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Daria Davydova
Rüdiger Fahlenbrach
Leandro Sanz
René M. Stulz

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## ABSTRACT

From 2010 to 2021, 639 US VC-funded firms achieved unicorn status. We investigate why there are so many unicorns and why founders grant investors privileges to obtain unicorn status. Unicorns rely more than other VC-funded startups on organizational capital and network effects. Unicorn status enables startups to access new sources of capital, and growth in available funding causes the number of unicorns to increase. As a result, unicorns can stay private longer, which enables them to grow their organizational intangible assets with less expropriation risk and better capture the economies of scale on which their business model relies.



Daria Davydova
Swiss Finance Institute @ EPFL
daria.davydova@epfl.ch

Rüdiger Fahlenbrach
Swiss Finance Institute @ EPFL
Quartier UNIL-Dorigny, Extranef 211
CH – 1015 Lausanne
Switzerland
ruediger.fahlenbrach@epfl.ch

Leandro Sanz
The Ohio State University
810 Fisher Hall
2100 Neil Avenue
Columbus, OH 43210
sanz.8@osu.edu

René M. Stulz
The Ohio State University
Fisher College of Business
806A Fisher Hall
Columbus, OH 43210-1144
and NBER
stulz@cob.osu.edu

Unicorns are private companies with headline valuations of at least $1 billion.[1] Founders of some startups value unicorn status so much that they are willing to grant new investors special privileges to ensure a share price that results in a headline valuation of at least a billion (Gornall and Strebulaev, 2020). Founders' willingness to grant special privileges to investors to have unicorn status appears paradoxical. Before the 2000s, founders would have just taken their startups public by issuing common shares before they reached unicorn status rather than grant special privileges to new investors to reach a unicorn valuation. In this paper, we investigate the puzzle of why founders of certain startups find the unicorn status valuable and the closely related question of why the number of unicorns increased so much recently.

Unicorns are a 21st century phenomenon, with the term coined only in 2013.[2] We create a new database of U.S. unicorns, including 639 U.S. startups that achieved unicorn status since the beginning of the 2000s until the end of Q3 2021. The number of active unicorns increases steadily throughout our sample period. We have 427 active unicorns at the end of our sample period and observe 212 unicorn exits. By ending in Q3 2021, we essentially cover the whole bull market that followed the global financial crisis (GFC). Though our sample ends at the peak of the bull market and the rate of unicorn births falls afterwards, many unicorns have been created since.[3]

Unicorns reach a size that is much larger than the size of the typical IPO firm. For instance, unicorn IPOs have median sales more than 25 times larger than the median sales of other IPOs. To evaluate why founders find it valuable for their startups to stay private even though they have a much larger size than the typical IPO, we start by assessing how changes in the benefits and costs of being public may explain the emergence of unicorns.[4] There is a large literature that examines reasons for firms to go public (for reviews,

[1] As is common, we calculate the headline valuation by multiplying the per share price of the most recent round with the fully diluted number of common shares (with convertible preferred shares and both issued and unissued stock options counted based on the number of common shares they convert into).
[2] "Welcome to the unicorn club: Learning from billion-dollar startups," by Aileen Lee, TechCrunch, Nov. 2, 2013.
[3] As an example, there were more unicorn births in June 2022, after stock market valuations had fallen substantially, than in any quarter in our sample except the first three quarters of 2021. See "Meet the 32 new unicorns that joined the board in June 2022," by Gené Teare, Crunchbase.com.
[4] Some startups have controlling shareholders who are not founders. Our analysis applies to these controlling shareholders as well. We use the term founder for the controlling shareholder for simplicity.

see Ritter and Welch, 2002; Lowry, Michaely, and Volkova, 2017). According to this literature, going public enables firms to raise funds in public markets, facilitating their growth and making it easier for them to use their equity for acquisitions and compensation. Further, IPOs are liquidity events that enable owners of private firms to obtain cash or marketable securities that they can sell over time, to diversify their wealth, and to exit their firms. For a firm to stay private, the costs of being public must more than offset these benefits of being public. First, there are pecuniary costs of going public and being public, including the cost of floating shares, SEC registration, SEC periodic reporting, and exchange listing. Second, being public reduces a manager's decision-making autonomy (Boot, Gopalan, and Thakor, 2006). A public firm receives more attention, is subject to more legal and regulatory constraints, and has to disclose more information than a private firm. Third, a public firm no longer has the option of going public. A firm's valuation as a private firm plus the value of the option to time its IPO when its valuation is high may be higher than its value as a public firm (Benninga, Helmantel, and Sarig, 2005).

Since the unicorn phenomenon is a new phenomenon that did not exist before the 2000s, it has to be explained by changes in the 2000s that make going public less attractive for the startups that eventually become unicorns. Our explanation for the emergence of unicorns has two parts. First, funding has become increasingly available for unicorns, which has decreased the funding and liquidity benefits of being public for these startups. Second, a new type of firm that relies more on organizational capital and network effects has emerged. These firms are highly valuable if they succeed at capturing the benefits associated with the organizational capital and network effects that are central to their business plan, but they may not succeed in their efforts to build sufficient organizational capital and create network effects if they have to do so as public firms. The emergence of the new type of firms makes it optimal for firms with unicorn status to stay private as they build up their organizational capital and network, but these firms could not stay private without the increased availability of funding.

The first element of our proposed explanation for the unicorn phenomenon is that in the unicorn era, the funding and liquidity benefits associated with being a public firm are lower because of greater access to private funding. In the pre-unicorn world, private firms were funded by venture capitalists with a well-

defined investment horizon and strict regulatory limitations on their ability to raise funds, which resulted in a limited supply of capital and pressure on startups to go public (de Fontenay, 2017; Ewens and Farre-Mensa, 2020). Since then, as one study puts it, "advances in the ease of capital raising in private markets have made it possible for firms to remain private indefinitely" (de Fontenay and Rauterberg, 2021).

We show that achieving unicorn status enables firms to access sources of finance other than traditional venture capital funding (see also Kwon, Lowry, and Qian, 2020). We find that VC firms are less likely to participate in post-unicorn rounds, but asset managers are more likely to do so. From the literature, we know that a startup finds it easier to obtain VC funding from VC firms located close to the startup. The San Francisco area has the most VC firms (Chen, Gompers, Kovner, and Lerner, 2010). We show that the location of investors changes with unicorn status. The likelihood of an investor participating in a post-unicorn round increases with distance from San Francisco, while the likelihood of an investor participating in a pre-unicorn round decreases with distance from San Francisco. In addition, we document that the alternative sources of finance are willing to provide liquidity to founders and employees and, therefore, also reduce the liquidity motive of going public.

The second element of our proposed explanation of the unicorn puzzle is the emergence of a new type of firm. For these firms, the cost of being public is high even at high private valuations because they are still developing intangible assets and are not sufficiently established yet. Disclosure costs are high for firms that invest heavily in intangible assets because the non-rivalry property of such assets makes it harder for firms to exert property rights on intangible assets (Haskel and Westlake, 2017; Crouzet, Eberly, Eisfeldt, and Papanikolaou, 2022). The literature identifies spending on two distinct types of intangible assets: research and development (R&D) and organizational capital. The former type typically results in patents that protect the property rights of the innovating firm. The latter type corresponds to "the knowledge used to combine human skills and physical capital into systems for producing and delivering (…) products" (Evenson and Westphal, 1995). Broadly, spending on organizational capital includes advertising, information technology, human capital, and customer relations (Corrado and Hulten, 2010) and is more difficult to protect through patents, leading to high costs of public disclosure.

With this hypothesis, firms whose business model is centered on developing organizational capital delay going public until they have built enough intangible assets to capture at least some of the network effects or economies of scale on which their business model relies. At the same time, the scale effects and network effects that will be realized if they can execute their business model justify high valuations. Importantly, the emergence of these firms is partly made possible by the increased funding available to firms with high private valuations. If such funding were not available, firms that rely on organizational capital and are made valuable by economies of scale and scope would either go public too fast, and then possibly fail, or not exist at all.

Our database allows us to measure unicorn frequency among startups that have received at least $50 million of VC funding. Within this database, we find that unicorns and other startups differ in an important way in how they create intangible capital. Specifically, unicorns have fewer patents per dollar of VC funding in the years before the IPO than other startups. If organizational capital is important, only firms with specific characteristics benefit from unicorn status. We conjecture that most industries may not have firms with those characteristics. Indeed, we find strong evidence of very high industry concentration in unicorns.

Startups in industries where young listed firms have high SG&A expenses to assets, a proxy for organizational capital (Peters and Taylor, 2017), are more likely to be unicorns. We show that 59% of unicorns have a business model that relies on the internet for distribution, where network and scale effects are particularly important. Further, using a new measure of the importance of network effects in a startup's business model, we find that a firm for which network effects are important is more likely to be a unicorn. Startups in industries with more intangibles exit later. We would also expect that agglomeration externalities would be stronger for startups building intangible capital (see, for instance, Moretti, 2021). Therefore, it is not surprising that Silicon Valley, which specializes in funding and developing technology that exploits network and scale effects, has a particularly high share of unicorns.

For startups to become unicorns, funding has to be available that enables them to stay private and grow. We indeed find that high fund inflows in an industry accompany more unicorn births. The venture capital

literature has studied the causes and consequences of fund inflows since Gompers and Lerner (2000).[5] A perennial difficulty in examining the role of fund inflows on startups is the direction of causality. Do inflows merely reflect good opportunities or do they cause startup creation and valuations? This issue is important for our explanation of the growth of unicorns since funding could respond to the investment opportunities of unicorns rather than being an independent cause for the growth in unicorns. We obtain a source of exogenous variation in inflows using the investment plan at the inception of the Vision Fund of SoftBank. We find that exogenous variation in the supply of funding increases the number of unicorn births, consistent with a decrease in the net benefit of being public as the funding motive for an IPO becomes less important.

A prominent alternative explanation for why some startups stay private longer, which could help explain the existence of unicorns, is that founders want to stay private because they enjoy benefits of control (Ewens and Farre-Mensa, 2020). Such an explanation is not incompatible with ours. Our contribution is to show that there are efficiency reasons for unicorns to exist. We find that a surprisingly large fraction of unicorns that go public, namely 51%, have a dual class share structure that allows founders to retain control even after their firms become public. This evidence weakens arguments that unicorns stay private because of benefits of control, but it could be that the greater monitoring from being public (Holmstrom and Tirole, 1993, and Bolton and Von Thadden, 1998) reduces the benefits of control even when founders have majority control of a public company.

In a contemporaneous paper, Gahng (2022) argues that achieving unicorn status "makes employees more favorably assess the companies they work for." He estimates that authorized but not issued shares for future employee compensation at the unicorn round account for 11% of the headline valuation. These shares are valued as if they will be issued, which may not be the case. He points out that this leads to another reason why the headline valuation may overstate the fair value of a startup.

The paper proceeds as follows. In Section 1, we describe how we construct our sample and document the unicorn phenomenon by showing the evolution of the number of unicorns, the births and exits of

[5] Janeway, Nanda, and Rhodes-Kropf (2021) survey the subsequent literature.

unicorns, and the returns to unicorn round investors. In Section 2, we develop a framework to explain why we observe so many unicorns. In Section 3, we ask whether unicorn status makes a difference to founders and firms. In Section 4, we investigate which private firms are more likely to become unicorns. In Section 5, we investigate the determinants of exits. We conclude in Section 6.

## 1. How many firms achieve unicorn status, and how do their investors do?

In this section, we explain how we construct our sample and then show how the number of unicorns evolves over time. We also provide summary statistics on the performance of unicorns that exit during our sample period.

### 1.1. Sample construction

Our main data provider is CB Insights. CB Insights defines a unicorn as a VC-backed private company with a post-money headline valuation of $1 billion or more. Note that a company whose only valuation of $1 billion or more is the value at exit (either the IPO valuation or the M&A deal value) is not a unicorn under the CB Insights definition. We focus on U.S. unicorns, defined as unicorns with a registered office in the U.S.

The initial sample consists of 567 unicorns. We then add 72 unicorns from the sample of Gornall and Strebulaev (2020) to our initial sample. The Gornall and Strebulaev (2020) unicorn sample enables us to add unicorns to our sample that had an exit before the first CB Insights list was compiled in 2015. Our final sample consists of 639 unicorns, and the first unicorn in our sample was born in 2005Q3. Appendix A contains more details on the sample construction.

We obtain data for exits of unicorns from SDC Platinum, CB Insights, S&P Capital IQ, and individual web searches. We distinguish between five different types of exits – direct listings (DLs), initial public offerings (IPOs), reverse mergers through special purpose acquisition companies (SPACs), M&As, and failures. We classify a company as failed if it declares bankruptcy or if it is acquired for less than 25% of the unicorn round post-money headline valuation (which we call a rescue merger). For direct listings and

IPOs, the exit date is the offer date. The exit date for reverse mergers and M&As is the deal completion date.

Out of the 639 unicorns in our database, 427 are still unicorns at the end of our sample period (September 30, 2021).[6] An additional 10 unicorns are classified as alive but "down" if they had a final funding round with a post-money headline valuation of less than $1 billion or less than 25% of their peak valuation. The remaining 202 unicorns had an exit event.

In several of our tests, we compare unicorns to other startup companies that raised significant amounts of venture capital financing. We compile a list of U.S. startups that took money from VCs and raised at least $50 million of total funding (cumulatively across all available rounds) sometime between 2010 and 2021Q3. The data source is CB Insights. A subset of companies from this list become unicorns, and other startups exit through the paths described above. We track all of them through time.

Finally, in some of our analyses, we compare the accounting characteristics and patents of unicorn and VC-backed startups around their IPO or use industry averages of accounting characteristics of young publicly listed firms as independent variables. These data come from Standard & Poor's Compustat database and CB Insights. We also use the list of venture-capital-backed IPOs compiled by Jay Ritter.[7]

### 1.2. Unicorn births and exits

Panel A of Figure 1 shows that until the third quarter of 2018, there were always less than 20 unicorns created per quarter. Until the end of the first quarter of 2021, there were always less than thirty unicorns created. During the last three quarters of our sample, the numbers increased markedly, with each quarter generating more than 60 new unicorns.

Panel B shows the number of unicorn exits (listings, M&A, or failure). No quarter until 2020Q2 featured more than ten unicorn exits. Exits increased markedly towards the end of our sample period. Panel

[6] Seventeen of those 427 companies had a pending M&A deal, but the deal was not consummated by the end of our sample period. We classified those as alive.
[7] Available for download free of charge from https://site.warrington.ufl.edu/ritter/ipo-data/

C, however, shows that the exit rate, defined as the number of exits per quarter divided by the number of unicorns in existence in the previous quarter, was not particularly elevated toward the end of the sample period, although public companies had high valuations at that time. Panel D indicates that the number of unicorns in existence increased steadily through time as the number of births exceeded the number of exits.

Panel A of Table 1 shows summary statistics for the entire unicorn sample. The average firm took 6.9 years to reach unicorn status (median 6.3). The mean firm became a unicorn after 5.3 rounds of equity financing (median 5 rounds). The average post-money headline valuation of the unicorn round was $1.64 billion, and the median was $1.2 billion. The average post-money headline valuation of the last financing round (be it a private round or the exit valuation) was $4.07 billion (median $2.0 billion).

Unicorns raised on average $328 million in funding until they became unicorns, and a total of $708 million as a private company (medians are $253 and $383 million, respectively). Equity rounds were the dominant financing method, with the mean unicorn raising 95% of all funds through equity rounds, and the median unicorn raising 100% through equity financing. We observe exits for 33.17% (or 212 unicorns) of the total sample. For the subset of firms that exit, the time between the unicorn round and exit was slightly more than three years, for a total average life as a private company of 10 years.

Panel B of Table 1 shows select summary statistics for exited unicorns, by type of exit.[8] Though a majority of the unicorns in our sample do not exit during our sample period, 181 unicorns had successful exits, meaning that their value at exit exceeds their headline value at their last funding round. A unicorn exits the sample if its valuation falls below the threshold of $1 billion or if it has a valuation less than 25% of the peak post-money headline valuation (*down*). We consider a unicorn to have failed if it files for

[8] We determine the valuation at exit for the different exit types as follows. For direct listings, the exit valuation is the number of shares outstanding (summed across all share classes for dual class companies) multiplied by the price per share at the end of the first listing day. For initial public offerings, it is the number of shares outstanding (summed across all classes) multiplied by the offer price. For dual class companies, we obtain the number of shares outstanding across all classes from the IPO prospectus's summary page of the offering. For reverse mergers, we equate the valuation at exit with the enterprise value at the time the reverse merger was announced. For M&A exits, we use the disclosed purchase price. For some M&A exits, no official purchase price is available. We classify these as M&A exits with an undisclosed purchase price unless the acquiring company mentions in its SEC filings that the purchase price was immaterial. Then we classify the M&A exit as a failure. For failures, we either assign the rescue merger consideration or the value, if any, disclosed in the press article describing the bankruptcy.

bankruptcy or if it is acquired for less than 25% of the unicorn round post-money headline valuation (*failed*). Such outcomes are exceedingly rare during our sample period. Ten firms had down-rounds. Twenty-one firms failed altogether. Unicorns that fail live 4.42 years on average as unicorns. The unicorns that fail have a median market value of zero after the last fundraising round, and, on average, 90% of the unicorns that fail have a PMV at exit of less than their total funding. The typical failure is not bankruptcy but an acquisition for less than 25% of the unicorn round post-money headline valuation.

Firms can become listed on public markets in essentially three ways during our sample period: a) IPO (110 obs.); b) SPAC (18 obs.); and c) direct listing (9 obs.). Panel B of Table 1 shows that, on average, a unicorn that IPOs stays private 2.79 years between achieving unicorn status and the IPO and has on average an additional 2.34 equity financing rounds as a private company. The average (median) PMV at exit for an IPO firm is 4.78 (2.57) times the average (median) PMV at the unicorn round.[9] On average (median), the IPO firm raises $1.02 billion ($483 million) of funding before the IPO. Firms that exit through a SPAC are unicorns on average 3.55 years when they exit, after 2.4 additional equity financing rounds as a private company. They raise on average (median) $914 million ($633 million). Their average (median) PMV at exit is 4.19 (2.89) the PMV at the unicorn round. The direct listing firms were on average unicorns for 4 years and raised an additional 3.22 equity financing rounds as private companies. They raise amounts comparable to the firms that exit through IPOs or SPACs. However, they have a much higher PMV at exit relative to the PMV at the unicorn round since it is 10.6 on average and 5.07 at the median. The last exit category is exit through an acquisition. The number of acquired unicorns is small at 44. The acquired unicorns have been unicorns for a similar number of years compared to those that exit through an IPO but had on average fewer additional equity financing rounds (1.07). The PMV at exit for the acquired unicorns relative to the PMV at the unicorn round is smaller than that of IPOs. The average is 3.2 compared to 4.8, and the median is 1.57 compared to 2.57.

[9] In these comparisons, we use the traditional VC post-money headline valuation and do not price the special privileges as in Gornall and Strebulaev (2020). Hence, the reported ratios likely underestimate the true ratios.

