Is There a "Platform Premium"? An Exploratory Study of Unicorn Business Models and Valuations

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Abstract

Despite the importance of digital platforms in the global economy and increasingly among academic researchers and policy makers, there has been little systematic or quantitative analysis of their financial valuations or long-term performance of their different competitive strategies. This paper contributes to the literature by analyzing the effect of "platformness" (the degree to which a firm has a multisided business model driven by network effects) on unicorn valuations. We investigated 959 unicorns (private companies valued at $1 billion or more) existing as of December 31, 2021, to assess whether investors placed a premium on firms operating platform over non-platform business models. We found that platforms commanded a statistically significant premium compared to non-platform companies, but this varied by region: North America 129%, Europe 68%, and Asia-Pacific (APAC) 39%. We also found an investor premium for innovation platforms, which enable an ecosystem of third-party complementary products and services, over transaction platforms, which link buyers and sellers in online marketplaces as well as users of social media, messaging systems, and financial exchanges. The innovation platform premium in this sample was 34%.

INTRODUCTION[1]

Since the diffusion of the personal computer, the Internet, and smartphones, "platformness" or platform business models have drawn increasing attention from academic researchers, entrepreneurs, investors, and government regulators (Gawer and Cusumano, 2002; Rochet and Tirole, 2003, 2006; Rysman, 2009; Evans and Schmalensee, 2016; Parker, Van Alstyne, and Choudhary, 2016; Khan, 2017; Jia, Cusumano, and Chen, 2021). As we will show in this paper, there also has been a dramatic rise between 2013 and 2022 in the number of "unicorns" (private firms with a valuation of at least $1 billion) with exhibiting some elements of a platform strategy. In our definition, a platform strategy or business model involves connecting two or more sides of a market with the potential to generate cross-side network effects. By contrast, a non-platform business sells a standalone product or service to one side of the market (buyers) without the potential benefit of network effects.

Platform business models have been associated with rapid growth in sales, profits, and market values. At least in part, this seems due to network effects that function as positive feedback loops and can increase the value of the platform with each additional user or complementary product or service. In one recent study, Cusumano, Gawer and Yoffie (2019) used the Forbes Global 2000 list of companies to identify 43 public firms in 2015 that derived approximately 20 percent or more of their revenues from businesses driven by multisided market businesses and network effects. The majority of this sample were in markets related to the personal computer, the Internet, or mobile devices. They compared the performance of these firms between 1995 and 2015 to a control sample of 100 non-platform firms in the same set of businesses. The platform companies and control sample had roughly the same level of median annual revenues (about $4.5 billion). However, the platform companies achieved these sales with half the number of employees, were twice as profitable, growing twice as fast, and more than twice as valuable as the control sample. The authors attributed these differences to network effects and the ability to leverage third-party complementary innovations and other

[1] The authors thank Fernando Suarez of Northeastern University and Seyhan Erden of Columbia University for their advice on the econometrics used in this paper.

resources outside the firm, such as non-employee "Gig" workers. Other authors have also described platform business models as "inverting" the firm and leveraging assets outside traditional organizational boundaries (Parker, Van Alstyne, and Jiang, 2017; Benzell, Hersh, and Van Alstyne, 2023).

In this paper, we ask two main questions. First, do private investors place a premium on pre-public companies with platform business models compared to non-platforms? Second, do investors offer a premium for different types of platforms or subtypes? We investigated these questions with cross-sectional data from a 2021 list provided by CB Insights (959 unicorns counted as of December 31, 2021).[2] We hand-coded each company as a platform or non-platform as well as by type of platform and other variables.

We expected platform unicorns to command a premium based on our 2019 study of prominent public platform companies, which included firms such as Apple, Google (Alphabet), Microsoft, Amazon, Meta (Facebook), Alibaba, and Tencent. The question of how much of a premium *should* investors place on platform businesses is beyond the scope of this dataset, however. Until a unicorn goes public, there is limited or no financial performance data available to analyze.

Various summary statistics illustrate the characteristics of our sample. Figure 1 describes the composition after our coding, including the number and percentages of platforms, non-platforms, and our two main platform types, following the definitions in Cusumano, Gawer, and Yoffie (2019). These main types are *innovation platforms*, which enable an ecosystem of third-party complementary products and services; and *transaction platforms*, which link buyers and sellers in online marketplaces as well as users of social media, messaging systems, and financial exchanges. Table 1 shows the average platform and non-platform valuations for each industry sector. Of the 959 unicorns, we classified 404 (42%) as platforms. We based these platform identifications on our analysis of company business models from their websites and some other public

[2] Source: CB Insights Tracker: The Complete List of Unicorn Companies. https://www.cbinsights.com/research-unicorn-companies (Accessed 1st January 2022).

information when available. At times, our identification was at odds with company statements about being a platform business or not.

Of the 404 companies, we determined that 71 (18%) were innovation platforms and 333 (82%) were transaction platforms. Internet Software and Services as an industry sector contained the most unicorns as well as the most unicorn platforms. The summary statistics also show that, without any adjustments for age, industry, region, or other factors, the average unicorn platform valuation in 2021 was $4.3 billion. This contrasts with the average $2.5 billion valuation for non-platform unicorns, which we can describe as "standalone" product or service companies.

