+1	IPO+3
Surviving Firms	652	530	417
Founder-CEO #	269	209	138
Founder-CEO %			
- of surviving IPO research sample	*41.2%*	*39.4%*	*33.1%*
- of IPO research sample	*41.2%*	*32.1%*	*21.2%*

Panel B: Firm Survival (unconditional)

	At IPO	IPO+1	IPO+3
Surviving Firms	652	530	417
Non-Surviving Firms (cumulative total)		122	235
- non-survival due to merger-sale		*53*	*124*
- non-survival for other reasons		*69*	*111*

Panel C: Firm Survival (conditional on Founder-CEO at IPO)

	At IPO	IPO+1	IPO+3
Surviving Firms w/ Founder-CEO at IPO	269	235	197
Non-Surviving Firms (cumulative total)	.	34	70
- non-survival due to merger-sale	.	*9*	*32*
- non-survival for other reasons	.	*25*	*38*

IV. DO FOUNDER-CEOS HAVE (AND KEEP) SUBSTANTIAL VOTING POWER?

While being CEO gives one power in a public firm, it does not necessarily provide real control or even substantial insulation from a control challenge. This lack of control may help explain why, in our IPO research sample, 50% of founder-CEOs at IPO are no longer CEO at IPO+3. "Strong" control comes from a founder-CEO, along with cofounders, having a large block of shares conferring substantial voting power.[68] There is

[68] Although board seats might be seen as an indicator of founder control, directors can be replaced by shareholders. Thus, what matters is shareholder voting power. For completeness, however, we collect data on founder board seats at IPO and find that, on average, they occupy 15.3% of these seats.

little known about founder voting power.[69] We thus investigate founder voting power in our IPO research sample at IPO and thereafter to determine whether founders reacquire strong control in the event of IPO.

A. Founder Voting Power at and after IPO

To determine founder voting power at close of IPO, we rely on the "Principal Stockholders" section of the IPO prospectus. This section lists the stock ownership—after the issuance of new IPO shares—of each person who owns at least 5% of the common stock, each director, each named executive officer, and all stockholders selling shares in the IPO. We aggregate the voting power of any founders on this list.[70] If no founder is listed, we record founder voting power as zero.[71] After IPO (at IPO+1 and IPO+3), we rely on the "Security Ownership of Certain Beneficial Owners and Management" section of the annual proxy statement, which provides similar information.

We begin by describing average voting power in the full IPO research sample and then focus more closely on firms with founder-CEOs at IPO. For the full IPO research sample, average founder voting power is 11.1% at IPO and 6.3% at IPO+3, with higher equity ownership by founder-CEOs (Table 5, Panel A).[72] Table 3 provides an overview of factors associated with founder voting power. We find that founder voting power is significantly higher in firms that receive less pre-IPO financing, receive fewer rounds of VC financing, go from initial VC financing to IPO more quickly, and are dual-class.

We find only thirty-four dual-class IPOs among the 652 firms in the IPO research sample, of which 41.2% have founder-CEO at IPO. Table 3 shows that founder voting power at IPO is significantly higher in dual-class IPOs than in other IPOs (24.1% versus 10.4%), reflecting the effects of this structure. But even among dual-class firms, founder-CEOs do not typically have outright control (greater than 50% voting power). Google (which is in our IPO research sample), Facebook, and Snap—three prominent dual-class

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[69] Kaplan et al., provides some information about founder equity ownership around IPO in two samples of VC-backed firms (one of 106 firms, the other of thirty-two firms) but one cannot determine founder-CEO voting power at IPO. *See* Kaplan et al., *supra* note 5, at 96.

[70] In other words, we implicitly assume that all founders vote together to support the founder-CEO. If not, our methodology overstates founder voting power and thus founder-CEO voting power.

[71] There may well be stock-owning founders who are no longer officers or directors and own less than 5% of the outstanding equity. For such firms (and for the IPO research sample firms in aggregate), we understate average founder voting power. However, our main interest is the frequency with which founders have large or controlling stakes, and our ability to estimate this frequency is not impaired by our inability to identify founders owning stakes smaller than 5%.

[72] Our results are consistent with Kaplan et al. *See* Kaplan et al., *supra* note 5 (reporting that in a sample of thirty-two VC-backed firms, average founder ownership at IPO is 9%, but not distinguishing between firms with a founder-CEO and those without).

firms in which the founders had voting control after the IPO—are outliers in this respect.[73]

B. Founder-CEO/Blockholder at and after IPO

We now consider the frequency with which a founder is CEO at IPO and (by herself or with other founders) has at least 30% voting power ("founder-CEO/blockholder"); we define this combination as "strong" control.[74] Of the 652 firms in the IPO research sample, forty-six (7.1%) had a founder with strong control upon completion of IPO (Table 5, Panel B).[75] Figure 3 illustrates time trends in the percentage of IPOs with a founder-CEO/blockholder. Panel A reports results over IPO vintage. It shows a general decline in the likelihood of strong control for more recent IPOs despite the increased use of dual-class structures in recent years.[76] This decline may be driven by the increased time to IPO over the past decade[77] because, as Table 3 shows, time to IPO negatively correlates with founder control. Consistent with this explanation, Figure 3, Panel B shows little change in the rate of founder-CEO/blockholders when sorted by financing vintage instead of IPO vintage.