Unicorn round investors of unicorns that exit during our sample period did extremely well. We show statistics on the performance of unicorn investors in the Internet Appendix. The IPO price is on average 3.74 times the unicorn round share price. The median is 2.21. Both the mean and the median are statistically significantly different from the benchmark of one. We follow Kaplan and Schoar (2005) and compute the public market equivalent (PME) using the S&P 500, Russell 2000, and the S&P 500 Tech indices as benchmarks. The mean PME using the S&P 500 (Russell 2000) as benchmark is 2.62 (2.82); the median is 1.61 (1.65). The mean (median) PME using the S&P 500 Tech is lower at 2.04 (1.33), reflecting the strong performance of technology stocks during our sample period. All PMEs are statistically significantly different from one, which is the benchmark of equal performance of public and private markets. However, since the typical unicorn did not exit during our sample period, it is difficult to interpret the performance of the unicorns that exit. It could be that the unicorns that exit had unusual performance or timed their exit well, but that other unicorns from our sample will not be able to exit on as favorable terms.

## 2. Understanding the unicorn phenomenon

We first discuss briefly firms' decision to go public and then develop our proposed explanation for why unicorns exist and why so many unicorns were created in the 2010s. There is a considerable literature focused on explaining why firms go public (see, e.g., Boot, Gopalan, and Thakor, 2006; Brau and Fawcett, 2006; Pagano, Panetta, and Zingales, 1998; Chemmanur and Fulghieri, 1999), and why the number of IPOs dropped after the 1990s (see, e.g., Gao, Ritter, and Zhu, 2013; Doidge, Karolyi, and Stulz, 2017; Stulz, 2020). The unicorn puzzle is related to but distinct from the issue of why the yearly number of IPOs is low in the 2000s (with the exception of 2021, which ranks as the 11th year in the number of IPOs from 1980 to 2021).[10]

The literature suggests that there are many potential benefits for a startup to become a public firm. However, there is general agreement that there are two main benefits from going public. First, firms go

[10] See Jay Ritter, Initial Public Offerings: Updated Statistics. Available for free at https://site.warrington.ufl.edu/ritter/files/IPO-Statistics.pdf.

public when they require funding that private markets cannot provide on acceptable terms or require a currency to make acquisitions and for compensation in the form of tradeable equity. We call this the funding motive. Using a survey of CFOs, Brau and Fawcett (2006) conclude that having a currency for acquisitions is the most important motive for an IPO. Second, insiders will want a firm to go public so that they can sell shares and diversify their wealth. We call this the liquidity motive. Going public has important costs. There are obvious pecuniary costs arising from registration with the SEC, the floating of shares, and the listing of shares (Ritter, 1987). In addition, it takes time for firms to go public, which diverts management's attention from running the firm. Public firms are the subject of more attention, different laws, and more regulations. They have to disclose much information about themselves regularly. The production of this information involves costs but, more importantly, can help competitors and draw the attention of regulators and politicians. For instance, existing evidence shows that public disclosures can attract the attention of antitrust authorities (Barrios and Wollmann, 2022). Being public can also make it difficult for management to make large changes to the business model, as management would have to spend time explaining these changes to various constituencies and might experience strong pushback from analysts, shareholders, and politicians. We call these the costs of public exposure. Finally, a cost of going public is that the startup loses the option of going public at a higher valuation. This cost explains that there can be waves of IPOs when valuations are especially high. Lowry (2003) finds that the demand for funding and sentiment are important determinants of IPO volume. When sentiment is high, the loss of the option of going public is worth little, and more startups go public.

The traditional view is that as a firm grows, the benefits outweigh the cost of being public. Figure 2 shows the traditional view of the net benefit of being public as a function of the firm's private valuation using the framework of Doidge, Karolyi, and Stulz (2017). The net benefit is negative for low private valuations, and increases with the level of the private valuation. Historically, the net benefit became positive and the firm went public much before its private firm valuation exceeded $1 billion (solid red line). The additional lines in Figure 2 show how the unicorn phenomenon could arise. With a uniform decrease in the net benefit, resulting from regulatory changes or an increase in the supply of funding available to private

firms, all firms go public at higher valuations (black dashed line). Alternatively, a new type of firms could emerge for which the net benefits of being public are lower. The flatter dotted green line shows the relation between the new type of firm and the net benefit of being public. The net benefit of being public only becomes positive for valuations exceeding $1 billion by some amount. The increased availability of funding for firms with private valuations of at least $1 billion lowers the slope of the relation between the net benefit of being public and a firm's private valuation once a $1 billion valuation is achieved (solid green line).

We argue that the green line describes well firms for which organizational capital centered on network effects is especially important. For these firms, the net benefit of being public does not become positive until they have successfully built enough organizational capital that their position in the market is relatively secure. These firms are expected to be highly valuable if they succeed in building their organizational capital, but they might never succeed in doing so if they have to go public early.

Intangible assets have become much more important over time (e.g., Haskel and Westlake, 2017; Kahle and Stulz, 2017; Falato, Kadyrzhanova, Sim, and Steri, 2022). Tangible assets cannot be expropriated easily. But the use of many intangible assets is not restricted to one firm; other firms can imitate what a firm is doing (Haskel and Westlake, 2017; Crouzet, Eberly, Eisfeldt, and Papanikolaou, 2022). The digital economy has led to business models that rely intensively on network effects and economies of scale. Firms have to grow quickly to get to a scale where these effects are in play. Firms for which intangible assets are particularly important benefit from achieving scale while private because they face much less demanding public disclosure requirements, they are better able to change plans, and they are less distracted by outside attention.

Firms invest in intangible capital in two main ways. First, they spend on R&D. Second, they spend on organizational capital. A growing literature emphasizes the importance of organizational capital (e.g., Lev and Radhakrishnan, 2005; Hulten and Hao, 2008; Eisfeldt and Papanikolaou, 2013; Peters and Taylor, 2017). Lev, Radhakrishnan, and Zhang (2009) argue that the expenses that firms incur to develop intangible capital are reported as sales, general, and administrative (SG&A) expenses and include "IT outlays, employee training costs, brand enhancement activities, payment to systems and strategy consultants, and

the cost of setting up and maintaining Internet-based supply and distribution channels." Recent empirical evidence shows that for the typical firm, the capitalized value of organizational capital is more than four times the capitalized value of R&D (Iqbal, Rajgopal, Srivastava, and Zhao, 2022).

Organizational capital is fragile because it depends in part on the personnel in place and on its training. Further, it cannot be protected as easily as R&D intangible capital. Part of organizational capital consists of business processes that have been developed. In 2014, the Supreme Court revoked patent protection on a wide range of business methods patents, making it harder to patent business processes. Acikalin, Cakurlu, Hoberg, and Phillips (2022) investigate the impact of the Supreme Court's decision and show that the sectors most affected were those where innovation took the form of software or involved digital data processing. Importantly, small firms exposed to the decision experienced a loss in value while large firms benefitted. The authors argue that large firms were in a better position to defend their product space. This evidence supports our hypothesis that a firm whose business model relies primarily on intangible capital may want to build that capital before going public so that its products are robust and less at risk from competitors.

A leading explanation of the decrease in IPOs for the U.S. is the economies of scope hypothesis of Gao, Ritter, and Zhu (2013), which states that companies have to become large quickly to exploit economies of scope, because small companies have become less profitable. With this hypothesis, many small private firms are better off to be acquired rather than wait to be ready to IPO because it is important to get "big fast" and private firms typically cannot do so on their own. Unicorns are firms for which the building of organizational capital leads to economies of scope, but the economies of scope hypothesis may not apply to them in the same way that it may apply to startups that build R&D intangible capital. In particular, an acquisition might disrupt organizational capital rather than help build it as the acquisition could result in the loss of key human capital assets or limit the flexibility and focus of the young firm.

We have emphasized the importance of a new type of firm that relies heavily on intangible capital. One might argue that such firms existed as the internet came into existence and started to grow in the 1990s. An

example of such a firm is TheGlobe.com.[11] Its business model was to create a virtual community on the internet. It was an attempt at what Facebook would become. This firm had to IPO because, according to one of the founders, "We were running outta money." When it went public, it did so with a bang as its first-day return was more than 600% and its valuation came close to $1 billion. It eventually fell to almost nothing. Had the firm been able to raise more money while private, its evolution might have been different. The example demonstrates that for firms to stay private to build intangible capital, they have to be able to obtain funding. When additional funding for startups with very high private market valuations became available, startups could contemplate a path towards building their intangible capital to a level where they would be less vulnerable to competition and could benefit from network effects or economies of scale.

The increase in traditional VC funding has made it possible for firms to stay private longer, but reliance on VC funding has obvious limits. As a firm acquires a higher valuation, it has to find other investors besides VC investors. Unicorns can access funding sources that are not typically available to firms with lower valuations, partly because firms that have demonstrated success have lower risk and partly because larger firms raise larger amounts that make it worthwhile for more regulated asset managers to conduct due diligence. These asset managers include mutual funds, hedge funds, and sovereign wealth funds. Historically, private firms faced severe limitations in raising funds from investors. Many investment managers were limited to investing in public firms, and most individual investors were generally restricted from investing in private firms. However, the restrictions that limited access to funding by private firms have been relaxed over time (de Fontenay, 2017; Ewens and Farre-Mensa, 2020). Further, institutional investors have become more important, and over time they have become better able to invest in private firms. As a result of this evolution, funding for private firms is often abundant, and it is much easier for firms that benefit from staying private to do so (see, for instance, de Fontenay, 2019).

Equity compensation is an important component of the compensation package of startup employees. If the firm remains a stand-alone private firm, employees may not able to monetize the equity they have

[11] See Joe Weisenthal and Tracy Alloway, Markets Odd Lots, "Transcript: The Globe.com co-founder on what a bubble bursting feels like." The above quote from the founder is from that transcript.

acquired. As a result, employees can be an important force pushing firms to go public unless firms find a way to provide some liquidity to employees. As we will show, the new institutional investors have been more willing to provide liquidity to employees (and early-round investors) than the traditional VC financiers.

The Jumpstart Our Business Startups (JOBS) Act relaxed another important limitation to firms staying private in 2012. Before April 5, 2012, the SEC required firms with more than $10 million of assets to register under the securities laws if they had a class of securities with more than 499 holders of record, basically forcing firms to go public. For instance, Facebook went public as it exceeded that threshold. Importantly, employees who exercised stock options to receive common shares were counted against the threshold. The JOBS Act increased the threshold to 1,999 holders, and modified the definition of holders of record. Employees exercising stock options were no longer counted against the threshold (Rodrigues, 2015). Several firms that ultimately went public might have had to go public earlier or to change their compensation practices without the JOBS Act changes (see Alon-Beck and Livingstone, 2022, Table 2).

Funding could also be abundant for firms with headline valuations of less than $1 billion that never reach the status of unicorns because they go public. The same is the case for the change in the threshold for the number of shareholders of record. To explain the unicorn phenomenon, there have to be additional reasons related to firms' business model and the sources of value creation that are unique to unicorns.

In summary, our proposed explanation for the unicorn phenomenon is as follows. A new type of firm for which organizational capital is a key asset has become much more important. These firms benefit from building their organizational capital as private firms as long as they are not sufficiently established to withstand the costs of public exposure. If they can execute their business model, scale and network effects make them extremely valuable. They require a sufficient supply of funding, which became available in the 2000s because of deregulation and developments in the asset management industry. Startups have access to a new set of investors once they become unicorns. The new investors are less opposed than VCs to offer liquidity to early investors and insiders.

## 3. Does unicorn status make a difference?

We show first that founders value unicorn status. Next, we show that firms with unicorn status have access to a larger set of investors. We then provide evidence that these investors enable liquidity rounds for earlier investors and insiders.

### 3.1. Do founders grant special privileges?

Panel A of Figure 3 shows that a large fraction of unicorns in our sample - more than 200 - had a headline valuation of exactly $1 billion at the unicorn round (see also Brown and Wiles, 2015; Brown and Wiles, 2020; Gahng, 2022). The median unicorn in our sample had a headline valuation of $1.2 billion. We obtain the headline valuations for all funding rounds of startups with at least $50 million of venture funding. The distribution of these headline valuations in the range of $500m to $1,500m is plotted in Panel B of Figure 3 and we observe a huge spike at $1,000m. Panel C shows the cumulative distribution function (CDF) of the empirically observed post-money headline valuations and the counterfactual CDF estimated without the window [$750 million, $1,100 million]. Clearly, the empirically observed CDF is strictly below the counterfactual CDF in the region just below the unicorn threshold. Using a fuzzy bunching estimator, we estimate the number of missing financing rounds ($M$) between $750m and $999m to be 138.[12] The hypothesis that $M$ is equal to zero is rejected with a $p$-value less than 0.01 using bootstrapped standard errors.

Gornall and Strebulaev (2020) demonstrate that founders often grant unicorn (and later round) investors special privileges that make their preferred shares worth significantly more than the founder's common shares. Their valuation model shows that the usual post-money headline valuation formula ($ investment / percentage ownership) often leads to inflated valuations.[13] If founders ascribe a large value to reaching

[12] We follow Alvero and Xiao (2022) and Ewens, Xiao, and Xu (2022) and provide details on the fuzzy bunching estimator in the Internet Appendix.

[13] Gahng (2022) further argues that the denominator in the headline valuation formula is understated because the fully diluted number of shares used to calculate percentage ownership of the unicorn round investors includes shares reserved for the option pool that may never be issued or that may never vest.

unicorn status, we should observe them granting large privileges to investors in financing rounds that would have otherwise failed to reach the threshold of a $1 billion headline valuation. We examine this conjecture in Figure 4. To construct Figure 4, we start with Table 7 of Gornall and Strebulaev (2020). Their table lists the fair values, post-money headline valuations, and overvaluations derived from the most recent unicorn financing round before February 1, 2017. We focus on entries that correspond to the actual unicorn round and show in Figure 4 the distribution of fair market values and post-money headline valuations (Panel A) as well as the value of the special benefits granted relative to the fair market values (Panel B).

Figure 4, Panel A shows that the distribution of the fair market values around the $1 billion threshold is wider than that of the post-money headline valuations. Similarly, Panel B shows that the value of the benefits is higher the lower the fair market value.[14] This evidence supports the hypothesis that founders value unicorn status and are willing to grant new shareholders special benefits to inflate the price they pay for their shares. The evidence also helps explain the "missing" financing rounds just below the unicorn threshold in Panel C of Figure 3.

### 3.2. Access to more investors

Private firms have limited access to investors due to regulation and the nature of private markets. They are viewed as inherently riskier, so that there are legal and regulatory restrictions concerning who can invest in such firms and how they can raise funds.

Many young promising firms receive funding from venture funds. The general partners of these funds have specific skills that help them assess the prospects of young firms and guide their growth. VC firms are not typically publicly listed and they face constraints in raising funds. They also have a finite life of typically ten years, meaning they have to exit investments before the ten-year limit – though some exceptions can be

[14] The average value of benefits as a fraction of fair value is positive, even for post-money headline valuation bins away from the threshold of $1 billion. It reflects the liquidation preference and seniority of the last round of preferred shares.

allowed. As a firm grows and wants to stay private, it may have to access other investors than venture funds. These investors may be willing to offer liquidity to the early investors and, potentially, early employees.

Unicorns can attract investors that typically do not invest in startups with lower valuations. These investors include mutual funds, sovereign funds, hedge funds, private equity funds, and so on. It is already well known that mutual funds invest in unicorns (Chernenko, Lerner, and Zeng, 2021; Kwon, Lowry, and Qian, 2020; Imbierowicz and Rauch, 2023). We build on this evidence in Table 2 by showing that the investor composition for the unicorn round is quite different from the investor composition of the early rounds. In Table 2, we list in Panel A the top 20 investors in B rounds of firms that eventually become unicorns.[15] We then show in Panel B the top 20 investors in unicorn rounds. Finally, in Panel C, we report the top 20 investors in unicorn rounds that are not in B rounds. Out of the 20 top investors in unicorn rounds, 8 are not top 20 investors in B rounds.

The top investors that show up in unicorn rounds but not in B rounds are a mix of different types of investors. As expected, four mutual fund complexes, BlackRock, Fidelity, T. Rowe Price, and Wellington Management are active investors in unicorn rounds. The top investor is Tiger Global Management, an investment management firm with both public and private equity investment strategies. Though it invests in private businesses of all stages, its investment style makes it better suited to invest in more advanced rounds. Other investment firms in the list are growth-stage private equity investors. For instance, Meritech describes its objective to "invest in the best late-stage tech companies in the universe."[16] One of the most active investors in unicorn rounds is ICONIQ Capital, which is part family office to some billionaires (for instance, Mark Zuckerberg) and part private equity and venture capital general manager. Many investors that show up at the unicorn round are known for having a different degree of involvement in the companies in which they invest and different due diligence requirements than investors who participate in earlier

[15] By top 20 investors in B rounds, we mean the investors who participate the most often in B rounds in our data. We do not have the amounts invested and it would not be feasible to collect these amounts for all the B round investors across hundreds of unicorns.
[16] See https://www.meritechcapital.com/about-us.

rounds. For instance, they are unlikely to want board seats. Chernenko, Lerner, and Zeng (2021) show that rights granted to mutual fund companies typically differ from those granted to venture capital funds.

Table 2 shows that unicorn rounds attract investors who differ substantially from traditional venture capitalists. Founders of unicorns have access to a supply of capital to which they would not have access otherwise. Table 3 examines the changes in the types of investors and their distance from the unicorn's headquarters and from San Francisco across funding rounds using a regression framework. In Panel A (Panel C), the regression sample consists of 16,221 (15,044) firm-funding round-investor observations for our sample of startups with at least $50 million of venture funding, and in Panel B (Panel D), the regression sample consists of 3,924 (4,182) firm-funding round observations for 639 unicorns. In Panel A of Table 3, we show that the change in the composition of investors post-unicorn round shown in Table 2 is robust to controlling for the startup's industry and whether its headquarters are close to San Francisco (we postpone a detailed discussion of these two variables and their influence on unicorn status to Section 4). Venture firms are more likely to participate in pre-unicorn rounds and less likely to participate in post-unicorn rounds compared to the unicorn round. The opposite is the case for asset managers. We use an alternative approach in Panel B. We regress the fraction of investors of a given type on a firm fixed effect, a round fixed effect, and an indicator variable for the unicorn round. The round fixed effect controls for later stage investors being different from early stage investors. The firm indicator variable controls for time-invariant unobserved differences in interest from different types of investors across firms. We find strong evidence that the share of asset managers in a round, computed as the number of asset manager investors to the total number of investors, is significantly higher in the unicorn round, while the shares of angel investors and venture funds are significantly smaller. We also find that the share of growth funds is significantly higher.