Table 2 presents the summary statistics for platform subtypes, which we believe is the first large-sample analysis showing the dispersion of platform business models in a specific population of companies, in this case, 2021 unicorns. We classified the sample into nine subtypes, ranging from content-sharing platforms to e-commerce marketplaces.

Within our sample's 71 innovation platforms, we identified three main subtypes. The largest subtype was product companies or digital services companies with open application programming interfaces (APIs) used by third parties to create complementary products and services. Other researchers have also identified open APIs as an important platform business model (Benzell, Hersh, and Van Alstyne, 2023). This group represented 75% of innovation platforms by count and 61% by total unicorn investment value. The other innovation platform subtypes we classified as content-sharing applications or data-integration layers and "superapps" that enabled users to share their innovations or that enabled end users to access a variety of product and service providers.

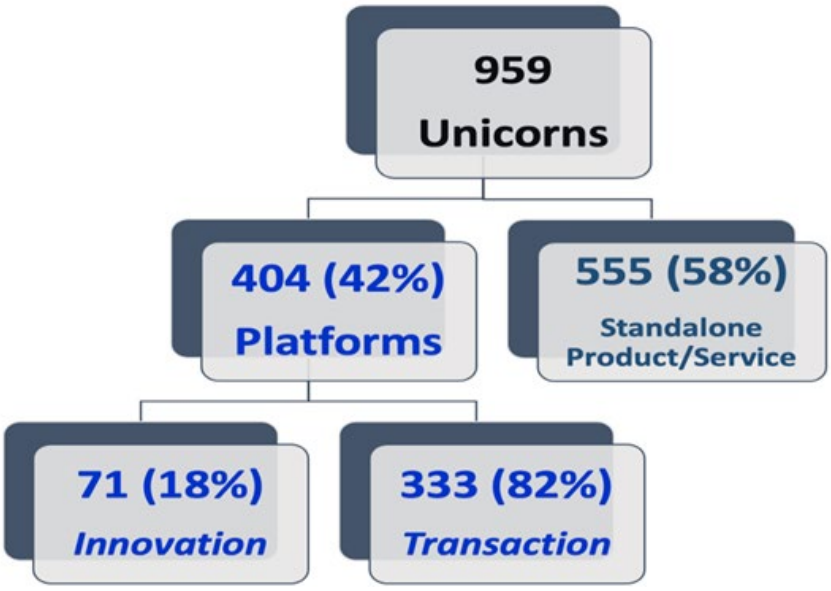
Within our sample's 333 transaction platforms, we identified six subtypes: service marketplaces, FinTech exchanges or service providers, e-commerce marketplaces, consumer-oriented social media applications, business-oriented social media applications, and data and cloud services providers. The majority (42% by count) were service marketplaces (though these only accounted for 26% of investment values), with examples including Devoted Health and Lalamove. The other two main subtypes of transaction platforms were FinTech payment processing and currency exchanges (26%

by count, 36% by valuation) and e-commerce marketplaces (22% by count, 18% by valuation). For unicorns that could qualify either as "data integration layers/superapps" or "data cloud services," we determined whether the business model was an innovation or transaction platform based on their 3rd-party development focus (i.e., Databricks) or how they generate revenue (e.g., Global Switch). We provide more details on innovation/transaction platform classifications in later sections of this paper.

Our main results indicate that unicorn investors generally did pay a significant premium for platform businesses, though this premium varied by region. North America had the largest platform premium with 129%, followed by Europe at 68% and APAC at 39%. There was no premium for platform businesses in other parts of the world. We also found that investors paid a 34% premium for innovation platforms over transaction platforms. There was no premium associated with platform subtypes or sectors, except for Internet Software & Services companies.

The remainder of this paper presents a brief literature review, followed by a more detailed discussion of our methods, dataset, and statistical analyses. We conclude with some additional observations and directions for future research.

Figure 1: Composition of 2021 Unicorn Sample (December 31, 2021)



Sources: Dataset and CB Insights

Table 1: Unicorn Sample Summary Statistics (no controls)

Industry Sectors	Number of Unicorns by Sector	Number of Platforms by Sector	Platform Average Valuation ($ billions) by Sector	Non-platform Average Valuation ($ billions) by Sector
Artificial Intelligence	44	5	$6.2	$1.9
Internet Software & Services	334	117	3.5	2.2
Social Media & Communications	32	19	9.9	1.7
Biotech & Healthcare	67	33	2.5	2.8
E-commerce & Retail	175	100	3.6	3.0
FinTech	182	102	5.2	2.3
Manufacturing & Supply Chain	74	12	3.4	4.2
Other	51	16	4.9	2.1
Totals	959	404	$4.3	$2.5

Sources: Dataset and CB Insights

Table 2: Description of Platform Main Types and Subtypes

Innovation Platforms Subtypes (Unicorn Sample)	% of Innovation Platforms (71)	% of Total Innovation Platform Valuations ($0.4T)
Products or digital services with 3rd-party developers (determined from websites and GitHub downloads) e.g., Epic Games, Celonis	75%	61%
Content sharing for users e.g., Canva, Notion Labs	14%	19%
Data integration layer/SuperApp e.g., Databricks, Plaid Technologies	11%	20%