Again, we consider not only the extent of founder control after IPO, but also whether this control is durable. We find that founder control declines in the three years after IPO, as firms delist, founders quit or are removed from the CEO position, or founder voting power is diluted by founder stock sales or firm equity issuances. Table 5 reports the number and percentage of founder-CEOs with 20% and 40% holdings, showing a similar pattern regardless of the choice of blockholder threshold. The pattern of founders losing strong control post-IPO is illustrated in Figure 3 by comparing the likelihood of founder-CEO/blockholder at IPO (solid line) to IPO+3 (dotted

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[73] Interestingly, Google's founders controlled only about 38% of the votes at IPO. *See* Google, Prospectus (Form 424(b)(4)) (Aug. 18, 2004). One year later, their voting control had increased to 57%. *See* Google, Proxy Statement (Form DEF 14A) (Apr. 20, 2006). We assume that other holders of high-vote B shares sold stock, and these sales caused their B shares to convert to low-vote A shares.

[74] Generally, voting power of at least 40% is needed to make control non-contestable. We chose a minimum of 30% voting power to be overinclusive. For completeness, however, we also report frequencies for founder blocks with at least 20% and at least 40% voting power. Of course, the degree of protection provided by a 20% or 30% block depends heavily on the identities and sizes of other shareholders; the presence of activist shareholders and potential hostile acquirers in the market; structural defenses in the corporation's charter (for example, a staggered board); and the (often evolving) legal rules that would govern a control battle at a particular firm at a particular point in time.

[75] In another twenty firms, the founder group had at least 30% of the equity voting power but a nonfounder served as CEO. *Compare* Table 5, Panel B, *with* Table 5, Panel C. In such firms, a founder might have been able to remain CEO had he or she so chosen, and thus it might be appropriate to include these firms as well. Table 5, Panel C thus reports results for different amounts of founder voting power, without regard to whether a founder is the CEO.

[76] *See* Field & Lowry, *supra* note 54, at 29, 43.

[77] *See* Paul Rose & Steven Davidoff Solomon, *Where Have All the IPOs Gone? The Hard Life of the Small IPO*, 6 HARV. BUS. L. REV. 83, 93 (2016).

line). Indeed, of the forty-six founder-CEO/blockholders at IPO, only sixteen remain at IPO+3 (Table 5). This decay is inconsistent with the "call option on control" theory. It shows that many founder-CEO/blockholders cannot, or do not wish to, maintain strong control. To the extent founders anticipate not having durable control after IPO, they are likely to place less value ex ante on any call option on control.

TABLE 5: FOUNDER VOTING POWER AT AND AFTER IPO

This table reports data on founder voting power (at IPO, IPO+1, and IPO+3) in 652 US-based VC-backed IPO firms that received initial VC financing during 1990-2012. In Panel B we use "F-CEO" to denote Founder-CEO.

Panel A

	IPO	IPO+1	IPO+3
Founder Voting Power % (unconditional)	11.1%	8.4%	6.3%
Founder Voting Power % (conditional)			
- founder-CEO at IPO	*17.3%*	*13.1%*	*10.0%*
- nonfounder-CEO at IPO	*6.6%*	*4.7%*	*2.9%*

Panel B

	IPO	IPO+1	IPO+3
F-CEO + ≥20% Voting Power	80	45	25
- % of IPO Research Sample	*12.3%*	*6.9%*	*3.8%*
F-CEO + ≥30% Voting Power	46	25	16
- % of IPO Research Sample	*7.1%*	*3.8%*	*2.5%*
F-CEO + ≥40% Voting Power	28	10	5
- % of IPO Research Sample	*4.3%*	*1.5%*	*0.8%*

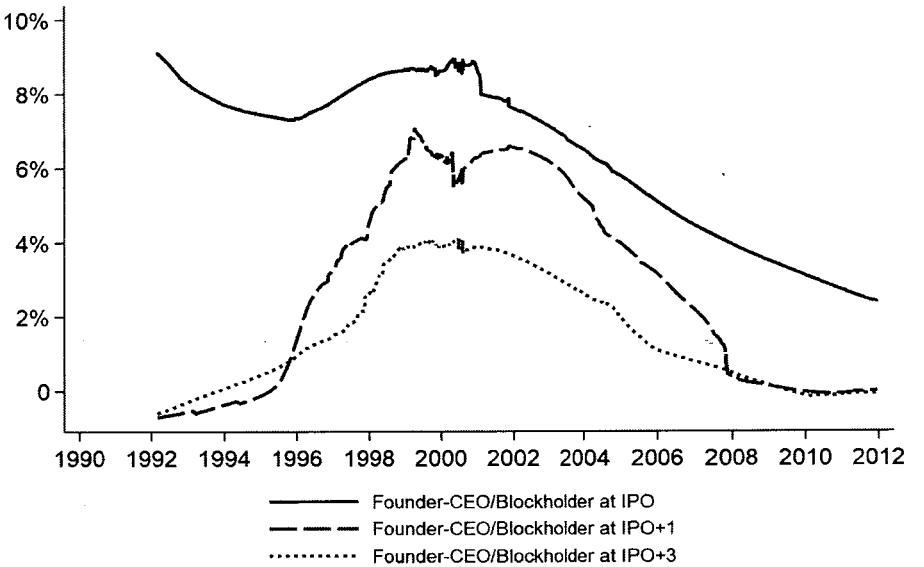
Panel C

	IPO	IPO+1	IPO+3
Founders with ≥20% Voting Power	133	78	47
- % of IPO Research Sample	*20.4%*	*12.0%*	*7.2%*
Founders with ≥30% Voting Power	66	38	20
- % of IPO Research Sample	*10.1%*	*5.8%*	*3.1%*
Founders with ≥40% Voting Power	42	24	10
- % of IPO Research Sample	*6.4%*	*3.7%*	*1.5%*