In Panel C of Table 3, we show that the investors' distance from both the unicorn's headquarters and from San Francisco changes as well with the unicorn round. Controlling for a unicorn's industry and its distance from San Francisco, we find in column (1) that investors in pre-unicorn rounds are closer to a unicorn's headquarters than unicorn-round investors, and investors in post-unicorn rounds are farther from a unicorn's headquarters than unicorn-round investors. Similarly, investors in pre-unicorn rounds are closer

to San Francisco than unicorn-round investors, and investors in post-unicorn rounds are farther from San Francisco than unicorn-round investors (column (2)). Using our alternative approach, we show in Panel D that average investor distance from the unicorn's headquarters (column (1)) and from San Francisco (column (2)) increases with the unicorn round.

### 3.3. Liquidity events for early round investors and employees

An additional important characteristic of late-stage investors is that they frequently offer liquidity events to earlier-round investors, employees, and founders. Ample evidence for such liquidity events for our sample comes from IPO prospectuses because companies have to disclose in the related party transactions section any transaction that involved the purchase or sale of company stock by an executive officer, director, or existing large shareholder in the last three years prior to the IPO. Door Dash (IPO December 2020), for example, disclosed that in September 2018, three executive officers, among other parties, were allowed to sell stock in a liquidity event that totaled $62 million. Similarly, Lyft disclosed that a year prior to the IPO, several executive officers were allowed to sell stock for approximately $60 million in a tender offer to existing stockholders.

The *Wall Street Journal* published an article to discuss equity sales amounting to several hundred million dollars of the founder of WeWork in the years before it first attempted to go public. The article gives other examples of founders (including those of the sample unicorns Groupon, Snap, Slack, and Zynga) cashing out partially before the IPO and attributes this growing practice to the willingness of late-stage investors to allow founders and employees to cash out, a practice that is typically frowned upon by traditional venture investors.[17] The same article points out that late-stage investors have also let early venture investors cash out. Another example is the investment of Intel in Cloudera in 2014, where Intel

[17] "WeWork co-founder has cashed out at least $700 million via sales, loans," by Eliot Brown, Maureen Farrell, and Anupreeta Das, July 18, *The Wall Street Journal*.

obtained new shares for $371 million and then obtained additional shares for $371 million from employees and investors Accel Partners and Greylock Partners.[18]

Larcker, Tayan, and Watts (2018) discuss the emergence of exchanges that facilitate sales of shares by private market company insiders and early investors and report that over $4 billion in transaction volume was executed by only four private market liquidity providers in 2017. Large unicorns also can hold tender offers where investors can acquire shares from founders and employees.[19] SpaceX has held such tender offers twice annually (see, e.g., Vance, 2015). Uber and Airbnb had at least one such tender offer each before going public.[20] Lastly, there can be an active secondary market for unicorn shares. This was especially the case for Facebook before its IPO (see Rodrigues, 2015).

## 4. Which private firms are more likely to become unicorns?

With the explanation for unicorns we proposed in Section 2, unicorns are more likely to be firms with high investment in organizational capital that rely on network effects and that have access to sufficient funding. In this section, we provide support for this possible explanation. We first show that unicorns are concentrated in industries and geographically. We then show that the industries to which they belong are industries where organizational capital appears more important. We finally show that ample funding causes unicorn births.

The tests of the section are based on 5,070 startups with at least $50 million in funding between 2010 and 2021, 639 unicorns, and industry averages calculated from 7,224 public firms.

### 4.1. The role of industry and location in the likelihood of achieving unicorn status

CB Insights classifies each venture-funded startup into one of 20 sectors. CB Insights classifies startups as belonging to the internet sector if their business depends on a delivery mode that uses the internet. With

[18] "Why Intel paid a premium for a stake in Cloudera," by Rachael King, Dow Jones Newswire, May 1, 2017.
[19] See, e.g., "Pre-IPO Liquidity for Late State Start-Ups" by Dawn Belt, Lexis Practice Advisor.
[20] "What Tesla Shareholders could learn from SpaceX," by Alfred Lee, The Information, August 8, 2018.

this CB Insights classification, 59% of unicorns belong to the internet sector and 32% of startups are in that sector. We decided to reclassify startups that CB Insights classifies as belonging to the internet sector according to the type of goods or services they provide. Admittedly, this reclassification has an element of subjectivity. We believe, however, that it is more descriptive of the industry of startups than the original CB Insights classification. We describe the reclassification procedure in the Internet Appendix. After the reclassification, the number of unicorns in each sector is shown in column (1) of Panel A of Table 4 and the percentage of unicorns in each sector is shown in column (2).

The sector with the largest number of unicorns is the business products and services sector (shortened to "business" in the tables), with 168 unicorns or 26% of unicorns. The internet sector has 111 (17%) unicorns, followed by the financial sector with 86 (14%) and the healthcare sector with 73 (11%) unicorns. Four sectors have more than 10% of unicorns each, and seven sectors have less than 1% each.

We compare the unicorn industry distribution with that of startups that raised more than $50 million. We show the distribution of startups across sectors in column (3) and the percentage of firms in each sector in column (4). The healthcare sector has the largest number of startups (1,427 firms, or 28% of startups). The next most important sector is the internet sector with 767 firms, or 15% of startups. Thirteen sectors have a higher percentage of startups than unicorns. The sector that is the most overweighted among startups compared to unicorns is the healthcare sector. That sector has 28% of startups, but only 11% of unicorns. In contrast, the business products and services sector is the most underweighted among startups compared to unicorns. It has 9% of startups but 26% of unicorns.

We then map the 20 CB Insights sectors to 4-digit NAICS codes so that we can make an industry comparison between unicorns, publicly listed firms, and IPOs. The mapping is described in the Internet Appendix. Column (5) in Panel A of Table 4 shows the number of public firms for each sector in our sample and column (6) shows the percentage of public firms in each sector. We further show in columns (7) and (8) each sector's number and percentage of IPOs. The sector with the largest number of IPOs is healthcare,

with 586 IPOs, followed by the business products and services sector, with 505 IPOs, and finally the industrial sector, with 485 IPOs.[21]

We compare the percentage distribution of unicorns across sectors (column (2)) with the distribution of listed firms across sectors (column (6)). Two sectors stand out in having a large percentage of unicorns compared to their percentage of listed firms. The business products and services sector has 26% of unicorns but only 6% of listed firms. The internet sector has 17% of unicorns but only 4% of listed firms.

Lastly, we compare the distribution of unicorns across sectors (column (2)) to the distribution of IPOs across sectors (column (8)). We find that the business products and services sector and the internet sector are very much overrepresented among unicorns compared to these sectors' representation in the population of IPOs. While 26% of unicorns are in business products and services, only 14% of IPOs are in that sector. For the internet sector, 17% of unicorns are in that sector, but only 1% of IPOs.

We next explore whether unicorns are concentrated geographically. If organizational capital plays an important role for the creation of unicorns, we would expect geographic concentration. Evenson and Westphal (1995) define organizational capital "as the knowledge used to combine human skills and physical capital into systems for producing and delivering (…) products." It is easy to see that the San Francisco area as a technology innovation hub would have the ideal combination of available human capital, physical capital, and experience to develop companies that rely on organizational capital (see Moretti, 2021, for agglomeration externalities concerning inventors).

Of course, San Francisco is important for startups for another reason, which is that it is the heart of the VC-funding industry. It is well-known that the VC-funding industry is heavily geographically concentrated (see Chen, Gompers, Kovner, and Lerner, 2010). Proximity to San Francisco could make access to funding through VC firms easier. It could also help the development of startups, so they are more likely to succeed.

[21] The large number of IPOs in the healthcare sector is likely, in part, the result of one of the few public disclosure requirements that apply to private companies. In 2007, Congress passed the Food and Drug Administration Amendments Act (FDAAA) that requires all companies (including private companies) to disclose publicly the results of Phase II trials or above. As a result, firms in the biopharmaceutical industry that were private lost a disclosure advantage of being private, which led to an increase in IPOs from these firms (see Aghamolla and Thakor, 2022).

However, Chen, Gompers, Kovner, and Lerner (2010) show some evidence that more distant investments of VCs seem to perform better. Further, we have already shown that VC funding becomes less important when a startup reaches unicorn status and investors located farther from San Francisco become more important.

In Figure 5, we show how unicorns (Panel A), startups (Panel B), and young public firms (Panel C) are distributed around the country. Young firms are those in the lowest quartile of the age distribution of their industry. The figure shows the share of these firms across U.S. counties. The distribution of unicorns is very concentrated, with a large share of unicorns in counties in California and especially those close to San Francisco. The startups are also heavily concentrated in California. In contrast, there is much less concentration for young public firms. While San Francisco has more than 20% of unicorns, no county has more than 5% of young public firms except for one county in New York and New Jersey each.

To explore the importance of the San Francisco area for unicorns, we compute the distance, as a straight line, from a firm's headquarters to central San Francisco. We find that unicorns are much closer to San Francisco than either the typical startup with at least $50 million in funding or the typical listed firm. In Panel B of Table 4, we report median distances from San Francisco for listed firms, startups, and unicorns. The proximity to San Francisco is particularly pronounced for unicorns in the internet sector and the business products and services sector, which are the two sectors with an overrepresentation of unicorns compared to listed firms, IPOs, and VC startups.[22] For the internet sector, we find in column (1) that the median distance of a unicorn from San Francisco is 33 miles. In contrast, the median distance for a listed firm in column (3) is 1,581 miles and the median distance for a VC-funded startup is 447 miles in column (2). In five sectors, the median distance from San Francisco of unicorns is less than 50 miles.

We now turn to linear regressions to assess the relative importance of these factors for the likelihood that a startup becomes a unicorn. We report these cross-sectional regressions in Table 5. The dependent

[22] The distance from central San Francisco is also small for the Energy & Utilities as well as the Food & Beverages sectors. However, those only have 9 (respectively 3) unicorns.

variable takes the value one if a startup that has obtained at least $50 million in financing is a unicorn, and zero otherwise.[23]

Model (1) in Table 5 uses only indicator variables for a startup's sector, an indicator variable for whether the startup is located within 200 miles of San Francisco, and a variable that measures scale effects. We predict in Section 2 that startups for which scale effects and organizational capital are more important are more likely to become unicorns. For each startup, we determine whether scale effects of the type associated with unicorns, namely network effects, are important. The variable *Scale* takes a value of one if the description of a startup's business in CB Insights includes one of the words "platform", "network", or "connect". We see that the largest positive coefficients for the sector indicator variables (relative to the industrial sector) are for the business products and services, leisure, and internet sectors. Startups in electronics, metals and mining, and retail are least likely to become unicorns. Startups located within 200 miles of San Francisco are much more likely to be unicorns. *Scale* has a large and statistically significant positive effect on the likelihood to be a unicorn. In Model (2), we include a firm's birth cohort to control for any effect of birth cohort on the likelihood that a startup becomes a unicorn. A startup's birth cohort is the year the firm raised more than $50m in funding (and thus enters the sample). The omitted birth cohort year is 2010. All indicator variables have positive and significant coefficients except for 2012 and 2021. Model (3) combines Models (1) and (2). The statistical and economic significance of the sector indicator variables does not change, but the magnitude of the birth cohort coefficients decreases. The birth cohort 2021 indicator variable is now significantly negative. Such a result is not surprising since one would expect startups to become unicorns sometime after having entered the sample.[24] Scale and proximity to San Francisco remain positively and statistically significantly related to the likelihood of being a unicorn.

[23] The total number of startups in the regressions presented in Table 5 decreases from 5,709 (5,070+639) to 5,690 because we require data on a startup's industry, the description of its business, and its zip code. The total number of startups decreases further in the results presented in Tables 6, 9, and 10 because we require data on financing rounds and startup status (i.e., whether the startup is alive or exited). The decrease in observations is due to missing data for the set of startups that never become unicorns.

[24] We also estimate Model (3) using the logarithm of the distance from headquarters to San Francisco and show the results in the Internet Appendix. The coefficient on the distance measure is significantly negative, so that startups that are farther away from San Francisco are less likely to become unicorns.

4.2. Industry fundamentals and the likelihood that a startup becomes a unicorn

We now turn to regressions predicting the likelihood that a startup becomes a unicorn. Regressions shown in Table 6 are estimated using 77,054 firm-quarter observations. The dependent variable takes the value one if a VC-backed startup is a unicorn in quarter *t* and zero if it is not. In Section 2, we conjecture that unicorns can only arise if there is sufficient funding available to support private funding rounds. Hence, we include lagged industry funding flows in our regressions.

We cannot observe the intangible investments of unicorns and instead use data from young publicly listed firms in the unicorn's industry. We assume that if organizational capital is more important for young public firms in the unicorn's industry, it will be more important for the unicorn. SG&A net of R&D expenditures is a widely used proxy for investment in organizational capital. For simplicity, in the following, we use SG&A to denote SG&A net of R&D expenditures.[25]

Our proposed explanation has additional implications for the characteristics of industries where unicorns are more likely to be found. These industries should have lower fixed assets and lower capital expenditures. We would expect startups in industries where firms have more foreign income to be more likely to be unicorns as greater foreign income suggests that scale is more important in that industry. An industry with larger and older public firms might be harder to disrupt, leaving less room for unicorns. We expect an industry with more public firms that have losses to be in the process of being disrupted or ripe for disruption. Our regressions use Tobin's q as a measure of growth opportunities and intangibles. We would expect firms in industries where Tobin's q is higher for public firms to be more likely to be unicorns. Lastly, we include variables capturing the state of the economy and the state of financial markets that have

[25] The literature differs in how to determine which part of SG&A corresponds to investment and which corresponds to expenses for current production. While Eisfeldt and Papanikolaou (2013) and Peters and Taylor (2017) attribute 30% of SG&A to investment, Lev and Radhakrishna (2005) and Falato, Kadyrzhanova, Sim, and Steri (2022) use, as we do, all of SG&A as a proxy for organizational capital investment. For our purpose, all we need is that organizational capital investment is proportional to SG&A. The Compustat variable SGA very often includes R&D expenditures so that R&D has to be subtracted to get to SG&A as a measure of organization capital (we follow the procedure of Peters and Taylor, 2017).

been used in previous research concerning IPOs and funding conditions. These variables are the previous quarter's IPO volume, equal-weighted IPO first-day returns, real GDP growth, equal-weighted market returns, the aggregate market-to-book ratio, credit spread, and the federal funds rate. All variables we use are defined in detail in Appendix B. All the regressors are lagged by one quarter.

We show estimates of a regression with no fixed effects in column (1) of Panel A of Table 6. We find strong evidence that a startup is more likely to be a unicorn if its lagged industry private funding flows are high. We also find strong support for the importance of intangible capital as a determinant of the likelihood that a startup is a unicorn, since the coefficients on the industry ratio of SG&A to assets and on the scale variable are positive and significant. In contrast, we find a negative significant coefficient on R&D expenses to assets. Further, we find that a startup is more likely to be a unicorn if its industry Tobin's q is high, and the distance to San Francisco is low. These results support our proposed explanation. However, the sign on foreign income is not consistent with our proposed explanation as it is negative.

We also include in column (1) variables that proxy for the state of the IPO market, of financial markets in general, and of the economy. A startup is more likely to be a unicorn if the first-day equally-weighted return of IPOs is high, the aggregate market-to-book ratio is high, the credit spread is high, and the federal funds rate is high. The other variables are not significant. Except for the evidence on the credit spread and the federal funds rate, the macroeconomic variables are consistent with the view that unicorns are more likely to be created when IPO market conditions are good and when valuations in public markets are high.

Model (2) re-estimates Model (1) with the addition of quarter fixed effects instead of variables proxying for the state of the IPO market, financial markets, and the economy. The results are qualitatively and quantitatively similar.

We also estimated these regressions omitting the three quarters of 2021 that are in our sample and in which many unicorns are born and report the results in the Internet Appendix. The results are quantitatively and qualitatively similar to those obtained for the whole sample, except that in the regressions with variables capturing the state of the economy and the state of financial markets, the credit spread and the federal funds rate no longer have a significant coefficient and IPO volume and EW market returns have negative and

statistically significant coefficients. To the extent one might have been concerned that 2021 reflects irrational exuberance in a way that earlier years do not, our results supporting the role of organizational capital do not depend on the unicorns created in 2021. Lastly, we re-estimate the regression of column (2) adding industry fixed effects. This regression has a different interpretation from the regressions we just discussed in that it shows how changes in an industry are related to the probability that a startup in that industry is a unicorn. As we would expect, variation across industries is much more important than variation within industries in explaining whether a startup becomes a unicorn. The coefficient on R&D is positive in that regression and the coefficient on SG&A is insignificant. Tobin's q does not have a significant coefficient.

The venture capital funding variable used in Models (1) and (2) of Panel A of Table 6 is subject to an important endogeneity concern due to potentially omitted variables. Rather than ample available industry funding causing a higher likelihood of becoming a unicorn, it could be that funding in the prior quarter flows to the industries with the highest potential. To identify an effect from funding flows to the likelihood of being a unicorn, we need an instrument that is correlated with industry fund flows in the prior quarter but uncorrelated with the potential of the industry. We use the creation of the first SoftBank Vision Fund as an instrument for industry fund flows. SoftBank, at the announcement of the first closing of the fund in May 2017, committed to investing in only a subset of industries.[26] We create an indicator variable *Ex ante target SoftBank industry* equal to one if the respective industry was on the target list of industries in the announcement of first closing and if the quarter is after 2017Q2.

Any instrument needs to satisfy the relevancy condition and exclusion restriction. SoftBank surprised the market by the size of the fund of almost $100 billion (in the press release of October 2016 on the establishment of the vison fund, SoftBank announced a size of approximately $25 billion). The National

[26] See https://group.softbank/en/news/press/20170522. "The Fund and its associated vehicles are expected to be active across a wide range of technology sectors, including but not limited to: the Internet of Things, artificial intelligence, robotics, mobile applications and computing, communications infrastructure and telecoms, computational biology and other data-driven business models, cloud technologies and software, consumer internet businesses and financial technology."

Venture Capital Association, in their annual yearbook, estimates that in all of 2016, the U.S. VC industry invested approximately $70 billion in startups. The relevancy condition is therefore likely fulfilled, as the Vision Fund is large relative to total VC funding. Regarding the exclusion restriction, one needs to maintain that SoftBank in early 2017 was not better able to predict the potential of industries than the remainder of the VC industry. Wang (2020) examines the impact of what she calls the Softbank Vision Fund shock on the strategies of other VC funds. She finds that neither large established funds nor new funds moved investments towards Softbank Vision Fund industries, which suggest that these funds did not believe that Softbank had a better ability to predict the potential of industries.

In Panel B of Table 6, we show the estimates of our two stage least squares regressions where we instrument industry fund flows with the *Ex ante target SoftBank industry* instrument. Columns (1) and (2) show the first stage results and demonstrate that the relevancy condition is fulfilled. The Softbank instrument is strongly and positively correlated with industry fund flows. Columns (3) and (4) use the instrumented fund flows in the regressions. We find that the higher instrumented industry fund flows are, the more likely it is that a startup is a unicorn. Our finding is therefore suggestive of ample available industry funding causing a higher likelihood of startups becoming unicorns. Note that the other independent variables of particular interest, namely scale, operational capital as proxied by SG&A / total assets, and proximity to San Francisco, retain their statistical and economic significance in columns (3) and (4) when compared to Panel A.

