The Unicorn Puzzle*

Daria Davydova
Ecole Polytechnique Fédérale de Lausanne (EPFL)

Rüdiger Fahlenbrach
Ecole Polytechnique Fédérale de Lausanne (EPFL), Swiss Finance Institute, and ECGI

Leandro Sanz
Fisher College of Business, The Ohio State University

René M. Stulz
Fisher College of Business, The Ohio State University, NBER, and ECGI

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ABSTRACT

From 2010 to 2021, 639 US VC-funded firms achieved unicorn status. We propose an efficiency reason for the existence of unicorns. They are firms that rely more on organization capital and network effects than other startups. As private firms, they can grow their organization intangible assets with less expropriation risk and can better capture the economies of scale on which their business model relies. Consequently, these firms benefit from staying private longer. Access to new sources of capital that comes from unicorn status makes it easier for them to do so.

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Unicorns are private companies with headline valuations of at least $1 billion.[1] They are a 21st century phenomenon, with the term coined only in 2013.[2] Before the 2000s, founders would have just taken their startups public by issuing common shares before they reached unicorn status.[3] However, in the 2000s, unicorn status is prized by founders and investors. Paradoxically, 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 $1 billion (Gornall and Strebulaev, 2020). In this paper, we investigate the puzzle of why founders of certain startups find unicorn status valuable and the closely related question of why the number of unicorns increased so much recently.

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.[4]

Since the unicorn phenomenon 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. Second, a new type of firm that relies on investment in organization capital to succeed, with a business model centered on network effects, has emerged. These firms are highly valuable if they succeed, but have little value if they fail to do

[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] 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 60 times larger than the median sales of other IPOs.
[4] 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.

so. Because of potential competition, these firms at early stages are racing to build sufficient organization capital and create network effects. Being public could prevent them from achieving scale and potentially increase competition. As a result, it is optimal for them to stay private until they have built enough organization capital to achieve valuable network effects.

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). Though the provision of venture funding has a history of cyclicality (Gompers and Lerner, 2004), the ample availability of capital in much of this century has made it plausible to argue that "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 that relies heavily on intangible assets. The literature identifies spending on two distinct types of intangible assets: research and development (R&D) and organization 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) and is more difficult to protect through patents, leading to high costs of public disclosure.[5] Broadly, spending on organization capital includes advertising, information technology, human capital, and customer relations (Corrado and Hulten, 2010). Another way to put it is that investing in organization capital involves investing "in certain business models, organizational practices, and corporate culture" (Brynjolfsson, Hitt, and Yang, 2002). These firms often have a business model that relies on economies of scale and scope based on network effects. Organization intangible assets are key to the success of these firms because they have to develop processes, methods, human capital, and a culture to be able to exploit network effects.

For such firms, the cost of going public is high because it distracts them from their race to grow to reach scale before they become threatened by competition. Going public means that management has to take time away from building the firm to deal with the IPO. Being public before the firm has reached scale increases the risk that it will never reach scale. It slows it down, thereby opening the door to competition and imitation, and makes it less flexible. Once a firm is public, disclosure costs are high and management has to explain and justify itself publicly, which can make it hard to change the firm's business model. Disclosure can also give information to potential competitors. Management of the public firm has to deal with disclosures, regulators, and investors in ways that it would not have to if the firm were private. Being public can subject management to public pressures that it would not have to deal with if the firm were still private. These pressures can also distract employees and even cause them to leave the firm. All these costs of being public might be worth it if the firm had funding needs or if its management or shareholders had a need for a liquidity event. However, with the changes in private markets, firms can obtain funding without going public and new investors at the unicorn stage can help in providing liquidity to founders and other

[5] Disclosure costs are high for firms that invest heavily in intangible assets because the limited excludability 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).

shareholders of private firms. Lastly, going public has important consequences for the composition of the work force, as the firm may lose employees that are critical to building its organization capital. After going public, employees are bound less tightly to the firm because its equity becomes publicly traded. Recent evidence shows that firms experience a large turnover in labor after they go public (Bias et al., 2023). As a result, being public has important costs but limited benefits as long as the firm has not reached a stage where it is sufficiently established. For instance, once it has reached scale, disclosures become less costly because it is in a position where it can more easily and effectively defend its product space.

The scale and network effects that such firms realize if they can execute their business model justify high valuations. Investors in these firms get access to material non-public information about the firm to which they could not have access if they were public investors. Because they can overcome information asymmetries about the firm's business model and prospects by being inside investors, they make funding available to firms with high private valuations. Without such funding, firms that rely on organization 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 of startups that have received at least $50 million of VC funding allows us to measure the likelihood that a startup becomes a unicorn and to examine the determinants of that likelihood. As predicted, we find that unicorns and other startups differ in an important way in how they create intangible capital. At the IPO, we find that unicorn IPO firms spend much more on SG&A, a well-known measure of investment in organization capital (e.g., Peters and Taylor, 2017), than on R&D capital and have fewer patents per dollar of VC funding that other IPO firms. In contrast, startup IPOs that are not unicorns but have the same age as unicorns spend more on R&D capital than on organization capital. This evidence is strongly supportive of our explanation for the existence of unicorns.

If unicorns differ from other startups in the importance of organization capital, only firms with characteristics that make them more reliant on organizational capital should 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. 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. Our explanation for unicorns implies that industries where young listed firms have high SG&A expenses to assets should have a higher fraction of unicorns and we find support for that prediction. Finally, 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.

For startups to become unicorns, funding has to be available that enables them to stay private and grow. The venture capital literature has studied the causes and consequences of fund inflows since Gompers and Lerner (2000).[6] 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 increase 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 sources of exogenous variations in capital inflows using the investment plan at the inception of the Vision Fund of SoftBank and inflows into buyout funds. 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 unicorns also exist for efficiency reasons. 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 only stay private because of benefits of control, although 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.

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

In a contemporaneous paper, Gahng (2022) argues that achieving unicorn status "makes employees more favorably assess the companies they work for," which leads firms to take steps to achieve unicorn status. The channel he focuses on is that the headline valuation increases as the firm increases authorized but not issued shares. He argues that firms use these shares to achieve unicorn status.

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 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 compare unicorns to other startups at IPO 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).[7] 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 unicorns 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 (accounting characteristics) and CB Insights (patents). We also use the list of venture-capital-backed IPOs compiled by Jay Ritter.[8]

[7] 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.
[8] Available for download free of charge from https://site.warrington.ufl.edu/ritter/ipo-data/

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 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.[9] Though a majority of unicorns in our sample do not exit during our sample period, 181 unicorns had successful exits,

[9] 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

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 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 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.[10] 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

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.

[10] 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.

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 have 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.