FIGURE 3: EX POST LIKELIHOOD OF FOUNDER-CEO/BLOCKHOLDER AT AND AFTER IPO

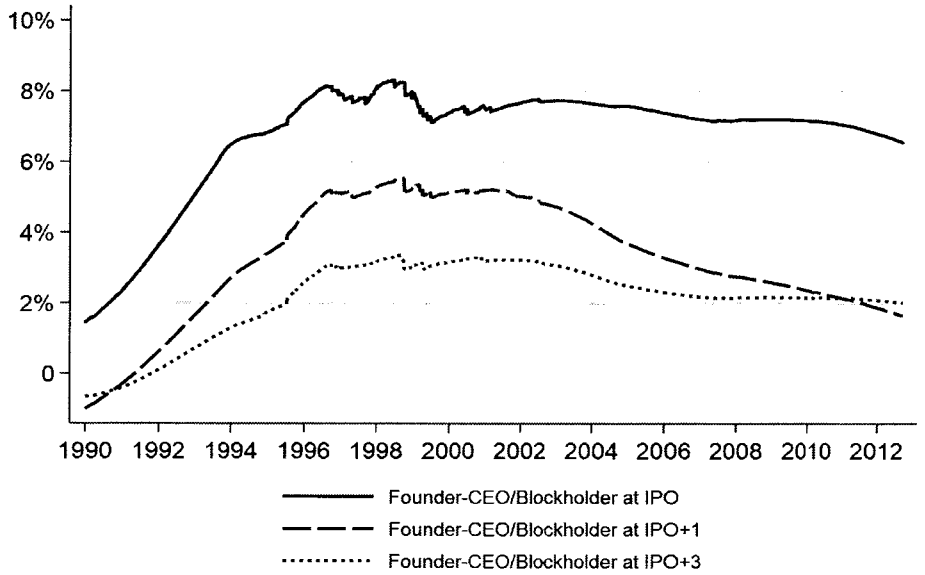
Using data from a sample of 652 U.S.-based VC-backed IPO firms, the figures below plot Lowess curves illustrating the likelihood that a sample firm has (at IPO, IPO+1, and IPO+3) a founder with strong control: a founder is CEO and founders in aggregate hold at least 30% of voting rights. Data are displayed separately based on IPO vintage (Panel A) and financing vintage (Panel B).[78]

Panel A: Likelihood of Founder-CEO/Blockholder Sorted by IPO Vintage



[78] Generally, the frequency of founder control at IPO+1 is higher than at IPO+3; the apparently opposite relationship over some periods is an artifact of the Lowess curve's smoothing function.

Panel B: Likelihood of Founder-CEO/Blockholder Sorted by Financing Vintage



V. Ex Ante Likelihood of Control Reacquisition via IPO

The "call option on control" theory assumes that the prospect of a control-returning IPO induces a control-valuing founder to cede control to VCs in exchange for financing. To evaluate this assumption, we examine the ex ante likelihood that a founder receiving an initial round of VC financing later reacquires either weak or strong control via IPO.

As noted above, only about 10% of VC-backed firms in our VC-backed population even make it to IPO. However, this figure reflects truncation caused by the inclusion of firms from recent financing vintages. To minimize truncation, we limit our ex ante analysis to pre-2003 financing vintages (1990–2002). Such firms had at least ten years to reach IPO before data collection. For these financing vintages, we find that 14.7% reached IPO before 2013.[79] They constitute 566 of the 652 firms in the full IPO research sample.

A. Founder-CEO

In the pre-2003 financing vintages, we find—similar to the full IPO research sample—that 42.2% of IPO firms had a founder-CEO (that is, "weak" control) at completion of IPO. From an ex ante perspective, how-

[79] This result can be obtained from Table 1, Panel A by dividing the aggregate number of IPOs of firms receiving initial VC financing during 1990–2002 (n=1627) by the total number of firms entering the VC-backed population during 1990–2002 (n=11,104).

ever, the founder must clear two hurdles: first, taking the firm public and, second, remaining CEO at IPO. We find that only 6.2% of founders in the VC-backed population are able to clear both hurdles and obtain at least weak control at IPO (Table 6). The ex ante likelihood that a firm will conduct an IPO and have durable weak control (that is, lasting through IPO+3) is about half that (3.3%).

Within pre-2003 financing vintages, however, we find that the ex ante probability of a founder reacquiring weak control declines over time. The primary reason is the declining rate of IPOs since the late 1990s. For example, Table 1 reports that 30%–40% of startups with early 1990s financing vintages reached IPO. By contrast, only 4.5%–9.5% of firms in financing vintages 1999–2002 reached IPO. So, even though the ex post likelihood (that is, conditional on IPO) of founder-CEO at IPO remains relatively stable, we find a large decline in ex ante likelihood over time.

Figure 4 illustrates this trend. For each year, we take firms receiving initial VC financing and from this annual cohort determine the number of firms with a founder-CEO at IPO and IPO+3. After adjusting for sampling rate, we estimate for each year the percentage of the VC-backed population with both an IPO and a founder holding the CEO position (at IPO and at IPO+3). Figure 4, Panel A shows a sharp decline over time in the ex ante likelihood of founder-CEO. Indeed, for firms initially financed during 1999–2002, Figure 4 suggests a 2%–4% ex ante likelihood of founder-CEO at IPO, with a lower likelihood at IPO+3.