Transaction Platforms Subtypes (Unicorn Sample)	% of Transaction Platforms (333)	% of Total Transaction Platform Valuations ($1.3T)
Service marketplaces (matching buyers and sellers of services) e.g., Devoted Health, Lalamove	42%	26%
Fintech (payment processing and currency exchanges) e.g., Stripe, Klarna	26%	36%
E-commerce marketplaces (matching buyers and sellers of goods) e.g., Instacart, Faire	22%	18%
Consumer-oriented social media (focus on digital content) e.g., Bytedance, WhatsApp	5%	15%
Business-oriented social media (messaging services and collaboration tools) e.g., Discord, Slack	4%	3%
Data cloud services (connecting providers and users) e.g., Global Switch	2%	2%

Sources: Dataset and CB Insights

LITERATURE REVIEW

The early literature on platforms approached the concept from contrasting perspectives. For example, Gawer and Cusumano (2002) defined platforms as core products or technologies that increased in value with external complementary innovations, such as compatible software applications that added to the functionality of personal-computer operating systems, Internet browsers, or personal digital assistants, the predecessor of smartphones. They developed the concept of an "innovation platform" as an extension of a "product platform" in industries such as automobiles and consumer electronics, where a firm builds families of related products around common components (Meyer and Lehnerd, 1997). The key difference is that innovation platforms function at the industry or ecosystem level, enabling third parties to use interfaces or functions in the platform to build their own complementary products and services, such as software applications or peripheral devices, that make the platform increasingly valuable.

Functioning at the level of an industry or ecosystem presents the opportunity for industry platforms to generate "indirect" or "cross-side" network effects, such as between users and third-party complementors, or users and advertisers. More users on one side make the platform more useful to users or to other market participants. Another distinguishing feature of industry platforms is that complementors generally join an ecosystem, such as to build hardware or applications for a Windows PC or Google Android smartphone, without the formal supplier contracts required for a company's product platforms (Gawer, 2014; Gawer and Cusumano, 2014). This concept of an innovation platform is consistent with what Evans, Hagiu, and Schmalensee (2006) have called "invisible" software platforms, such as computer operating systems.

In parallel, economist developed theory on "multisided platforms" (Rochet and Tirole, 2003, Rochet and Tirole, 2006, Evans, 2003, Rysman, 2009) as special kinds of markets that play the role of facilitators of exchange between different types of consumers that could not easily transact with each other. Researchers saw network effects that arise among multiple market sides (Evans, 2003; Rochet and Tirole, 2003; Rochet and Tirole, 2006; Armstrong, 2006) as critical to these markets and associated businesses.

Eisenmann, Parker, and Van Alstyne (2006) also defined platforms as any set of "products and services that bring together groups of users in two-sided networks." Linking two or more market sides creates the potential to generate cross-side network effects.

Over the past decade, there has been increasing cross-fertilization and convergence on what the term platform means (Gawer, 2009, 2014). Scholars in management have used the term to refer to other businesses with multiple market sides and network effects, such as online marketplaces at Amazon, Alibaba, and eBay, as well as Internet applications like Google search (with AdWords), Facebook's social media and messaging properties, and sharing-economy services like Uber and Airbnb. There is now wide agreement that these types of network effects are a common feature of all industry-level platforms and their associated ecosystems (Parker, Van Alstyne, and Choudary, 2016; Evans and Schmalensee, 2016; Cusumano, Gawer, and Yoffie, 2019). As Evans and Schmalensee (2016: 15) explain, "the differences between single-sided businesses and multisided platforms are stark. Ordinary businesses buy inputs of various sorts from suppliers, sometimes transform them into finished products, and sell goods or services to customers. Their focus is on attracting customers and selling to them on profitable terms. Multisided platforms, in contrast, need to attract two or more types of customers by enabling them to interact with each other on attractive terms. Their most important inputs are generally their customers."

Business and scholarly enthusiasm for platforms stems from their ability to generate value by reducing search costs as well as transaction costs or "economic friction" (Parker, Van Alstyne, and Choudary, 2016) and the possibility of achieving "Winner-Take-All" (or most) outcomes in the presence of strong network effects (Eisenmann, Parker, and Van Alstyne, 2006). We now see a rapidly growing body of academic research in several areas, such as *platform competition* (Rochet and Tirole, 2003, 2006; Eisenmann et al., 2011; Cennamo and Santaló, 2013; Bresnahan and Greenstein, 2014; Hagiu and Wright, 2015); *platform leadership and innovation* (Gawer and Cusumano, 2002, 2014; Gawer, 2009, 2014; Boudreau, 2010); *platform ecosystems*

(Ceccagnoli et al., 2012; Parker et al., 2017; Jacobides et al., 2018); and *platforms as new organizational forms* (McIntyre et al., 2020; Gawer, 2021, 2022).