Unicorn round investors in 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).[11]

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 public when they require funding that private markets cannot provide on acceptable terms, when they require a currency to make acquisitions, or when they need tradeable equity for performance-based compensation. We call this the funding motive. 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). The non-pecuniary costs can be more important. It takes time for firms to go public, which diverts management's attention from running the firm. After the firm has joined public markets, it often experiences turnover in its workforce as early employees move on or are no longer good matches for the firm, and the organization has to evolve to meet the challenges of public markets (Bias, Lochner, Obernberger, and Sevilir, 2023). Public firms are the subject of more attention. For instance, they are monitored by the SEC and are followed by analysts. They are subject to 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. 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

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

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 costs 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, all firms go public at higher valuations (black dashed line). Alternatively, a new type of firms could emerge for which the net benefit of being public is lower (the flatter dotted green line). 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 organization capital to support a business model centered on network effects is especially important. For these firms, the net benefit of being public does not become positive until their position in the market is relatively secure. These firms are expected to be highly valuable if they succeed in building their organization capital and reach scale, but they might never succeed if they go public early since doing so might slow down their progress and give a window of opportunity to potential competitors.

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 build on intangible capital to create network effects and economies of scale. 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, they can better bind employees to the firm, and they are less distracted by outside attention. Founders can be vocal about "the additional painful scrutiny that comes with being public." [12]

Firms invest in intangible capital in two main ways. First, they spend on R&D. Second, they spend on organization capital. A growing literature emphasizes the importance of organization 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 organization 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 organization capital is more than four times the capitalized value of R&D (Iqbal, Rajgopal, Srivastava, and Zhao, 2022).

Organization capital is fragile because it depends in part on the personnel in place and on its training. As a result, the ownership of organization capital is more complex than the ownership of alienable assets (Rajan and Zingales, 2000; Eisfeldt and Papanikolaou, 2013). Employees that leave may take some organization capital with them. Since personnel is more tied to the firm while it is private, it is valuable for firms that rely on organization capital to stay private until the organizational capital is sufficiently established and the firm can cope with personnel turnover (Rajan, 2012). For instance, employees of private firms may not be able to exercise options while the firm is private because of liquidity constraints, which give them incentives to stay with the firm until the IPO (Bias, 2021). Further, organization capital cannot be protected as easily from expropriation as R&D intangible capital. Part of organization 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

[12] See Vance (2015).

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. Their 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.

We have emphasized the importance of a new type of firm that relies heavily on organization capital. One might argue that such firms came into existence with the growth of the internet in the 1990s. An example of such a firm is TheGlobe.com.[13] Its business model was to create a virtual community on the internet. It was an attempt at what Facebook would become. TheGlobe.com 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.

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

[13] 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.

(de Fontenay, 2017; Ewens and Farre-Mensa, 2020). As a result of this evolution, funding for private firms is often abundant (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 be able to monetize the equity they have 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, unicorn investors have been more willing to provide some liquidity to employees (and early-round investors) than 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).

In summary, our proposed explanation for the unicorn phenomenon is as follows. A new type of firm for which organization capital and network effects are key assets has become much more important. These firms benefit from building their organization capital and network effects 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 can 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. Because the new unicorn investors are less opposed than VCs to offer liquidity to early investors and insiders, they further reduce pressures for startups to go public.

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. We follow Alvero and Xiao (2022) and Ewens, Xiao, and Xu (2022) and provide details on the fuzzy bunching estimator in the Internet Appendix. Using their estimator, we estimate the number of missing financing rounds (M) between $750m and $999m to be 138. 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.[14] If founders ascribe a large value to reaching

[14] 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.[15] 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. The vehicles for the investments made by VC firms, the VC funds, have a finite life of typically ten years, meaning they have to exit investments before the ten-year limit – though some exceptions can be allowed. As a firm grows and wants

[15] 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.

to stay private, it may have to access other investors than venture funds. To enable the firm to stay private, these investors may have to provide liquidity to early investors and perhaps even to 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.[16] 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."[17] 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

[16] 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.
[17] 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. We include the distance from San Francisco because Silicon Valley is in many ways at the center of the VC industry. 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.[18] 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

[18] "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.[19]

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.[20] 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.[21] 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 proposed in Section 2, unicorns are firms with high investment in organization capital that rely on network effects. Greater availability of funding enables these firms to stay private and unicorn status makes it possible for these firms to stay private longer as it opens the door to funding from new types of investors. In this section, we provide support for our 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 organization capital appears more important. We finally establish that ample funding results in more 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 3,096 young public firms.

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

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 this CB Insights classification, 32% of startups and 59% of unicorns belong to the internet 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. We believe 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. It 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.[22]

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. One potential reason is the heavy geographic concentration of the VC- industry (see Chen, Gompers, Kovner, and Lerner, 2010). Proximity to the San Francisco area could make access to funding through VC firms easier. It could also help the development of startups, and make them more likely to succeed. However, Chen, Gompers, Kovner, and Lerner (2010) show some evidence that more distant investments of VCs seem to perform better. Another potential reason is that the San Francisco area is a hub for skills and services that may be particularly valuable to entrepreneurs with a business model involving network effects and the use of the internet as a tool for distribution of products and services.

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

[22] 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).

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.[23] 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 variable takes the value one if a startup that has obtained at least $50 million in financing is a unicorn, and zero otherwise.[24]

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 organization capital are more important

[23] 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.

[24] 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 and 9 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.

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. Startups with a value of *Scale* equal to one have a 3.5% higher likelihood to achieve unicorn status, which is large relative to the 11.19% average unconditional probability of achieving unicorn status in the cross-section of startups that raise more than $50 million in funding. 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.[25] Scale and proximity to San Francisco remain positively and statistically significantly related to the likelihood of being a unicorn.

4.2. Industry fundamentals and the fraction of startups in an industry that are unicorns

[25] 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.

In Section 2, we conjecture that unicorns are more likely to be firms with high investment in organization capital. We do not observe accounting variables such as intangible investments of startups. Instead, we use data from young publicly listed firms in the unicorn's industry. We therefore assume that if organization 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 organization capital. For simplicity, in the following, we use SG&A to denote SG&A net of R&D expenditures.[26]

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 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.

In Table 6, we show the results of a regression of the fraction of startups in an industry that are unicorns on firm characteristics in that industry. The regression is at the industry-quarter level. Model (1) uses the entire sample, an industry-quarter panel running from 2010Q1 to 2021Q3. Model (2) uses an industry-quarter panel running from 2010Q1 to 2020Q4, to address concerns that the large number of unicorn births and very favorable market conditions in 2021 drive our results.