TABLE 6: EX ANTE LIKELIHOOD OF FOUNDER CONTROL AT AND AFTER IPO

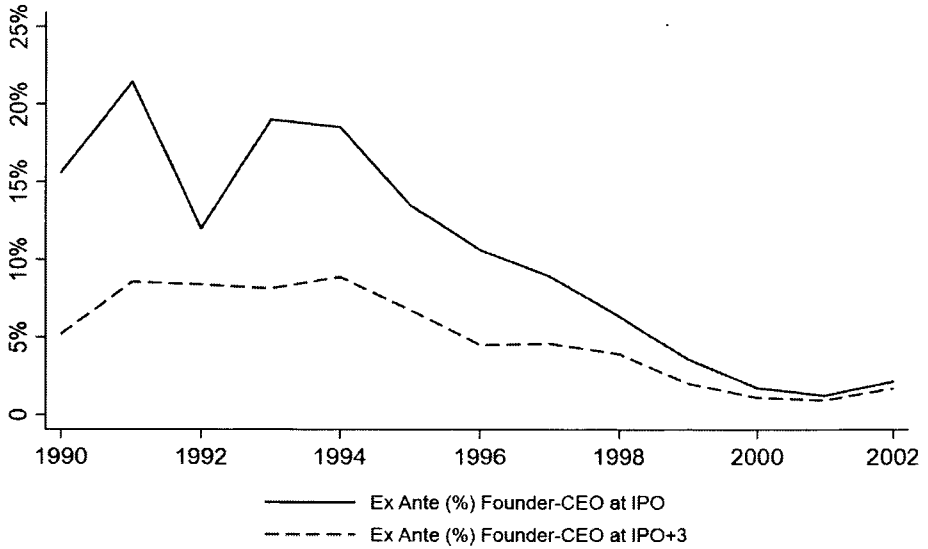
Using data from a sample of 11,104 U.S.-based VC-backed firms receiving initial VC financing during 1990–2002 (pre-2003 financing vintages of the VC-backed population), this table reports the number and percentage of firms that ultimately had an IPO exit with a founder-CEO (or with founder-CEO and various amounts of founder voting power), and the corresponding number and percentages for IPO+1 and IPO+3.

	IPO	IPO+1	IPO+3
Founder-CEO (F-CEO)	239	194	126
- % of VC-backed population	*6.2%*	*5.0%*	*3.3%*
F-CEO + ≥20% voting power	71	41	21
- % of VC-backed population	*1.8%*	*1.1%*	*0.5%*
F-CEO + ≥30% voting power	39	21	14
- % of VC-backed population	*1.0%*	*0.5%*	*0.4%*
F-CEO + ≥40% voting power	23	9	4
- % of VC-backed population	*0.6%*	*0.2%*	*0.1%*

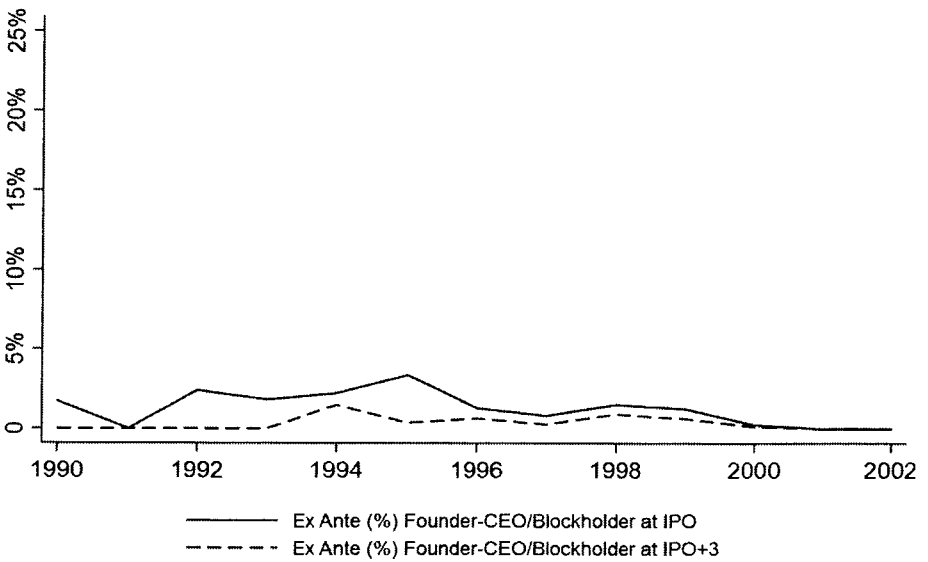
FIGURE 4: EX ANTE LIKELIHOOD OF FOUNDER CONTROL AT IPO

Using data from a sample of 11,104 U.S.-based VC-backed firms receiving initial VC financing during 1990–2002 (pre-2003 financing vintages of the VC-backed population), the figures below report the ex ante likelihood that these firms ultimately have founder-CEO at IPO and IPO+3 (Panel A) and founder-CEO/blockholder on those two dates (Panel B).

