Going Public with IPOs and SPAC Mergers

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Abstract

The vast majority of "liquidity events" by successful venture capital (VC)-backed companies are trade sales in which the company is sold to a larger firm in the same industry. Many of the most successful startups, however, remain independent and go public either by conducting an initial public offering (IPO) or, more recently, merging with a special purpose acquisition company (SPAC), a transaction known as a deSPAC. Companies conducting an IPO when they have more than $100 million in inflation-adjusted sales have produced much higher subsequent returns for public market investors than have smaller companies, whether VC-backed or not. Since 1999, VC-backed IPOs have had higher first-day returns than other IPOs, but have had lower subsequent returns. DeSPACs have produced far worse returns for investors than IPOs.

Keywords: Initial Public Offerings, SPACs, deSPACs, VC-backed IPOs, tech IPOs, life science IPOs, direct listings

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Private funds that make equity investments in private companies, including both venture capital (VC) and private equity (PE) buyout funds, normally must exit investments within 10-12 years of the creation of the fund. The two main types of exits for successful VC-backed startups are to either sell the portfolio company for cash to a larger company in the same industry, known as a trade sale, or to take the portfolio company public and distribute shares to the limited partners (LPs), who can then individually decide whether to keep or sell the shares. A trade sale is typically a cleaner "liquidity event," in that the sale may be entirely for cash, whereas in going public most or all pre-issue shareholders are typically locked up for 180 days or more. In the 1980s, taking a company public by conducting an initial public offering (IPO) was the most common exit for successful portfolio companies. In the 1990s, trade sales became more common, and since 2001 have been the predominant method for exiting for successful VC-backed companies. Figure 1 here, an updated version of Figure 2 in Gao, Ritter, and Zhu (2013), shows that for VC-backed companies, only about 10% of successful exits have been via IPOs over the last twenty years. Recently, as VC-backed companies have stayed private longer, VC funds sometimes exit by selling their shares to another VC fund or to another investor, such as a mutual fund, with the cash (net of any carried interest earned) distributed to the LPs and the portfolio company remaining private.

[Insert Figure 1 about here]

Even though there have been, on average, many hundreds of companies acquired by buyout firms each year for many decades (Strömberg, 2008), on average less than 30 buyout-backed IPOs have occurred per year during 2001-2022, as shown in Table 1. This low rate of IPO activity by buyout-backed companies suggests that most exits occur with either trade sales

or by selling the portfolio company to another fund. Some exits also occur with portfolio companies being sold to a continuation fund managed by the same general partner (GP), with the company remaining private (see Table 4 of Jenkinson, Kim, and Weisbach (2022)). Brown and Volckmann (2023, Figure 2), using MSCI/Burgiss data, estimate that 40% of PE exits have been sales to another PE fund in the past decade. They report (Figure 3) that in 2018-2023 only about 5% of buyout exits have been via IPOs. Below, we discuss why exiting via a trade sale rather than going public has become much more common.

[Insert Table 1 about here]

We compile the amount of cash raised by startup firms from i) venture capital firms, ii) through trade sales, and iii) from public equity markets, whether through IPOs, seasoned equity offerings (SEOs), or through merging with a special purpose acquisition company (SPAC). The numbers show that in the early 1990s, public equity markets were the dominant source of equity capital. During 1990-2023, although there has been substantial year-to-year variation, the inflation-adjusted amount of cash raised from public equity markets shows only a slight upward trend. In contrast, VC investments and trade sales have grown enormously, and now eclipse public equity markets in importance for equity financing.

We document the returns earned by public market investors on companies going public, and compare the returns on VC-backed and buyout-backed companies with those of other companies. During 1980-1998, for investors buying at the market close on the first day of public trading, VC-backed IPOs outperformed other IPOs. Since 1999, however, VC-backed IPOs have underperformed other IPOs. We show that there has been poor performance of both life science and tech company IPOs since 1999. We report that small company IPOs, whether VC-backed or not, have underperformed large company IPOs by an economically significant 30% in the three

years after going public. The decline in IPO volume has been concentrated in these small companies. The poor post-issue returns on these companies suggest that public market investors have been helped rather than harmed by the lack of opportunities to invest in them.

For portfolio companies going public, merging with a publicly traded SPAC rather than conducting an IPO became somewhat common in 2020-2023. In 2022 and 2023, there were more exits via SPAC mergers than via traditional IPOs, partly due to a very low number of IPOs.

We document the returns earned by IPO investors versus those earned by investors after a merger between an operating company and a SPAC. These so-called deSPACs have produced dramatically lower returns for public market investors than the returns earned on traditional IPOs, as also documented by Groh, Proelss, Sannajust, and Schweizer (2022). For new listings during 2017-2022, the average 3-year buy-and-hold return for deSPACs has been -61.0%, whereas for IPOs it has been -8.2%. We show that the returns on the VC-backed deSPACs from 2017-2022 have been much worse than the returns on VC-backed IPOs. These patterns are consistent with the hypothesis that many low quality companies go public by merging with a SPAC.

Why Have Public Market Exits Become Less Common?

In this chapter, we focus on patterns in the United States. We focus on startups that are in industries such as technology and life science, rather than the vast majority of startups in such businesses as lawn care, plumbing, and family-owned restaurants that are likely to always be small local firms. Table 1 shows that the fraction of operating company IPOs that are VC-backed has grown over time, from an average of 25% in 1980-1989 to 52% in 2001-2022. Table 1 also shows that in 1980-2000 the number of operating companies going public in the U.S. averaged

310 per year, before dropping dramatically to an average of 119 per year during 2001-2022, in spite of a larger economy. Adding direct listings and mergers with SPACs to the numbers adds only another 22 or so new listings per year in the last 22 years. The low rate of IPO activity since 2001 contributed to a 50% fall in the number of domestic operating companies listed on major U.S. exchanges between 1997 and 2013, with the number of listed operating companies being roughly constant since then.[1]

Initially, the most popular explanation for the drop in the number of listed firms in the U.S. following the 1997 peak was that excessive regulation of public firms was responsible. The academic literature, however, provides at most limited support for this explanation. Gao et al. (2013) find little evidence that the Sarbanes-Oxley Act of 2002, known as SOX, and the 2003 Global Settlement caused the decline in IPO activity, whose start predated regulations such as SOX. Two more recent papers provide some evidence that regulatory changes played a role, although a limited role. Chemmanur, He, Ren, and Shu (2023) show that the decline in the propensity of U.S. firms to go public can be partially attributed to regulatory events such as SOX. Ewens, Xiao, and Xu (2024) find that increased regulatory costs explain only a small fraction of the reduction in IPOs. The relaxation of IPO regulations in the 2012 Jumpstart Our Business Startups (JOBS) Act, however, is largely based on the argument that regulatory burdens have caused significant negative effects on IPO activity, in spite of the mixed empirical evidence.

Alternative explanations for the drop in the number of IPOs focus on cash flow channels and financing channels. The cash flow channel is discussed in Gao et al. (2013), who emphasize the disadvantages facing small firms in many industries due to the increased importance of

[1] See "The number of listed firms in the U.S. 1980-2023, by quarter" at https://site.warrington.ufl.edu/ritter/ipo-data/

economies of scale and scope, driven by technology. For an entrepreneur, whether to remain independent by going public or to sell the firm via a merger generally involves the choice of growing organically or immediately becoming part of a larger organization. A small private company may be able to use a large acquirer's established platform to bring a product to market more quickly. In many industries, due to a drop in communication and transportation frictions over time, getting big faster and being big has become increasingly important. Consistent with this economies-of-scope argument, Gao et al. show that a larger fraction of the small firm IPOs since 1997 have been unprofitable in the 3 years after their IPO than was previously the case. Importantly, Eckbo & Lithell (2024) find that the decline in the number of listed firms would disappear if one counted the target firms of public acquirers as independent firms.

Irani, Pinto, & Zhang (2024) posit that globalization can have a negative impact on IPO activity. It may be more costly to establish sales and supply channels in foreign countries than domestically. As a result, a firm operating in a more globalized industry may find it more cost effective to merge with an established partner, resulting in less IPO activity in more globalized industries, everything else being equal. The authors use the average percentage of foreign sales over total sales of all Compustat-listed firms in an industry as a measure of industry-level globalization. They show that, in time series and cross-sectionally, this globalization measure is negatively associated with U.S. IPO activity in the industry. Using tariffs as an instrumental variable and the 1994 North American Free Trade Agreement (NAFTA) as an exogenous shock, they also show that the negative impact of globalization on IPO activity is likely to be causal.

Cash flow considerations are not the only reasons for the declining popularity of traditional IPOs in the U.S. Another reason that many startup firms are remaining private longer is that it is easier for a private firm to raise large amounts of equity capital than it used to be (de Fontenay,

2016). Emphasizing this financing channel, Ewens & Farre-Mensa (2020) document that the supply of equity capital to private firms has increased since 1996. They posit that the deregulation of securities laws, especially the National Securities Markets Improvement Act (NSMIA) in 1996, has increased the supply of capital to private firms and has enabled them to stay private longer. The increased supply of capital to private firms likely has had a negative effect on IPO activity, or at least would result in a delay in the age at which a startup goes public.

Although there is no doubt that there is more venture capital money available than in earlier years, as shown in our Table 1, there is another explanation for this increase in supply in addition to regulatory changes. This alternative view, as discussed in Ewens and Farre-Mensa (2022), is that the increase in VC funding is due to inflows of money into this asset class due to two reasons that are unrelated to regulatory changes. The first reason is that money chases past returns. In particular, the success of the "Yale model" widely attributed to David Swenson, the long-serving head of Yale University's endowment, has resulted in many university endowments and pension funds allocating a significant fraction of their assets to illiquid investments such as private equity. The logic for why returns have been high is that the higher returns are earned as compensation for illiquidity. The second reason for the inflow of money is that state and local government pension plans, which in the U.S. bizarrely are allowed to calculate the present value of their funded liabilities at the expected return on their assets, no matter what the risk and maturity of the assets are, has created an incentive for these pension plans to place a larger fraction of assets in opaque and illiquid assets such as VC funds, for which the pension plans assume high expected returns.[2]

[2] Paragraph 44 of Government Accounting Standards Board Statement No. 67 (2012) states that the discount rate should be conditional on the funding status: If the amount of pension plan assets is projected to be greater than the liabilities, then the actuarial present value of benefit payments (the liabilities) should be determined using the long-

A recent working paper by Jackson, Ling, & Naranjo (2024) offers yet another reason for the growth of fund flows into private markets, in spite of the high fees charged by general partners. They posit that many investors desire assets for which there are overstated and smoothed returns, so that the investors (or their agents) can report higher risk-adjusted portfolio returns in the short run.

Even without regulatory changes, Stulz (2020) posits that the increased importance of the technology and healthcare sectors, where start-ups are mainly investing in intellectual property, would have resulted in an increased demand for venture capital to finance these companies. Stulz and Davydova, Fahlenbrach, Sanz, and Stulz (2024) posit that startup firms with assets that are intensive in organizational capital, defined as the knowledge used to combine human skills and other inputs into systems for producing goods and services, are better off staying private longer than other firms. This idea is consistent with the evidence that life science firms, which have high cash burn rates but only modest organizational capital, would go public at an earlier age than tech startups.[3]

In Table 2, we report the amount of inflation-adjusted (dollars of 2023 purchasing power) equity capital raised from private and public markets for startup firms, by year, from 1990-2023. All of the numbers are subject to certain limitations, which we discuss in the next two paragraphs, but the time trends in VC investments and trade sales are strong and clear. Equity

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term expected rate of return on those assets. The actuarial present value of unfunded benefit payments should be calculated using a high quality long-term municipal bond rate.