Across both specifications, the fraction of unicorns is much higher in industries with high Tobin's q, i.e., industries with firms that have high growth opportunities and intangible assets. Our measure of organization capital, SG&A/total assets, has a positive and statistically significant coefficient in both

[26] 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).

specifications. The economic magnitude is large. A one standard deviation increase in organization capital increases the fraction of unicorns in an industry by 1.04 percentage points, which corresponds to a 12.98% increase relative to the unconditional fraction unicorns of 8% across industry-quarters. Industries with large cash reserves have fewer unicorns. The coefficient on R&D expenditures is negative but insignificant. We can reject equality of the coefficients on SG&A/total assets and R&D/total assets at better than the 1% level (the F-statistic is 7.32 with a p-value of 0.007). As expected, the fraction of unicorns in an industry is negatively related to the importance of fixed assets for that industry. However, our predictions for capital expenditures and age are not borne out in the data. The coefficients on capital expenditures are negative and insignificant and the coefficients on age are positive and insignificant in both models. To the extent one might have been concerned that 2021 reflects irrational exuberance in a way that earlier years do not, model (2) indicates that our results supporting the role of organization capital do not depend on the unicorns created in 2021.

4.3. Industry fundamentals, VC fund flows, and the likelihood that a startup becomes a unicorn

We now turn to regressions examining the importance of VC fund flows for the likelihood that a startup becomes a unicorn. Regressions shown in Table 7 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 addition to the average industry characteristics from Table 6, we also include the indicator variables *Scale* and *Near San Francisco* in the regressions.

In Section 2, we conjecture that unicorns can only arise if there is sufficient funding available to support private funding rounds. Hence, we would like to include lagged VC industry funding flows in our regressions. However, the venture capital funding variable 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 instruments that are correlated with industry fund flows in the prior quarter but are uncorrelated with the

potential of the industry. We use two instruments. First, 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.[27] 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 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 able to predict the potential of specific industries. 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 an ability to predict the potential of industries.

Our second instrument consists of the inflows into leveraged buyout funds over the last four quarters, following Gompers and Lerner (2010). Flows into private equity funds are related to shifts in commitments to private markets (relevancy condition) more broadly, but should be unrelated to VC commitments to specific industries and their success, so that the exclusion restriction can be maintained.[28] We obtain information on capital raised by buyout funds from Prequin.

[27] 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."

[28] While we report results for using both instruments, we have estimated the regressions with each instrument separately and report these regressions in the Internet Appendix. The conclusions we draw from Table 7 do not depend on the choice of instrument.

Lastly, we include variables capturing the state of the economy and the state of financial markets that have 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 use year fixed effects since the variables capturing the state of the economy and of financial markets are observed quarterly.

Table 7 shows results. Column (1) shows OLS regression results for reference. Column (2) shows the first stage results, and column (3) shows the second stage result of the IV regression.

The first stage results in column (2) demonstrate that the relevancy condition is fulfilled. The Softbank instrument and the buyout fund flow variable are strongly and positively correlated with VC industry fund flows. The second stage results using the instrumented fund flows are shown in column (3). 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. We continue to 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. 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.

Column (3) shows that a startup is more likely to be a unicorn if the first-day equally-weighted return of IPOs is high, the equal-weighted market returns are high, and the credit spread is high. The other variables are not significant. Except for the evidence on the credit spread, 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.

Finally, in the OLS regression, the coefficient on R&D/total assets is significantly negative while the coefficient on SG&A/total assets is significantly positive. In the 2SLS regression, the coefficient on

R&D/total assets is negative but loses significance. Note that, except for R&D/total assets, the independent variables of particular interest, namely scale, operational capital as proxied by SG&A / total assets, fund flows, and proximity to San Francisco have similar statistical and economic significance in the OLS regressions.

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 of the second-stage regression are quantitatively and qualitatively similar to those obtained for the whole sample. Lastly, we re-estimate the regressions adding industry fixed effects. The second-stage 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.

5. Unicorn IPO exits and the unicorn puzzle

In this section, we investigate how unicorns differ from other startups at the IPO. By examining firms at the IPO, we have the benefit of extensive disclosures that allow us, in particular, to assess the spending by these firms on intangible capital and R&D. We can, therefore, test whether unicorns spend more on intangible capital relative to R&D compared to other exiting startups. Such an investigation is subject to an important caveat, which is that the exiting startups may differ from other startups for which we do not have the data we have for startups that undergo an IPO.

In Table 8, we compare the offer and accounting characteristics of unicorn IPOs to those of other startup IPOs of similar firm age (using nearest neighbor matching based on the Mahalanobis distance). 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 6% 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.[29] 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 8 a large difference between the percentage of unicorns and the percentage of other IPOs that price below the indicative range. While 30% of non-unicorn startups price below the indicative range, only 7% of unicorns do. The typical unicorn IPO prices above the indicative range in contrast to the typical non-unicorn venture-backed startup. Not surprisingly, the gross proceeds and valuations are much larger for unicorns and the underwriter spread is lower. On average, a larger fraction of the proceeds goes to selling shareholders with unicorn IPOs. The average first-day return of unicorns is not significantly different from the first day of other startup IPOs, but unicorns have a higher three-month return and six-month return. Overall, the evidence in Table 8 supports the view that unicorns are much more established when they go public.

The bottom part of Table 8 shows the fundamental characteristics of firms immediately before the IPO. We focus on medians since some of the averages seem influenced by outliers. Not surprisingly, unicorn IPOs have more than 8 times the total assets of other IPOs. They are also more established in that they have substantial sales (more than half of assets). The median sales of other IPOs are minimal (less than one tenth of assets). While all the unicorns IPOs but one have sales, 41% of the other startups have no sales. They do not differ from other IPOs in the importance of plant, property, and equipment or of capital expenditures. R&D to assets is low for unicorn IPOs compared to other startups (13% versus 27%). The opposite is the

[29] 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.

case with SG&A (net of R&D), since SG&A to assets is 40% for unicorns and 13% for other startups. It follows that for unicorn IPOs SG&A expenses to assets is roughly three times higher than R&D expenses to assets while for other startups SG&A expenses to assets is less than half the R&D expenses to assets. Unicorn IPOs have essentially no debt, but other IPOs have some debt. Cost of goods sold to assets are lower for unicorn IPOs than other IPOs although the median difference is not statistically significant. Not surprisingly, there is a very large difference in gross profits between unicorns and other startups. However, most unicorn IPOs have negative net income and almost all other startup IPOs have negative net income. Overall, the evidence in Table 8 suggests that unicorn firms at the IPO are more established and focused on investment in organization capital than other startup IPOs that are more focused on R&D investment.

We highlighted in Section 2 that R&D often results in patents protecting the property rights of the innovating firm, while organization capital does not, and that unicorns' business model is centered on developing organization capital rather than R&D. We provide supporting evidence for the relatively 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 data from all sample IPOs 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 9 is similar to Model (1) of Table 7, 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 8 and 9 is consistent with our hypothesis that the importance of organization capital distinguishes unicorns from non-unicorns.