Panel A: Ex Ante Likelihood of Founder-CEO (sorted by financing vintage)



Panel B: Ex Ante Likelihood of Founder-CEO/Blockholder (sorted by financing vintage)



B. Founder-CEO/Blockholder

Figure 4, Panel B also reports the annual ex ante likelihood that a startup will go public with a founder-CEO/blockholder. Over the entire sample period, the ex ante likelihood of reacquiring strong control is less than 5%; for post-1997 financing vintages, it is 1% or less. Table 6 shows that 1% of VC-backed startups from 1990–2002 will go public and have a founder-CEO/blockholder at IPO. This ex ante probability falls to 0.4% for durable strong control. At the initial VC financing, the likelihood of a founder reacquiring durable, meaningful control has always been low, including when Black & Gilson (1998)[80] was published, casting doubt on the theory that the possibility of an IPO gives founders a valuable call option on control at the time of initial VC financing.

VI. VC Returns and Founder Control in IPO Firms

According to the "call option on control" theory, VCs implicitly promise to return control to those founders who are the most successful from VCs' perspective—those who can achieve an IPO exit. Looking across all VC-backed firms, one would expect a correlation between founders reacquiring control and VC returns upon exit. Indeed, IPO exits are on average more lucrative than M&A exits, some of which are essentially a mere transfer of intellectual property and human capital ("acqui-hires") rather than a sale of a going concern,[81] and founders sometimes retain control following an IPO but never retain control in M&A exits.[82]

But the "call option on control" theory might also predict that, among IPO firms, VC returns should correlate with founder control at IPO. If return of control is a carrot dangled in front of founders to induce them to generate returns for VCs, we would expect that carrot to be disproportionately given to those founders of IPO firms that generate the highest returns for VCs. We thus investigate whether founder control is correlated with VC profits across IPO firms.

Table 7 provides a list of the largest IPOs in our IPO research sample (the twenty-seven firms with market caps exceeding $1.5 billion at IPO). Included are some familiar names, such as Google, Nextel, Groupon, and Zynga. The frequency of founder-CEO at IPO is 52%, slightly higher than the baseline rate (41%) in the full IPO research sample. Also higher are average founder voting power at IPO (19% versus 11%) and dual-class frequency (33% versus 5.2%). All of this suggests some correlation between success and founder control. But even in these twenty-seven large IPOs, almost 50% lack founder-CEO at IPO and the frequency of founder-CEO/

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[80] *See* Black & Gilson (1998), *supra* note 3, at 5.
[81] *See* Broughman & Fried (2010), *supra* note 6, at 386-87.
[82] *See supra* Part I.

blockholder at IPO is only 14.8% (versus 7.1% in the entire IPO research sample).

To investigate the link between financial returns and founder control across the entire research sample in more depth, we consider two alternative (albeit crude) estimates for VC returns. The first is VC Net Payout. We start by computing VCs' gross payout upon exit: VCs' estimated aggregate share ownership at IPO[83] multiplied by the IPO stock price.[84] We then obtain VC Net Payout by subtracting VCs' total investment from VCs' gross payout.

The second method is internal rate of return ("IRR"). Using data provided by the VX database on the timing and amount of each financing round, and using the same assumptions about VCs' gross payouts that we use to estimate VC Net Payout, we calculate the IRR on VC investments in each firm ("VC IRR").[85] The advantage of VC IRR over VC Net Payout is that it adjusts (or discounts) for time value of money. The disadvantage is that VC IRR can overstate the magnitude of VC profits when VC investment is close in time to the IPO. Neither measure is ideal; we thus include both.

To reduce truncation bias, we use firms from pre-2003 financing vintages that IPO before 2013. Figure 5 sorts these firms into deciles based on VC Net Payout and VC IRR for each firm. We report the likelihood of founder-CEO at IPO for each decile. The right side of each graph represents the highest decile of VC Net Payout or VC IRR respectively, and the left side represents the lowest. Figure 5 suggests there is no relationship between founder-CEO at IPO and VC returns; the frequency of founder-CEO at IPO is around 40% in each decile.

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[83] We cannot directly observe the aggregate equity ownership of a firm's VC investors, as this amount is not disclosed in the IPO prospectus and is not provided by VX. Instead, for each firm, we assume that nonfounder employees hold approximately 15% of pre-IPO equity (VC-backed firms generally reserve 10%–15% of their cap table for employee equity). We then take the total number of outstanding shares upon completion of IPO and we subtract (i) the number of shares sold in the IPO; (ii) the number shares owned by the firm's founders; and (iii) the number of shares assumed held by nonfounder employees. We assume the remaining shares are held by VC investors. Admittedly, our estimate is rather crude, as nonfounder employees may hold more or less than the assumed 15%. Nonetheless, for making a relative comparison among firms, our assumption should provide a reasonable proxy.