[3] Table 4g of Jay Ritter's IPO Statistics (Ritter (2024)) reports a median age at the IPO of 6 years for 632 life science firms in 2001-2022. Table 3 here reports that for 733 tech companies going public during 2001-2022 with financial sponsor-backing, the median age each year varies from 6 to 14 years, with 15 of the 22 years having a median age of 10 or more years.

capital for startups now comes primarily from venture capital, which has grown dramatically over time, from an average of less than $10 billion per year in the early 1990s to an average of about $250 billion per year in recent years. Acquisitions of VC-backed private firms by other operating companies have increased from an average of less than $5 billion per year in the early 1990s to an annual average of almost $70 billion in recent years. In contrast, cash raised in public markets from newly issued shares in IPOs and SEOs, and cash delivered in mergers with SPACs, has shown relatively little growth, averaging about $115 billion per year throughout this 34-year period, although with substantial year-to-year variation. Simply put, the relative importance of public markets for raising cash has fallen dramatically in recent decades.

[Insert Table 2 about here]

For the VC investments data, the NVCA/Pitchbook numbers that we use include the value of shares newly issued by domestic firms and shares purchased from existing shareholders, such as other VCs. The trade sales numbers for VC-backed startups include only those transactions for which a dollar value is given. Many transactions, especially those of smaller companies, do not include a dollar value. Furthermore, some M&A transactions involve contingent payments such as earnouts whose future value is not known at the time of the transaction. Nevertheless, the enormous growth of both the investments made by VC firms and the proceeds from trade sales suggests that these data problems would not change the big picture. The proceeds from trade sales generally go to existing shareholders, rather than to the operating company.

For IPO and SEO proceeds, we include all operating companies, including those that did not have VC-backing. We do not subtract the fees earned by investment bankers. For IPOs, we do not include shares sold through the exercise of overallotment options. We include only the money raised through the issuance of newly issued shares, and thus do not count the value of

shares sold by existing shareholders. There is no reason to think that these omissions display a time trend, although the fraction of total proceeds that comes from VC-backed companies has grown over time. Money raised from mergers with SPACs (deSPACs) is computed in two ways, one for 1990-2015, and the other for 2016-2023. In the first period, when deSPACs typically did not include cash from private investment in public equity (PIPEs) and required 80% of shareholders to not redeem their shares, we assume that the cash delivered equaled the cash placed in the trust account if we cannot find the actual amount with a search on the SEC's EDGAR website. For the second period, we include both the cash in the SPAC trust fund after redemptions and cash raised through PIPEs and forward purchase agreements. In most years, SPAC mergers are relatively unimportant as a source of funds, with the boom year of 2021 being a notable exception.

Even after going public, existing shareholders generally do not have immediate liquidity. With an IPO or SPAC merger, the shareholders of the operating company, including those held by a VC firm, are frequently locked up for 180 calendar days. Even after the lockup ends, it is common for a GP to distribute shares to limited partners in several tranches, with only some of the shares received as soon as the lockup ends.

The illiquidity associated with VC investments has decreased over time, although distributions have been low in periods immediately following low IPO activity. A number of venues now exist in which existing shareholders of some VC-backed firms can sell their holdings, even though the company is still private. There was an active market in Facebook stock on SharesPost and Second Markets before its 2012 IPO. Today, Nasdaq Private Markets, EquityZen, and Forge Global all offer platforms for transactions in some VC-backed companies, albeit with higher fees than if the companies were publicly listed. Some private firms

periodically conduct tender offers in which employee shareholders can sell shares back to the company.

The increased VC investment in startup firms is a result of both supply and demand: a higher demand from startups because many of these firms benefit from staying private longer, and a higher supply of funds from institutional investors such as endowments, state and local government pension funds, and mutual funds.[4] This financing explanation for why IPO activity has been low since 2001 has two testable implications. The first prediction, which is supported by the evidence, is that the median age of recent IPOs should be older than in the pre-2001 period. The second prediction, which is rejected by the evidence, is that after a pause of a few years, IPO volume should have returned to higher levels as the now-older firms conducted their delayed IPOs.[5] The failure of this second prediction suggests that the financing channel can explain only some of the dramatic decline in IPO activity that has occurred.

Returns Earned by LPs on PE and VC Funds

Harris, Jenkinson, Kaplan, and Stucke (2023) analyze the returns earned by LPs in U.S. buyout and VC funds. Their main metric is the Public Market Equivalent (PME), which is the ratio of the gross returns earned by LPs relative to what they would have earned if they had

[4] Kwon, Lowry, and Qian (2020), Chernenko, Lerner, and Zeng (2021), and Huang, Mao, Wang, and Zhou (2021) document an increase in investments by mutual funds in late-stage startups in the last decade. Mutual funds are permitted to invest up to 15% of assets in illiquid investments. Some VC-backed IPO firms receive additional VC funds even after the IPO. Iliev and Lowry (2020) document that 15% of VC-backed IPO firms received additional venture financing within five years after the IPO. VC firms also frequently participate PIPE transactions (Dai (2007) and Brophy, Ouimet, and Sialm (2009)).

[5] Because young firms have a higher failure rate, young firms that went public in the 1980s and 1990s that then failed within a few years after the IPO presumably would have never gone public in recent decades, because they would have either failed or sold out at a fire-sale price while still private. The average annual number of companies going public with inflation-adjusted trailing annual sales of more than $50 million has fallen, however. See Table 12 at https://site.warrington.ufl.edu/ritter/files/IPOs-Sales.pdf

invested in a public market benchmark such as the S&P 500 at the same time as they contributed capital to a fund, selling the benchmark at the same time as they received distributions. A PME above 1.0 indicates outperformance for the PE fund. Using data from MSCI/Burgiss, which collects information from LPs, they report that the average buyout fund formed in a cohort year had a PME above 1.0 for every cohort from 1994 to 2015, with returns calculated through December 2020. The average PME for their entire sample of 929 buyout funds, involving approximately $1 trillion of capital commitments starting with cohort year 1987, is 1.18.

For VC funds, Harris et al. (2023) report an average PME through December 2020 of 1.29 for 1,408 VC funds from 1984 to 2015, using the total return on the S&P 500 as the benchmark, although the consistency of outperformance is not as high as for buyout funds.[6] In particular, 7 of the 8 cohort years from 1999-2006 produced PMEs of below 1.0, although all 9 years from 2007-2015 produced average PMEs of above 1.0.[7] Because VC funds are typically smaller than buyout funds, the total capital commitments in the VC funds tracked by MSCI/Burgiss is about $350 billion.

The Equilibrium Supply of VC and Private Equity Money

For an operating company, the choice of being private or public is largely determined by differences under the two regimes in expected cash flows and in the cost of funds. A publicly traded firm might have lower net cash flows due to higher director and officer (D&O) insurance costs, higher public reporting costs, higher expected litigation costs, and greater owner-manager

[6] See Table 1B of Harris et al. (2023) using VC vintage years of 1984-2015 and returns through December 2020, using MSCI/Burgiss data.

[7] Updated numbers from MSCI/Burgiss, supplied by Steve Kaplan, with returns through the first quarter of 2024, show that the 2016-2020 buyout and VC cohorts also have average PMEs above 1.0.

agency costs. Since some of these costs are fixed costs, they are particularly onerous for small companies, resulting in it being optimal to be private if a company is small. Financial sponsors (a term that includes both VC- and buyout-funds) might assist the company in generating higher cash flows by giving good advice. On the other hand, the firm's cost of capital from public market equity investors should be less than that from financial sponsor investors, both because private market investors may demand an (il)liquidity premium, and because GPs are collecting management fees and carried interest that can create a wedge of more than 2% per year between the cost to the operating company and the net returns to LPs.

Several recent papers question whether there is, in equilibrium, a positive illiquidity premium in private equity. Gupta and Van Nieuwerburgh (2021) suggest that many institutional investors such as endowments seem to value illiquid securities that they do not have to mark-to-market. Jackson et al. (2024) hypothesize that some LPs are willing to accept a negative illiquidity premium on opaque assets with smoothed returns. If there is too much private capital, financial sponsors may be forced to pay too high a price when investing in operating companies, lowering both pre- and post-fee expected returns. Furthermore, if there is too much money chasing deals, VCs may lose the ability to reduce private benefits of control by managers.[8]

In equilibrium, one would expect that money will flow into PE funds until the expected returns earned by LPs are just sufficient to generate an (il)liquidity premium. If this illiquidity premium is small, or even negative, retail investors that do not have access to this asset class are not missing out on an attractive investment opportunity. Furthermore, even if there is a positive

[8] There has been an increase in dual-class share structures in recent years among VC-backed IPOs (see Aggarwal, Eldar, Hochberg, and Litov (2022) and Field and Lowry (2022)), and anecdotal reports of unconstrained behavior by founders at companies such as Uber Technologies (see Isaac (2019)) and WeWork (see Brown and Farrell (2021)).

illiquidity premium on average, if retail investors are faced with adverse selection regarding the funds that they have access to, their average returns will be lower than if there was no adverse selection problem.

Changes Over Time in the Characteristics and Valuation Multiples of Tech IPOs

Table 3 shows that among financial sponsor-backed tech IPOs, there has been a substantial change after 2000 in the median inflation-adjusted sales (higher), the median age (older), and the probability of being profitable (lower).

[Insert Table 3 about here]

Table 3 also shows that a measure of valuation, the median price-to-sales ratio valued at the first closing market price, has crept up over time, being below 5.0 in all but two years from 1980 to 1993, but exceeding 10.0 in each year during 2018-2022, as well as surrounding the internet bubble during 1998-2001. Thus, the returns earned by VC investors, as well as buyout investors and public market investors, have partly been driven by multiple expansion. Public market investors in recent years are buying in at higher multiples than was true in the past. It is unlikely that future returns will continue to be boosted by multiple expansion.

Table 4 is identical to Table 3, except that it excludes buyout-backed tech IPOs. The patterns are similar to those shown in Table 3. In 2022, there was only one VC-backed tech IPO, partly because some VC-backed firms delayed going public during this year, when the stock market lost over 20%, or chose to merge with SPACs. In 2022, there were only 14 VC-backed IPOs (see Table 1), mostly of life science companies, but there were 54 VC-backed deSPACs (see Table 14).

[Insert Table 4 about here]

Long-run Performance of VC-backed IPOs

If the market underestimates the value of VC-backing at the IPO, VC-backed IPOs will be followed by higher long-run stock returns than nonVC-backed IPOs. Brav and Gompers (1997) provide evidence consistent with this conjecture, using a sample of 934 VC-backed IPOs from 1972-1992 and 3,407 non-VC-backed IPOs from 1975-1992.

Table 5 shows that VC-backed IPOs have outperformed other IPOs in the three years after the IPO, although this pattern is driven by the outperformance of VC-backed IPOs from the 1980-1998 cohorts. The pattern for VC-backing from 1980-1998 is largely consistent with the findings of Brav and Gompers (1997). However, VC-backed IPOs have not outperformed other IPOs since 1999. In Panel D, the average three-year market-adjusted returns following VC-backed IPOs and other IPOs in 1999-2000 are -40.5% and -17.9%, respectively. Correspondingly, in Panel E the average three-year market-adjusted returns following these two groups of IPOs in 2001-2022 are -11.8% and -10.2%, respectively.

[Insert Table 5 about here]

In Table 6, we categorize IPOs on the basis of both whether they had VC-backing and whether their inflation-adjusted trailing twelve months sales were higher or lower than $100 million, using dollars of 2023 purchasing power. Panels A and B measure long-term returns from the first closing market price. Panels C and D measure long-term returns from the offer price. The cross-sectional patterns are similar. The table shows that although the low sales companies on average have higher first-day returns, they then underperform on average.[9] The large

[9] On Jay Ritter's IPO Data page at https://site.warrington.ufl.edu/ritter/files/IPO-Statistics.pdf, Table 1 shows that the proceeds-weighted and equally weighted average first day return numbers are very similar: 18.9% on an EW basis, and 20.5% on a proceeds-weighted basis, for IPOs from 1980-2023..

companies have had substantially better long-run performance, whether or not they were VC-backed. The differences are economically large: the high sales companies have 3-year buy-and-hold and 3-year market-adjusted returns that are roughly 30% higher than those for the low sales companies.