An important part of platform strategy and ecosystem development for entrepreneurs and established companies is that platform companies can leverage resources that reside outside traditional firm boundaries. They may not need to do all their own innovation in-house or own all the assets they need to run their businesses (Gawer and Cusumano, 2002; Parker, Van Alstyne, and Jiang, 2017). Parker, Van Alstyne, and Choudary (2016) also describe platforms as "intermediaries" that connect labor, machines, and data and aggregate market players. These attributes have profound implications for the main locus of value creation and capture and shift value away from the traditional firm and its supply chain to the platform business and its related ecosystem (McIntyre et al., 2021). Global, pervasive connectivity and massively distributed computing capabilities also have made it possible to identify and exploit complementarities across users, machines, and sectors through the use of data, software, and networks (Gawer, 2022).

FRAMEWORKS AND RESEARCH STRATEGY

Cusumano, Gawer, and Yoffie (2019) offered a way to integrate these different views of platforms by categorizing all platforms into two basic types, depending on their primary business models and how they create value. First, some digital platforms facilitate *transactions*. They provide a structure that can take advantage of the low search costs afforded by digital technologies to connect Internet users and create efficient matches and interactions or exchanges of different types. These types of platforms often serve as intermediaries between buyers and sellers. Their success is closely tied to the success of a range of businesses that use platforms to reach customers. Platforms allow firms, especially smaller businesses, to extend their operations beyond their home area and potentially cater to consumers across the globe. These platforms include social media properties as well as "matchmaker" businesses described by Evans and Noel

(2005) and Evans and Schmalensee (2016). They also include credit cards, as described in a Supreme Court briefing (Supreme Court of the United States, 2018).

Second, digital platforms can facilitate *innovation*s. Innovation platforms enable third-party firms, such as software developers, to build their own complementary products or services that leverage unique features of the platform, which increases in value for users with more complementary innovations. For example, platform technologies such as Microsoft's DOS and Windows operating systems, as well as Apple's iOS operating system with the iPhone and iPad, and Google's Android operating system with smartphones and tablets, since the 1990s, have facilitated the development of millions of software applications (Cusumano and Selby, 1995; Gawer and Cusumano, 2002; Evans, Hagiu, and Schmalensee, 2006; Ceci, 2022).

In short, *transaction platforms* facilitate search and matching or other exchanges among individuals and organizations that otherwise might have difficulties finding each other, such as with online marketplaces, social media, or messaging systems. Common examples of public-company transaction platforms are Airbnb, eBay, and Uber, with privately-held transaction platforms including Instacart and Stripe. *Innovation platforms* serve as a common foundation of technological building blocks and tools through which third parties can develop complementary products or services, such as applications for personal computers, smartphones, and other devices. Common examples of public-company innovation platforms are Microsoft Windows and Google Android, while privately-held innovation platforms including Epic Games and Canva, which strongly encourage third-party development through their websites or GitHub pages.

Hybrid companies offer both innovation and transaction platforms (Cusumano, Gawer, and Yoffie, 2019). In the case of Apple, for example, the iOS operating system with the iPhone serves as an innovation platform while the Apple App Store serves as a transaction platform to distribute and monetize innovations (software apps). Amazon is also a hybrid company: The Amazon Marketplace is a transaction platform while Amazon Web Services (AWS) is an innovation platform as well as a digital cloud service that

facilitates the development of many applications through programming interfaces in the AWS cloud environment. Most importantly, these platform businesses are distinct compared to standalone product or service businesses in their potential to general cross-side network effects.

However, despite the increasing attention given to platform companies, there are few large-sample studies of how platform companies perform and how investors value them. Although three authors of this article published in 2019 a comparative analysis of public platform versus non-platform companies, the sample was relatively small (43 platforms over a maximum of 21 years of data, 1995 to 2015) and it did not include failed platforms or privately-owned companies (Cusumano, 2022). Until our study of the 2021 unicorn dataset, there has not been, to our knowledge, a systematic analysis of how much of a premium or discount platform companies command in private valuations. This is the main question we explore in this paper.

One caveat is that there has been a boom in unicorn investments in recent years that may have impacted investments in platform versus non-platform companies. Kenney and Zysman (2019) attribute this rapid expansion of unicorn stature to changes in the environment for forming and financing new firms. They argue that open-source software, digital platforms, and cloud computing have made it easier to establish new firms quickly and with a lower cost of market entry, at least in the United States. Ample funding sources also have made it possible for new firms to run massive losses for long periods of time to dislodge incumbents or triumph over other lavishly funded start-ups. Together, these conditions have led to high valuations and unicorn status for many venture-backed companies.

Other recent research suggests that most unicorns are overvalued (Gornall & Strebulaev, 2022).[3] This overvaluation stems from the fact that unicorns tend to have

[3] Gornall & Strebulaev (2022) develop a valuation model for venture capital–backed companies and apply it to 135 U.S. unicorns. They value unicorns using financial terms from legal filings and find that reported unicorn post-money valuations average 48% above fair value, with 14 being more than 100% above. Reported valuations assume that all shares are as valuable as the most recently issued preferred shares. Gornall & Strebulaev calculate values for each

multiple share classes that do not all consist of the same terms and claims. Shares issued to early investors grant major protections, while common share issues do not have the same value-inflating terms. The overvaluation may be in part a result of the (wrong) generalization that all of the company's shares are of equal value. Currently, professionals assign rough values to companies by multiplying the stock prices of the latest round of funding and the outstanding shares together for an overall estimation of worth. However, Gornall and Strebulaev (2022) argue that the most recently issued shares have a different value than older shares, so equating them inflates valuations.