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 efficiency explanation for the unicorn phenomenon based on two developments: 1) the emergence of a new type of firm that relies heavily on organization capital, especially organization 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. Organization capital is fragile. It can be easily expropriated by competitors and employees can walk away with some of it. Firms for which organization capital is important benefit from staying private until this capital gives them a strong enough position in their industry that they can depend their product space effectively. 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 unrelated flows to buyout funds and the surprise of the size of the Softbank Vision Fund and its business plan to create exogenous variation in funding and show that the likelihood of startups becoming unicorns increases with funding shocks.

In support of our explanation for the emergence of unicorns, we find that industries where organization 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 invest more in organization capital than other VC-funded firms. In contrast, the other VC-funded firms invest more in R&D. When unicorns exit through an IPO, they are more likely to have 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 organization 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 organization capital such as those that occurred in 2022 and 2023. Our explanation for unicorns would indicate that having less funding available makes it less likely that startups relying on organization 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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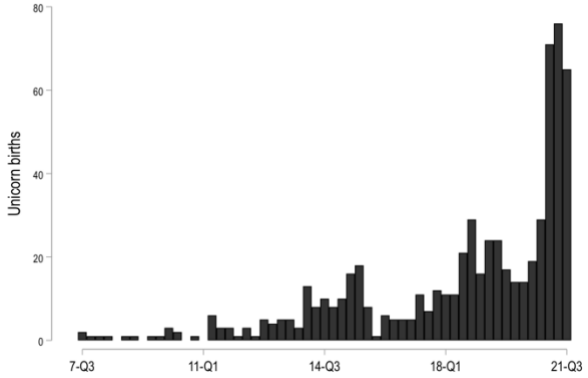
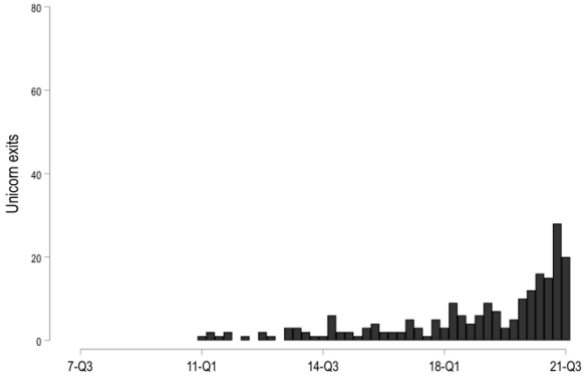
Figure 1. U.S. unicorns births, exits, and exit rate

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.

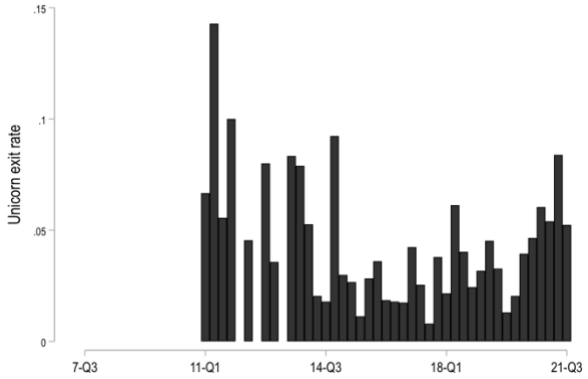
Panel A: Unicorn births



Panel B: Unicorn exits



Panel C: Unicorn exit rate



Panel D: Cumulative numbers

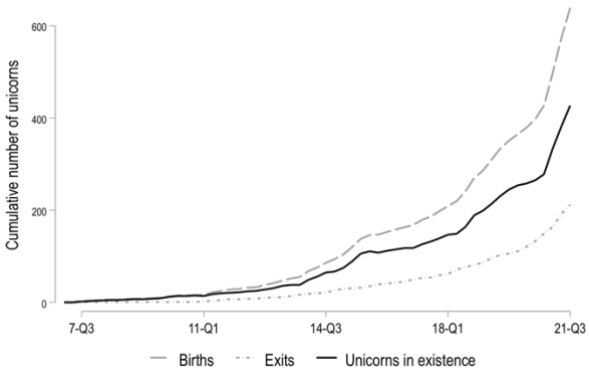


Figure 2. Net benefit of being public and private valuation

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).

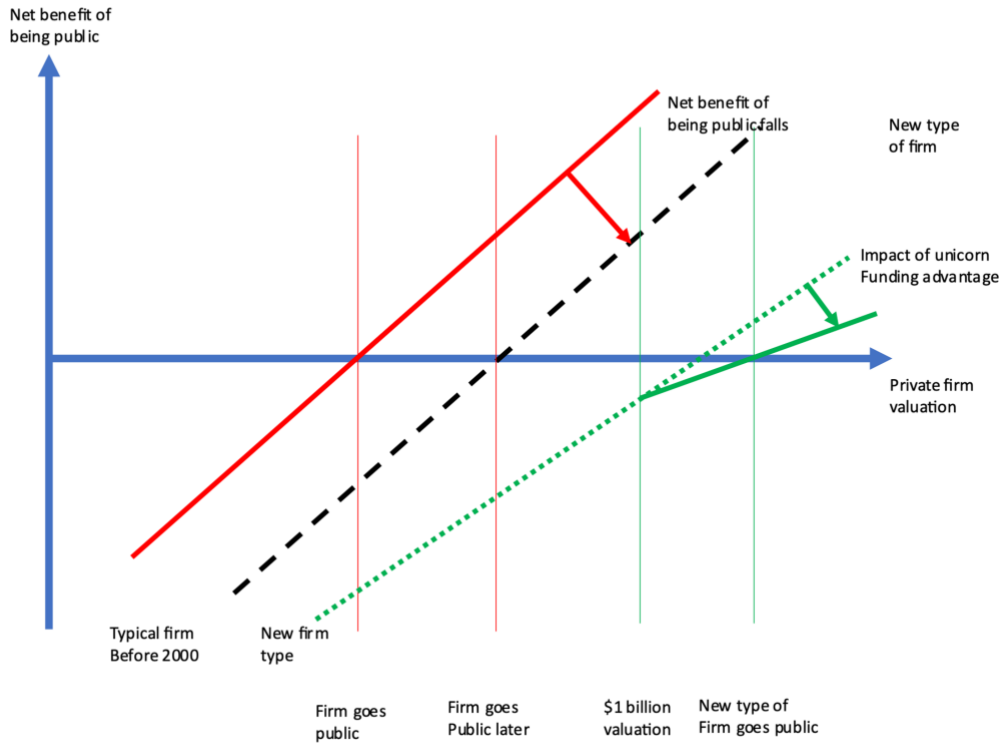
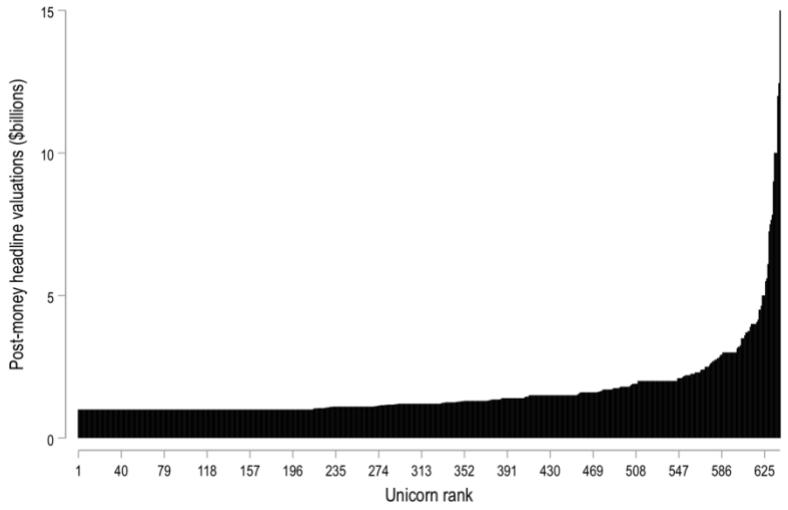