## 5. Unicorn exits and the unicorn puzzle

In this section, we investigate whether the information from unicorn exits supports the explanation proposed in Section 2. The main predictions we investigate are that: 1) unicorns go public when they have built their organizational capital sufficiently to be able to protect it from competitors; 2) investment in organizational capital is more important than investment in R&D intangible capital for exiting unicorns; 3) exiting unicorns are more likely to exit through IPOs than through acquisitions controlling for industry

characteristics and variables relevant to the state of the economy and markets; and 4) time to exit is longer for unicorns given same characteristics and same state of the economy and markets.

### 5.1. How do exiting unicorns differ from other startups at the IPO?

In Table 7, we compare the IPO characteristics of unicorn IPOs to those of other IPOs. The first part of the table shows offer characteristics, and the second accounting characteristics. The most striking difference is that unicorns are much more likely to have dual class shares when they become public compared to other firms. We find that 51% of unicorns have dual class shares, but only 8% of non-unicorn IPOs have dual class shares. This sharp difference is consistent with unicorn status giving more power to founders. It also reduces the weight of the argument that founders want their firm to stay private for control benefits when their firm has achieved unicorn status.[27] However, recent evidence suggests that dual share structures are value-creating for firms at the IPO by making it more likely that the founders can carry out their business strategy (Aggarwal, Eldar, Hochberg, and Litov, 2022; Fields and Lowry, 2022).

If unicorns are better established, there should be less uncertainty about demand for their shares at the IPO, and we expect fewer unicorn IPOs to price below the indicative range. We find in Table 7 a large difference between the percentage of unicorns and the percentage of other IPOs that price below the indicative range. While 26% of non-unicorn startups price below the indicative range, only 7% of unicorns do. The typical unicorn IPO prices above the indicative range, which is relatively rare for other IPOs. Not surprisingly, the gross proceeds and valuations are much larger for unicorns and the underwriter spread is lower. A larger fraction of the proceeds goes to selling shareholders with unicorn IPOs. The first-day return of unicorns is higher than for other IPOs. There is no statistically significant difference between the returns of unicorns and the returns of other IPOs for the first three months and the first six months following the

[27] It could be that unicorns are more likely to exit with dual class shares because of their characteristics rather than because they are unicorns. We show in the Internet Appendix that startups with more organizational capital investment are more likely to have dual class shares. However, the most important variable in explaining whether a startup has dual class shares when it exits through an IPO is whether it has unicorn status, so that even controlling for characteristics does not alter our conclusion.

IPO. Overall, the evidence in Table 7 seems to support the view that unicorns are much more established when they go public.

The bottom part of Table 7 shows the fundamental characteristics of firms immediately before the IPO. We focus our discussion on the medians as they are less affected by extreme values. Not surprisingly, unicorns are much larger firms. The median assets of unicorns are $452 million, while the median assets of other IPOs are $56 million. Debt ratios are trivially low for both unicorns and non-unicorn firms.

Unicorns have substantial sales. Median sales for unicorns are $274 million, compared to $10 million for other IPOs. Surprisingly, both unicorns and other firms have extremely high median cash holdings the year before the IPO. Median ratios of cash to assets are in excess of 50%. While these cash ratios are enormous compared to those of more established firms (see Kahle and Stulz, 2017), it is notable that non-unicorn IPOs have also enormous R&D investment rates. The median ratio of R&D expenditures to assets is 31% for non-unicorn firms. In contrast, it is only 11% for unicorns. As a result, non-unicorn startups have a fairly short period of time during which they can finance their R&D expenditures with their cash reserves.

Median SG&A to assets (where SG&A is net of R&D) is much larger for unicorns than other startups, namely 33% versus 17%.[28] While mean SG&A to assets is similar for unicorns and startups in general, this is due to extreme outliers for SG&A to assets for non-unicorn startups. When we winsorize at the 5$^{th}$ percentile and the 95$^{th}$ percentile, average SG&A to assets for non-unicorn startups is 26% instead of 32%. Not surprisingly, capital expenditures are extremely low for all startups. Median capital expenditures to assets are 2% both for unicorns and other startups. The mean and median ratios of gross profits to assets are much larger for unicorns than other startups.

We highlighted in Section 2 that R&D often results in patents protecting the property rights of the innovating firm, while organizational capital does not, and that unicorns' business model is centered on developing organizational capital rather than R&D. We provide supporting evidence for the relatively

[28] One might be concerned that this difference is driven by the fact that unicorns have substantial sales, so that SG&A to assets is larger for unicorns because they have more sales. This is not the case. Median SG&A to sales is zero for the VC-funded IPOs that are not unicorns.

smaller role of R&D for unicorns in Figure 6. For each company in our IPO sample, we calculate the ratio of the total number of patents divided by the total amount of funding obtained (in $ millions) at a given point in time and plot medians for unicorn IPOs and other IPOs in the ten quarters surrounding the IPO. Figure 6 shows that per dollar of funding raised, the number of patents is indeed much lower for unicorns than for non-unicorns, especially in the quarters prior to the IPO.

We next estimate regressions using the data of Table 7 that relate unicorn status to characteristics of IPO startups the year before the IPO. In these regressions, the left-hand side variable (unicorn status) is established before the accounting variables are measured. We think of the right-hand side accounting variables as proxies for the fundamental business model of the firms, and do not use them to predict unicorn status. Model (1) of Table 8 is similar to Model (1) of Table 6, except that now we use characteristics of the startups. Since we are using characteristics for the year before the IPO, we cannot compute Tobin's q. We winsorize SG&A to assets at the 1% level. As before, we find significant positive coefficients for scale, SG&A, and whether the unicorn is near San Francisco. Model (2) uses year- and industry-fixed effects. The results are quantitatively and qualitatively similar.

Overall, the evidence presented in Figure 6 and Tables 7 and 8 is consistent with our hypothesis that the importance of organizational capital distinguishes unicorns from non-unicorns.

### 5.2. Determinants of the exit decision for unicorns

We conjectured that unicorn status enables firms to stay private longer to build their organizational capital to take advantage of economies of scope and network externalities. If our conjecture is correct, we expect them to be more likely to exit through an IPO than a merger since they are less likely to have to merge to exploit their economies of scope than other startups. We test this hypothesis in Section 5.2.a. We then examine the determinants of the time to exit in Section 5.2.b using industry characteristics as well as metrics for the state of the economy.

5.2.a. Exit through IPO or merger

We estimate a multinomial model to examine the factors that make exiting through a listing or an acquisition relatively more likely. Listings include traditional IPOs, direct listings, and SPACs. The baseline group to which both exit types are compared is firms that do not exit as well as firms that fail.[29] We proceed as in Table 6 in that we allow the exit decision to depend on the characteristics of the industry to which the startup belongs. In addition to industry characteristics, we use our indicator variables for scale and proximity to San Francisco, and five macroeconomic variables. These variables are the same as those we use in Table 6.

The estimates are shown in Table 9. The reported coefficients are relative risk ratios (exponentiated multinomial logit coefficients). A relative risk ratio larger than 1 indicates that the risk of the outcome falling in the comparison group relative to the risk of the outcome falling in the baseline group increases as the variable increases. The first multinomial model uses as industry variables averages across all young public firms in the industry. Column (1) gives the hazard ratios for listing and column (2) gives the hazard ratios for M&A exit. We see that startups that have reached unicorn status are significantly more likely to exit through a listing relative to the baseline case. Startups that have reached unicorn status are less likely to exit through an M&A relative to the baseline group, controlling for industry characteristics and other variables. In columns (3) and (4), we restrict the sample to unicorns only. Relatively few variables are significant. Unicorns are more likely to exit through a listing when lagged private funding flows into the industry are large, and when firms in an industry are older. Merger exits are more likely relative to the baseline case when existing young firms in an industry are larger, stock market returns are low, and the federal funds rate is low.[30]

[29] While we can identify well the unicorns that fail, we are not able to identify all the non-unicorns that fail.
[30] We conduct robustness tests that we report in the Internet Appendix. We remove from the sample the last three quarters of the sample period in which we observe a high number of IPOs and an even higher number of new unicorns. The results are quantitatively and qualitatively similar to the results that we report in Table 9.

5.2.b. The timing of exit

We finally examine the determinants of the time of exit. We consider all exits, i.e., whether they are through a listing or through M&A. We estimate Cox Proportional Hazard Models. The explanatory variables are the same as in Table 9. We report hazard ratios in Table 10, i.e., a coefficient larger than one indicates that an increase in the independent variable makes it more likely that a startup exits the sample. The first column examines whether unicorns exit later. We use industry characteristics based on the average characteristics of young public firms in the industry. We see in column (1) that unicorns exit later than other startups. Note that we control for the age since founding of a startup, so that our result is conditional on a startup's age. Startups exit earlier when they are in industries with more private funding flows, more capital expenditures, older firms, and with more loss firms. They exit later if they are in an industry with larger firms, more fixed assets, more cash, higher R&D expenditures, higher SG&A expenditures, and more foreign income. Lastly, startups exit later when last quarter's first day IPO returns, aggregate market-to-book ratios, credit spreads, and federal funds rates are higher. In contrast, they exit faster if IPO volume is higher, economic growth is higher, and market returns are higher.

To investigate whether the determinants of unicorn exits are the same as those for other VC-backed firms, we estimate the Cox Proportional Hazard model on the sample of unicorns. The results are presented in column (2). There are few differences. The industry funding flow does not have a significant effect. Further, earlier research shows that startups exit when industry valuations are high (e.g., Lerner, 1994). We find that this result holds for the sample of all VC startups, but not for unicorns. In other words, there is no evidence that unicorns are more likely to go public when industry valuations are high.[31]

[31] In unreported robustness regressions, we estimated these models omitting the three quarters from 2021. The results are similar except that unicorns are more likely to exit when credit spreads are high and when interest rates are low.

## 6. Conclusion

The existence of so many unicorns is a puzzling phenomenon. Before the 2000s, it was rare for firms to wait to go public until their private market headline valuation exceeded $1 billion. We develop an explanation for the unicorn phenomenon based on two developments: 1) the emergence of a new type of firm that relies heavily on organizational capital, especially organizational capital involving network effects, and 2) the greater ability of firms with a headline valuation in excess of $1 billion to attract funding from different types of investors than startups with lower valuations. Organizational capital can be easily expropriated by competitors, and firms for which organizational capital is important benefit from staying private until this capital gives them a strong enough position in their industry. However, firms cannot stay private without adequate funding. The easier availability of funding for unicorns made it possible for the new type of firm to grow and succeed in a way that would not have been possible without that funding. The success of early unicorns and the arrival of new types of private market investors with deep pockets were critical to the emergence and growth of the unicorn phenomenon. We show the importance of funding using the surprise of the size of the Vision Fund and its business plan to create exogenous variation in funding and show that the likelihood of startups becoming unicorns increases with the funding shock.

In support of our explanation for the emergence of unicorns, we find that industries where organizational capital is important have more unicorns. VC-funded firms with a business model that relies on network and scale effects are more likely to become unicorns. Using data from firms that go public, we find that unicorns that go public invest more in organizational capital than other VC-funded firms that go public. In contrast, the other VC-funded firms invest more in R&D. Unicorns exit later, and when they do, they are more likely to exit through an IPO and with a dual class share structure that allows founders to retain control. Our explanation for the emergence of unicorns emphasizes economic efficiency in contrast to private benefits for founders. However, our explanation is not inconsistent with a role for private benefits of founders in explaining the existence of unicorns.

The efficiency gains from building organizational capital privately could not be obtained in the absence of ample capital for private firms that have high valuations. Further research should explore the implications

of decreases in available funding for startups that rely heavily on organizational capital. Our explanation for unicorns would indicate that having less funding available makes it less likely that startups relying on organizational capital will succeed in capturing the economies of scale and the network effects that make them especially valuable as public firms.

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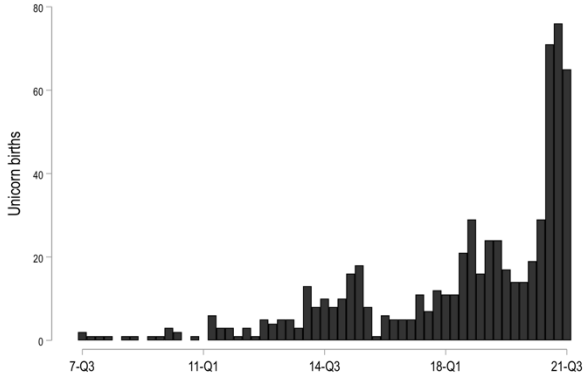
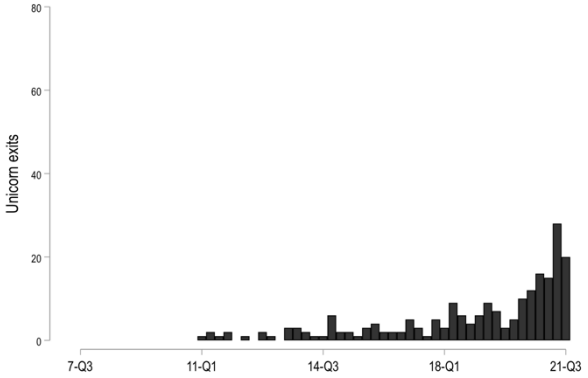
**Figure 1. U.S. unicorns births, exits, and exit rate**

The four panels of the figure show the number of new U.S. unicorns by quarter (Panel A), the number of unicorn exits by quarter (Panel B), the unicorn exit rate, defined as the number of exits per quarter divided by the number of unicorns in existence in the prior quarter (Panel C), and the cumulative number of U.S. unicorns born, exited, and in existence by quarter (Panel D). The sample consists of 639 U.S. unicorns, defined as private companies with a post-money headline valuation of at least $1 billion. The sample period is from 2005Q3 to 2021Q3. Data are from CB Insights, S&P's Capital IQ, Gornall and Strebulaev (2020), and Crunchbase.

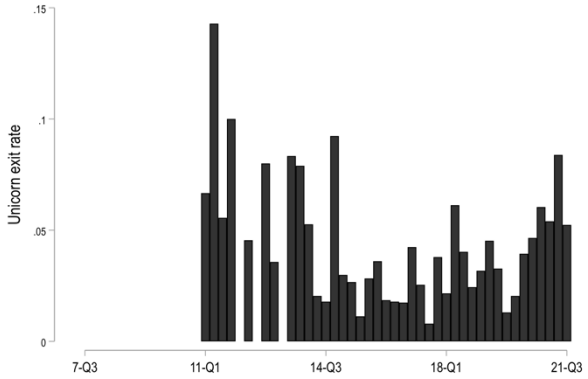
**Panel A**: Unicorn births




**Panel B**: Unicorn exits




**Panel C**: Unicorn exit rate




**Panel D**: Cumulative numbers

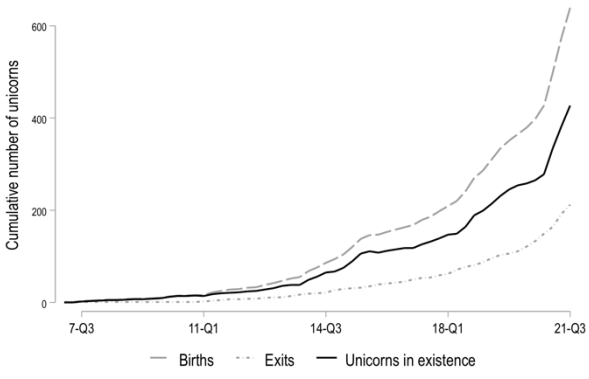
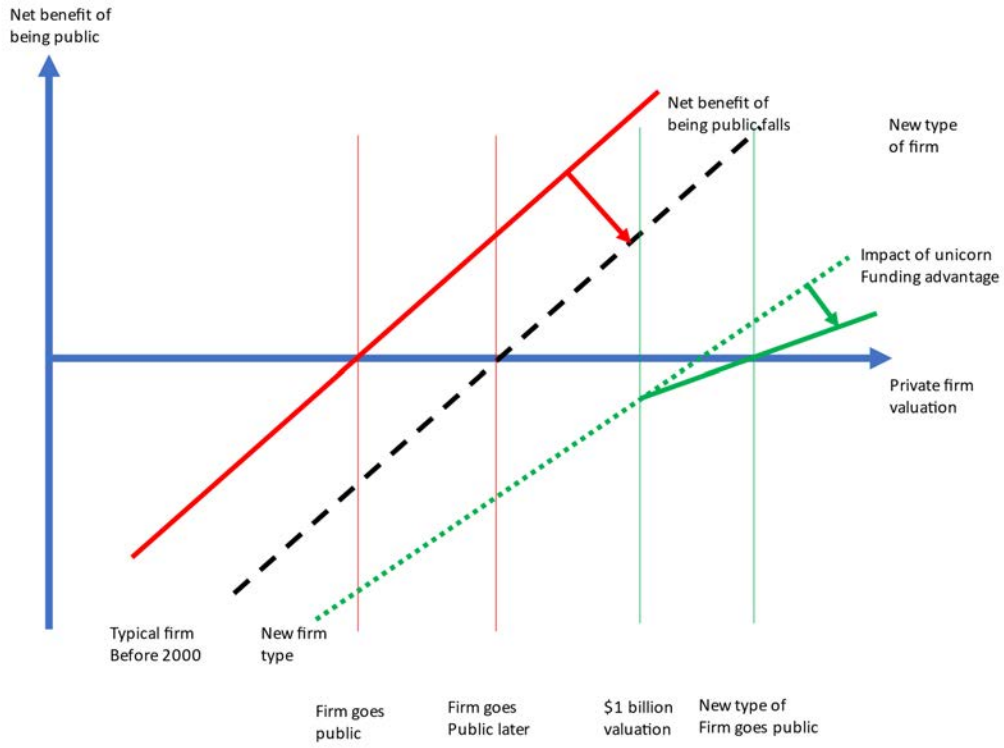


**Figure 2. Net benefit of being public and private valuation**

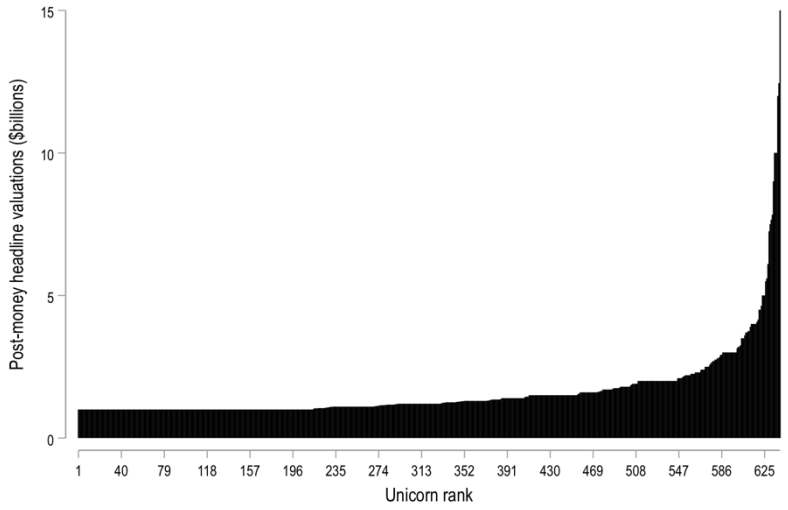
This figure shows the net benefit of being public as a function of a firm's private valuation. The continuous red line shows that it becomes advantageous for firms to go public when their valuation exceeds a threshold. The firm goes public when the net benefit is positive. A decrease in the net benefit of being public shifts the net benefit line to the right, so that firms go public at higher valuations (black dashed line). The green dotted line shows a new type of firm for which the net benefit of being public is lower than for existing firms and is decreased further through a funding advantage if they become unicorns (solid green line).