Our objective in this paper is not to assess the absolute value of a unicorn but rather to analyze the differences between platforms and non-platforms. These relative differences can be important for entrepreneurs trying to identify the business model that might get the highest valuation and for investors looking to build a superior portfolio. While venture-capital investors look at many variables to determine valuations, business models remain one of the most important criteria. In fact, 83% of venture investors in one recent survey believed "business model" was the second-most important criteria for investment decisions, only after the "team" (Gompers, Gornall, Kaplan, Strebulaev, 2016). Platform business models also can have a material impact on venture investors' top two valuation considerations: comparable companies and anticipated exit. Conversely, venture investors have noted that "business model" is one of the most important reasons for failed venture investments, once again, second only to "team" (Gompers, Gornall, Kaplan, Strebulaev, 2016).

Adequate financing of venture-backed startups can be extremely important for economic growth. Venture-backed companies accounted for 41% of total US market capitalization and 62% of US public companies' R&D spending as of 2020 (Gornall and Strebulaev, 2021). Among public companies founded within the last 50 years, VC-backed companies accounted for half in number, three-quarters by value, and more than 92% of

share class, which yields lower valuations because most unicorns gave recent investors major protections such as initial public offering (IPO) return guarantees (15%), vetoes over down-IPOs (24%), or seniority to all other investors (30%). Common shares lack all such protections and are 56% overvalued. After adjusting for these valuation-inflating terms, almost half (65 out of 135) of unicorns lose their unicorn status.

R&D spending and patent value (Gornall & Strebulaev, 2022). We believe that the intersection of VC funding and platform entrepreneurship is a particularly promising area of study given that the five largest US companies by market capitalization as of the end of December 2021 (Apple, Microsoft, Amazon, Alphabet/Google), Meta/Facebook) were all platform businesses that began as venture-backed start-ups. If successful, platform business models can produce extraordinary financial returns. Two illustrative recent IPO examples are Square and Shopify (both transaction platforms). According to public data, they first became unicorns in 2011 (Square) and 2013 (Shopify), with private valuations of $1.2 and $1.0 billion, respectively. They both went public in 2015 with valuations of $3.0 and $1.3 billion and then ended 2022 with market values of $37.6 and $44.2 billion, respectively.

DATA AND METHODS

For this paper, we have built and analyzed a sample of all unicorns existing in 2021 as determined by CB Insights, including platforms and non-platform firms. Our dataset is cross-sectional, and each company represents one point. Unicorns that went public before December 31, 2021, are automatically excluded, while companies that had their initial public offerings after this date were included. Significant variables from CB Insights include each unicorn's valuation as of year-end 2021, the founding year, the year in which the company became a unicorn, the industry sector, and the country of origin. From this initial dataset, as described in Tables 1 and 2 cited earlier, we performed a qualitative analysis and added several more variables, including "platformness" (i.e., whether or not the company had a platform business model), type of platform business (innovation, transaction, or hybrid and subtypes), product or service orientation, and B2B or B2C orientation.

Table 3 highlights these summary statistics. It also lists additional attributes of the platform unicorns in vertical columns, which we used as controls or instruments in some of our analyses. Among the 404 unicorn platforms, 80 (20%) were product-oriented, and 324 (80%) were service-oriented, based on our analysis of NAIC (North American

Industrial Classification) codes. Similarly, 182 platforms (45%) were B2B-focused, and 222 (55%) were B2C-focused, based on our analysis of website descriptions of business models. Additionally, 138 (34%) were hybrid companies, meaning they contained platforms with both innovation and transaction functions.

We also consolidated CB Insight's 15 industry categories into eight (see Table 1) to allow for more precise statistical analysis: (1) Artificial Intelligence, (2) Biotech and Healthcare, (3) E-commerce and Retail, (4) FinTech, (5) Internet Software and Services, (6) Manufacturing and Supply Chain, (7) Social Media and Communications, and (8) Other. If a unicorn qualified for two or more industry categories, we assigned it to the category that seemed to describe the largest part of its business. For example, if a technology-focused financial company utilized AI to trade bitcoin, we would classify it as a FinTech company, even though it might also be classified as AI or e-commerce.

Table 3: Platform Unicorns (404 Total) Breakdown by Orientation

Platform Type	Product	Service	B2B	B2C	Hybrid
Innovation	27 (34%)	44 (14%)	55 (30%)	16 (7%)	37 (52%*)
Transaction	53 (66%)	280 (86%)	127 (70%)	206 (93%)	101 (30%*)
Totals	80 (100%)	324 (100%)	182 (100%)	222 (100%)	138

Sources: Dataset and CB Insights

* These represent 52% of all innovation platforms and 30% of all transaction platforms. This is why the numbers do not sum to 100% of the 404 platforms.