[Insert Table 6 about here]

The poor performance of small company IPOs has implications for the suggestions to create a junior market for small companies to go public, allowing individual investors to have access to investing in small companies. The decline in the number of operating company IPOs since 2001 has been most pronounced among small companies. If these companies severely underperform, on average, what opportunity are retail investors missing out on?

Table 7 shows that in the 1980s and 1990s, the median tech company going public was small, with trailing annual sales of less than $80 million (2023 purchasing power) in every year from 1980-2001. During 2002-2022, the median inflation-adjusted sales number has been higher than $80 million in every single year. From 1980-1995, in spite of the typical tech IPO being that of a small company, 65% or more were profitable in the 12 months before the IPO in every single year, but since then the percentage being profitable has been below 65% in all but two years. In the last decade, the vast majority of the larger, older tech companies going public have been unprofitable. The increase in the proportion of unprofitable tech IPO firms is consistent with the findings of Denis and McKeon (2021). They document in their Figure 1 that negative net cash flows have become increasingly more common among publicly traded companies in the U.S. during 1978-2000. After the IPO, many unprofitable firms need to raise additional equity capital from public or private investors (DeAngelo, DeAngelo, and Stulz (2010), Huang and Ritter (2021), and Huang and Ritter (2022)).

[Insert Table 7 about here]

In addition to financing tech companies, venture capitalists also finance many startup healthcare companies. Healthcare can be divided into three categories: medical technology, life sciences (biotech and pharma), and healthcare services such as managed care.[10] Life sciences is sometimes referred to as biotech, although purists distinguish between pharmaceuticals (chemical-based drugs) and biotech (biology-based drugs). In the 1980s and 1990s, many large pharmaceutical firms realized that they were not earning high returns on the massive amounts that they were spending on new drug development. As a result, they cut their R&D staffs, but they still wanted new drugs to sell. The industry changed from being vertically integrated to one in which startups, many of them offshoots from universities, were funded by venture capital to do early stage R&D. If the early results look promising, the company frequently then goes public. Because of the long process of drug development, these firms typically have no revenue from product sales and have high cash burn rates (they burn through money). A common practice is for the public company to raise additional funds through follow-on equity offerings. If the drug development continues to look promising, the company typically gets acquired by a big pharmaceutical company, which has experience (and deep pockets) at arranging expensive phase III clinical trials, gaining regulatory approval, production, and marketing. In 2013-2022, approximately 30% of all U.S. operating company IPOs were conducted by life science startups, as shown in Table 7.

[10] Ritter (2015, Table 8) documents that among VC-backed IPOs, 344 out of 2,770 VC-backed IPOs (12%) involved "growth capital," defined as investing in tangible assets such as assisted living facilities and managed care or restaurants, or for making acquisitions. 88% of the VC-backed IPOs involved companies spending heavily on R&D or related expenditures traditionally associated with VC financing.

Table 8 shows that among VC-backed IPOs, tech stocks have done better than life science stocks during the three years after the IPO. VC-backed tech IPOs outperform other tech IPOs and do not underperform style-matched non-issuers, suggesting that the market underestimates the value of VC-backing for tech companies at the IPO. In contrast, VC-backed life science IPOs underperform style-matched non-issuers and other life science IPOs, suggesting that the market overestimates the value of VC-backing for life science companies at the IPO. Inspection of Table 8 shows that nonVC-backed life science IPOs have had the best long-run performance of any of the categories shown. Many of these 199 IPOs have been spinoffs.

[Insert Table 8 about here]

Table 9 uses a shorter sample period, the 1999-2022 period during which VC-backed IPOs have underperformed other IPOs. The table shows that low long-run returns on VC-backed companies are present for both tech and life science companies. The relatively high average first-day return on VC-backed tech companies is partly due to the 1999-2000 and 2020-2021 periods during which valuation ratios, as shown in Tables 3 and 4, rapidly escalated and then peaked. These periods also saw low long-run returns.

[Insert Table 9 about here]

Because the vast majority of buyout-backed companies conducting IPOs have substantial sales, it is important to control for sales when analyzing the relative performance of buyout-backed IPOs. Panel A of Table 10 shows that financial-sponsor-backed IPOs outperform other IPOs during the three years after the IPO, consistent with the Table 6 results in which IPOs were categorized on the basis of VC-backing and sales. Panel B of Table 10 suggests that this pattern of underperformance of IPOs without a financial sponsor is driven by the poor performance of small firms. Among IPOs with at least $100 million in LTM sales (2023 purchasing power),

buyout-backed and non-buyout-backed IPOs have similar performance and do not noticeably underperform style-matched non-issuers.

[Insert Table 10 about here]

The results in Tables 6 and 10, in which companies with annual sales of below $100 million subsequently underperform, and the larger companies do not, is consistent with the following hypothesis: The main buyers, at both the offer price and in the aftermarket, of the larger companies are institutional investors. On average, these institutions value the companies appropriately. In contrast, smaller companies are disproportionately bought by retail investors, who on average are too optimistic. A caveat, however, is that most life science companies, which frequently have zero trailing revenue, are mainly held by institutions.

SPACs

During 2020-2024, merging with a SPAC became an important way for a private company to enter public markets. Table 11 documents the explosive growth and collapse of the SPAC IPO market, with the 2020 and 2021 cohorts having 63% (861 of 1,356) of the SPAC IPOs during 1990-2022, and an even higher share of the proceeds.[11] From 2021 to 2023, 399 operating companies went public by merging with a SPAC in the three-year period, as shown in Table 12.

[Insert Table 11 about here]

A SPAC is a blank check company that is created by a sponsor, which goes public in an IPO and then places the IPO proceeds into a trust account, which is normally invested in short-

[11] During the 2004-2008 SPAC boom, Cumming, Hass, and Schweizer (2014) report that 59% of SPAC IPOs completed a merger, with the other 41% liquidating. Jenkinson and Sousa (2011) and Vulanovic (2017) also examine SPACs from the pre-2020 period.

term T-bills. The SPAC has a set period of time, generally two years after the IPO, to consummate a merger with a private operating company. If no merger occurs, the money in the escrow account is returned to public shareholders, generally with interest. If a merger is negotiated, each public shareholder (frequently a hedge fund) has the right to redeem its shares, receiving the principal and interest. Further details about SPACs are explained in Klausner, Ohlrogge, and Ruan (2022) and Gahng, Ritter, and Zhang (2023), among other places.

[Insert Table 12 about here]

Klausner et al. (2022) and Klausner and Ohlrogge (2023) analyze deSPACs. They document that mergers with high redemption rates, on average, deliver less cash per share to the merged entity than those with low redemption rates. The reason for this pattern is that SPAC sponsors almost always have founder shares equal to 25% of the number of shares issued in the SPAC IPO, and unless the sponsor relinquishes some of these shares or attracts a large PIPE investment, these founder shares become a larger fraction of the SPAC shares when there are high redemptions of the public shares. Because the cash comes from public shares that aren't redeemed and PIPE shares, the founder shares dilute the cash per share. The authors report that the cash per share delivered is positively related to deSPAC returns.

Table 12 reports the average redemption rates, by quarter, for deSPACs, for the seven years from 2017-2023. The table shows that in the last quarter of 2020 and the first two quarters of 2021, the average redemption rate was less than 30%. In contrast, in all quarters of 2022 and 2023, the average redemption rate was above 80%. The dramatic changes in average redemption rates can be attributed to several factors. First, because there is a delay of several months between when deal terms are announced and redemption decisions are made, changes in market conditions affect the attractiveness of the merger. Probably more importantly, however, changes

in investor sentiment also come into play. In late 2020 and early 2021, when investors were enthusiastic about both SPAC mergers and some of the industries represented among the operating companies represented in the mergers, such as electric vehicles, the redemption ratios were much lower than they have subsequently been.

In Table 12, we also report the average redemption rates separately for VC-backed and non-VC-backed deSPACs based on whether the operating company in a deSPAC merger is VC-backed or not. Although VC-backed deSPACs have lower long-run returns than other deSPACs as reported in Tables 13 and 14, the redemption rates for these two groups are largely similar.

Many people view the 2020-2021 boom in SPAC IPOs and announced mergers as a bubble. If so, why did it occur? Although one can only make conjectures, Robert Shiller's book *Narrative Economics* (2019) posits that sometimes a story "goes viral." It may not be a coincidence that the SPAC bubble occurred at about the same time that cryptocurrency prices peaked, and so-called "meme stocks" such as Bed Bath & Beyond (ticker BBBY), AMC (ticker AMC), and Gamestop (ticker GME) shot up in price, only to collapse later on.[12] In the year beginning in March 2020, the COVID-19 pandemic resulted in a drop in personal expenditures on services. Some of this reduced spending on services such as restaurant meals probably was directed towards speculative investments.

[12] These three companies were money-losing companies that many thought were heading for bankruptcy in 2020. BBBY went from less than $5 per share in March 2020 to over $35 in January 2021 before falling to less than $0.25 per share in April 2023. AMC went from less than $1.50 per share in December 2020 to over $35 in June of 2021 before declining to less than $5 per share in April 2023 before a 1-10 reverse split, with the stock falling even more by September 2023. GME went from less than $1 in July of 2020 to over $80 in January 2021 before falling to about $10 per share less than a month later. Bitcoin prices went from less than $7,000 in March 2020 to over $60,000 in April 2021 before declining to less than $17,000 in late 2022. Bitcoin price surged again in late 2024, with a price of $96,157.79 at the end of November, 2024.

Panel A of Table 13 reports the post-merger returns for deSPACs from 2012-2022. The table shows that over a one-year or three-year horizon (through the end of 2023 for the 2021-2022 cohorts), the equally weighted (EW) average buy-and-hold returns have been negative, with the market-adjusted returns even worse.[13] These negative market-adjusted returns are much lower than the long-run returns on IPOs from 2001-2022, reported in Panel E of Table 5.

[Insert Table 13 about here]

Although the EW deSPAC returns reported in Table 13 are low, it should be noted that, due to high redemption rates on the mergers that subsequently did worst, when returns are weighted by the amount of cash delivered by public market investors net of redemptions, this public cash-weighted average return has not been as bad as the EW average return. As documented in Gahng et al. (2023, Panel B of Table 4), the public cash-weighted one-year return of -3.0% for deSPACs from 2012-2020 is not as negative as the EW average return of -11.3%. The reason is that, consistent with Klausner et al (2022), deSPACs with high redemption ratios do worse, and these deSPACs have relatively little public cash invested.

Long-run Performance of VC-backed deSPACs

Panel B of Table 13 categorizes deSPACs by whether they were VC-backed or not. During 2017-2022, VC-backed deSPACs have been followed by lower stock returns than other deSPACs during the one-year and three-year periods after the deSPAC. The average one-year

[13] Kiesel, Klingelhofer, Schiereck, and Vismara (2023) report an average announcement return of 7.4% at the time of the merger announcement, and a -14.1% abnormal return in the year after the announcement, which typically includes both a pre-merger and post-merger period, for 236 deSPACs completed between January 2012 and June 2021.

market-adjusted returns for VC-backed deSPACs and other deSPACs are -59.4% and -38.9%, respectively. Thus, the market appears to overestimate the value of VC-backing at the deSPAC during 2017-2022, consistent with the results on IPOs in Table 5. Although not shown, very few of these deSPACs have been life science companies.