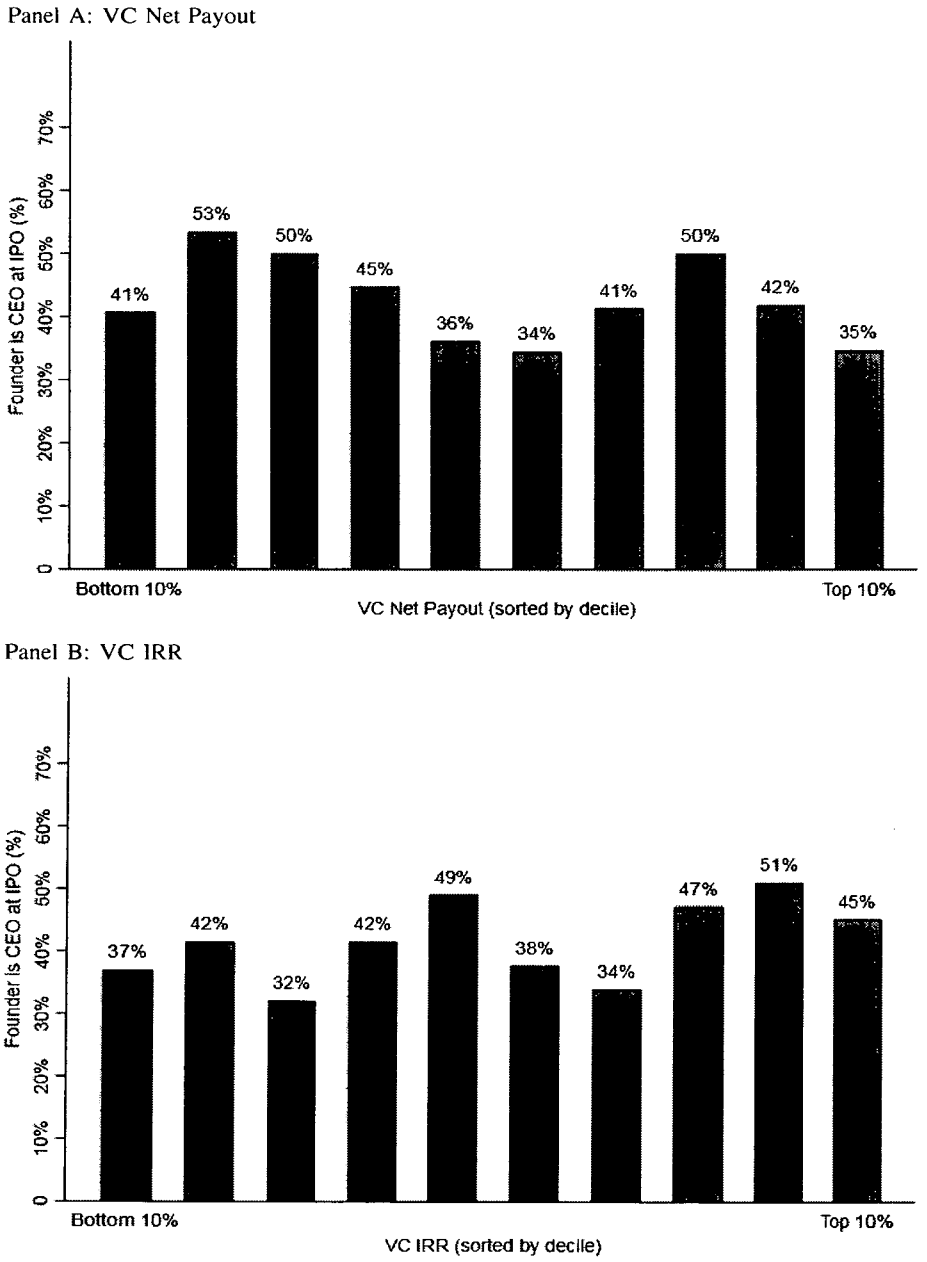
[84] The actual timing of VC exit is generally delayed by lockups that prevent the VCs from registering and selling their shares until (typically) 180 days after the IPO. Unfortunately, we cannot observe the actual timing or price at which the VCs in each firm sell their shares. Instead, we use the IPO offering price as a rough proxy for exit price.

[85] We use the XIRR function in Excel to generate values for VC IRR.

TABLE 7: FOUNDER CONTROL: LARGEST IPOS IN IPO RESEARCH SAMPLE

Company	IPO Year	Founder-CEO	Founder Voting (%)	Dual-Class Structure	Market Cap ($B)
Google, Inc.	2004	No	31.7%	1	23.0
Groupon Inc	2008	Yes	58.0%	1	12.0
360networks, Inc.	2000	No	7.0%	1	11.0
Zynga, Inc.	2011	Yes	37.4%	1	7.0
Nextel Partners Inc	2000	Yes	1.4%	1	4.7
Global Telesystems Inc	1998	No	1.1%	0	4.5
Workday, Inc.	2012	Yes	67.0%	1	4.5
LinkedIn Corp	2003	No	20.0%	1	4.3
Zayo Group LLC	2007	Yes	4.0%	0	3.8
NorthPoint Communications, Inc.	1999	Yes	6.2%	0	2.9
Vonage Holdings Corporation	2006	No	33.0%	0	2.6
Handspring, Inc.	2000	Yes	50.3%	0	2.5
Akamai Technologies, Inc.	1999	No	21.0%	0	2.4
Tritel, Inc.	1999	No	53.4%	1	2.3
Priceline.com, Inc.	1999	No	44.0%	0	2.3
FireEye Inc	2006	No	9.0%	0	2.3
CenturyLink Technology Solution	2000	No	0.0%	0	2.2
Nutanix Inc	2011	Yes	8.0%	1	2.2
Cinemark Holdings, Inc.	2007	No	12.3%	0	2.0
eToys, Inc.	1999	Yes	7.4%	0	2.0
Onvia, Inc.	2000	Yes	13.5%	0	1.7
VeraSun Energy Corporation	2006	No	0.0%	0	1.7
Utstarcom Inc	2000	Yes	3.7%	0	1.6
FreeMarkets, Inc.	1999	Yes	16.9%	0	1.6
Next Level Communications Inc	1999	Yes	2.0%	0	1.6
Rhythms Netconnections Inc	1999	No	0.0%	0	1.5
Niku Corporation	2000	Yes	18.9%	0	1.5
Average		**51.9%**	**19.5%**	**33.3%**	**4.13**