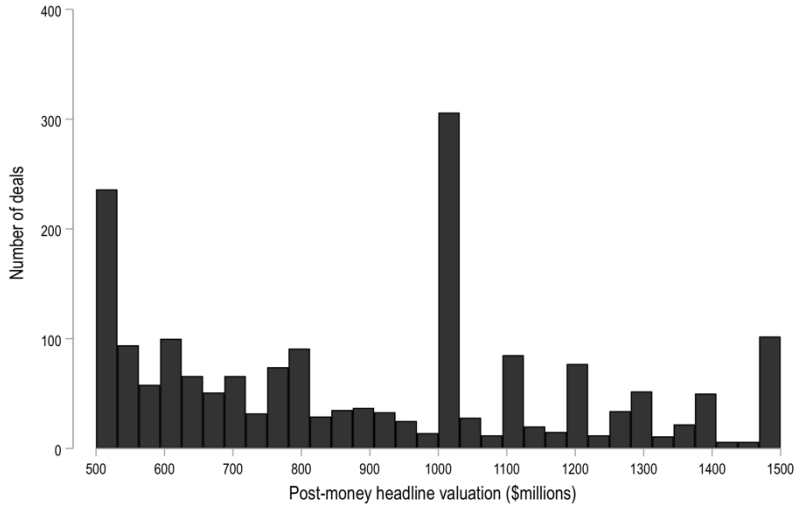
## Figure 3. Distribution of headline valuations at unicorn and other financing rounds

Panel A of the figure shows the post-money headline valuations, defined as the product of the number of shares and the share price used in the unicorn fundraising round, for the 639 sample unicorns. Unicorns are private companies with a post-money headline valuation of at least $1 billion. The sample period is from 2005Q3 to 2021Q3. Data are from CB Insights, S&P's Capital IQ, Gornall and Strebulaev (2020), and Crunchbase. Panel B shows the post-money valuations of all VC-backed startups in the CB Insights database who obtained more than $50 million in funding and had a post-money valuation between $500 million and $1,500 million. Panel C shows the cumulative distribution function (CDF) of the empirically observed post-money valuations and the counterfactual CDF estimated without the window [$750 million, $1,100 million]. Data for Panels B and C are from CB Insights.

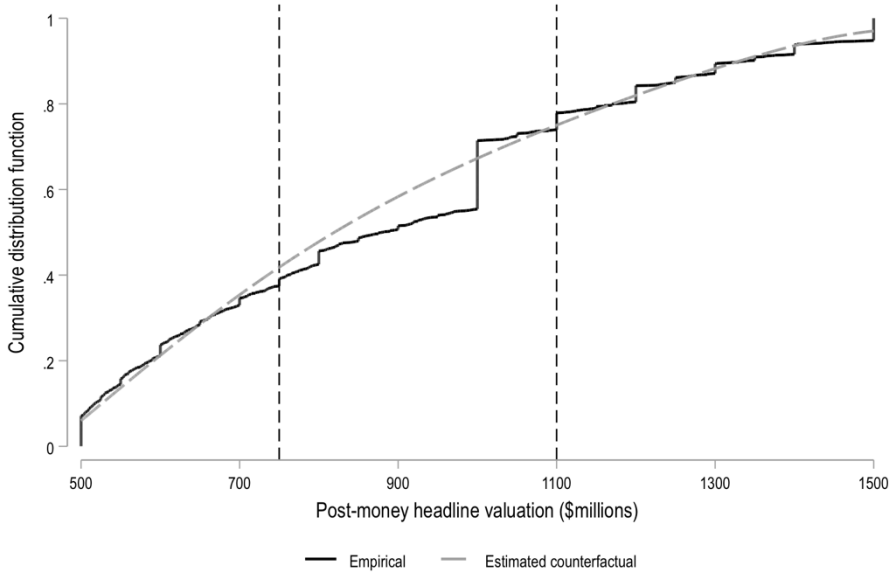
**Panel A: Post-money headline valuations of unicorns**




**Panel B: Distribution of post-money valuations between $500m and $1500m for a sample of large VC-backed startups**



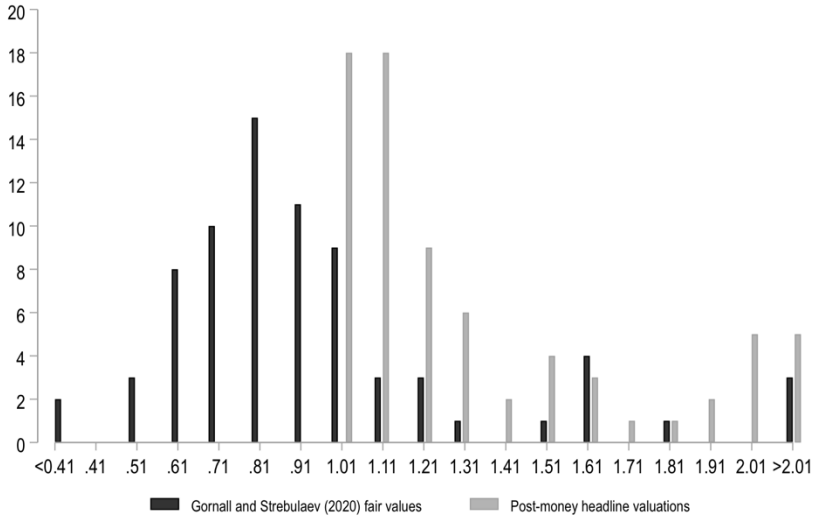
**Panel C: Empirical and estimated counterfactual cumulative distribution functions of post-money valuations between $500m and $1,500m**



## Figure 4. U.S. unicorns' headline valuations vs. fair values

The figure shows the distribution of post-money headline valuations and fair values of unicorn financing rounds using the valuation model of Gornall and Strebulaev (2020). Unicorns are private companies with a post-money headline valuation of at least $1 billion. The sample period is from 2005Q3 to 2021Q3. Panel A compares the distribution of fair values according to the valuation model of Gornall and Strebulaev (2020) (black bars) to the distribution of post-money headline valuations (gray bars). Panel B shows the value of the benefits in dollars (black bars) and the value of the benefits as a fraction of fair value (gray bars) given to the unicorn round investors across fair value bins (in billions of dollars).

**Panel A:** Unicorn round post-money headline valuations vs. Gornall and Strebulaev (2020) fair valuations




**Panel B:** Value of benefits given to unicorn round investors based on Gornall and Strebulaev (2020) fair valuations

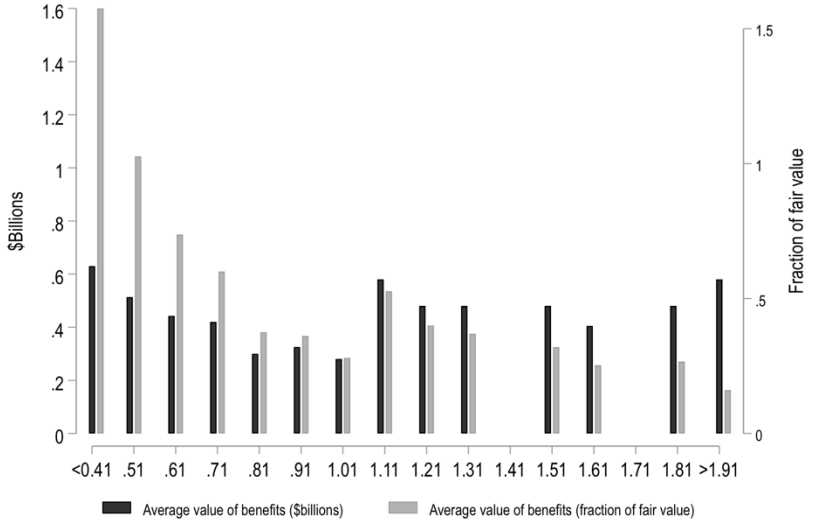
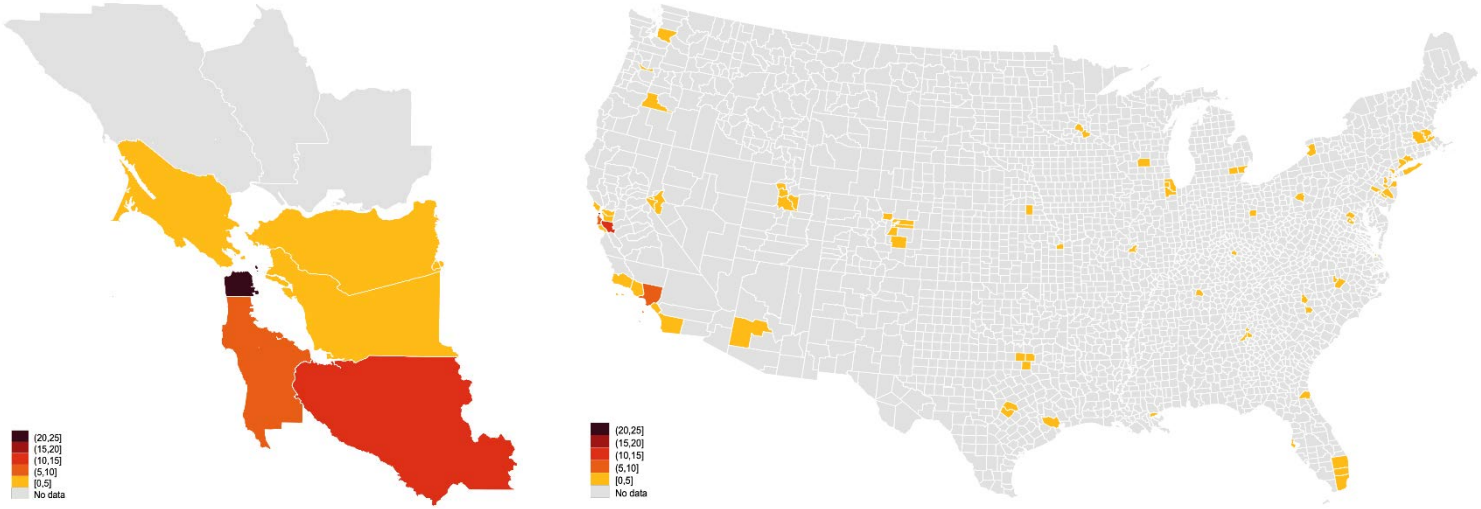


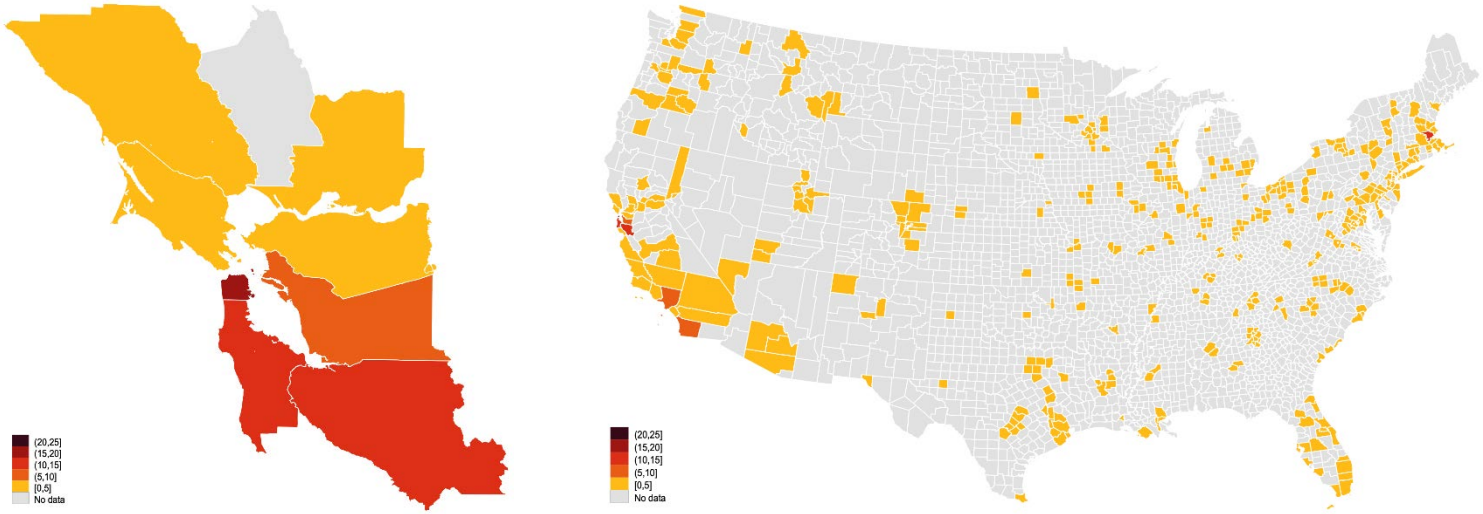
**Figure 5. Geographic distribution of U.S. unicorns, VC firms, and public firms**

The figure shows the share of unicorns (Panel A), VC firms (Panel B), and young public firms (Panel C) across U.S. counties. In each figure, the map on the left shows the distribution of firms across counties in the San Francisco Bay Area, and the map on the right shows the distribution of firms across all counties in the U.S. Unicorns are private companies that reach a post-money headline valuation of at least $1 billion. VC firms are startups in the CB Insights database that cumulatively obtained at least $50m in VC financing between 2010Q1 and September 2021Q3. Young public firms are firms in the lowest quartile of firm age each year. Data are from CB Insights and Standard & Poor's Compustat database.

Panel A: Unicorns



Panel B: VC firms




Panel C: Young public firms

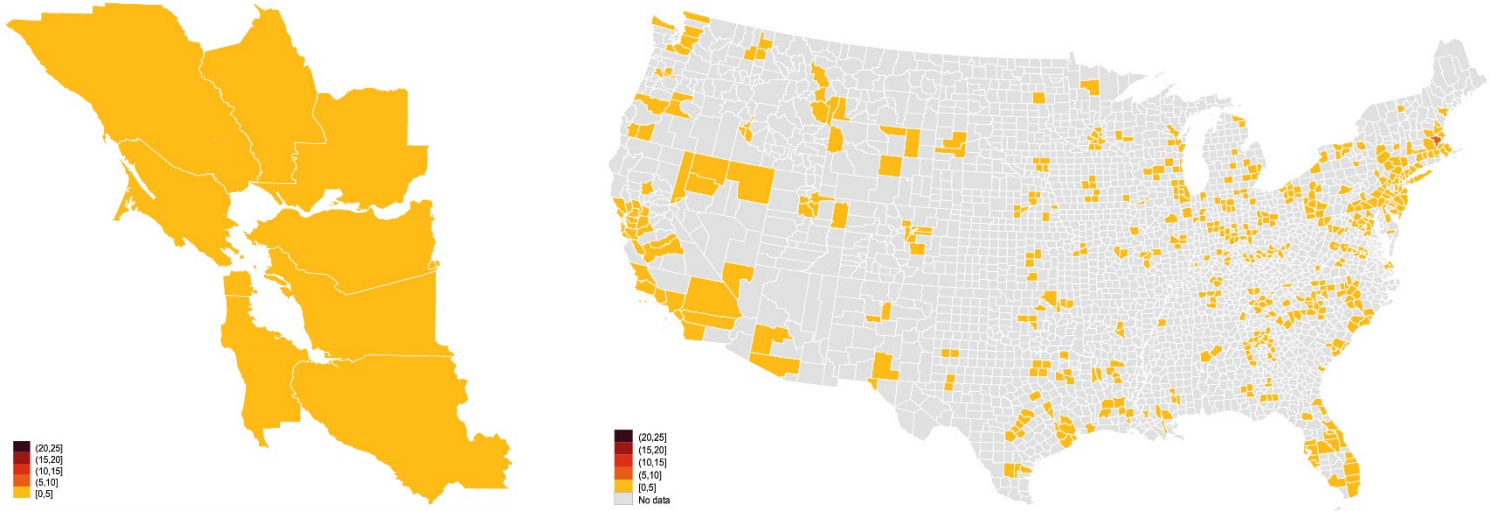
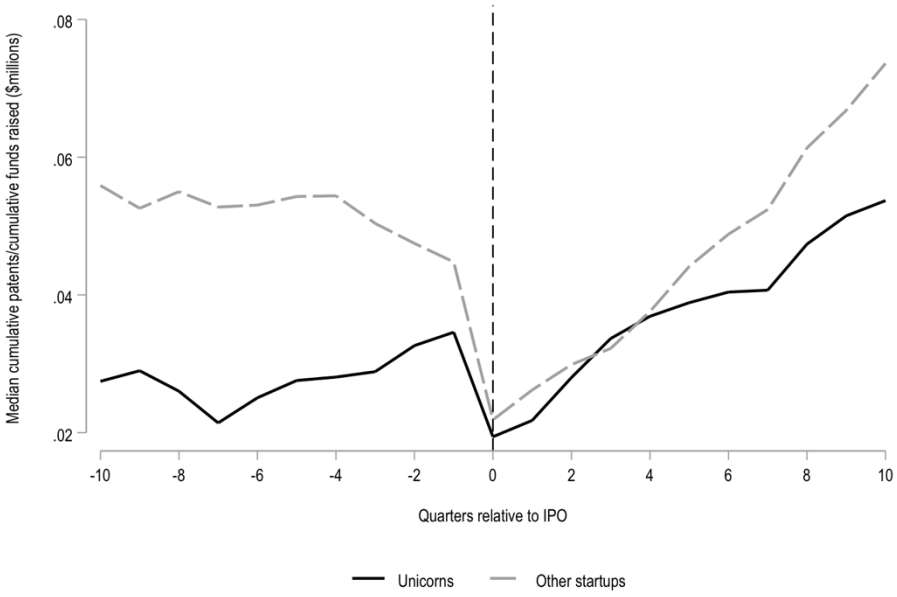


**Figure 6. Patent activity of unicorn IPOs vs other IPOs**

The figure shows the median of the ratio of the total number of patents per dollar of total funding (in millions), for the ten quarters before and after the IPO. The sample consists of 778 IPOs of U.S. firms between 2010Q1 and 2021Q3, 110 of which are unicorn IPOs. Data are from CB Insights. The solid black line shows the median ratio for unicorns, and the gray dashed line shows the ratio for other startups. The vertical black dashed line represents the IPO quarter.