Table 14 shows the three-year returns following deSPACs (Panel A) and IPOs (Panel B) in each year of 2017-2022, sorted by VC-backing. In each cohort year, VC-backed deSPACs have lower average three-year market-adjusted returns than other deSPACs. VC-backed IPOs have higher average three-year market-adjusted returns than other IPOs in 2017, 2018, and 2022, but the opposite is true in 2019-2021. Overall, VC-backed IPOs and other IPOs during 2017-2022 have similar average three-year market-adjusted returns.

[Insert Table 14 about here]

Taken together, the results in Table 4, Table 5, Table 9, Panel B of Table 13, and Table 14 provide some evidence that the market has on average overestimated the value of VC-backing for IPOs since 1999 and for deSPACs since 2017.

Panel C of Table 14 reports the equally weighted 3-year buy-and-hold returns on deSPACs, IPOs, and direct listings from 2017-2022, without separating VC-backed and nonVC-backed listings. For the 13 direct listings, the company starts to trade with shares being sold by existing shareholders. 3-year buy-and-hold returns are computed from the opening price for the direct listings, whereas for deSPACs and IPOs, the returns have been computed from the closing market price on the first day of trading.[14] The numbers show that the average returns for IPOs

[14] For IPOs and direct listings, the average open-to-close return during the first day is close to zero, whereas for deSPACs, on average this return is slightly negative.

and direct listings have been very similar, but that deSPACs have done dramatically worse, whether one looks at raw returns or market-adjusted returns.

At this point, there is no well received theory to explain why some firms might find it optimal to go public with a SPAC merger while others conduct a traditional IPO or direct listing. Gahng et al. (2023, Table 2) run a probit regression using inflation-adjusted sales, age, and profitability to explain the choice, but report a pseudo R-squared value of less than 1%.

Groh et al. (2022) analyze VC-backed companies that exit via SPAC mergers and compare them with those that exit via an IPO. They conclude that the VC-backed companies that exit via SPAC mergers are on average of lower quality than those conducting IPOs, as measured by subsequent returns. A comparison of VC-backed deSPACs in Panel A of Table 14 and VC-backed IPOs in Panel B provides support for their interpretation.

Conclusions

For successful portfolio companies financed with venture capital, the most common exit in recent decades has been to get acquired by a larger company in the same industry, known as a trade sale. Many of the most prominent exits, however, have been with an IPO or, more recently, going public by merging with a SPAC. The reduction in the number of IPOs since 2001 has largely been driven by two factors: 1) The increase in the availability of VC money has allowed companies to stay private longer, and 2) the increasingly attractive business strategy of merging to achieve scale faster, instead of remaining independent, has encouraged startups to be acquired. The second factor appears to be more important in explaining the reduced IPO volume, in that if companies were merely staying private a few years longer, there would be older, and not dramatically fewer, companies going public.

Venture capital investments in startup companies have grown dramatically over time, from an inflation-adjusted average of less than $10 billion per year in the early 1990s to an average of about $250 billion per year in recent years. In contrast, cash raised from newly issued shares in IPOs and SEOs, and cash delivered in mergers with SPACs, has shown relatively little growth, averaging about $115 billion per year throughout this 34-year period, although with substantial year-to-year variation. Simply put, the importance of private markets relative to public markets for raising cash has grown dramatically in recent decades. Successful operating company startups increasingly exit via a trade sale, with the value of these exits increasing from an average of less than $5 billion per year in the early 1990s to an annual average of almost $70 billion in recent years.

On average, VC-backed IPOs have had higher returns than nonVC-backed IPOs in the three years after the IPO. Using 9,127 U.S. IPOs from 1980-2022, Table 5 reports an average three-year market-adjusted return of -12.5% for VC-backed IPOs, whereas nonVC-backed IPOs had an average market-adjusted return of -24.2%, with both of these returns measured from the first closing market price. For IPOs from 1999-2022, however, there has been a reversal of this pattern. Table 9 reports that the average market-adjusted return following nonVC-backed IPOs has become less negative, whereas it has become worse for VC-backed IPOs.

For IPOs from 1980-2022, the long-run returns on small companies, as measured by inflation-adjusted annual sales, have been substantially worse than those on large company IPOs, whether VC-backed or not. The poor performance for public market investors of these small company IPOs suggests that the reduction in the number of small company IPOs that has occurred since 2000 may be good for retail investors.

In recent years, merging with a SPAC has also become a common way for a company to go public. In 2012-2022, 451 operating companies completed a merger with a SPAC and started to trade on Nasdaq or the NYSE. Of these 451 so-called deSPACs, the average three-year market-adjusted buy-and-hold return has been -74.7%, substantially worse than the -11.0% average for 2,608 IPOs during 2001-2022. It should be noted, however, that some of the deSPACs with high redemption rates had a very small public float after the deSPAC, so that the dollar amount of money lost by public market investors was not large for those deals. For deals from 2017-2022, Table 14 shows that deSPACs have resulted in far worse returns than IPOs and direct listings, with the VC-backed deSPACs doing especially poorly. These return patterns are consistent with the hypothesis that on average the operating companies merging with SPACs are disproportionately of low quality. Alternatively stated, the VC-backed companies going public through SPAC mergers in particular have suffered from adverse selection, and the market has not fully taken this fact into account at the time of the merger.

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Figure 1

VC Exits

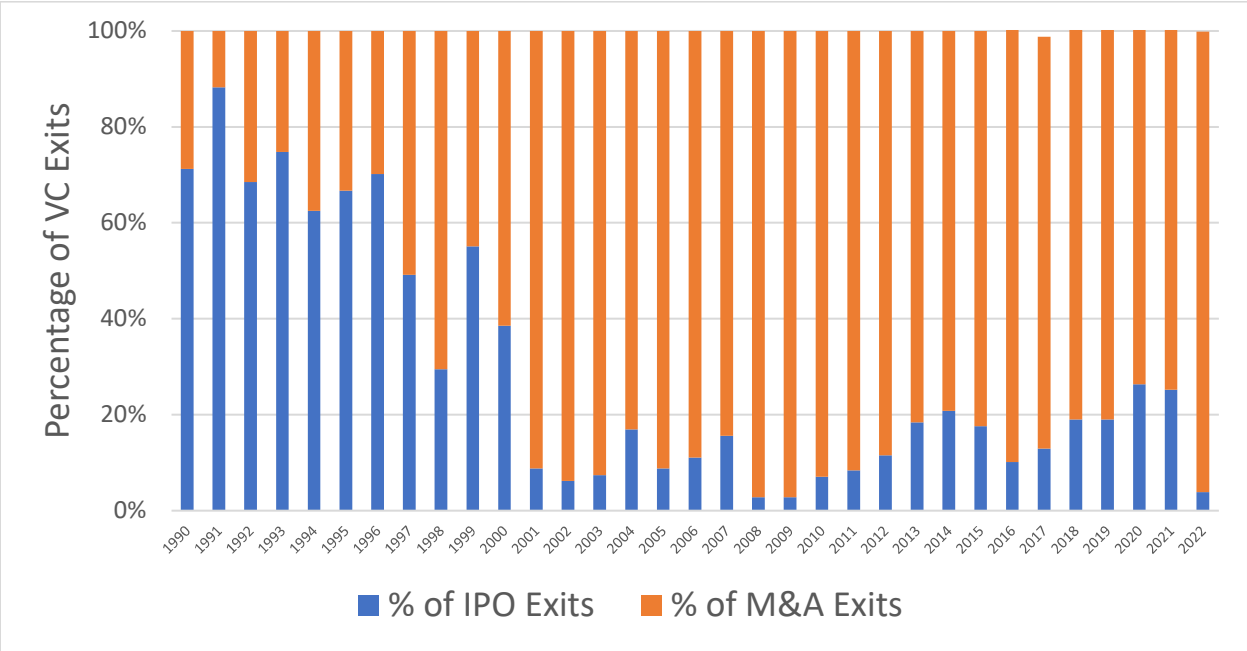

Figure 1 (an updated version of Figure 2 in Gao, Ritter, and Zhu (2013)) shows that the percentage of successful portfolio companies that exit via an initial public offering (IPO) rapidly declined during the 1990s before plateauing at roughly 10% after 2000. Most other exits are either trade sales (M&A), with some sales to financial buyers and, especially in 2021 and 2022, mergers with SPACs (which could also be classified as IPOs, since the portfolio company goes public via the merger). These alternative exits are included in the M&A category. Data are from NVCA Yearbooks, Pitchbook/NVCA Quarterly Reports, and JP Morgan *Private Equity Distribution Management* newsletters (for 2016-2022).

Table 1

VC-backed and Buyout-backed IPOs, 1980-2022

There are 9,127 initial public offerings (IPOs) after excluding those with an offer price below $5.00 per share, unit offers, ADRs, closed-end funds, natural resource limited partnerships, special purpose acquisition companies (SPACs), REITs, bank and S&L IPOs, small best efforts offerings, and firms not listed on CRSP within six months of the IPO. Financial sponsors are venture capital (VC) and buyout funds. Jerry Cao has provided information on which IPOs are buyout-backed, and Will Gornall and Ilya Strebulaev have supplied information on VC-backed IPOs. VC-backing classification is based on whether an IPO has an independent venture capital firm as a shareholder at the time of the IPO.

(table on the next page)

Year	Number of IPOs	Financial sponsor-backed		VC-backed		Buyout-backed	
		No.	%	No.	%	No.	%
1980	71	24	34%	23	32%	1	1%
1981	192	54	28%	53	28%	1	1%
1982	77	23	30%	21	27%	2	3%
1983	451	133	29%	116	26%	17	4%
1984	171	49	29%	44	26%	5	3%
1985	186	57	31%	39	21%	18	10%
1986	393	121	31%	79	20%	42	11%
1987	285	107	38%	66	23%	41	14%
1988	105	41	39%	32	30%	9	9%
1989	116	50	43%	40	34%	10	9%
1990	110	55	50%	42	38%	13	12%
1991	286	188	66%	115	40%	73	26%
1992	412	236	57%	138	33%	98	24%
1993	510	251	49%	172	34%	79	15%
1994	402	151	38%	129	32%	22	5%
1995	462	220	48%	190	41%	30	6%
1996	677	300	44%	266	39%	34	5%
1997	474	172	36%	134	28%	38	8%
1998	283	110	39%	80	28%	30	11%
1999	476	310	65%	280	59%	30	6%
2000	380	277	73%	245	64%	32	8%
2001	80	53	66%	32	40%	21	26%
2002	66	43	65%	23	35%	20	30%
2003	63	46	73%	25	40%	21	33%
2004	173	122	71%	79	46%	43	25%
2005	159	113	71%	45	28%	68	43%
2006	157	122	78%	56	36%	66	42%
2007	159	109	69%	79	50%	30	19%
2008	21	12	57%	9	43%	3	14%
2009	41	31	76%	12	29%	19	46%
2010	91	68	74%	40	44%	28	29%
2011	81	63	78%	46	57%	17	21%
2012	93	77	83%	49	53%	28	30%
2013	158	118	75%	81	52%	37	23%
2014	206	170	83%	132	64%	38	18%
2015	118	98	83%	78	65%	20	17%
2016	75	62	83%	49	65%	13	17%
2017	106	82	77%	64	60%	18	17%
2018	134	106	79%	91	68%	15	11%
2019	113	88	79%	77	69%	11	10%
2020	165	135	82%	113	68%	22	13%
2021	311	242	78%	175	56%	67	22%
2022	38	16	42%	14	37%	2	5%
1980-1989	2,047	659	32%	513	25%	146	7%
1990-1998	3,616	1,683	47%	1,266	35%	417	12%
1999-2000	856	587	69%	525	61%	62	7%
2001-2022	2,608	1,976	76%	1,369	52%	607	23%
1980-2022	**9,127**	**4,905**	**54%**	**3,673**	**40%**	**1,232**	**13%**

Table 2: Proceeds from Venture Capital, Trade Sales, and Equity Issues, 1990-2023

The table reports investments by VC funds in U.S. startups, the value of VC-backed firms being acquired (trade sales), and the proceeds from newly issued shares in IPOs and SEOs, plus the cash delivered in deSPAC transactions, of operating companies. All numbers are in billions of dollars of January 2023 purchasing power.