FIGURE 5: NON-CORRELATION BETWEEN VC RETURNS AND FOUNDER-CEO AT IPO



To investigate the connection between VC profits and founder control at IPO in a multivariate setting, we estimate the following equation:

$$Founder\ Control = \alpha + \beta_1 * VC\ Profits + \beta * \boldsymbol{X} + \varepsilon$$

where ε is the error term and $\boldsymbol{X}$ is a vector of included control variables. Founder Control represents two different dependent variables used in the analysis below:

(i) Founder-CEO equals 1 if founder-CEO at IPO, and 0 otherwise;

(ii) Founder-CEO/Blockholder equals 1 if founder-CEO at IPO and founders (in aggregate) have voting power of least 30% at close of IPO, and 0 otherwise.

VC Profits represents the two explanatory variables—VC Net Payout and VC IRR—which we use as proxies for VC returns at each firm. In the regression context, VC IRR is winsorized at the 90% level to reduce the impact of extreme IRR values. All variables are observed at close of IPO.

We control for several explanatory variables that may impact founder control, including years from initial VC financing to IPO; amount of pre-IPO VC financing; number of VC rounds; number of VC firms; and presence of an elite VC firm. We also control for dual-class voting structure (use of which suggests an intent to preserve founder control), Delaware domicile, and California headquarters. Each model also includes dummies for business sector, headquarters location, and financing vintage year.

Results are reported in Table 8. In each model, our proxies for VC returns have an insignificant (or negative) impact on the likelihood of founder-control reacquisition in the event of IPO. For example, in Model 1 we find an insignificant correlation between VC Net Payout and Founder-CEO, and in Model 2 we find a negative correlation (significant at the 10% level) between VC IRR and Founder-CEO. Similarly, we find a negative correlation between VC returns and both the likelihood of founder-CEO/blockholder at IPO (Models 3, 4) and the likelihood of founder equity of at least 30% at IPO (Models 5, 6). If anything, the results in Table 8 suggest—contrary to the control-reacquisition theory—that founders of IPO firms that generate the most profits for VCs are less likely to reacquire control at IPO.[86]

[86] This finding is consistent with evidence that VCs' replacement of founders as CEO can improve startup performance. *See* Ewens & Marx, *supra* note 7, at 29.

TABLE 8: MULTIVARIATE ANALYSIS OF FOUNDER CONTROL AT IPO

Using data from 562 U.S.-based VC-backed firms that received initial financing during 1990–2002 and completed an IPO prior to 2013, this table reports marginal effects based on logit estimates evaluated at the mean of each variable. Depending on the model, the dependent variable is Founder-CEO (Models 1, 2), Founder-CEO & Equity ≥ 30% (Models 3, 4), or Founder Equity ≥ 30% (Models 5, 6). All variables are defined as of the completion of IPO. Standard errors are reported below each coefficient estimate. We use a two-sided test for statistical significance (* = 10%; ** = 5%; *** = 1% significance).

	--- Logit Marginal Effects ---					
	Founder-CEO		Founder-CEO & Equity ≥ 30%		Founder Equity ≥ 30%	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Explanatory Variable						
VC Net Payout	-.0001		-.0000*		-.0000	
	(.000)		(.000)		(.000)	
VC IRR		-.031*		-.002		-.010**
		(.018)		(.002)		(.004)
Years from VC financing to IPO	-.022**	-.027**	-.002*	-.004*	-.009**	.013*
	(.010)	(.012)	(.001)	(.002)	(.003)	(.004)
Amount of pre-IPO financing	-.0003	.0005*	.0019	.0001	.012	.005
	(.000)	(.000)	(.002)	(.004)	(.015)	(.015)
Number of VC rounds	.005	.002	.000	.001	.001	.000
	(.011)	(.011)	(.000)	(.001)	(.003)	(.003)
Number of VC investors	-.008	-.006	-.002*	-.003**	-.009***	-.008***
	(.006)	(.006)	(.001)	(.001)	(.002)	(.002)
Financed by elite VC	-.046	-.053	.005	.004	.015	.016
	(.056)	(.056)	(.003)	(.005)	(.017)	(.016)
Dual-class IPO	.061	.028	.009*	.012	.062**	.057**
	(.121)	(.116)	(.006)	(.008)	(.026)	(.023)
Delaware incorporation	-.027	-.013	-.001	-.004	-.011	-.011
	(.058)	(.059)	(.002)	(.005)	(.015)	(.014)
California headquarters	-.120**	-.124**	-.002	-.003	-.018	-.016
	(.051)	(.052)	(.002)	(.004)	(.014)	(.013)
State Headquarters Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Sector Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year of first VC financing Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	558	540	558	540	558	540
Pseudo R-squared	.074	.074	.456	.388	.258	.271

VII. WHAT CAN THE DATA TELL US?

As discussed in Part V, the ex ante likelihood that a founder receiving first-round VC financing will reacquire control at IPO is extremely low, whether weak (founder-CEO) or strong (founder-CEO/blockholder). The ex ante likelihood that control will be durable is even lower; about 50% of founders lose by IPO+3 whatever type of control they reacquire at IPO, as many IPO firms delist shortly after IPO, and many founders leave the CEO

position even when the firm remains public. It seems unlikely that most founders, in deciding whether to accept funding from VCs, would weigh such low-probability outcomes heavily.