Table 4 illustrates the extraordinary growth in both unicorns and platform unicorns. More than 86% (733) of the 959 companies in the sample became unicorns during 2018-2021, including an astounding 53% (509) in the year 2021. Also, in 2021, 198 private platform firms became unicorns. Although some of the 2021 unicorns already fell below

the billion-dollar valuation level in 2022, our analysis focuses on understanding the relative differences between platforms and non-platforms, not the absolute valuations.

Table 4: Total Number of Non-Platform Unicorns and Platform Unicorns Per Year (2021 Sample)

	Non-platform Unicorns		Platform Unicorns	
Year	Incorporation	Became a Unicorn	Incorporation	Became a Unicorn
2000	6	0	4	0
2001	3	0	6	0
2002	4	0	0	0
2003	5	0	3	0
2004	8	0	1	0
2005	7	0	6	0
2006	8	0	5	0
2007	16	0	8	1
2008	9	0	12	0
2009	16	0	13	0
2010	20	1	17	0
2011	38	1	38	1
2012	48	3	36	1
2013	54	2	34	1
2014	51	6	50	7
2015	74	15	59	20
2016	69	11	26	11
2017	32	23	30	22
2018	25	56	23	49
2019	22	65	12	44
2020	17	61	7	49
2021	4	311	3	198

Sources: Dataset and CB Insights

Note: 30 unicorns were incorporated before 2000 (approximately 3% of our dataset). These are not shown in this table for reasons of space. No unicorns remaining (and no public companies) in the 2021 dataset became unicorns before 2007.

In 2021, the top three unicorns in terms of valuations were ByteDance, SpaceX, and Stripe, valued at $140 billion, $100 billion, and $95 billion, respectively. We categorized SpaceX as a product company that manufactures rockets, while we identified ByteDance (the owner of TikTok, the most visited social media website in the world in 2022) and Stripe (a payment processing firm) as transaction platforms. The next highest valued unicorns were Klarna (a digital services transaction platform enabling e-commerce instalment payments) at almost $46 billion and Epic Games (a video-game product company with both an innovation platform for third-party complements and a transaction platform in the form of an open app store) at $42 billion. The other unicorns in this dataset were valued between $1 and $40 billion, with 95% valued below $10 billion.

Since the valuations of ByteDance, SpaceX, and Stripe were statistical outliers in the sample, we changed the dependent variable from valuations in levels to the natural log of these valuations. For platform regressions, the main regressor is a binary variable, with "0", meaning the unicorn is not a platform, and "1", indicating that it is. Because the primary regressor is binary, we do not interpret the beta coefficient as a growth rate but rather as a percentage difference-in-means between the two values of the binary regressor. This difference is the platform premium. We calculated this percentage premium by inserting the value of beta as the exponent on the number e and subtracting this value from 1 ($e^{\beta} - 1$).

Table 5, which lists the top 10 transaction and innovation platforms in our sample, illustrates how we coded the individual unicorns. The transaction platforms were all involved in bringing together different market actors. ByteDance connected influencers, end users, and corporate advertisers. Stripe and Klarna provided payment processing services for multiple companies and their customers. Instacart linked professional shoppers with end users and grocery stores. Revolut, FTX, and Chime provided financial services, such as for buyers and sellers of cryptocurrencies (note that FTX is now bankrupt). Xiaochongshu linked shoppers with users providing shopping tips. Fanatics connected sports fans with sports teams for multiple types of sports-related purchases and other transactions. Devoted Health was a marketplace connecting seniors, doctors, and insurance providers.

Table 5: Top Ten Transaction and Innovation Platforms (2021)

Most Valuable Unicorn *Transaction Platforms* (2021)

Company	Founded	Valuation $Billion	Country	Platform Description
Bytedance	2012	$140	China	Video platforms (Douyin, TikTok, etc.) that connect *influencers, end users*, and *advertisers/e-commerce*
Stripe	2010	$95	USA	Payment processing & operations management; facilitates transactions between *companies* and their *customers*
Klarna	2005	$46	Sweden	Payment & credit/financing app for e-stores; facilitates transactions between *vendors* and their *customers*
Instacart	2012	$39	USA	Online grocery shopping and delivery; *connects food stores, independent shoppers,* and *customers*
Revolut	2015	$33	U.K.	Superapp for FX and money transfer, trading, savings; facilitates transactions among *individuals and companies*
FTX	2018	$25	Hong Kong	Cryptocurrency exchange; facilitated *transactions among traders, and between traders* and *crypto holders/owners*
Chime	2013	$25	USA	Banking mobile app; *links customers with multiple banks* and their products & services
Xiaohongshu	2013	$20	China	Enables sharing of shopping tips for e-commerce: connects *customers and companies* for online shopping
Fanatics	1995	$18	USA	*Connects fans* and *sports teams* for gear, online betting, and collectables (multiple transactions)
Devoted Health	2017	$13	USA	*Connects seniors, doctors, and insurance providers*; matches different sides of the healthcare market

Most Valuable Unicorn *Innovation Platforms* (2021)