Public equity is the sum of net IPO proceeds, net SEO proceeds, and cash delivered in deSPAC transactions. Net IPO and SEO proceeds are for all operating companies, not just those that are VC-backed, and exclude unit offers and ADRs and GDRs. Net IPO and SEO proceeds are defined as the proceeds from newly issued shares of operating companies, and do not subtract fees paid to underwriters. For IPOs, unit offers and those with an offer price below $5.00 (with no inflation adjustments) are also excluded, as are IPOs of banks and S&Ls and limited partnerships of natural resource-based companies. For SEOs, banks and S&Ls are included, there is no offer price screen, and foreign issuers that are also listed on a foreign exchange are excluded. For both IPOs and SEOs, OTC issues are excluded. Net proceeds refers to the proceeds raised by the issuing firm, and excludes proceeds from selling shareholders, if any. For IPOs, we exclude overallotment shares, but for SEOs, we include them.

DeSPACs is the amount raised by operating companies through mergers with SPACs. SPAC Research is the source of the data used for the 2016-2023 deSPAC proceeds calculations, and includes the trust account value multiplied by (1– redemption ratio) with the proceeds from PIPE and forward purchase agreements (FPA), if any, added. For deSPACs from 2000-2015, we manually checked the SEC EDGAR files. We use the initial trust account value when redemptions are not available in the 8-K deSPAC filing. Milos Vulanovic supplied deSPAC proceeds numbers for the 1990s.

For trade sales, transactions for which the value of the deal is not included are treated as zero. The conventional wisdom is that these missing transaction values are disproportionately for smaller deals. Deal value includes both cash and the value of acquirer stock received, but generally excludes the value of earnout provisions. VC investments and trade sales numbers come from the 2012 and 2024 editions of the *NVCA Yearbook*. The numbers for 1990-2009 for "VC M&A" in Figure 5.07 of the 2012 Yearbook are multiplied by 1.47 to adjust for the fact that the 2010 and 2011 numbers in the 2024 Yearbook are on average 47% higher than those reported for those years in the 2012 Yearbook. The numbers for 1990-2006 are multiplied by 1.30 to adjust for the fact that the 2007-2010 numbers in the 2024 Yearbook for "U.S. VC Deal Flow (Capital Invested)" are on average 30% higher than those reported on page 29 of the 2012 Yearbook for "VC Capital Investments."

Year	Venture Capital Investment	Trade Sales	Public Equity	Net IPOs	Net SEOs	DeSPACs
1990	$7.8	$0.3	$18.0	$6.6	$11.4	0
1991	$5.8	$0.6	$63.5	$26.3	$37.2	0
1992	$9.2	$7.3	$78.7	$37.5	$41.2	0
1993	$9.3	$5.2	$101.5	$52.3	$49.0	$0.2
1994	$10.1	$10.1	$47.7	$26.2	$21.3	$0.2
1995	$18.7	$11.0	$79.5	$40.8	$38.6	0
1996	$26.4	$24.0	$116.6	$67.5	$49.1	0
1997	$34.2	$18.9	$97.2	$47.5	$49.7	0
1998	$47.2	$25.6	$105.7	$53.6	$52.1	0
1999	$120.3	$99.7	$198.0	$103.3	$94.7	0
2000	$226.3	$175.6	$231.8	$109.5	$122.2	0.0
2001	$83.7	$44.1	$134.2	$55.1	$79.1	0.0
2002	$44.5	$18.4	$95.4	$25.0	$70.4	0.0
2003	$39.4	$17.7	$76.1	$11.2	$64.9	0.0
2004	$46.6	$36.2	$98.8	$32.1	$66.7	0.0
2005	$46.5	$39.1	$99.9	$34.7	$65.0	$0.3
2006	$45.0	$42.4	$88.4	$36.8	$51.0	$0.6
2007	$51.8	$58.4	$97.0	$36.7	$56.5	$3.8
2008	$52.4	$28.5	$214.9	$28.6	$183.3	$2.9
2009	$39.3	$23.9	$243.7	$11.0	$227.1	$5.6
2010	$44.4	$44.0	$101.2	$13.8	$84.6	$2.7
2011	$61.5	$38.4	$76.3	$22.6	$53.6	$0.1
2012	$54.6	$47.4	$66.5	$25.7	$40.3	$0.5
2013	$64.2	$38.0	$113.1	$43.9	$68.3	$0.9
2014	$94.0	$80.3	$102.1	$38.4	$63.3	$0.4
2015	$109.9	$50.3	$111.1	$24.0	$85.6	$1.5
2016	$105.4	$60.3	$102.7	$12.2	$88.2	$2.3
2017	$110.2	$49.0	$97.9	$21.5	$72.5	$3.9
2018	$176.0	$72.5	$121.8	$34.8	$80.7	$6.3
2019	$175.9	$78.0	$108.7	$42.6	$58.8	$7.3
2020	$199.0	$79.5	$215.6	$63.4	$125.5	$26.7
2021	$394.4	$116.8	$336.5	$115.0	$107.7	$113.8
2022	$255.2	$42.5	$52.2	$4.7	$32.2	$15.3
2023	$170.6	$26.7	$52.1	$9.4	$37.6	$5.1
Total	**$2,980**	**$1,484**	**$3,944**	**$1,314**	**$2,430**	**$200**

Table 3

Financial Sponsor-backed Technology Company IPOs, 1980-2022

There are 2,225 IPOs are tech companies with a financial sponsor (VC or buyout firm), after excluding those with an offer price below $5.00 per share, unit offers, ADRs, closed-end funds, small best effort offers, natural resource limited partnerships (and most other LPs, but not buyout firms such as Carlyle Group), special purpose acquisition companies (SPACs), direct listings, REITs, bank and S&L IPOs, and firms not listed on CRSP. Missing and questionable numbers from the SDC new issues database are supplemented by direct inspection of prospectuses on EDGAR, information from Dealogic for IPOs after 1991, Howard and Co.'s *Going Public: The IPO Reporter* from 1980-1985, and the Graeme Howard-Todd Huxster collection of IPO prospectuses for 1975-2006. Tech stocks are defined as internet-related stocks plus other technology stocks including telecom, but not including life sciences. Loughran and Ritter (2004) list the SIC codes in their appendix 3 and sources of founding dates in appendix 1. The definition of technology stocks has been changed from that in Loughran and Ritter (2004 *Financial Management*), with SIC=3559, 3576 (computer communications equipment code for 21 companies, including Cisco Systems), 3844, and 7389 added to tech. Some 7389 (business services) companies have had their SIC codes changed into non-tech categories, such as consulting and two new SIC codes that Jay Ritter made up: 5614 for telemarketing firms and 7388 for non-tech business services such as Sotheby's Auctions.

For buyout-backed IPOs, the founding date of the predecessor company is used. Price-to-sales ratios are computed using both the offer price (OP) and the first closing market price (MP) for computing the market capitalization of equity. Market cap is calculated using the post-issue shares outstanding, with all share classes included in the case of dual-class companies. The undiluted number of shares is used, which is some cases (e.g., Facebook, Twitter, and Castlight Health) understates the market cap due to the existence of substantial amounts of in-the-money employee stock options that are highly likely to be exercised. Sales are the last twelve months (LTM) revenues as reported in the prospectus. The median sales, in millions, is expressed in both nominal dollars and in dollars of 2023 purchasing power using the CPI. The median age, in years, is the number of years between the calendar year of the founding date and the calendar year of the IPO. Martin Kenney and Don Patton have contributed to the data on founding dates. The percentage of IPOs that are profitable measures profitability using trailing LTM earnings (usually using after extraordinary items earnings, and usually using pro forma numbers that are computed assuming that any recent or concurrent mergers have already occurred, and the conversion of convertible preferred stock into common stock). In some cases, last fiscal year earnings are used when LTM earnings are unavailable.

(table on the next page)

Year	Number of Financial-sponsor-backed tech IPOs	Median Price-to-sales		Median sales, $mm		Median age	% profitable
		OP	MP	Nominal	$2023		
1980	14	3.0	3.4	16.9	64.5	6.5	93%
1981	29	3.8	4.3	11.9	40.5	9	90%
1982	15	6.1	7.6	18.9	59.6	3	67%
1983	68	7.3	8.3	12.0	36.3	4.5	65%
1984	26	2.3	2.3	21.9	63.6	5	81%
1985	16	3.0	3.3	17.1	48.2	5	81%
1986	34	4.0	4.5	19.4	52.5	5	71%
1987	41	3.2	3.2	22.3	59.4	5	88%
1988	18	2.7	2.7	29.2	74.8	6	94%
1989	24	3.3	3.7	36.2	88.6	7.5	83%
1990	24	3.9	4.5	28.6	66.4	7.5	100%
1991	52	2.7	3.2	39.6	87.3	9	73%
1992	83	3.5	3.7	24.7	53.0	8	55%
1993	92	3.0	3.6	26.1	54.1	8	73%
1994	67	4.1	5.2	20.8	42.2	8	67%
1995	126	5.0	6.5	21.3	42.0	8	71%
1996	157	9.6	10.9	14.7	28.2	7	36%
1997	78	6.2	7.7	20.1	37.5	7	40%
1998	62	10.2	13.9	20.8	38.1	6	24%
1999	264	28.1	53.7	11.3	20.5	4	9%
2000	202	35.6	60.1	10.2	17.8	5	8%
2001	19	13.7	14.6	24.6	41.7	6	16%
2002	17	2.9	3.1	101.1	169.1	10	41%
2003	16	3.5	4.1	86.2	140.6	8.5	44%
2004	50	6.6	7.1	51.7	82.7	8	40%
2005	34	4.8	5.1	66.8	103.9	9	29%
2006	39	5.3	5.9	59.2	88.5	9	54%
2007	65	6.5	8.0	72.5	102.8	8	28%
2008	5	4.2	5.6	240.3	337.3	14	60%
2009	11	3.3	4.0	180.4	253.2	10	64%
2010	32	3.4	3.9	132.8	181.5	11	63%
2011	34	5.3	6.5	160.1	215.4	10.5	35%
2012	38	4.3	4.9	119.8	156.7	10.5	42%
2013	40	5.2	5.8	110.3	142.0	9.5	25%
2014	46	6.2	7.0	99.4	125.9	10	17%
2015	36	5.3	6.2	126.3	160.1	11	22%
2016	17	4.2	4.3	109.5	137.1	10	29%
2017	27	4.9	6.5	162.6	198.5	13	11%
2018	33	7.7	11.7	184.9	221.0	12	12%
2019	30	9.4	13.3	205.8	242.3	11	20%
2020	38	14.9	25.3	220.4	253.4	12	21%
2021	105	15.5	18.4	208.4	236.2	12	20%
2022	1	20.6	24.0	70.4	74.2	14	0%
1980-2022	**2,225**	**6.8**	**8.4**	**28.3**	**56.2**	**8.0**	**40%**

Table 4

VC-backed Tech IPOs. 1980-2022

There are 1,992 VC-backed tech IPOs, after excluding those with an offer price below $5.00 per share, unit offers, ADRs, closed-end funds, small best effort offers, natural resource limited partnerships (and most other LPs, but not buyout firms such as Carlyle Group), special purpose acquisition companies (SPACs), direct listings, REITs, bank and S&L IPOs, and firms not listed on CRSP. The definition of tech stocks is described in the caption to Table 3.