## Table 1. Summary statistics on unicorns

The table shows summary statistics on the financing, post-money headline valuations, and status of 639 U.S. unicorns, defined as private companies that reach a post-money headline valuation of at least $1 billion. The sample period is 1995Q2 (the earliest funding round for firms that eventually become unicorns) to 2021Q3. Panel A shows summary statistics for the entire sample of unicorns, and Panel B shows summary statistics for the 212 unicorns that had an exit. Unicorns exit the sample because of a down round, a failure (outright failure or acquisition at less than 25% of unicorn post-money headline valuation), a public listing through an IPO, a de-SPAC transaction, and a direct listing, or an acquisition. Data are from CB Insights, S&P's Capital IQ, Gornall and Strebulaev (2020), and Crunchbase. Appendix B contains detailed variable definitions.

Panel A: All unicorns

| | Obs | Mean | 25th Pct. | Median | 75th Pct. |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Years between founding and unicorn status | 639 | 6.91 | 4.15 | 6.28 | 8.70 |
| Equity rounds between founding and unicorn status | 639 | 5.27 | 4.00 | 5.00 | 7.00 |
| PMV unicorn round ($ billions) | 639 | 1.64 | 1.00 | 1.20 | 1.70 |
| Market value after last round ($ billions) | 554 | 4.07 | 1.17 | 2.00 | 3.90 |
| Total funding until unicorn status ($ millions) | 630 | 328.34 | 181.50 | 252.96 | 381.00 |
| Total funding after unicorn status ($ millions) | 639 | 376.65 | 0.00 | 1.28 | 280.00 |
| Total funding while private ($ millions) | 633 | 707.96 | 235.75 | 383.40 | 666.00 |
| Total equity funding while private ($ millions) | 633 | 623.90 | 225.00 | 351.64 | 602.82 |
| Equity fraction, funds raised | 633 | 0.95 | 0.99 | 1.00 | 1.00 |
| Exit (=1) | 639 | 33.18 | | | |
| Years between unicorn status and exit | 212 | 3.08 | 1.52 | 2.63 | 4.21 |

Panel B: Exited unicorns

| | Down (10 obs.) | | Failed (21 obs.) | | IPO (110 obs.) | | SPAC (18 obs.) | | Direct listings (9 obs.) | | M&A (44 obs.) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | Median | Mean | Median | Mean | Median | Mean | Median | Mean | Median | Mean | Median |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| Years between unicorn status and exit | 2.83 | 2.54 | 4.42 | 4.59 | 2.79 | 2.35 | 3.55 | 3.48 | 3.99 | 3.43 | 2.84 | 2.49 |
| Equity rounds btw. unicorn status and exit | 2.80 | 1.00 | 1.90 | 2.00 | 2.34 | 1.00 | 2.44 | 1.50 | 3.22 | 2.00 | 1.07 | 1.00 |
| PMV unicorn round ($ billions) | 1.25 | 1.19 | 1.99 | 1.25 | 1.52 | 1.20 | 1.79 | 1.10 | 1.62 | 1.50 | 1.60 | 1.02 |
| PMV at exit | | | 0.06 | 0.00 | 7.61 | 3.49 | 5.00 | 3.35 | 17.57 | 6.08 | 4.26 | 2.23 |
| Total funding while private ($ millions) | 2255.81 | 506.52 | 651.03 | 509.30 | 1022.99 | 482.50 | 914.29 | 632.57 | 789.02 | 538.67 | 703.34 | 402.00 |
| PMV at exit/PMV unicorn round | | | 0.04 | 0.00 | 4.78 | 2.57 | 4.19 | 2.89 | 10.58 | 5.07 | 3.15 | 1.57 |
| PMV at exit/total equity funding | | | 0.17 | 0.00 | 10.67 | 7.92 | 9.45 | 8.21 | 27.29 | 15.37 | 15.93 | 5.92 |
| PMV at exit < total fundraising (=1) | | | 0.90 | 1.00 | 0.02 | 0.00 | 0.06 | 0.00 | 0.00 | 0.00 | 0.07 | 0.00 |

## Table 2. Unicorn investors

Panel A of the table lists the top 20 investors in B rounds of firms that eventually become unicorns. Panel B shows the top 20 investors in unicorn rounds. Panel C lists the top 20 investors in unicorn rounds that are not in B rounds. The sample consists of 639 U.S. unicorns, defined as private companies with a post-money headline valuation of at least $1 billion. The sample period is 1995Q2 (the earliest funding round for firms that eventually become unicorns) to 2021Q3. Data are from CB Insights and Gornall and Strebulaev (2020).

| Panel A: Top 20 Series B investors | | | Panel B: Top 20 unicorn round investors | | | Panel C: Top 20 unicorn round investors not in Series B rounds | | |
|---|---|---|---|---|---|---|---|---|
| Rank | Investor | Deals | Rank | Investor | Deals | Rank | Investor | Deals |
| 1 | Andreessen Horowitz | 42 | 1 | Tiger Global Management | 70 | 1 | Tiger Global Management | 70 |
| 2 | Accel | 41 | 2 | Sequoia Capital | 56 | 2 | SoftBank Group | 38 |
| 3 | Sequoia Capital | 39 | 3 | Andreessen Horowitz | 54 | 3 | Sapphire Ventures | 37 |
| 4 | Kleiner Perkins | 33 | 4 | Accel | 45 | 4 | T. Rowe Price | 35 |
| 5 | Google Ventures | 32 | 5 | Insight Partners | 43 | 5 | Fidelity Investments | 33 |
| 6 | Lightspeed Venture Partners | 32 | 6 | SoftBank Group | 38 | 6 | ICONIQ Capital | 32 |
| 7 | Khosla Ventures | 25 | 7 | Sapphire Ventures | 37 | 7 | Coatue Management | 31 |
| 8 | Founders Fund | 24 | 8 | Institutional Venture Partners | 37 | 8 | Meritech Capital Partners | 30 |
| 9 | New Enterprise Associates | 23 | 9 | Lightspeed Venture Partners | 35 | 9 | Wellington Management | 22 |
| 10 | Greylock Partners | 23 | 10 | Kleiner Perkins | 35 | 10 | Spark Capital | 22 |
| 11 | Index Ventures | 21 | 11 | Google Ventures | 35 | 11 | Salesforce Ventures | 21 |
| 12 | Benchmark | 20 | 12 | T. Rowe Price | 35 | 12 | Goldman Sachs | 21 |
| 13 | General Catalyst | 20 | 13 | Fidelity Investments | 33 | 13 | capitalG | 20 |
| 14 | Thrive Capital | 19 | 14 | New Enterprise Associates | 32 | 14 | General Atlantic | 19 |
| 15 | Insight Partners | 19 | 15 | ICONIQ Capital | 32 | 15 | Dragoneer Investment Group | 19 |
| 16 | Institutional Venture Partners | 18 | 16 | Coatue Management | 31 | 16 | BlackRock | 17 |
| 17 | Redpoint Ventures | 18 | 17 | Meritech Capital Partners | 30 | 17 | Norwest Venture Partners | 17 |
| 18 | Bessemer Venture Partners | 17 | 18 | Bessemer Venture Partners | 30 | 18 | DST Global | 17 |
| 19 | Y Combinator | 17 | 19 | Index Ventures | 30 | 19 | GGV Capital | 16 |
| 20 | Battery Ventures | 16 | 20 | General Catalyst | 28 | 20 | Silver Lake | 16 |

## Table 3. The composition and distance of unicorn investors

The table reports results from panel regressions of changes in the composition and distance of investors when firms achieve unicorn status. The sample is a firm-funding round-investor (Panels A and C) or a firm-funding round (Panels B and D) panel of 639 U.S. unicorns, defined as private companies that reach a post-money headline valuation of at least $1 billion. The sample period is 1995Q2 (the earliest funding round for firms that eventually become unicorns) to 2021Q3. In Panels A and B, the dependent variables are indicator variables that equal one if an investor of a given type (*Angel*, *Venture*, *Asset management*, *Corporate*, or *Growth*) participates in a funding round and zero otherwise and the share of investors of a given type that participate in a given round, respectively. In Panel C, the dependent variables are *Ln(Investor distance from unicorn)* and *Ln(Investor distance from San Francisco)*, defined as the distance of an investor in a funding round from the unicorn headquarters and San Francisco, respectively. In Panel D, the dependent variables are *Ln(Average investor distance from unicorn)* and *Ln(Average investor distance from San Francisco)*, defined as the average distance of the investors in a funding round from the unicorn headquarters and San Francisco, respectively. *Pre-unicorn* is an indicator variable that equals one for funding rounds before the unicorn round and zero otherwise. *Post-unicorn* is an indicator variable that equals one for funding rounds after the unicorn round and zero otherwise. Industry assignments are from CB Insights. The CB Insights industry assignment process is described in Section 4 of the paper. *Near San Francisco* is an indicator variable that equals one if a unicorn is headquartered within 200 miles of central San Francisco. *P*-values based on standard errors clustered at the firm level are shown in parentheses below coefficient estimates. Statistical significance at the 1, 5, and 10 percent significance level is denoted by ***, **, *, respectively. Appendix B contains detailed variable definitions.

Panel A: Investor composition

| | Investor type | | | | |
|---|---|---|---|---|---|
| | Angel | Venture | Asset management | Corporate | Growth |
| | (1) | (2) | (3) | (4) | (5) |
| Pre-unicorn | -0.005 | 0.113*** | -0.071*** | -0.004 | -0.031*** |
| | (0.652) | (0.000) | (0.000) | (0.672) | (0.000) |
| Post-unicorn | -0.022** | -0.040** | 0.070*** | -0.007 | -0.002 |
| | (0.018) | (0.016) | (0.000) | (0.538) | (0.860) |
| Risk & Security | -0.069 | 0.098* | -0.030* | 0.028 | 0.012 |
| | (0.134) | (0.063) | (0.099) | (0.280) | (0.398) |
| Media | 0.004 | -0.080 | -0.012 | 0.051 | 0.075** |
| | (0.940) | (0.229) | (0.646) | (0.185) | (0.016) |
| Environment | 0.113 | -0.182** | 0.059 | 0.021 | -0.025 |
| | (0.119) | (0.015) | (0.521) | (0.448) | (0.171) |
| Leisure | -0.052 | 0.060 | -0.012 | 0.011 | 0.026 |
| | (0.262) | (0.312) | (0.548) | (0.767) | (0.368) |
| Agriculture | -0.080* | -0.038 | 0.242*** | -0.080* | 0.010 |
| | (0.060) | (0.434) | (0.000) | (0.053) | (0.288) |
| Transportation | -0.023 | -0.169** | 0.037 | 0.183*** | -0.023 |
| | (0.669) | (0.021) | (0.516) | (0.000) | (0.173) |
| Computer | -0.080* | 0.038 | 0.014 | 0.034 | 0.028 |
| | (0.063) | (0.542) | (0.545) | (0.431) | (0.184) |
| Energy & Utilities | -0.092** | 0.040 | -0.006 | 0.016 | 0.058** |
| | (0.033) | (0.556) | (0.874) | (0.642) | (0.036) |
| Financial | -0.052 | 0.036 | 0.022 | -0.003 | 0.026** |
| | (0.232) | (0.467) | (0.242) | (0.890) | (0.021) |
| Food & Beverages | 0.284*** | -0.152* | -0.025 | -0.114*** | -0.005 |
| | (0.005) | (0.081) | (0.573) | (0.000) | (0.834) |

| | | | | | |
|---|---|---|---|---|---|
| Business | -0.034 | 0.055 | -0.011 | -0.015 | 0.029*** |
| | (0.429) | (0.251) | (0.518) | (0.461) | (0.002) |
| Electronics | -0.092** | 0.055 | 0.097** | -0.027 | 0.013 |
| | (0.041) | (0.451) | (0.015) | (0.572) | (0.747) |
| Consumer | 0.046 | -0.084 | -0.004 | -0.050** | 0.121*** |
| | (0.502) | (0.205) | (0.917) | (0.038) | (0.000) |
| Software | 0.010 | -0.050 | 0.020 | 0.040 | 0.008 |
| | (0.901) | (0.513) | (0.357) | (0.307) | (0.620) |
| Mobile | -0.044 | 0.024 | -0.004 | 0.014 | 0.036*** |
| | (0.364) | (0.682) | (0.844) | (0.657) | (0.006) |
| Healthcare | -0.055 | 0.001 | 0.015 | 0.024 | 0.043*** |
| | (0.209) | (0.987) | (0.431) | (0.352) | (0.004) |
| Internet | -0.001 | 0.019 | 0.003 | -0.019 | 0.031*** |
| | (0.981) | (0.695) | (0.882) | (0.356) | (0.003) |
| Near San Francisco | 0.031*** | 0.037** | -0.020** | -0.005 | -0.042*** |
| | (0.006) | (0.012) | (0.012) | (0.599) | (0.000) |
| Fixed effects | | | | | |
| Industry | Yes | Yes | Yes | Yes | Yes |
| Funding round | Yes | Yes | Yes | Yes | Yes |
| Observations | 16,221 | 16,221 | 16,221 | 16,221 | 16,221 |
| Adj. R2 | 0.16 | 0.07 | 0.09 | 0.06 | 0.06 |

Panel B: Investor composition shares

| | Investor type | | | | |
|---|---|---|---|---|---|
| | Angel share | Venture share | Asset management share | Corporate share | Growth share |
| | (1) | (2) | (3) | (4) | (5) |
| Unicorn | -0.015*** | -0.071*** | 0.050*** | 0.001 | 0.037*** |
| | (0.008) | (0.000) | (0.000) | (0.901) | (0.000) |
| Fixed effects | | | | | |
| Firm | Yes | Yes | Yes | Yes | Yes |
| Funding round | Yes | Yes | Yes | Yes | Yes |
| Observations | 3,924 | 3,924 | 3,924 | 3,924 | 3,924 |
| Adj. R2 | 0.16 | 0.23 | 0.19 | 0.20 | 0.30 |

| Panel C: Investor distance | | |
|---|---|---|
| | Ln(Investor distance from unicorn) | Ln(Investor distance from San Francisco) |
| | (1) | (2) |
| Pre-unicorn | -0.554*** | -0.374*** |
| | (0.000) | (0.000) |
| Post-unicorn | 0.200** | 0.175* |
| | (0.015) | (0.062) |
| Risk & Security | -0.273 | 0.195 |
| | (0.339) | (0.475) |
| Media | -0.359 | 0.688** |
| | (0.400) | (0.033) |
| Environment | 0.275 | 0.875** |
| | (0.419) | (0.023) |
| Leisure | -0.459 | 0.934*** |
| | (0.170) | (0.000) |
| Agriculture | -1.468*** | 1.441*** |
| | (0.000) | (0.000) |
| Transportation | 0.804* | 1.411*** |
| | (0.072) | (0.002) |
| Computer | -0.367 | 0.518** |
| | (0.141) | (0.037) |
| Energy & Utilities | -0.215 | 0.397 |
| | (0.620) | (0.292) |
| Financial | -0.544** | 0.457** |
| | (0.011) | (0.027) |
| Food & Beverages | 0.165 | 0.795* |
| | (0.557) | (0.062) |
| Business | -0.604*** | -0.011 |
| | (0.002) | (0.954) |
| Electronics | -1.297*** | -0.784*** |
| | (0.001) | (0.000) |
| Consumer | -0.116 | 0.531 |
| | (0.779) | (0.189) |
| Software | -0.026 | 0.290 |
| | (0.946) | (0.482) |
| Mobile | -0.419* | 0.382 |
| | (0.079) | (0.172) |
| Healthcare | -0.457* | 0.475** |
| | (0.056) | (0.039) |
| Internet | -0.604*** | 0.185 |
| | (0.003) | (0.355) |
| Near San Francisco | -1.434*** | -1.103*** |
| | (0.000) | (0.000) |
| Fixed effects | | |
| Industry | Yes | Yes |
| Funding round | Yes | Yes |
| Observations | 15,044 | 15,044 |
| Adj. R2 | 0.10 | 0.08 |

| Panel D: Average investor distance | | |
|---|---|---|
| | Ln(Average investor distance from unicorn) | Ln(Average investor distance from San Francisco) |
| | (1) | (2) |
| Unicorn | 0.538*** | 0.478*** |
| | (0.000) | (0.000) |
| Fixed effects | | |
| Firm | Yes | Yes |
| Funding round | Yes | Yes |
| Observations | 4,182 | 4,182 |
| Adj. R2 | 0.26 | 0.23 |

**Table 4. Industry sector comparisons of public firms, IPOs, unicorns, and other large private firms**

The table reports firm counts (Panel A) and distances from central San Francisco (Panel B) by CB Insights industry sectors. In Panel A, columns (1) and (2) show the number and (%) of unicorns, columns (3) and (4) show the number and (%) of startups that obtained at least $50m in cumulative financing between 2010 and September 2021, columns (5) and (6) show the total number and (%) of public firms, and columns (7) and (8) show the number and (%) of IPOs. In Panel B, columns (1) to (3) show the median distance in miles of firms' headquarters from central San Francisco for publicly listed firms (column (1)), unicorns (column (2)), and startups that obtained at least $50m in funding (column (3)). Appendix B contains detailed variable definitions.