Company	Founded	Valuation $Billion	Country	Platform Description
Epic Games	1991	$42	USA	Video game developer with a strong third-party developer community and open app store (hybrid)
Canva	2012	$40	Australia	Web-based, collaborative design tool with a third-party developer and content-sharing platform
Databricks	2013	$38	USA	Data integration and analytic services platform (integrates a company's data & cloud with tools/AI providers)
DJI Innovations	2006	$15	China	Aerial robotics technology with a third-party developer tools & accessories (product + platform)
Plaid Technologies	2012	$13	USA	API provider for financial app developers (strong third-party developer community and 5500 Fintech partners)
Airtable	2013	$12	USA	Collaboration software & information toolkit, enhanced by open APIs & third-party apps
Celonis	2011	$11	Germany	Business process management software with third-party technology & service partners
Talkdesk	2011	$10	USA	Cloud-based call center software developer with third-party app-developers & app store
Notion Labs	2016	$10	USA	Work information, collaboration workflow integration & sharing platform with open APIs
Gusto	2011	$10	USA	Consolidates online a company's payroll system, benefits information, and HR with open APIs

Sources: Dataset and CB Insights

The innovation platforms were primarily software product or digital service companies with open programming interfaces (APIs) connected to ecosystems of third-party application providers and service partners. Epic Games, as described earlier, was primarily a video-game software company. Canva, Airtable, and Notion Labs sold collaboration or content-sharing tools. Databricks was a data warehouse service that integrates with various cloud providers and analytics applications. Plaid Technologies was a development environment for financial applications. Celonis, Talkdesk, and Gusto provided business-process, call-desk, and HR management software with access to third-party products and services that complemented these applications. DJI Innovations, the fourth-ranked innovation platform on our 2021 list, valued at $15 billion, is a drone hardware manufacturer that has opened its technology (e.g., cameras and sensors) to third-party application and analytics providers.

PROPOSITIONS AND ANALYSES

Supported by our analysis of the literature summarized in the previous section, two propositions drove our research strategy.

Proposition 1: Given their potential for high profitability and growth, all other things being equal, platform unicorns should be more highly valued by investors than non-platform unicorns.

As Proposition 1 indicates, our first task was to determine whether or not there was a premium for platform unicorns. We checked for variance in the error terms (heteroskedasticity) for our statistical model and found that most of the regressions contained very similar (homoskedastic) errors. Additionally, to avoid potential omitted variable bias in our beta estimates, we checked for endogeneity in all five of the primary regressors, and found endogeneity in the platformness regression for North America.

The endogeneity test for platformness checked if having a higher valuation might cause a company to become a platform. In other words, if investors guarantee more funds to a non-platform company (which would bring this company to unicorn status) on the condition that the company introduce some elements of a platform business model, this

could result in a higher valuation and cause a non-platform to become a platform. We also ran similar endogeneity tests on the other regressions, checking whether investors seemed to exchange higher valuations for becoming either innovation or transaction platforms or a specific platform subtype.

To check for this possibility, we ran 2SLS models with robust standard errors of each primary regressor, followed by Woolridge's 1995 robust test score for endogeneity. Most of the regressions have exogenous primary regressors, and therefore we utilized OLS in those cases. However, the North American platformness regression had a primary regressor that was endogenous. To treat this, we utilized the number of platform-focused papers published per unicorn year collected from the Web of Science (following the methodology used by Jia, Cusumano, and Chen, 2021). In this case, we utilized a two-stage least squares model (2SLS), with industry-clustered standard errors to account for heterogeneity in the regressions. (For any regression with heteroskedastic errors, we clustered by industry in the 2SLS case, and, for the OLS models, we utilized robust standard errors.) The platform premium regression equations for North American platformness are:

$$\ln(val)_i = \beta_0 + \beta_1 \widehat{platform}_i + \beta_2\, age_i + \varepsilon_i \quad (1)$$

$$\widehat{platform}_i = \delta_0 + \delta_1 B2B_i + \delta_2\, product_i + \delta_3\, papers_i + u_i \quad (2)$$

Equation (2) is the first stage equation instrumented into equation (1). In equation (2), $B2B_i$ represents the business or consumer orientation of a unicorn, $product_i$ is product or service orientation, and $papers_i$ is the publication instrumental variable described above. For $B2B_i$, we reviewed each unicorn's website to determine if they were business- or consumer-oriented and created a binary variable. We also utilized their NAICS codes and our website analyses to categorize every unicorn (both platform and non-platform) into product- or service-oriented companies in order to create a binary variable (following the methodology used in Suarez, Cusumano, and Kahl, 2012).

After instrumenting, clustering errors, and changing the dependent variable to the natural log version to account for the three extreme outliers in valuations, we found a platform premium of approximately 129% ($3.3 billion) over non-platform unicorns. In North America, we included B2B/B2C and product/service orientations as instruments in the 2SLS regressions, but we utilized these attributes as control variables for the OLS regressions in Europe, APAC, and ROW.

We also ran the same endogeneity tests for Europe, APAC, and ROW, and found that being a platform is exogenous in all three regions. This finding allowed us to utilize OLS with B2B/B2C and product/service orientation as control variables rather than as instruments. However, we still do not know why platformness is exogenous in Europe, APAC, and ROW but endogenous in North America. One possible explanation is that investors are focused on North American companies (with more than half of the unicorns in our sample coming from the United States). If receiving more funding is conditional on being or becoming a platform in North America, this could create endogeneity in the data through simultaneous causality. If this condition is not apparent for unicorns in other regions, then platformness should remain exogenous for these locations. In other words, some investors in North America may make the amount of funding they provide conditional on whether a non-platform will transition to a platform business model, creating simultaneous causality in the data. This can also apply to entrepreneurs, who may change their non-platform business model to a platform strategy if they expect to receive higher valuations from investors. This does not appear to be the case for European, APAC, or ROW non-platforms, at least not yet.