Price-to-sales ratios are computed using both the offer price (OP) and the first closing market price (MP) for computing the market capitalization of equity. Market cap is calculated using the post-issue shares outstanding, with all share classes included in the case of dual-class companies. The undiluted number of shares is used, which is some cases (e.g., Facebook, Twitter, and Castlight Health) understates the market cap due to the existence of substantial amounts of in-the-money employee stock options that are highly likely to be exercised. Sales are the last twelve months (LTM) revenues as reported in the prospectus. The median sales, in millions, is expressed in both nominal dollars and in dollars of 2023 purchasing power using the CPI. The median age, in years, is the number of years since the calendar year of the founding date and the calendar year of the IPO. The percentage of IPOs that are profitable measures profitability using trailing LTM earnings (usually using after extraordinary items earnings, and usually using pro forma numbers that are computed assuming that any recent or concurrent mergers have already occurred, and the conversion of convertible preferred stock into common stock). In some cases, last fiscal year earnings are used when LTM earnings are unavailable.

Even concepts like market cap (for the price-to-sales ratios) become ambiguous when you realize that companies like Facebook have many deep in-the-money options outstanding, so whether you use the fully diluted number of shares or the undiluted number can affect the calculations substantially for some companies.

(table on the next page)

Year	Number of VC-backed tech IPOs	Median Price-to-sales		Median sales, $mm		Median age	% profitable
		OP	MP	Nominal	$2023		
1980	14	3.0	3.4	16.9	64.5	6.5	93%
1981	29	3.8	4.3	11.9	40.5	9	90%
1982	15	6.1	7.6	18.9	59.6	3	67%
1983	67	7.2	8.1	11.7	35.4	5	66%
1984	26	2.3	2.3	21.9	63.6	5	81%
1985	16	3.0	3.3	17.1	48.2	5	81%
1986	31	4.3	4.7	17.0	46.0	5	71%
1987	39	3.2	3.2	22.0	58.6	5	87%
1988	17	2.6	2.7	28.2	72.2	6	94%
1989	23	3.4	3.7	35.5	86.9	7	83%
1990	24	3.9	4.5	28.6	66.4	7.5	100%
1991	45	3.2	3.5	35.9	79.0	9	71%
1992	67	3.9	4.4	22.0	47.2	7	61%
1993	88	3.1	3.6	24.3	50.5	8	72%
1994	64	4.3	5.2	18.9	38.3	8	66%
1995	115	5.5	6.9	19.7	38.8	8	70%
1996	154	9.8	11.3	14.3	27.4	7	35%
1997	73	6.9	8.3	19.3	36.0	6	38%
1998	55	11.6	14.8	18.8	34.5	6	22%
1999	250	30.9	56.6	11.0	19.9	4	9%
2000	183	41.4	65.7	9.3	16.3	5	6%
2001	17	14.9	17.4	22.8	38.6	6	12%
2002	13	3.5	3.9	87.3	146.0	6	31%
2003	12	5.2	6.1	65.0	106.0	7	50%
2004	40	6.9	7.9	41.0	65.7	7	30%
2005	22	6.4	7.2	46.5	72.3	7.5	23%
2006	27	6.2	8.1	51.2	76.6	8	52%
2007	58	7.3	8.3	66.5	94.3	8	26%
2008	4	4.1	4.7	156.7	219.9	12	50%
2009	6	4.6	5.8	105.7	148.3	9.5	50%
2010	23	3.2	3.9	112.9	154.4	10	61%
2011	30	6.8	7.2	117.2	157.8	9.5	37%
2012	35	4.6	5.0	103.7	135.7	9	37%
2013	35	5.8	7.1	104.2	134.1	9	17%
2014	40	6.5	8.2	86.8	110.0	10	18%
2015	29	6.0	7.5	76.6	97.1	10	21%
2016	15	4.5	5.9	101.7	127.3	9	27%
2017	24	5.0	6.9	158.4	193.4	13	13%
2018	30	8.6	12.4	173.6	207.4	12	13%
2019	26	9.8	13.7	146.6	172.7	10.5	15%
2020	33	15.7	27.2	201.3	231.3	11	18%
2021	77	20.3	26.6	136.4	154.6	11	16%
2022	1	20.6	24.0	70.4	74.2	14	0%
1980-2022	**1,992**	**7.6**	**9.7**	**23.9**	**48.5**	**7**	**39%**

Table 5

Long-run Returns on IPOs Categorized by VC-backing, by Subperiod

The sample is composed of 9,127 IPOs from 1980-2022, with returns calculated through the end of December 2023. IPOs with an offer price below $5.00 per share, unit offers, small best efforts offerings, ADRs, REITs, closed-end funds, SPACs, natural resource limited partnerships, banks and S&Ls, and IPOs not listed on CRSP within six months of the offer date are excluded. Buy-and-hold returns are calculated from the first closing market price until the earlier of the three-year anniversary or the delisting date (Friday, Dec. 29 of 2023 for IPOs from 2021 and 2022). Market-adjusted returns use the CRSP value-weighted index. Style adjustments use firms matched by market cap and book-to-market ratio with at least five years of CRSP listing and no follow-on equity issues in the prior five years. Specifically, the firm with the closest book-to-market ratio within the size decile of the IPO is used for the matching firm. Market capitalization (size) is calculated using the first closing market price after the IPO. All returns are equally weighted averages and include dividends and capital gains, including the index returns.

Panel A: IPOs from 1980-2022 categorized by venture capital backing

VC-backed or not	Number of IPOs	Average First-day Return	Average 3-year Buy-and-hold Return		
			IPOs	Market-adjusted	Style-adjusted
VC-backed	3,673	27.2%	21.9%	-12.5%	-3.3%
NonVC-backed	5,454	13.5%	18.0%	-24.2%	-12.4%
All	9,127	19.0%	19.6%	-19.5%	-8.7%

Panel B: IPOs from 1980-1989

VC-backed or not	Number of IPOs	Average First-day Return	Average 3-year Buy-and-hold Return		
			IPOs	Market-adjusted	Style-adjusted
VC-backed	513	8.6%	31.9%	-14.0%	14.0%
NonVC-backed	1,534	6.8%	19.3%	-25.5%	-1.8%
All	2,047	7.2%	22.5%	-22.6%	2.2%

Panel C: IPOs from 1990-1998

VC-backed or not	Number of IPOs	Average First-day Return	Average 3-year Buy-and-hold Return		
			IPOs	Market-adjusted	Style-adjusted
VC-backed	1,266	17.3%	60.7%	-1.1%	27.0%
NonVC-backed	2,350	13.5%	28.4%	-31.8%	-14.9%
All	3,616	14.8%	39.7%	-21.0%	-0.2%

Panel D: IPOs from 1999-2000

VC-backed or not	Number of IPOs	Average First-day Return	Average 3-year Buy-and-hold Return		
			IPOs	Market-adjusted	Style-adjusted
VC-backed	525	80.9%	-62.3%	-40.5%	-62.5%
NonVC-backed	331	38.7%	-38.6%	-17.9%	-53.3%
All	856	64.6%	-53.1%	-31.8%	-58.9%

Panel E: IPOs from 2001-2022

VC-backed or not	Number of IPOs	Average First-day Return	Average 3-year Buy-and-hold Return		
			IPOs	Market-adjusted	Style-adjusted
VC-backed	1,355	22.2%	14.5%	-11.8%	-15.0%
NonVC-backed	1,215	14.6%	11.8%	-10.2%	-9.9%
All	2,608	19.0%	13.2%	-11.0%	-12.6%

Table 6
Long-run Returns on IPOs Categorized by VC-backing and Real Sales

The sample is composed of 9,127 IPOs from 1980-2022, with returns calculated through the end of December 2023. IPOs with an offer price below $5.00 per share, unit offers, small best efforts offerings, ADRs, REITs, closed-end funds, SPACs, natural resource limited partnerships, banks and S&Ls, and IPOs not listed on CRSP within six months of the offer date are excluded. Buy-and-hold returns are calculated from the first closing market price in Panels A and B, and from the offer price in Panels C and D, until the earlier of the three-year anniversary or the delisting date (Dec. 29 of 2023 for IPOs from 2021 and 2022). Market-adjusted returns use the CRSP value-weighted index. Style adjustments use firms matched by market cap and book-to-market ratio with at least five years of CRSP listing and no follow-on equity issues in the prior five years. Sales are the trailing twelve month revenues listed in the IPO prospectus, measured in terms of dollars of January 2023 purchasing power using the CPI.

Panel A: IPOs with Sales<$100 million from 1980-2022 categorized by VC-backing

		Average	Average 3-year Buy-and-hold Return		
VC-backed or not	Number of IPOs	First-day Return	IPOs	Market-adjusted	Style-adjusted
VC-backed	2,724	28.8%	12.4%	-20.9%	-8.3%
NonVC-backed	2,599	17.3%	1.8%	-43.6%	-24.4%
All	5,323	23.2%	7.2%	-32.0%	-16.2%

Panel B: IPOs with Sales>$100 million from 1980-2022 categorized by VC-backing

		Average	Average 3-year Buy-and-hold Return		
VC-backed or not	Number of IPOs	First-day Return	IPOs	Market-adjusted	Style-adjusted
VC-backed	949	22.5%	49.2%	11.5%	11.1%
NonVC-backed	2,855	10.0%	32.8%	-6.6%	-1.4%
All	3,804	13.1%	36.9%	-2.1%	1.7%

Panel C: IPOs with Sales<$100 million, with returns measured from the offer price

		Average	Average 3-year Buy-and-hold Return		
VC-backed or not	Number of IPOs	First-day Return	IPOs	Market-adjusted	Style-adjusted
VC-backed	2,724	28.8%	34.8%	1.6%	14.2%
NonVC-backed	2,599	17.3%	14.6%	-30.8%	-11.6%
All	5,323	23.2%	25.0%	-14.2%	1.6%

Panel D: IPOs with Sales>$100 million, with returns measured from the offer price

		Average	Average 3-year Buy-and-hold Return		
VC-backed or not	Number of IPOs	First-day Return	IPOs	Market-adjusted	Style-adjusted
VC-backed	949	22.5%	79.9%	42.2%	41.8%
NonVC-backed	2,855	10.0%	44.6%	5.2%	10.4%
All	3,804	13.1%	53.4%	14.4%	18.2%

Table 7

Technology and Life Science Company IPOs, 1980-2022

There are 3,311 tech and 988 life science IPOs from 1980-2022, after excluding those with an offer price below $5.00 per share, unit offers, ADRs, closed-end funds, partnerships, acquisition companies, REITs, bank and S&L IPOs, and firms not listed on CRSP. Life science includes biotech and pharmaceutical firms. Life science is defined as SIC=2830, 2834, 2835, 2836, and some 8731.

Tech stocks are defined as internet-related stocks plus other technology stocks including telecom, but not including biotech. Loughran and Ritter (2004) list the SIC codes in their appendix 3 and sources of founding dates in appendix 1. The definition of technology stocks has been changed from that in Loughran and Ritter (2004 *Financial Management*), with SIC=3559, 3576, and 7389 added to tech. Some 7389 (business services) companies have had their SIC codes changed into non-tech categories, such as consulting and two new SIC codes that Jay Ritter created: 5614 for telemarketing firms and 7388 for non-tech business services such as Sotheby's Auctions.

Missing and questionable numbers from the SDC new issues database (now owned by LSEG) are supplemented by direct inspection of prospectuses on EDGAR, information from Dealogic for IPOs after 1991, Howard and Co.'s *Going Public: The IPO Reporter* from 1980-1985, and the Graeme Howard-Todd Huxster collection of IPO prospectuses for 1975-2006.