Panel A: Firm counts

| | Unicorns | Unicorns (%) | VC firms | VC firms (%) | Public | Public (%) | IPOs | IPO (%) |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Metals & Mining | 0 | 0 | 6 | 0.1 | 58 | 0.8 | 12 | 0.3 |
| Risk & Security | 33 | 5.2 | 178 | 3.5 | 7 | 0.1 | 7 | 0.2 |
| Retail | 0 | 0.0 | 32 | 0.6 | 199 | 2.8 | 97 | 2.7 |
| Media | 16 | 2.5 | 97 | 1.9 | 256 | 3.5 | 167 | 4.6 |
| Environment | 4 | 0.6 | 9 | 0.2 | 38 | 0.5 | 5 | 0.1 |
| Leisure | 18 | 2.8 | 71 | 1.4 | 156 | 2.2 | 39 | 1.1 |
| Agriculture | 2 | 0.3 | 37 | 0.7 | 12 | 0.2 | 7 | 0.2 |
| Transportation | 6 | 0.9 | 64 | 1.3 | 213 | 2.9 | 75 | 2.1 |
| Computer | 20 | 3.1 | 194 | 3.8 | 781 | 10.8 | 401 | 11.0 |
| Energy & Utilities | 9 | 1.4 | 205 | 4.0 | 276 | 3.8 | 86 | 2.4 |
| Financial | 86 | 13.5 | 502 | 9.9 | 1,098 | 15.2 | 283 | 7.8 |
| Food & Beverages | 3 | 0.5 | 65 | 1.3 | 188 | 2.6 | 42 | 1.2 |
| Business | 168 | 26.3 | 449 | 8.9 | 394 | 5.5 | 505 | 13.9 |
| Electronics | 2 | 0.3 | 140 | 2.8 | 846 | 11.7 | 410 | 11.3 |
| Industrial | 27 | 4.2 | 240 | 4.7 | 710 | 9.8 | 485 | 13.3 |
| Consumer | 17 | 2.7 | 146 | 2.9 | 216 | 3.0 | 90 | 2.5 |
| Software | 16 | 2.5 | 186 | 3.7 | 421 | 5.8 | 275 | 7.6 |
| Mobile | 28 | 4.4 | 255 | 5.0 | 169 | 2.3 | 30 | 0.8 |
| Healthcare | 73 | 11.4 | 1,427 | 28.1 | 907 | 12.6 | 586 | 16.1 |
| Internet | 111 | 17.4 | 767 | 15.1 | 279 | 3.9 | 37 | 1.0 |
| Total | 639 | 100 | 5,070 | 100 | 7,224 | 100 | 3,639 | 100 |

| Panel B: Median distances from central San Francisco | | | |
|---|---|---|---|
| | Unicorns | VC Firms | Public |
| | (1) | (2) | (3) |
| Metals & Mining | | 2,558 | 1,478 |
| Risk & Security | 40 | 608 | 2,432 |
| Retail | | 1,634 | 1,962 |
| Media | 188 | 527 | 2,135 |
| Environment | 1,494 | 2,251 | 1,822 |
| Leisure | 344 | 915 | 1,578 |
| Agriculture | 2,692 | 1,504 | 943 |
| Transportation | 366 | 803 | 1,942 |
| Computer | 214 | 602 | 1,578 |
| Energy & Utilities | 31 | 1,578 | 1,630 |
| Financial | 596 | 1,645 | 2,198 |
| Food & Beverages | 23 | 935 | 1,854 |
| Business | 341 | 1,504 | 1,943 |
| Electronics | 35 | 287 | 1,633 |
| Industrial | 384 | 1,167 | 2,063 |
| Consumer | 344 | 948 | 1,943 |
| Software | 242 | 928 | 2,012 |
| Mobile | 183 | 949 | 1,824 |
| Healthcare | 606 | 1,729 | 2,383 |
| Internet | 33 | 447 | 1,581 |

## Table 5. Determinants of unicorn status

The table reports results from cross-sectional regressions of the determinants of unicorn status. The sample consists of 5,690 startups in the CB Insights Database that cumulatively obtained at least $50 million in financing between 2010Q1 and 2021Q3. The dependent variable is *Unicorn status*, an indicator variable that equals one if the firm reached a post-money headline valuation of at least $1 billion at any time during the sample period and zero otherwise. Industry assignments are from CB Insights. The CB Insights industry assignment process is described in Section 4 of the paper. *Birth cohort* is the first year a company reaches $50m in cumulative funding. *Near San Francisco* is an indicator variable that equals one if a company is headquartered within 200 miles of central San Francisco. *P*-values based on heteroskedasticity-robust standard errors are shown in parentheses below coefficient estimates. Statistical significance at the 1, 5, and 10 percent significance level is denoted by ***, **, *, respectively. Appendix B contains detailed variable definitions.

| | Unicorn status | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| Metals & Mining | -0.078*** | | -0.050** |
| | (0.000) | | (0.046) |
| Risk & Security | 0.041 | | 0.033 |
| | (0.184) | | (0.279) |
| Retail | -0.074*** | | -0.077*** |
| | (0.000) | | (0.000) |
| Media | 0.048 | | 0.041 |
| | (0.214) | | (0.289) |
| Environment | 0.023 | | 0.036 |
| | (0.698) | | (0.551) |
| Leisure | 0.095** | | 0.096** |
| | (0.028) | | (0.028) |
| Agriculture | -0.031 | | -0.028 |
| | (0.439) | | (0.481) |
| Transportation | -0.004 | | -0.013 |
| | (0.906) | | (0.733) |
| Computer | -0.017 | | -0.025 |
| | (0.519) | | (0.348) |
| Energy & Utilities | -0.044** | | -0.043* |
| | (0.048) | | (0.050) |
| Financial | 0.043* | | 0.040* |
| | (0.050) | | (0.069) |
| Food & Beverages | -0.041 | | -0.048 |
| | (0.174) | | (0.113) |
| Business | 0.081*** | | 0.075*** |
| | (0.000) | | (0.001) |
| Electronics | -0.099*** | | -0.097*** |
| | (0.000) | | (0.000) |
| Consumer | 0.018 | | 0.009 |
| | (0.534) | | (0.767) |
| Software | 0.034 | | 0.030 |
| | (0.363) | | (0.411) |
| Mobile | 0.024 | | 0.022 |
| | (0.425) | | (0.448) |
| Healthcare | -0.045** | | -0.046** |
| | (0.016) | | (0.013) |
| Internet | 0.059** | | 0.059*** |
| | (0.010) | | (0.010) |
| Birth cohort 2011 | | 0.057** | 0.052** |
| | | (0.016) | (0.028) |

| | | | |
|---|---|---|---|
| Birth cohort 2012 | | 0.024 | 0.011 |
| | | (0.227) | (0.584) |
| Birth cohort 2013 | | 0.086*** | 0.066*** |
| | | (0.001) | (0.007) |
| Birth cohort 2014 | | 0.090*** | 0.071*** |
| | | (0.000) | (0.001) |
| Birth cohort 2015 | | 0.083*** | 0.064*** |
| | | (0.000) | (0.001) |
| Birth cohort 2016 | | 0.086*** | 0.067*** |
| | | (0.000) | (0.001) |
| Birth cohort 2017 | | 0.111*** | 0.093*** |
| | | (0.000) | (0.000) |
| Birth cohort 2018 | | 0.085*** | 0.065*** |
| | | (0.000) | (0.000) |
| Birth cohort 2019 | | 0.066*** | 0.048*** |
| | | (0.000) | (0.003) |
| Birth cohort 2020 | | 0.069*** | 0.056*** |
| | | (0.000) | (0.001) |
| Birth cohort 2021 | | -0.016 | -0.036*** |
| | | (0.159) | (0.002) |
| Scale | 0.035*** | 0.054*** | 0.034*** |
| | (0.000) | (0.000) | (0.000) |
| Near San Francisco | 0.073*** | 0.079*** | 0.072*** |
| | (0.000) | (0.000) | (0.000) |
| Fixed effects | | | |
| Industry | Yes | No | Yes |
| Birth cohort | No | Yes | Yes |
| Observations | 5,690 | 5,690 | 5,690 |
| Adj. R2 | 0.04 | 0.04 | 0.06 |

## Table 6. Panel regressions of unicorn status

The table reports results from panel regressions of the determinants of unicorn status. The sample is a firm-quarter panel of 5,141 startups (77,054 firm-quarter observations) in the CB Insights database that cumulatively obtained at least $50m in VC financing between 2010Q1 and 2021Q3. The dependent variable is *Unicorn status*, an indicator variable that equals one from the quarter a firm reached a post-money headline valuation of at least $1 billion until the end of the sample and zero otherwise. Accounting variables are calculated as the average of all young public firms in an industry. Young firms are firms in the lowest quartile of firm age each year. Panel A presents OLS results, and Panel B presents results from instrumental variables regressions, where we instrument *Ln(Industry funding flow)* with *Ex ante target SoftBank industry. Ex ante Softbank industry* is an indicator variable that equals one after 2017Q2 for industries targeted by SoftBank when it created its first Vision Fund. Columns (1) and (2) of Panel B present first stage results, and columns (3) and (4) present second-stage results of the IV regression. *P*-values based on standard errors clustered at the firm level are shown in parentheses below coefficient estimates. Statistical significance at the 1, 5, and 10 percent significance level is denoted by ***, **, and *, respectively. Appendix B contains detailed variable definitions.

Panel A: OLS regressions

| | Unicorn status | |
|---|---|---|
| | (1) | (2) |
| Ln(Industry funding flow)$_{t-1}$ | 0.022*** | 0.017** |
| | (0.000) | (0.010) |
| Tobin's q$_{t-1}$ | 0.010* | 0.013** |
| | (0.070) | (0.027) |
| Ln(Assets)$_{t-1}$ | 0.007 | 0.003 |
| | (0.355) | (0.755) |
| Fixed assets/total assets$_{t-1}$ | -0.001*** | -0.001*** |
| | (0.006) | (0.000) |
| CAPX/total assets$_{t-1}$ | 0.001 | 0.003*** |
| | (0.252) | (0.010) |
| Cash/total assets$_{t-1}$ | -0.002*** | -0.002*** |
| | (0.002) | (0.001) |
| COGS/total assets$_{t-1}$ | -0.001 | -0.001 |
| | (0.106) | (0.140) |
| R&D/total assets$_{t-1}$ | -0.006** | -0.006* |
| | (0.027) | (0.083) |
| SG&A/total assets$_{t-1}$ | 0.006*** | 0.005** |
| | (0.002) | (0.011) |
| Loss firm$_{t-1}$ | 0.020 | 0.008 |
| | (0.357) | (0.698) |
| Foreign income/total assets$_{t-1}$ | -0.023*** | -0.024*** |
| | (0.005) | (0.005) |
| Ln(Age)$_{t-1}$ | -0.001 | -0.016 |
| | (0.958) | (0.597) |
| Scale | 0.028*** | 0.028*** |
| | (0.001) | (0.001) |
| Near San Francisco | 0.054*** | 0.054*** |
| | (0.000) | (0.000) |
| IPO volume$_{t-1}$ | -0.002 | |
| | (0.653) | |
| EW IPO first day returns$_{t-1}$ | 0.034** | |
| | (0.031) | |
| Real GDP growth$_{t-1}$ | -0.012 | |
| | (0.546) | |
| EW market returns$_{t-3 \text{ to } t-1}$ | 0.013 | |
| | (0.118) | |
| Aggregate MB$_{t-1}$ | 0.038*** | |
| | (0.000) | |
| Credit spread$_{t-1}$ | 0.023*** | |
| | (0.000) | |
| Federal funds rate$_{t-1}$ | 0.007** | |
| | (0.039) | |
| Fixed effects | | |
| Quarter | No | Yes |
| Observations | 77,054 | 77,054 |
| Adj. R2 | 0.04 | 0.03 |

Panel B: IV regressions

| | First stage | | Second stage | |
|---|---|---|---|---|
| | Ln(Industry funding flow) | | Unicorn status | |
| | (1) | (2) | (3) | (4) |
| Ex ante target SoftBank industry | 0.595*** | 0.693*** | | |
| | (0.000) | (0.000) | | |
| Instrumented Ln(Industry funding flow)$_{t-1}$ | | | 0.062*** | 0.052*** |
| | | | (0.000) | (0.002) |
| Tobin's q$_{t-1}$ | -0.205*** | -0.206*** | 0.019*** | 0.020*** |
| | (0.000) | (0.000) | (0.005) | (0.004) |
| Ln(Assets)$_{t-1}$ | -0.028 | 0.001 | 0.009 | 0.006 |
| | (0.103) | (0.936) | (0.222) | (0.461) |
| Fixed assets/total assets$_{t-1}$ | -0.001* | -0.002*** | -0.001** | -0.001** |
| | (0.063) | (0.000) | (0.047) | (0.040) |
| CAPX/total assets$_{t-1}$ | 0.018*** | 0.037*** | 0.000 | 0.001 |
| | (0.000) | (0.000) | (0.895) | (0.639) |
| Cash/total assets$_{t-1}$ | 0.041*** | 0.043*** | -0.004*** | -0.004*** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| COGS/total assets$_{t-1}$ | 0.012*** | 0.014*** | -0.002** | -0.002** |
| | (0.000) | (0.000) | (0.020) | (0.035) |
| R&D/total assets$_{t-1}$ | -0.105*** | -0.107*** | -0.002 | -0.002 |
| | (0.000) | (0.000) | (0.549) | (0.646) |
| SG&A/total assets$_{t-1}$ | -0.049*** | -0.050*** | 0.009*** | 0.008*** |
| | (0.000) | (0.000) | (0.000) | (0.001) |
| Loss firm$_{t-1}$ | -0.153*** | -0.137*** | 0.032 | 0.022 |
| | (0.000) | (0.000) | (0.137) | (0.333) |
| Foreign income/total assets$_{t-1}$ | -0.276*** | -0.287*** | -0.014 | -0.016 |
| | (0.000) | (0.000) | (0.122) | (0.104) |
| Ln(Age)$_{t-1}$ | -0.573*** | -0.444*** | 0.008 | 0.003 |
| | (0.000) | (0.000) | (0.724) | (0.909) |
| Scale | 0.025*** | 0.020*** | 0.026*** | 0.027*** |
| | (0.001) | (0.007) | (0.002) | (0.002) |
| Near San Francisco | -0.001 | -0.001 | 0.054*** | 0.054*** |
| | (0.935) | (0.890) | (0.000) | (0.000) |
| IPO volume$_{t-1}$ | 0.213*** | | -0.006 | |
| | (0.000) | | (0.147) | |
| EW IPO first day returns$_{t-1}$ | -0.764*** | | 0.034** | |
| | (0.000) | | (0.029) | |
| Real GDP growth$_{t-1}$ | -0.247*** | | 0.016 | |
| | (0.000) | | (0.476) | |
| EW market returns$_{t-3 \text{ to } t-1}$ | 0.117*** | | 0.010 | |
| | (0.000) | | (0.209) | |
| Aggregate MB$_{t-1}$ | 0.378*** | | 0.013 | |
| | (0.000) | | (0.231) | |
| Credit spread$_{t-1}$ | 0.303*** | | 0.010** | |
| | (0.000) | | (0.041) | |
| Federal funds rate$_{t-1}$ | 0.164*** | | -0.007 | |
| | (0.000) | | (0.183) | |
| Fixed effects | | | | |
| Industry | No | No | No | No |
| Quarter | No | Yes | No | Yes |
| Observations | 77,054 | 77,054 | 77,054 | 77,054 |
| Adj. R2 | 0.73 | 0.76 | | |

## Table 7. Offer characteristics and fundamental characteristics of firms at their IPOs

The table reports summary statistics on IPOs and the financial characteristics of firms immediately before their IPO. The sample consists of 778 IPOs of U.S. firms between 2010Q1 and 2021Q3, 110 of which are unicorn IPOs. Columns (1) to (3) report summary statistics for unicorn IPOs and columns and columns (4) to (6) report summary statistics of all IPOs excluding unicorn IPOs. Column (7) reports differences in means between unicorn IPOs and all other IPOs. Column (8) reports differences in medians between unicorn IPOs and all other IPOs. The stars correspond to *t*-tests (Wilcoxon test) of differences in means (medians). Statistical significance at the 1, 5, and 10 percent significance level is denoted by ***, **, and *, respectively.

| | Unicorn IPOs (N=110) | | | All other IPOs (N=668) | | | Diff. in | Diff. in |
|---|---|---|---|---|---|---|---|---|
| | Obs | Mean | Median | Obs | Mean | Median | means | medians |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| **Offer characteristics** | | | | | | | | |
| Dual class (=1) | 110 | 0.51 | 1 | 668 | 0.08 | 0 | 0.43*** (0.000) | 1*** (0.000) |
| IPO valuation ($millions) | 110 | 7555.13 | 3228.05 | 668 | 624.21 | 407.8 | 6930.93*** (0.000) | 2902.29*** (0.000) |
| Offer price | 110 | 27.78 | 22 | 668 | 14.77 | 15 | 13.01*** (0.000) | 7*** (0.000) |
| Underwriter spread (%) | 110 | 5.76 | 6.24 | 668 | 6.93 | 7 | -1.17*** (0.000) | -0.76*** (0.000) |
| Offer price below range | 110 | 0.07 | 0 | 668 | 0.26 | 0 | -0.19*** (0.000) | 0*** (0.000) |
| Offer price above range | 110 | 0.62 | 1 | 668 | 0.25 | 0 | 0.37*** (0.000) | 1*** (0.000) |
| Gross Proceeds | 110 | 864.86 | 419.38 | 668 | 118.8 | 91 | 746.1*** (0.000) | 328.38*** (0.000) |
| Fraction of proceeds to company | 110 | 0.93 | 1 | 668 | 0.96 | 1 | -0.03* (0.060) | 0*** (0.001) |
| Fraction of proceeds to selling shareholders | 110 | 0.07 | 0 | 668 | 0.04 | 0 | 0.03* (0.060) | 0*** (0.001) |
| First-day return | 110 | 0.37 | 0.33 | 668 | 0.25 | 0.16 | 0.12*** (0.002) | 0.17*** (0.000) |
| Three-month return | 110 | 0.35 | 0.25 | 668 | 0.36 | 0.21 | -0.01 (0.841) | 0.04 (0.960) |
| Six-month return | 110 | 0.19 | 0.08 | 668 | 0.27 | 0.13 | -0.08 (0.289) | 0.04 (0.118) |
| **Accounting characteristics** | | | | | | | | |
| Total assets | 110 | 1139.2 | 452.3 | 668 | 127.7 | 56.23 | 1011.5*** (0.000) | 396.05*** (0.000) |
| Sales | 109 | 580.4 | 273.7 | 660 | 60.9 | 9.93 | 519.5*** (0.000) | 263.73*** (0.000) |
| Cash and STI/total assets | 110 | 0.5 | 0.53 | 667 | 0.61 | 0.66 | -0.11*** (0.000) | -0.13*** (0.000) |
| Net PPE/total assets | 110 | 0.11 | 0.07 | 665 | 0.10 | 0.06 | 0.01 (0.480) | 0.01** (0.033) |
| CAPX/total assets | 108 | 0.04 | 0.02 | 635 | 0.04 | 0.02 | 0 (0.893) | 0 (0.307) |
| R&D/total assets | 110 | 0.14 | 0.11 | 667 | 0.58 | 0.31 | -0.44** (0.002) | -0.2*** (0.000) |
| SG&A/total assets | 110 | 0.37 | 0.33 | 667 | 0.36 | 0.17 | 0.01 (0.981) | 0.16*** (0.001) |
| LT Debt/total assets | 104 | 0.19 | 0.05 | 655 | 0.18 | 0.01 | 0.01 (0.896) | 0.04 (0.121) |
| COGS/total assets | 109 | 0.35 | 0.19 | 660 | 0.44 | 0.22 | -0.09 (0.346) | -0.03 (0.358) |
| Gross profit/total assets | 110 | 0.36 | 0.34 | 660 | 0.11 | 0.00 | 0.25** (0.014) | 0.34*** (0.000) |
| SG&A/sales | 109 | 0.72 | 0.55 | 660 | 2.80 | 0 | -2.08 (0.601) | 0.55*** (0.000) |
| Negative net income (=1) | 110 | 0.88 | 1 | 665 | 0.86 | 1 | 0.02 (0.514) | 0 (0.629) |

## Table 8. Unicorn status and firm characteristics at IPO

The table reports results of cross-sectional regressions of unicorn status on firm characteristics. The sample consists of 762 VC-backed IPOs between 2010Q1 and 2021Q3. The dependent variable is *Unicorn status*, an indicator variable that equals one if the firm reached a post-money headline valuation of at least $1 billion as a private company at any time during the sample period and zero otherwise. Statistical significance at the 1, 5, and 10 percent significance level is denoted by ***, **, and *, respectively. Appendix B contains detailed variable definitions.