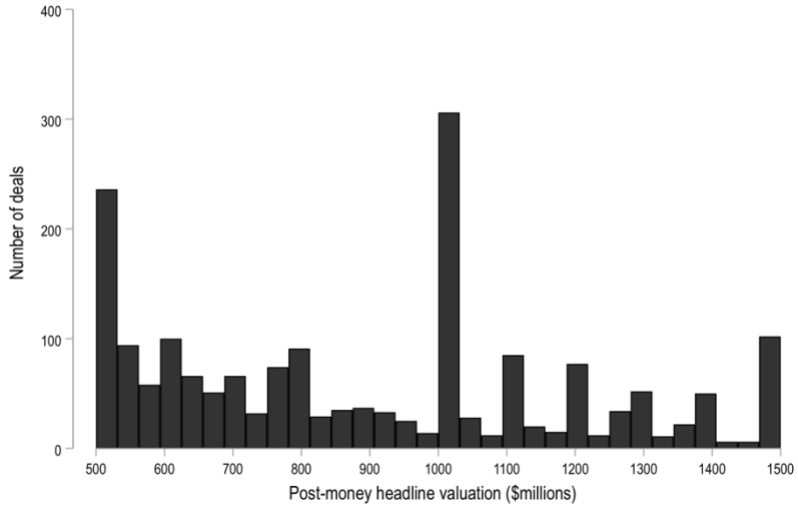
Figure 3. Distribution of headline valuations at unicorn and other financing rounds

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

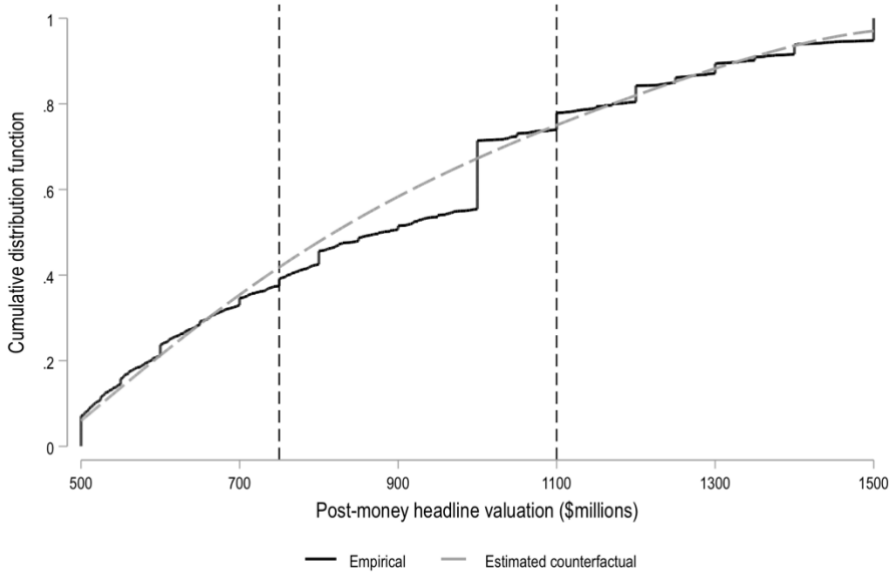
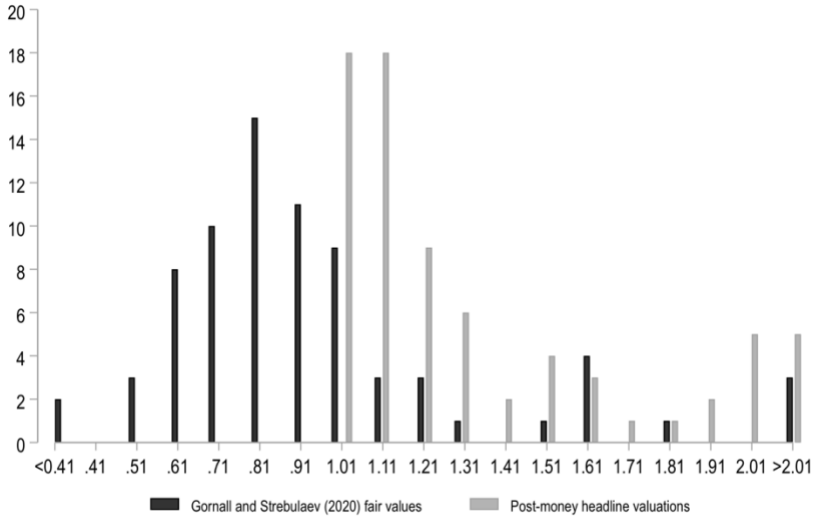