Sales are the last twelve months (LTM) revenues as reported in the prospectus. The median sales, in millions, are expressed in dollars of 2023 purchasing power using the CPI. Pro forma numbers are usually used if there have been recent mergers or mergers that coincide with the IPO. The percentage of IPOs that are profitable measures profitability using trailing LTM earnings (usually using after extraordinary items earnings, and usually using pro forma numbers that are computed assuming that any recent or concurrent mergers have already occurred, and the conversion of convertible preferred stock into common stock). In some cases, last fiscal year earnings are used when LTM earnings are unavailable.

(table on the next page)

	Number of IPOs			% Profitable			Median sales ($2023, mm)		
Year	Tech	Life Sci	Other	Tech	Life Sci	Other	Tech	Life Sci	Other
1980	22	3	46	91%	67%	70%	61.7	21.6	81.5
1981	72	10	110	88%	30%	85%	44.0	5.2	45.7
1982	42	2	33	83%	50%	79%	33.1	4.2	31.6
1983	173	21	257	71%	42%	86%	26.1	7.8	93.5
1984	50	2	119	80%	100%	85%	28.4	143.6	73.3
1985	37	5	144	84%	40%	87%	37.6	13.2	112.1
1986	77	23	293	74%	35%	84%	35.2	11.4	100.3
1987	59	10	216	86%	20%	85%	47.4	8.3	116.9
1988	28	2	75	79%	0%	85%	61.5	10.4	242.0
1989	35	4	77	77%	0%	82%	77.1	2.8	128.8
1990	32	4	74	94%	0%	87%	66.4	4.8	135.9
1991	71	32	183	75%	16%	88%	76.2	7.4	163.2
1992	115	33	264	65%	18%	80%	48.1	2.8	149.6
1993	127	27	356	74%	22%	75%	56.1	3.1	126.7
1994	115	20	267	70%	20%	80%	42.6	3.3	112.9
1995	205	21	236	71%	14%	75%	42.2	6.1	126.2
1996	276	44	357	47%	14%	73%	32.0	4.3	104.8
1997	174	22	278	50%	14%	77%	39.4	10.4	117.7
1998	113	10	160	36%	30%	69%	40.5	14.1	130.4
1999	370	10	96	14%	20%	63%	21.8	10.7	204.5
2000	261	50	69	14%	12%	50%	21.3	6.9	161.4
2001	24	5	51	30%	0%	66%	40.1	0.3	601.9
2002	20	5	41	40%	40%	63%	159.3	240.2	721.7
2003	18	8	37	39%	0%	76%	169.1	0.1	657.4
2004	61	30	82	44%	7%	70%	88.8	5.6	316.8
2005	45	16	98	36%	13%	70%	105.7	19.2	337.3
2006	48	24	85	50%	8%	80%	86.1	5.1	498.1
2007	76	19	64	30%	5%	73%	101.1	2.1	340.4
2008	6	1	14	67%	0%	57%	219.9	0.4	283.2
2009	14	3	24	71%	67%	71%	244.6	52.8	631.0
2010	33	11	47	64%	0%	70%	163.4	0.0	441.5
2011	36	8	37	36%	0%	59%	190.2	4.2	434.8
2012	40	10	43	43%	0%	77%	148.3	0.5	447.4
2013	45	40	73	27%	7%	59%	136.1	12.5	534.4
2014	53	71	82	17%	7%	55%	114.6	0.0	301.6
2015	38	42	38	26%	0%	66%	165.8	0.0	216.9
2016	21	25	29	29%	8%	59%	137.1	1.2	817.3
2017	30	32	44	17%	0%	43%	229.9	0.0	544.0
2018	39	59	36	15%	0%	53%	214.2	0.0	565.0
2019	37	43	33	30%	0%	45%	231.5	0.0	131.1
2020	46	76	43	22%	5%	44%	231.8	0.0	295.3
2021	121	89	101	22%	2%	49%	213.3	0.0	342.9
2022	6	16	16	33%	0%	38%	97.7	0.0	7.5
2001-22	857	633	1,118	32%	4%	63%	142.5	0.0	400.0
1980-22	**3,311**	**988**	**4,828**	**47%**	**10%**	**75%**	**49.5**	**1.6**	**142.7**

Table 8

Long-run Returns on VC-backed and other IPOs Segmented by Industry

9,127 IPOs from 1980-2022 are used, with returns calculated through December 29, 2023. IPOs with an offer price below $5.00 per share, unit offers, SPACs, ADRs, REITs, closed-end funds, natural resource partnerships, banks and S&Ls, small best efforts offers, and IPOs not listed on CRSP within six months of the offer date are excluded. Buy-and-hold returns are calculated from the first closing market price until the earlier of the three-year anniversary or the delisting date (Dec. 29 of 2023 for IPOs from 2021 and 2022). The captions to Tables 3 and 7 provide industry classification details. Market-adjusted returns use the CRSP value-weighted index. Style adjustments use firms matched by market cap and book-to-market ratio with at least five years of CRSP listing and no follow-on equity issues in the prior five years. The market-adjusted and style-adjusted returns are the average buy-and-hold return on the IPOs minus the average compounded return on the benchmark. Market capitalization (size) is calculated using the first closing market price after the IPO and the post-issue number of shares outstanding.

Panel A: Long-run Returns on VC-backed IPOs, by Industry, 1980-2022

Sector	Number of IPOs	Average First-day Return	Average 3-year Buy-and-hold Return		
			IPOs	Market-adjusted	Style-adjusted
Tech	1,992	37.3%	26.4%	-4.4%	5.7%
Life science	789	15.7%	9.2%	-22.9%	-19.4%
Other	892	14.7%	23.1%	-21.5%	-9.0%
All	3,673	27.2%	21.9%	-12.5%	-3.3%

Panel B: Long-run Returns on nonVC-backed IPOs, by Industry, 1980-2022

Sector	Number of IPOs	Average First-day Return	Average 3-year Buy-and-hold Return		
			IPOs	Market-adjusted	Style-adjusted
Tech	1,319	22.2%	15.1%	-23.5%	-9.0%
Life science	199	17.6%	35.7%	1.1%	26.0%
Other	3,936	10.4%	18.1%	-25.8%	-15.4%
All	5,454	13.5%	18.0%	-24.2%	-12.4%

Note: The high life science 3-year buy-and-hold return for the 199 nonVC-backed IPOs in Panel B is partly driven by the 2,444.8% return on the June 1980 IPO of Enzo Biochem and the 1,606.1% return on the August 2003 IPO of New River Pharmaceutical, which used a WR Hambrecht + Co auction to go public. Of the 988 life science IPOs during 1980-2022, these are two of the three top long-run performers, with the VC-backed July 1998 IPO of Abgenix being the third, with a 2,071.1% return. Moderna, a December 2018 VC-backed IPO, produced the fifth-highest return.

Table 9

Long-run Returns on VC-backed and other IPOs Segmented by Industry, 1999-2022

3,464 IPOs from 1999-2022 are used, with returns calculated through December 29, 2023. See the captions to Tables 1 and 7 for a description of the sample and industry definitions.

Panel A: Long-run Returns on VC-backed IPOs, by Industry, 1999-2022

Sector	Number of IPOs	Average First-day Return	Average 3-year Buy-and-hold Return		
			IPOs	Market-adjusted	Style-adjusted
Tech	1,030	54.4%	-13.7%	-18.9%	-28.2%
Life science	579	18.6%	2.2%	-21.2%	-25.5%
Other	285	23.4%	0.0%	-19.8%	-33.6%
All	1,894	38.8%	-6.8%	-19.8%	-28.2%

Panel B: Long-run Returns on nonVC-backed IPOs, by Industry, 1999-2022

Sector	Number of IPOs	Average First-day Return	Average 3-year Buy-and-hold Return		
			IPOs	Market-adjusted	Style-adjusted
Tech	458	32.8%	-21.5%	-23.4%	-34.4%
Life science	113	21.9%	3.5%	-15.1%	-10.7%
Other	999	13.9%	11.3%	-6.2%	-13.0%
All	1,570	20.0%	1.2%	-11.8%	-19.1%

Table 10

Long-run Returns on IPOs Categorized by VC-backing or Buyout Fund-backing

All Last Twelve Months (LTM) sales figures for the firms going public have been converted into dollars of January 2023 purchasing power using the Consumer Price Index. IPOs from 1980-2022 are used, with returns calculated through the end of December 2023. In Panel A, the sample size is 9,127 firms. Growth capital-backed IPOs are included in the VC-backed category. IPOs with an offer price below $5.00 per share, unit offers, small best efforts offerings, ADRs, REITs, closed-end funds, natural resource limited partnerships, banks and S&Ls, and IPOs not listed on CRSP within six months of the offer date are excluded. In Panel B, one additional screen is implemented, reducing the sample size. This additional screen is that the last twelve months (LTM) sales of the issuing firm is at least $100 million (2023 purchasing power). Buy-and-hold returns are calculated from the first close until the earlier of the three-year anniversary or the delisting date (Dec. 29 of 2023 for IPOs from 2022). Market-adjusted returns use the CRSP value-weighted index. Style adjustments use firms matched by market cap and book-to-market ratio with at least five years of CRSP listing and no follow-on equity issues in the prior five years. All returns include dividends and capital gains, including the index returns.

Panel A: IPOs from 1980-2022 categorized by venture capital backing

VC-backed or not	Number of IPOs	Average First-day Return	Average 3-year Buy-and-hold Return		
			IPOs	Market-adjusted	Style-adjusted
VC-backed	3,673	27.2%	21.9%	-12.5%	-3.3%
NonVC-backed	5,454	13.5%	18.0%	-24.2%	-12.4%
Financial Sponsored	4,905	22.7%	23.8%	-9.6%	-2.9%
NonFinancial Sponsored	4,222	14.6%	14.8%	-31.1%	-15.4%
1980-2022	9,127	19.0%	19.6%	-19.5%	-8.7%

Note: The nonVC- and nonBuyout-backed IPOs do not include a minimum sales screen, unlike in Panel B.

Panel B: IPOs with at least $100 million in LTM sales (2023 purchasing power) from 1980-2022 categorized by private equity (buyout fund) backing

Buyout-backed or not	Number of IPOs	Average First-day Return	Average 3-year Buy-and-hold Return		
			IPOs	Market-adjusted	Style-adjusted
Buyout-backed	1,086	9.2%	30.5%	0.3%	-0.1%
NonBuyout-backed	2,828	14.9%	39.0%	-3.5%	2.2%
All	3,914	13.3%	36.6%	-2.5%	1.5%

Table 11

Special Purpose Acquisition Company (SPAC) IPOs, 1990-2022

IR is the initial return, measured from the offer price to the first close. Proceeds are in billions and do not include overallotment shares. For 1990-1997 and 2004-2007, 50 of the initial returns are missing for SPAC OTC issues. For SPACs from before 2010, data has been provided by Tim Jenkinson, Andrew Karolyi, and Milos Vulanovic. SPAC Research, Gritstone Asset Management, and Dealogic have been used as data sources for SPACs in 2015-2022. For 1990-2022, LSEG (SDC) misclassifies over 140 SPAC IPOs, usually as closed-end funds (SIC 6726).