| | Unicorn status | |
|---|---|---|
| | (1) | (2) |
| Ln(Assets) | 0.142*** | 0.126*** |
| | (0.011) | (0.012) |
| Fixed assets/total assets | -0.118 | -0.061 |
| | (0.140) | (0.139) |
| CAPX/total assets | 0.125 | 0.006 |
| | (0.271) | (0.279) |
| Cash/total assets | 0.002 | 0.033 |
| | (0.054) | (0.057) |
| COGS/total assets | 0.002 | 0.009 |
| | (0.014) | (0.014) |
| R&D/total assets | 0.027*** | 0.027*** |
| | (0.009) | (0.009) |
| SG&A/total assets | 0.085*** | 0.067*** |
| | (0.019) | (0.018) |
| Sale/total assets | 0.001 | -0.017 |
| | (0.023) | (0.023) |
| Loss firm | 0.150*** | 0.149*** |
| | (0.036) | (0.037) |
| Foreign income/total assets | -0.155** | -0.136* |
| | (0.071) | (0.073) |
| Ln(Age) | 0.015 | 0.009 |
| | (0.018) | (0.018) |
| Scale | 0.081*** | 0.054** |
| | (0.024) | (0.025) |
| Near San Francisco | 0.061*** | 0.043* |
| | (0.023) | (0.024) |
| IPO volume$_{t-1}$ | -0.268 | |
| | (1.547) | |
| EW IPO first day returns$_{t-1}$ | 0.208 | |
| | (0.340) | |
| Real GDP Growth$_{t-1}$ | -0.001 | |
| | (0.013) | |
| EW market returns$_{t-3 \text{ to } t-1}$ | -0.090 | |
| | (0.141) | |
| Aggregate MB$_{t-1}$ | 0.019 | |
| | (0.101) | |
| Credit spread$_{t-1}$ | -0.037 | |
| | (0.119) | |
| Federal funds rate$_{t-1}$ | -0.014 | |
| | (0.036) | |
| Fixed effects | | |
| Industry | No | Yes |
| Year | No | Yes |
| Observations | 762 | 762 |
| Adj. R2 | 0.365 | 0.382 |

## Table 9. Determinants of startup exit

The table reports results from multinomial logit regressions of the determinants of startup exit. In columns (1) and (2), the sample is a firm-quarter panel of 5,141 startups (77,054 firm-quarter observations) in the CB Insights database that cumulatively obtained at least $50m in VC financing between 2010Q1 and 2021Q3. In columns (3) and (4), the sample is a firm-quarter panel of 639 startups (10,112 firm-quarters) that reached a post-money headline valuation of at least $1 billion between 2010Q1 and September 2021Q1 (unicorns). A firm can exit through a *Listing*, including an IPO, SPAC, and direct listing, or through an *M&A*. The baseline case includes firms that remain alive during the sample period and firms that failed. *Reached unicorn status* is an indicator variable that equals one if a startup reached a post-money headline valuation of at least $1b between 2010Q1 and 2021Q3 and zero otherwise. Accounting variables are calculated as the average of all young public firms in an industry. Young firms are firms in the lowest quartile of firm age each year. *P*-values based on standard errors clustered at the firm level are shown in parentheses below exponentiated log-odds ratios. The marginal effect for unicorn status shows the increase in probability of exiting relative to the baseline, holding all other covariates at their mean values Statistical significance at the 1, 5, and 10 percent significance level is denoted by ***, **, and *, respectively. Appendix B contains detailed variable definitions.

| | All VC startups | | Unicorns only | |
|---|---|---|---|---|
| | Listing | M&A | Listing | M&A |
| | (1) | (2) | (3) | (4) |
| Reached unicorn status | 2.125*** | 0.256*** | | |
| | (0.000) | (0.000) | | |
| Ln(Industry funding flow)$_{t-1}$ | 1.119 | 1.035 | 1.610** | 1.138 |
| | (0.273) | (0.638) | (0.014) | (0.709) |
| Tobin's q$_{t-1}$ | 1.178* | 1.003 | 1.154 | 1.011 |
| | (0.058) | (0.964) | (0.385) | (0.973) |
| Ln(Assets)$_{t-1}$ | 1.345* | 1.019 | 1.303 | 3.712** |
| | (0.089) | (0.871) | (0.464) | (0.017) |
| Fixed assets/total assets$_{t-1}$ | 1.014** | 0.992* | 1.016 | 0.998 |
| | (0.030) | (0.069) | (0.267) | (0.948) |
| CAPX/total assets$_{t-1}$ | 0.940 | 1.007 | 1.079 | 1.196 |
| | (0.155) | (0.769) | (0.331) | (0.103) |
| Cash/total assets$_{t-1}$ | 1.058*** | 0.989 | 1.035 | 1.001 |
| | (0.000) | (0.261) | (0.235) | (0.992) |
| COGS/total assets$_{t-1}$ | 1.011 | 1.017** | 0.984 | 1.035 |
| | (0.336) | (0.016) | (0.453) | (0.283) |
| R&D/total assets$_{t-1}$ | 1.008 | 1.084* | 0.975 | 1.260 |
| | (0.902) | (0.078) | (0.871) | (0.237) |
| SG&A/total assets$_{t-1}$ | 0.932** | 0.999 | 1.051 | 1.093 |
| | (0.042) | (0.973) | (0.429) | (0.422) |
| Loss firm$_{t-1}$ | 0.586 | 2.254*** | 0.561 | 0.875 |
| | (0.293) | (0.002) | (0.483) | (0.899) |
| Foreign income/total assets$_{t-1}$ | 1.001 | 1.340*** | 0.833 | 0.510 |
| | (0.997) | (0.009) | (0.649) | (0.318) |
| Ln(Age)$_{t-1}$ | 5.490*** | 1.819 | 88.137*** | 6.111 |
| | (0.001) | (0.123) | (0.000) | (0.296) |
| Scale | 1.053 | 1.159** | 1.288 | 1.267 |
| | (0.548) | (0.017) | (0.136) | (0.423) |
| Near San Francisco | 1.056 | 1.212*** | 1.179 | 0.826 |
| | (0.530) | (0.002) | (0.326) | (0.545) |
| IPO volume$_{t-1}$ | 1.015 | 1.200 | 1.249 | 0.904 |
| | (0.932) | (0.131) | (0.554) | (0.856) |
| EW IPO first day returns$_{t-1}$ | 2.332 | 1.716 | 0.599 | 0.958 |
| | (0.178) | (0.279) | (0.721) | (0.985) |
| Real GDP growth$_{t-1}$ | 1.167 | 15.877* | 0.103 | 135.417 |
| | (0.923) | (0.066) | (0.538) | (0.442) |
| EW market returns$_{t-3 \text{ to } t-1}$ | 0.367*** | 0.624* | 1.357 | 0.027*** |
| | (0.003) | (0.072) | (0.663) | (0.007) |
| Aggregate MB$_{t-1}$ | 2.015*** | 1.621*** | 1.403 | 3.692 |
| | (0.004) | (0.002) | (0.488) | (0.122) |
| Credit spread$_{t-1}$ | 0.887 | 1.109 | 0.905 | 0.789 |
| | (0.536) | (0.448) | (0.825) | (0.726) |
| Federal funds rate$_{t-1}$ | 0.914 | 1.029 | 0.816 | 0.520* |
| | (0.404) | (0.706) | (0.377) | (0.053) |
| Marginal effects | | | | |
| Reached unicorn status (=1) | 0.006*** | -0.018*** | | |
| | (0.000) | (0.000) | | |
| Observations | 77,054 | 77,054 | 10,112 | 10,112 |
| Pseudo R2 | 0.05 | 0.05 | 0.06 | 0.06 |

## Table 10. Cox proportional hazard regressions of startup exit

The table reports results from Cox proportional hazard regressions of startup exit. In column (1), the sample is a firm-quarter panel of 5,141 startups (77,054 firm-quarter observations) in the CB Insights database that cumulatively obtained at least $50m in VC financing between 2010Q1 and 2021Q3. In column (2), the sample is a firm-quarter panel of 639 startups (10,112 firm-quarters) that reached a post-money headline valuation of at least $1 billion between 2010Q1 and 2021Q3 (unicorns). The time variable is the number of quarters until a firm exits the sample. Firms can exit the sample because of a listing (IPO, SPAC, or direct listing) or a merger and acquisition. *Unicorn status* is an indicator variable that equals one from the quarter a startup reached a post-money headline valuation of at least $1 billion until the end of the sample and zero otherwise. Accounting variables are calculated as the average of all young public firms in an industry. Young firms are firms in the lowest quartile of firm age each year. *P*-values based on standard errors clustered at the firm level are shown in parentheses below hazard ratios. Statistical significance at the 1, 5, and 10 percent significance level is denoted by ***, **, and *, respectively. Appendix B contains detailed variable definitions.

| | All VC startups | Unicorns only |
|---|---|---|
| | (1) | (2) |
| Unicorn status$_{t-1}$ | 0.858*** | |
| | (0.000) | |
| Ln(Industry funding flow)$_{t-1}$ | 1.105*** | 0.987 |
| | (0.000) | (0.813) |
| Tobin's q$_{t-1}$ | 1.049** | 0.991 |
| | (0.012) | (0.853) |
| Ln(Assets)$_{t-1}$ | 0.867*** | 0.825*** |
| | (0.000) | (0.004) |
| Fixed assets/total assets$_{t-1}$ | 0.991*** | 0.984*** |
| | (0.000) | (0.000) |
| CAPX/total assets$_{t-1}$ | 1.008*** | 1.026** |
| | (0.005) | (0.030) |
| Cash/total assets$_{t-1}$ | 0.997* | 0.999 |
| | (0.098) | (0.865) |
| COGS/total sales$_{t-1}$ | 0.997 | 1.005 |
| | (0.182) | (0.391) |
| R&D/total assets$_{t-1}$ | 0.902*** | 0.950* |
| | (0.000) | (0.052) |
| SG&A/total assets$_{t-1}$ | 0.978*** | 0.955*** |
| | (0.000) | (0.003) |
| Loss firm$_{t-1}$ | 1.421*** | 1.612*** |
| | (0.000) | (0.006) |
| Foreign income/total assets$_{t-1}$ | 0.879*** | 1.231** |
| | (0.000) | (0.031) |
| Ln(Age)$_{t-1}$ | 1.540*** | 1.625* |
| | (0.000) | (0.052) |
| Scale | 1.044 | 1.048 |
| | (0.135) | (0.507) |
| Near San Francisco | 1.038 | 1.015 |
| | (0.199) | (0.834) |
| IPO volume$_{t-1}$ | 1.198*** | 1.236*** |
| | (0.000) | (0.000) |
| EW IPO first day returns$_{t-1}$ | 0.654*** | 0.398*** |
| | (0.000) | (0.000) |
| Real GDP growth$_{t-1}$ | 1.734*** | 1.626*** |
| | (0.000) | (0.004) |
| EW market returns$_{t-3 \text{ to } t-1}$ | 2.079*** | 1.695*** |
| | (0.000) | (0.000) |
| Aggregate MB$_{t-1}$ | 0.343*** | 0.406*** |
| | (0.000) | (0.000) |
| Credit spread$_{t-1}$ | 0.758*** | 0.781*** |
| | (0.000) | (0.000) |
| Federal funds rate$_{t-1}$ | 0.886*** | 0.864*** |
| | (0.000) | (0.000) |
| Observations | 77,054 | 10,112 |
| Pseudo R2 | 0.01 | 0.01 |

## Appendix A. Details on the sample construction

We use historical snapshots of the CB Insights unicorn list as the starting point for our sample since the inception of the list in 2015. We obtain historical snapshots of the CB Insights unicorn list through the Internet Archive's Wayback Machine at https://archive.org/web/. Using historical snapshots enables us to obtain the names of unicorns that exit between 2015 and 2021Q3, the end of our sample period. From the CB Insights unicorn list, we obtain data on the date of the unicorn round as well as the name of the company and the headquarters address. For each of the unicorns on the CB Insights unicorn list, we download the full funding history with data on all available rounds from CB Insights and obtain data on the name of the round, type of investment (grant, equity round, debt round), names of the key investors, amount raised, post-money headline valuation, and date of the round. We obtain the founding year of the unicorn from Crunchbase. We verify the CB Insights data with funding round data from Crunchbase and Standard and Poor's CapitalIQ databases. When these databases yield diverging results, we obtain additional information through web-based searches. We exclude a small set of companies from the unicorn base sample when we cannot verify a post-money headline valuation of more than $1 billion or determine that instead of an announced funding round, the company was instead acquired.

Gornall and Strebulaev (2020) provide an online appendix with a list of their sample unicorns as well as all unicorn candidates they examined, compiled from different sources. The online appendix is available for download free of charge at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2968003. Not all of those unicorn candidates make it to the final sample of Gornall and Strebulaev (2020), because they include additional exclusion filters (founding year before 1994, no VC round after 2004, or unavailability of a certificate of incorporation). We go through the list of all unicorn candidates in appendices B, C, and D of the online appendix to Gornall and Strebulaev (2020) and determine whether they are unicorns according to the CB Insights definition. Gornall and Strebulaev (2020) derive the unicorn status from amended certificates of incorporation that companies file after each additional funding round. As there is an overlap between the Gornall and Strebulaev (2020) sample and our CB Insights sample, we also compare the two data sources for a subset of unicorns. The comparison confirms the high quality of the CB Insights data.

## Appendix B. Variable definitions

This appendix contains detailed definitions of dependent and independent variables used in the analysis. Compustat data mnemonics are in italics within parentheses.

| Variable name | Description |
|---|---|
| **Dependent variables** | |
| Annualized return (%) | The annualized percent change in prices per share between the unicorn round and time *t.* Time *t* is either a firm's initial public offering (IPO), the last funding round with available information on prices and shares, or May 31, 2022. |
| Investor type | A set of indicator variables that identify investor types in a funding round. *Angel* is an indicator variable that equals one if an investor is classified as an angel investor and zero otherwise. *Venture* is an indicator variable that equals one if an investor is classified as a venture capital (VC) firm and zero otherwise. *Asset management* is an indicator variable that equals one if an investor is classified as a bank, mutual fund, sovereign wealth fund, or other asset management firm and zero otherwise. *Corporate* is an indicator variable that equals one if the investor is classified as a corporate venture and zero otherwise. *Growth* is an indicator variable that equals one if an investor is classified as a growth capital firm and zero otherwise. |
| Listing | An indicator variable that equals one if a firm exited the sample through an IPO, SPAC transaction, or direct listing and zero otherwise. |
| Matched young firm equivalent | The number of shares purchased during the unicorn round multiplied by the price per share at time t, all divided by dollar amount invested at the unicorn round multiplied by the total return of a set of matched young public firms that went public around the time when the startup became a unicorn, are in the same industry, and are geographically close to the unicorn. Time t is either a firm's IPO or the last funding round with available information on prices and shares. |
| Multiple of money invested | The number of shares issued at the unicorn round multiplied by the price per share at time *t*, all divided by the dollar amount invested at the unicorn round. Time *t* is either a firm's IPO or the last funding round with available information on prices and shares. |
| M&A | An indicator variable that equals one if a firm exited the sample through a merger and zero otherwise. |
| Public market equivalent (Russell 2000) | The number of shares purchased during the unicorn round multiplied by the price per share at time *t*, all divided by dollar amount invested at the unicorn round multiplied by the total return of the Russell 2000 index between the unicorn round and time *t.* Time *t* is either a firm's IPO or the last funding round with available information on prices and shares. |

| | |
|---|---|
| Public market equivalent (S&P 500) | The number of shares purchased during the unicorn round multiplied by the price per share at time *t*, all divided by dollar amount invested at the unicorn round multiplied by the total return of the S&P 500 index between the unicorn round and time *t*. Time *t* is either a firm's IPO or the last funding round with available information on prices and shares. |
| Public market equivalent (S&P 500 Tech) | The number of shares purchased during the unicorn round multiplied by the price per share at time *t*, all divided by dollar amount invested at the unicorn round multiplied by the total return of the S&P 500 Information Technology index between the unicorn round and time *t*. Time *t* is either a firm's IPO or the last funding round with available information on prices and shares. |
| Time to exit | The number of quarters until a firm exits the sample because of a listing (IPO, SPAC, or direct listing), a merger, or failure. |
| Unicorn status | An indicator variable that equals one from the quarter a unicorn reached a post-money headline valuation of at least $1 billion until the end of the sample and zero otherwise. |
| **Independent and other variables** | |
| Aggregate MB | The equally weighted average of the market value of common equity (*ceqq*) divided by book value of equity (*cshoq*×*prccq*) across all public firms in a quarter. |
| Cash/total assets | Cash (*chq*) divided by assets (*atq*). |
| CAPX/total assets | Capital expenditures (*capxy*) divided by assets (*atq*). |
| Credit spread | The spread between the yield of Baa-rated corporate bonds and 10-year treasuries at the end of a quarter. |
| Ex ante SoftBank target industry | An indicator variable that equals one after 2017Q2 for industries targeted by SoftBank when it created its first Vision Fund. |
| EW IPO first day returns | The difference between the first closing price and the offer price, divided by the offer price, averaged across all firms that went public in a quarter. |
| EW market returns | Compound monthly returns on the equally weighted index in a quarter. |
| COGS/total assets | Cost of goods sold (*cogsq*) divided by total assets (*atq*). |
| Federal funds rate | The effective federal funds rate at the end of a quarter. |
| Fixed assets/total assets | Fixed assets (*ppentq*) divided by assets (*atq*). |
| Foreign income/total assets | Quarterly foreign income (*pifo*) divided by assets (*at*). |
| IPO volume | The total number of IPOs, excluding penny stocks, units, and closed-end funds, divided by the total number of listed firms in a quarter. |
| Ln(Age) | The natural log of age. Age is calculated as the number of years since the minimum of the first year a firm appears in CRSP and the first year a firm appears in Compustat. |
| Ln(Assets) | The natural log of assets (*atq*). |

| | |
|---|---|
| Ln(Industry funding flow) | The natural log of aggregate funding flows, calculated as the sum of the total amount of funding in an industry-quarter provided to VC-backed startups with more than $50 million in cumulative funding in the CB insights database. |
| Loss firm | The percentage of firms in an industry-quarter with negative net income. |
| Near San Francisco | An indicator variable that equals one if a company is headquartered within 200 miles of central San Francisco. |
| Real GDP growth | The quarterly growth rate of real GDP. |
| R&D/total assets | Research and development expenses (R&D, *xrdq*) divided by assets (*atq*). If R&D is missing, it is set equal to zero. |
| Scale | An indicator variable that equals one if the words "platform," "network," or "connect" appear in the textual description of a firm's business in CB Insights. |
| SG&A/total assets | Selling, general, and administrative expenses (SG&A, *xsgaq*) minus research and development expenses (R&D, *xrdq*) and in-process R&D (*rdipq*) divided by assets (*atq*). If SG&A, R&D, or in-process R&D are missing, they are set equal to zero. If R&D excess SG&A but is less than COGS, or if SG&A is missing, we do not subtract R&D and in-process R&D from SG&A. |
| Tobin's q | Book value of assets (*atq*) minus book value of equity (*ceqq*) plus the market value of common equity (*cshoq*×*prccq*) divided by total assets (*atq*). |