Figure 4. U.S. unicorns' headline valuations vs. fair values

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

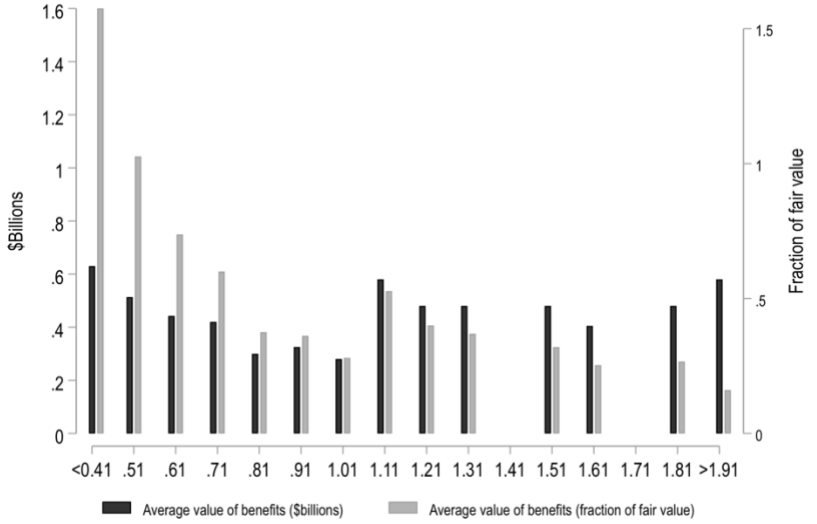
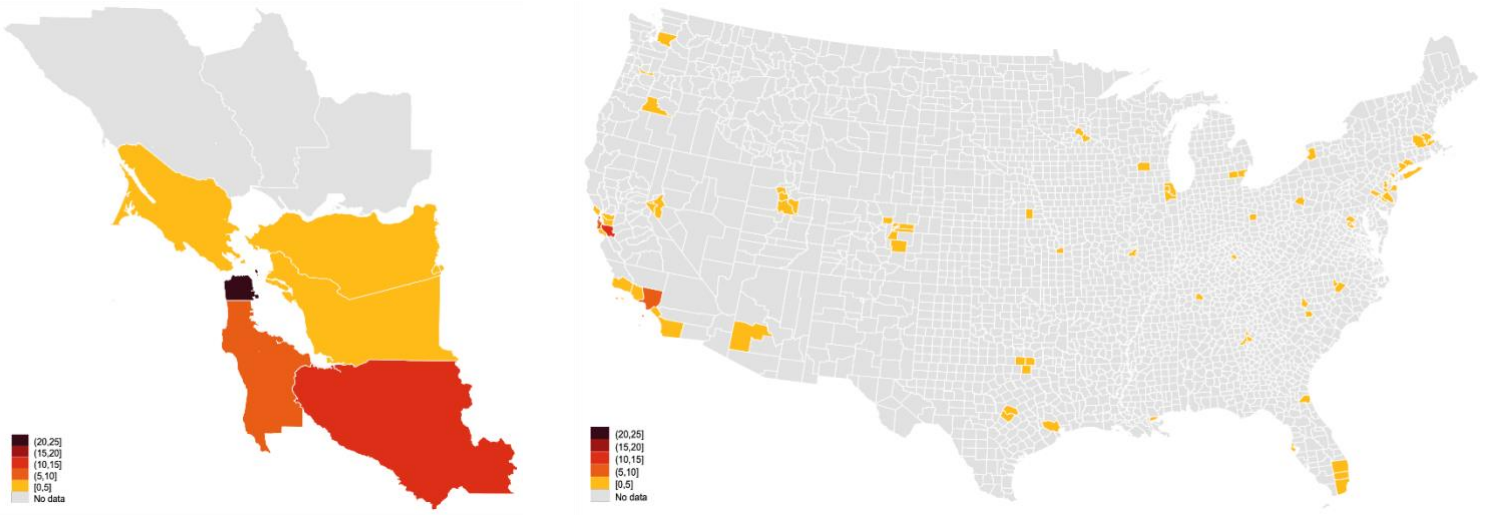


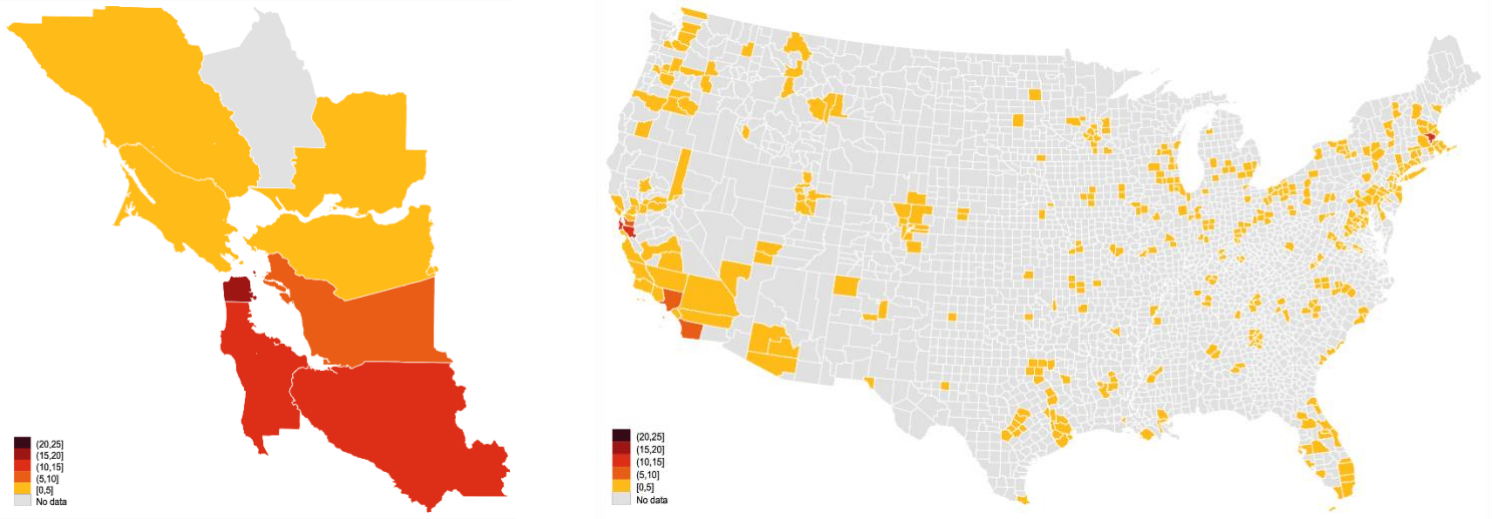
Figure 5. Geographic distribution of U.S. unicorns, VC firms, and public firms