	Operating Company IPOs		SPAC IPOs			SPAC IPOs	
Year	Number	Mean IR	Non-unit	Unit	Total	Proceeds, $b	Mean IR
1990	110	10.8%	0	1	1	$0.003	
1991	286	11.9%	0	1	1	$0.015	
1992	412	10.3%	0	2	2	$0.030	
1993	510	12.7%	0	8	8	$0.086	
1994	402	9.6%	0	7	7	$0.086	
1995	462	21.4%	0	2	2	$0.018	
1996	677	17.2%	0	4	4	$0.032	
1997	474	14.0%	0	1	1	$0.018	
1998	283	21.9%	0	0	0		
1999	476	71.2%	0	0	0		
2000	380	56.3%	0	0	0		
2001	80	14.0%	0	0	0		
2002	66	9.1%	0	0	0		
2003	63	11.7%	0	1	1	$0.024	0.9%
2004	173	12.3%	0	12	12	$0.425	0.8%
2005	159	10.3%	4	24	28	$1.846	1.9%
2006	157	12.1%	0	35	35	$3.013	3.2%
2007	159	14.0%	0	65	65	$10.985	0.7%
2008	21	5.7%	0	17	17	$3.627	0.2%
2009	41	9.8%	0	0	0	0	
2010	91	9.4%	0	7	7	$0.513	-1.5%
2011	81	13.9%	0	16	16	$1.049	0.4%
2012	93	17.7%	1	8	9	$0.475	0.0%
2013	158	20.9%	3	7	10	$1.325	0.2%
2014	206	15.5%	0	11	11	$1.555	-0.1%
2015	118	19.2%	1	19	20	$3.620	0.4%
2016	75	14.5%	0	13	13	$3.224	0.3%
2017	106	12.9%	0	34	34	$8.996	0.7%
2018	134	18.6%	0	46	46	$9.935	0.4%
2019	113	23.5%	0	59	59	$12.115	0.6%
2020	165	41.6%	11	237	248	$75.337	1.6%
2021	311	32.1%	33	580	613	$144.530	1.9%
2022	38	48.9%	0	86	86	$12.000	0.1%
Total	**7,080**	**22.4%**	**53**	**1,302**	**1,356**	**$294.86**	**1.4%**

SPAC IPOs by Quarter

1Q 21	298	3.7%	1Q22	54	0.0%
2Q 21	60	0.3%	2Q22	16	0.2%
3Q 21	89	-0.2%	3Q22	8	0.0%
4Q 21	166	0.5%	4Q22	8	0.5%

Table 12
Redemption rates on deSPACs, by quarter, 2017-2023

The redemption rates are equally weighted averages at the time of the merger between a SPAC and an operating company. The information on redemptions is from SPAC Research, and information on VC-backing is from Crunchbase, Capital IQ, and SEC filings. The sample includes 3 deSPACs in 2019, 1 in 2020, and 1 in 2021 that were listed OTC, and thus not included in Tables 13-14, which examine deSPAC returns for Nasdaq- and NYSE-listed companies. Furthermore, 1 deSPAC in 2022 listed on the last trading day of the year, and there is thus no post-listing return to include in Tables 13-14.

	All deSPACs		VC-backed		Non-VC-backed	
Quarter	Number of deSPACs	Average redemption rate	Number of deSPACs	Average redemption rate	Number of deSPACs	Average redemption rate
2017, first	3	38.4%	1	8.7%	2	53.3%
2017, second	2	36.2%	0	0.0%	2	36.2%
2017, third	4	60.2%	1	78.2%	3	54.2%
2017, fourth	4	57.8%	1	91.8%	3	46.5%
2018, first	6	64.9%	0	0.0%	6	64.9%
2018, second	1	8.4%	0	0.0%	1	8.4%
2018, third	5	41.8%	2	14.1%	3	60.3%
2018, fourth	11	72.1%	3	86.4%	8	66.8%
2019, first	6	73.0%	1	99.3%	5	67.8%
2019, second	6	72.5%	2	88.6%	4	62.2%
2019, third	5	74.2%	1	96.7%	4	68.6%
2019, fourth	11	53.1%	2	7.1%	9	63.3%
2020, first	10	52.2%	3	64.9%	7	46.7%
2020, second	8	54.1%	4	32.7%	4	75.6%
2020, third	8	56.3%	3	37.5%	5	67.5%
2020, fourth	38	27.4%	24	27.7%	14	26.7%
2021, first	24	11.3%	16	7.0%	8	19.8%
2021, second	40	24.2%	30	25.1%	10	21.6%
2021, third	82	54.5%	62	52.2%	20	61.3%
2021. fourth	53	62.0%	34	61.5%	19	63.0%
2022, first	29	85.6%	23	85.5%	6	86.1%
2022, second	20	81.4%	9	84.0%	11	79.2%
2022, third	26	82.2%	9	80.6%	17	83.0%
2022, fourth	27	88.1%	14	90.9%	13	85.0%
2023, first	28	94.3%	10	93.2%	18	94.9%
2023, second	10	85.8%	1	96.2%	9	84.6%
2023, third	29	93.8%	13	92.7%	16	94.7%
2023, fourth	31	97.1%	9	96.8%	22	97.2%
Total	**527**	**62.9%**	**278**	**57.5%**	**249**	**69.0%**

Table 13
Post-merger Returns on deSPACs, 2012-2022

This table is an updated version of Table 4 in "SPACs" by Minmo Gahng, Jay R. Ritter, and Donghang Zhang, published in the 2023 *Review of Financial Studies*. The table reports average equally weighted deSPAC period common share percentage returns based on a buy-and-hold strategy in which an investor purchases common shares of a merged company at the close of the first day of trading as a new entity (the deSPAC) and holds them for 1 or 3 years. The year column represents the year of the merger. In Panel A, the sample consists of 451 business combinations consummated between January 2010 and December 2022, after excluding a few deSPACs that were listed OTC rather than on Nasdaq or the NYSE. Returns include dividend yields and capital gains. When the full 1- or 3-year data are not available, we calculate the returns based on available data. For example, if a merged company started to trade in March 2020 and delisted in August 2020, we report the buy-and-hold returns from March 2020 to August 2020 for both one-year and three-year returns (not annualized). Returns end on December 29, 2023, a Friday. The CRSP return is the total return on the CRSP value-weighted market index, matched to each investment period.

For 2021 and 2022, the 3-year returns are for less than 3 years. In 2021, GNRS is not included because this deSPAC was traded OTC. For 2022, MLEC is not included because the deSPAC occurred on the last trading day of the year. It should be noted that if there is a high redemption rate, the public float after the deSPAC can be quite low until shares that were locked up become available for trading.

Panel A: deSPAC Returns Categorized by Cohort Year

		Average 1-year Return			Average 3-year Buy-and-hold Return		
Year	Number	deSPACs	Market	Market-adjusted	deSPACs	Market	Market-adjusted
2012	1	-53.2%	20.4%	-73.6%	-98.1%	37.2%	-135.3%
2013	5	-30.1%	17.9%	-48.0%	-41.1%	28.0%	-69.1%
2014	4	-51.6%	5.7%	-57.3%	-89.6%	26.7%	-116.2%
2015	9	-19.5%	0.7%	-20.2%	87.7%	33.1%	54.6%
2016	9	-5.2%	19.0%	-24.2%	-35.1%	40.3%	-75.3%
2017	13	-12.3%	11.5%	-23.7%	-44.6%	34.2%	-78.8%
2018	23	-34.6%	9.9%	-44.4%	-8.0%	66.2%	-74.2%
2019	25	1.8%	10.1%	-8.3%	-25.0%	34.9%	-59.9%
2020	63	-3.0%	32.6%	-35.6%	-56.0%	28.6%	-84.5%
2021	198	-64.2%	-10.2%	-54.0%	-73.0%	7.1%	-80.0%
2022	101	-63.8%	5.0%	-68.8%	-63.8%	16.9%	-80.6%
2012-2022	451	-46.3%	3.1%	-49.4%	-57.7%	17.0%	-74.7%

Panel B: deSPAC Returns Categorized by VC-backing

		Average 1-year Return			Average 3-year Buy-and-hold Return		
Year	Number	deSPACs	Market	Market-adjusted	deSPACs	Market	Market-adjusted
VC-backed	242	-59.9%	-0.5%	-59.4%	-75.4%	13.8%	-89.2%
Others	181	-31.9%	7.1%	-38.9%	-41.8%	24.3%	-66.1%
2017-2022	423	-47.9%	2.7%	-50.6%	-61.0%	18.3%	-79.3%

Table 14

Returns on deSPACs and IPOs, VC vs. NonVC Backed, 2017-2022

Panel A of this table reports average equally weighted deSPAC period common share percentage returns based on a buy-and-hold strategy in which an investor purchases common shares of a merged company at the close on the first day of trading as a new entity (the deSPAC) and holds them for 1 or 3 years, for both VC-backed and non-VC backed companies before the deSPAC merger. The year column represents the year of the merger. The sample consists of 423 business combinations consummated between January 2017 and December 29, 2022, after excluding a few deSPACs that were listed OTC rather than on Nasdaq or the NYSE. When the full 1- or 3-year data are not available, the returns are based on available data. For example, if a merged company started to trade in March 2020 and delisted in August 2020, we report the buy-and-hold returns from March 2020 to August 2020 for both 1-year and 3-year returns (not annualized). Returns end on Friday, December 29, 2023. The market return is the total return on the CRSP value-weighted market index, matched to each investment period. Panel B reports the same numbers for operating company IPOs, after excluding IPOs with an offer price below $5 per share, unit offers, REITs, closed-end funds, ADRs, small best effort offers, banks and S&Ls, and natural resource LPs. IPO returns are calculated from the closing market price on the first day of trading. Panel C reports the returns categorized by issue method, without separating VC-backed and nonVC-backed listings. In addition to deSPACs and IPOs, Direct listings are also added as a category.

Panel A: deSPACs

	VC-backed				NonVC-backed			
		Avg 3-yr Buy-and-hold Return, %				Avg 3-yr Buy-and-hold Return, %		
Year	No. of deSPACs	deSPACs	Market	Market-adjusted	No. of deSPACs	deSPACs	Market	Market-adjusted
2017	3	-74.8%	31.7%	-106.6%	10	-35.5%	35.0%	-70.5%
2018	5	-32.8%	76.3%	-109.1%	18	-1.1%	63.4%	-64.5%
2019	5	-45.1%	31.2%	-76.3%	20	-20.0%	35.8%	-55.8%
2020	34	-66.9%	27.2%	-94.1%	29	-43.1%	30.2%	-73.3%
2021	141	-80.0%	7.1%	-87.1%	57	-55.6%	6.9%	-62.5%
2022	54	-75.4%	14.6%	-89.9%	47	-50.4%	19.5%	-69.9%
2017-2022	242	-75.4%	13.8%	-89.2%	181	-41.8%	24.3%	-66.1%

Panel B: IPOs

	VC-backed				NonVC-backed			
		Avg 3-yr Buy-and-hold Return, %				Avg 3-yr Buy-and-hold Return, %		
Year	Number of IPOs	IPOs	Market	Market-adjusted	Number of IPOs	IPOs	Market	Market-adjusted
2017	64	73.8%	29.7%	44.2%	42	20.8%	31.1%	-10.3%
2018	91	88.6%	54.9%	33.7%	43	59.2%	57.6%	1.5%
2019	77	6.9%	36.7%	-29.8%	36	24.4%	39.7%	-15.3%
2020	113	-53.5%	31.2%	-84.7%	52	-36.3%	29.2%	-65.5%
2021	175	-54.8%	7.5%	-62.2%	136	-44.0%	8.4%	-52.4%
2022	14	-14.1%	11.5%	-25.6%	24	-42.2%	15.1%	-57.3%
2017-2022	534	-4.7%	27.6%	-32.2%	333	-13.8%	24.7%	-38.5%

Panel C: DeSPACs, IPOs, and Direct Listings, 2017-2022

Method of Going Public	Number	Average 3-year Buy-and-hold Return, % 3-year BHR	Market	Market-adjusted
DeSPACs	423	-61.0%	18.3%	-79.3%
IPOs	867	-8.2%	26.4%	-34.6%
Direct listings	13	-12.1%	25.5%	-37.6%