Despite the low ex ante probability of reacquiring control via IPO, we cannot rule out the possibility that this prospect sways some founders to give up control to VCs, and these founders' willingness to accept VC financing drives the venture ecosystem. There could be many founders who either believe they are "above average" and thus likely to reacquire durable control via IPO, and would turn down VC funding if such control reacquisition were not possible, or accept VC financing only because they receive a call option on control, but then later choose not to exercise the option. And perhaps there are enough such founders to generate a large fraction of VC returns and underwrite the ecosystem's vitality. Thus, our findings cannot disprove the "call option on control" theory linking VC and stock markets. All they can do is shed light on its plausibility.

However, current trends in VC investing and exits, taken as a whole, provide additional reason to be skeptical that the VC ecosystem is driven by VCs' ability to give founders a call option on control. As noted earlier, IPO frequency has declined dramatically over the last fifteen years. Thus, the ex ante likelihood of control reacquisition is likely to be far lower now than in the past. After 2000, the IPO market essentially dried up[87] and returned to low, pre-1990 levels, in both dollar volume and number of exits. M&A exits, which at best make founders hired managers of the acquirer, appear to have become more frequent and larger.[88] In theory, the decrease in IPOs could have been more than offset by an increase in the ex post frequency of founder control (that is, conditional on IPO). But our data show that this ex post likelihood has been flat or declining over time.

If VCs' ability to give founders a valuable call option on control stimulates venture activity, we would expect VC activity to have declined in recent years as it became apparent to founders that the ex ante likelihood of IPO (as of initial VC financing) was starting to approach zero. However, VC investment, which hovered in the range of $25–$40 billion annually during

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[87] *See* Robert P. Bartlett et al., *supra* note 50; Rose & Solomon, *supra* note 77, at 102–03.

[88] One of the largest M&A exits to date was Facebook's acquisition of WhatsApp for $19 billion in 2014. *See* Parmy Olson, *Facebook Closes $19 Billion WhatsApp Deal*, FORBES (Oct. 6, 2014), https://www.forbes.com/sites/parmyolson/2014/10/06/facebook-closes-19-billion-whatsapp-deal/#6f9446325c66. In 2016, there appears to have been at least one M&A exit over $10 billion (Stemcentrx, $10.2 billion), and at least five M&A exits between $1 and $10 billion (Acerta Pharma, $4 billion; Jet, $3.3 billion; Jasper, $1.4 billion; Afferent Pharmaceuticals, $1.25 billion; Cruise Automation, $1 billion). *See 2016 Year Review: Top 5 VC deals, exits & funds*, PITCHBOOK (Dec. 23, 2016), https://pitchbook.com/news/articles/2016-year-in-review-top-5-vc-deals-exits-funds; Cromwell Schubarth, *$10.2 Stemcentrx sale is one of the biggest in venture capital history*, BIZJOURNALS.COM (Apr. 28 2016), https://www.bizjournals.com/sanjose/blog/techflash/2016/04/10-2b-stemcentrx-sale-is-one-of-the-biggest-in.html; Riley McDermid, *Autonomous car startup bought by GM plans to add 1,100 jobs in S.F.*, BIZJOURNALS.COM (Apr. 5, 2017), https://www.bizjournals.com/sanfrancisco/news/2017/04/05/gm-autonomous-car-startup-jobs.html.

2001–2013, jumped to over $60 billion annually during 2014–2016, approaching late-1990s levels.[89] To be sure, if there were more IPOs and a greater likelihood of founder-control reacquisition, VC investment might have been even higher. But the point is this: there can be robust venture activity in the United States—indeed, more VC investment than the rest of the world combined—even if the ex ante likelihood of IPO exit has become extremely remote.

Conclusion

We have investigated the likelihood that founders of U.S.-based VC-backed startups reacquire control at IPO, in part to shed light on the plausibility of the claim that VCs' ability to use the prospect of an IPO exit as a means to give founders a call option on control can explain why a deep and liquid stock market is required to sustain a robust VC ecosystem.

Examining more than 18,000 U.S. startups that received initial VC financing between 1990 and 2012, we find that it is highly unlikely that any given founder will reacquire via IPO any form of control that is durable (lasts at least three years after IPO). The ex ante likelihood that a founder will reacquire durable weak control (founder is CEO, but controls less than 30% of equity voting power) is approximately 3%. The ex ante likelihood of reacquiring durable strong control (founder is CEO and the founder group controls at least 30% of equity voting power) is much lower: about 0.4%.

Our results suggest that founders, who must decide years before a potential IPO whether to accept initial VC funding, are unlikely to put much weight on the possibility of reacquiring control in an IPO. Our findings, along with the fact that the IPO market has been moribund for the last fifteen years even as VC financing in the United States is nearing peak levels, cast some doubt on the validity of the "call option on control" theory linking IPOs and venture investment, and thus call into question the more general proposition that deep and liquid stock markets are necessary for a robust VC ecosystem.

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[89] *See* PwC, *Value of Venture Capital Investment in the United States from 1995 to 2018 (in Billion U.S. Dollars)*, Statista, https://www.statista.com/statistics/277501/venture-capital-amount-invested-in-the-united-states-since-1995/ (last visited Jan. 31, 2019).