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

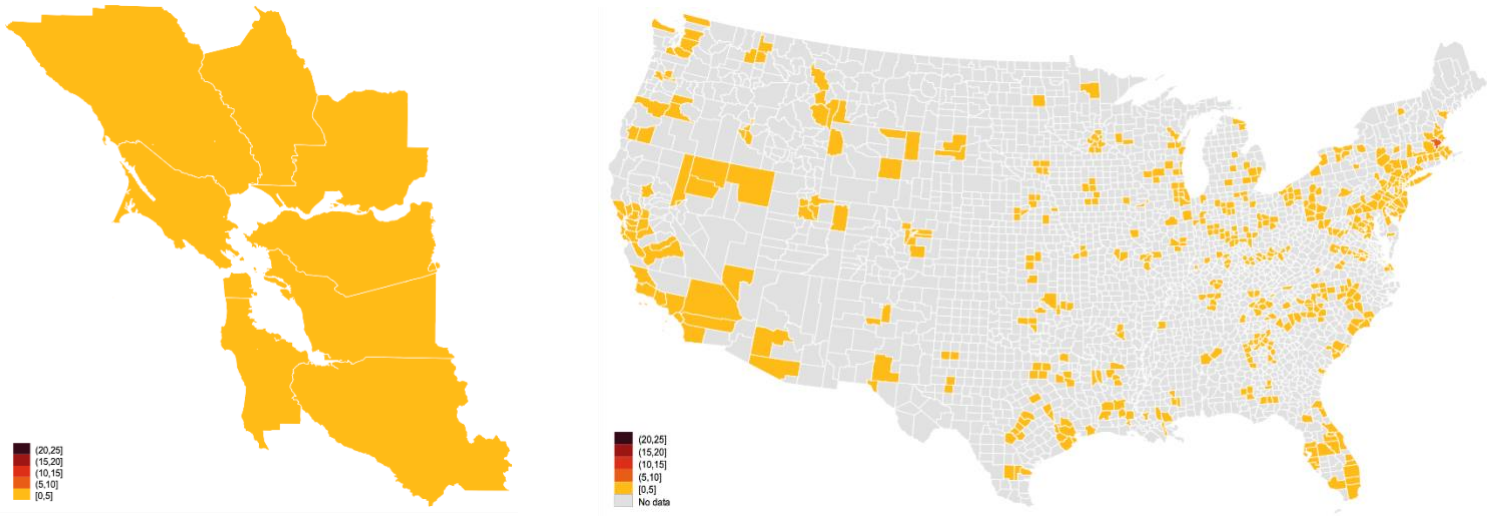


Figure 6. Patent activity of unicorn IPOs vs other IPOs

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.

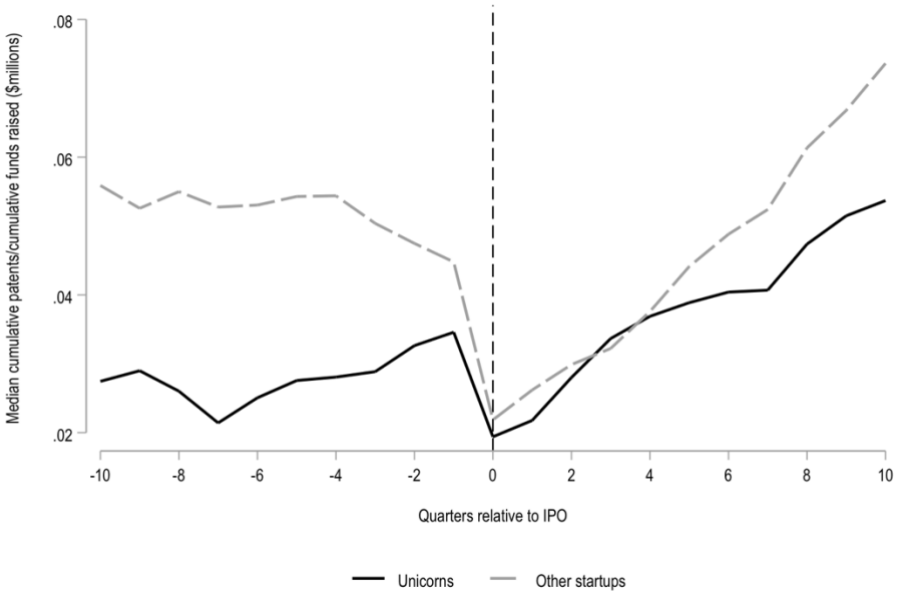


Table 1. Summary statistics on unicorns

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 fraction of startups that are unicorns, by industry

The table reports results from panel regressions of the determinants of the fraction of unicorns by industry. The sample is an industry-quarter panel of 5,141 startups (863 industry-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 %*, the fraction of startups in a given industry in that quarter that have a post-money headline valuation of at least $1 billion. 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. Model (1) shows results for the entire sample, and model (2) shows results omitting the year 2021. *P*-values based on robust standard errors 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.

	Unicorn (%)	
	2010Q1-2021Q3	2010Q1-2020Q4
	(1)	(2)
Tobin's Q_{t-1}	0.031***	0.030***
	(0.000)	(0.000)
$Ln(Assets)_{t-1}$	0.003	0.006
	(0.623)	(0.444)
Fixed assets/total $assets_{t-1}$	-0.001***	-0.001**
	(0.000)	(0.010)
CAPX/total $assets_{t-1}$	-0.001	-0.002
	(0.891)	(0.332)
Cash/total $assets_{t-1}$	-0.003***	-0.003***
	(0.000)	(0.000)
COGS/total $assets_{t-1}$	-0.003***	-0.003***
	(0.000)	(0.000)
R&D/total $assets_{t-1}$	-0.004	-0.002
	(0.123)	(0.322)
SG&A/total $assets_{t-1}$	0.003**	0.004***
	(0.029)	(0.002)
Loss $firm_{t-1}$	0.013	0.003
	(0.510)	(0.879)
$Ln(Age)_{t-1}$	0.028	0.010
	(0.369)	(0.770)
Fixed effects		
Industry	No	No
Quarter	Yes	Yes
Observations	863	803
Adj. R2	0.27	0.24

Table 7. 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. Column (1) shows OLS results, and columns (2) and (3) present the first and second stage of an instrumental variables regressions, where we instrument *Ln(Industry funding flow)* with *Ex ante target SoftBank industry* and *Ln(flows into buyout funds). 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. *Ln(flows into buyout funds)* are the new funds raised by buyout funds over the four prior quarters. *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.

	OLS	First stage	Second stage
	Unicorn status	Ln(Industry funding flow)	Unicorn status
	(1)	(2)	(3)
Ln(Industry funding flow)$_{t-1}$	0.020***		
	(0.002)		
Ex ante target SoftBank industry		0.552***	
		(0.000)	
Ln(Flows into buyout funds)$_{[t-4,t-1]}$		0.061***	
		(0.000)	
Instrumented Ln(Industry funding flow)$_{t-1}$			0.052***
			(0.001)
Tobin's Q$_{t-1}$	0.011**	-0.162***	0.017***
	(0.042)	(0.000)	(0.009)
Ln(Assets)$_{t-1}$	-0.003	-0.094***	0.000
	(0.647)	(0.000)	(0.992)
Fixed assets/total assets$_{t-1}$	-0.001***	-0.002***	-0.001***
	(0.001)	(0.000)	(0.008)
CAPX/total assets$_{t-1}$	0.001	0.019***	0.000
	(0.416)	(0.000)	(0.918)
Cash/total assets$_{t-1}$	-0.002***	0.036***	-0.004***
	(0.000)	(0.000)	(0.000)
COGS/total assets$_{t-1}$	-0.001	0.014***	-0.001*
	(0.221)	(0.000)	(0.062)
R&D/total assets$_{t-1}$	-0.003*	-0.058***	-0.001
	(0.097)	(0.000)	(0.583)
SG&A/total assets$_{t-1}$	0.004**	-0.072***	0.007***
	(0.017)	(0.000)	(0.001)
Loss firm$_{t-1}$	0.023	-0.115***	0.032
	(0.273)	(0.000)	(0.136)
Ln(Age)$_{t-1}$	0.014	-0.461***	0.019
	(0.499)	(0.000)	(0.351)

Scale	0.022***	0.019**	0.021**
	(0.009)	(0.034)	(0.013)
Near San Francisco	0.045***	-0.013	0.046***
	(0.000)	(0.151)	(0.000)
IPO volume$_{t-1}$	0.002	0.202***	-0.001
	(0.564)	(0.000)	(0.788)
EW IPO first day returns$_{t-1}$	0.026*	-0.779***	0.028*
	(0.088)	(0.000)	(0.073)
Real GDP growth$_{t-1}$	0.004	-0.012	0.022
	(0.847)	(0.790)	(0.311)
EW market returns$_{t-3 \text{ to } t-1}$	0.024***	0.158***	0.022***
	(0.002)	(0.000)	(0.005)
Aggregate MB$_{t-1}$	0.026***	0.354***	0.007
	(0.001)	(0.000)	(0.541)
Credit spread$_{t-1}$	0.021***	0.320***	0.011**
	(0.000)	(0.000)	(0.032)
Federal funds rate$_{t-1}$	0.003	0.158***	-0.007
	(0.387)	(0.000)	(0.146)
Fixed effects			
Industry	No	No	No
Quarter	No	No	No
Year	Yes	Yes	Yes
Observations	77,054	77,054	77,054
Adj. R2	0.05	0.69	0.02

Table 8. 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 110 unicorn IPOs between 2010Q1 and 2021Q3 and, for each unicorn IPO, the nearest neighbor VC-backed non-unicorn IPO based on firm age using the Mahalanobis metric. Columns (1) to (3) report summary statistics for unicorn IPOs and columns and columns (4) to (6) report summary statistics of the nearest neighbor non-unicorn IPOs. Column (7) reports differences in means between unicorn IPOs and the nearest neighbor non-unicorn IPOs. Column (8) reports differences in medians between unicorn IPOs and the nearest neighbor non-unicorn 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.

	Unicorns			Matched controls			Differences	
	Obs	Mean	Median	Obs	Mean	Median	Means	Medians
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Offer characteristics								
Dual class (=1)	110	0.51	1.00	110	0.06	0.00	0.45***	1.00***
IPO valuation ($millions)	110	7,555.13	3,228.05	110	354.74	262.91	7,200.40***	2,965.14***
Offer price	110	27.78	22.00	110	12.69	15.00	15.09***	7.00***
Underwriter spread (%)	109	5.76	6.24	110	7.00	7.00	-1.24***	-0.76***
Offer price below range	110	0.07	0.00	110	0.30	0.00	-0.23***	0.00***
Offer price above range	110	0.62	1.00	110	0.27	0.00	0.35***	1.00***
Gross proceeds	110	864.86	419.38	110	87.46	87.70	777.40***	331.68***
Fraction of proceeds to company	110	0.93	1.00	110	0.98	1.00	-0.05***	0.00
Fraction of proceeds to selling shareholders	110	0.07	0.00	110	0.02	0.00	0.05***	0.00
First-day return	108	0.37	0.33	110	0.44	0.15	-0.07	0.18***
Three-month return	110	0.35	0.25	110	0.14	0.00	0.21***	0.24***
Six-month return	110	0.19	0.08	110	-0.02	-0.07	0.21**	0.15**
Accounting characteristics								
Total assets	110	1,004.48	408.25	110	96.37	50.27	908.12***	357.98***
Sales	110	547.36	249.74	110	26.46	3.96	520.89***	245.78***
Number of firms with positive sales	109			65				
Cash and STI/total assets	110	0.47	0.49	110	0.74	0.88	-0.27***	-0.39***
Net PPE/total assets	110	0.12	0.08	110	0.12	0.09	0.00	-0.01
CAPX/total assets	108	0.05	0.02	110	0.05	0.02	0.00	0.01**
R&D/total assets	110	0.15	0.13	110	0.96	0.27	-0.81***	-0.14***
SG&A/total assets	110	0.44	0.40	110	0.25	0.13	0.20***	0.27***
LT Debt/total assets	109	0.16	0.04	110	0.21	0.18	-0.05	-0.14***
COGS/total assets	110	0.37	0.21	110	0.56	0.35	-0.19*	-0.14
Gross profit/total assets	110	0.40	0.40	110	-0.32	0.00	0.72***	0.40***
Negative net income (=1)	110	0.88	1.00	110	0.97	1.00	-0.09***	0.01***

Table 9. 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. *P*-values based on robust standard errors 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.

	Unicorn status	
	(1)	(2)
Ln(Assets)	0.141***	0.125***
	(0.011)	(0.012)
Fixed assets/total assets	-0.119	-0.062
	(0.139)	(0.139)
CAPX/total assets	0.129	0.009
	(0.272)	(0.280)
Cash/total assets	-0.003	0.029
	(0.054)	(0.056)
COGS/total assets	0.002	0.010
	(0.014)	(0.014)
R&D/total assets	0.027***	0.027***
	(0.009)	(0.010)
SG&A/total assets	0.085***	0.066***
	(0.019)	(0.018)
Sale/total assets	0.000	-0.018
	(0.023)	(0.023)
Loss firm	0.154***	0.152***
	(0.036)	(0.037)
Ln(Age)	0.011	0.006
	(0.018)	(0.018)
Scale	0.080***	0.053**
	(0.024)	(0.025)
Near San Francisco	0.062***	0.044*
	(0.023)	(0.024)
IPO volume$_{t-1}$	-0.334	
	(1.548)	
EW IPO first day returns$_{t-1}$	0.228	
	(0.340)	
Real GDP Growth$_{t-1}$	-0.001	
	(0.013)	
EW market returns$_{t-3 \text{ to } t-1}$	-0.096	
	(0.141)	
Aggregate MB$_{t-1}$	0.017	
	(0.102)	
Credit spread$_{t-1}$	-0.040	
	(0.120)	
Federal funds rate$_{t-1}$	-0.014	
	(0.036)	
Fixed effects		
Industry	No	Yes
Year	No	Yes
Observations	762	762
Adj. R2	0.363	0.382

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	
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.

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*) and multiplied by 100.
CAPX/total assets	Capital expenditures (*capxy*) divided by assets (*atq*) and multiplied by 100.
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*) and multiplied by 100.
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*) and multiplied by 100.
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.
Ln(Flows into buyout funds)	The natural log of new funds raised by buyout funds over the four prior quarters
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*) and multiplied by 100. 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*) and multiplied by 100. 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*).