The platform premium in Europe was 68% ($1.6 billion), while the premium in APAC was 39% ($960 million). There was no statistically significant platform premium in the ROW region. However, in Europe, we found an additional 25% premium for B2B (business-to-business) unicorns, suggesting that B2B companies are considered more valuable in Europe than B2C companies. In addition, in North America and APAC, age of the company is statistically significant at 0.01%. We expected a positive correlation between age and valuation since older firms have had more time to raise money and to

develop their business models, though we do not know why only Europe and ROW do not have an age premium.

Table 6: Regression results for platform premiums.

Key: Each of the beta coefficients is the exponent values on the number e, as mentioned in the previous section. The variable 'papers' is utilized as an instrument only in North America to control for endogeneity, and is not included as a control variable in the other three regressions because platformness in these regions is exogenous.

Variables	*(1)*	*(2)*	*(3)*	*(4)*
Platformness	0.83***	0.52**	0.33*	0.09
Founding Age	0.02***	0.01	0.02*	-0.02
B2B/B2C	Instrument	-0.14	0.0002	-0.09
Product/Service	Instrument	0.22*	-0.29	0.01
Papers	Instrument	-	-	-
Constant	0.26*	0.45**	0.52	0.72*
Regions				
North America	x			
Europe		x		
APAC			x	
ROW				x

Note: Significant at 0.001%***, 0.01%**, 1%*

Table 7: Region-specific regressions for platform premiums, significant at 0.1%.

Region	Platform Premium, percentage	Platform Premium, dollars (USD billions)	Average Platform Valuation (USD billions)	Top unicorn by valuation	Country and Valuation (USD billions)
North America	129%	$3.3	$5.8	SpaceX	United States ($100)
Europe	68%	$1.6	$3.5	Klarna	Sweden ($45.6)
APAC	39%	$0.96	$3.4	Bytedance	China ($140)
Rest of World	n/a	n/a	$2.3	Rappi	Colombia ($5)

Sources: Dataset and CB Insights

INNOVATION VS TRANSACTION

Our next set of regressions tested if the type of platform affected company valuation. In other words, does an innovation platform command a premium over a transaction platform, or is the opposite true? Utilizing a similar framework as the platformness regressions, we analyzed whether there is a premium in either direction. We also tracked the distribution of different platform subtypes or hybrids and explored if they had an impact on valuations.

There are several reasons why venture investors might value innovation platforms more than transaction platforms. As seen in Table 2, cited earlier, approximately 75% of unicorn innovation platforms were built around software products or digital services with ecosystems of third-party complements. We have done prior research indicating that software product companies tend to have very low marginal costs and very high potential profit margins (Cusumano, 2004; Suarez, Cusumano, and Kahl, 2012) and that automated digital services companies should perform similarly to software product companies (Cusumano, 2010). Among software product and digital services companies, innovation platforms also tend to occupy a central place within an ecosystem of users and complementors (Gawer and Cusumano, 2002; Cusumano and Gawer, 2008). In addition, our sample shows many fewer innovation platforms than transaction platforms (71 vs 333 – see Table 2). This finding suggests that there may be less rivalry as users and complementors tend to choose one or a small number of innovation platforms, with network effects encouraging a winner-take-all-or-most outcome. Furthermore, more innovation platforms tend to be B2B rather than B2C businesses, which may positively impact competition, profitability, and volatility of revenues (Table 8). These observations lead us to Proposition 2:

<u>Proposition 2</u>: Innovation platforms should be more valuable than transaction platforms, all other things (e.g., age, sector, and geography) being equal.

For the analysis of this proposition, we created a subset of the population that contained only platform unicorns and classified each as either an innovation or transaction platform. We restricted the categories to these two main types in order to test

whether there was an innovation or a transaction premium within the platform unicorn sample.

For our categorization of platform types, we used the Cusumano, Gawer, and Yoffie (2019) definitions. Innovation platforms are "platforms [which] usually consist of common technological building blocks that the owner and ecosystem partners can share in order to create new complementary products and services, such as smartphone apps or digital content." Transaction platforms are "largely intermediaries or online marketplaces that make it possible for people and organizations to share information or to buy, sell, or access a variety of goods and services." We made each classification based on unicorns' websites and information on their business models. In addition to looking at the developer and API (application programming interface) pages on the company websites, we analyzed GitHub pages, the number of forks and stars for their repositories, and the content of their repositories to assess whether platforms were focused on enabling or promoting third-party innovations (complements). We utilized a benchmark of at least 500 stars or forks to classify a firm as an innovation platform to insure there was some significant ecosystem activity. Once we completed the innovation/transaction classifications, we then tested for endogeneity of the platform type and determined that it was exogenous. For this reason, we ran the regression using OLS with robust standard errors. The basic platform type regression equation is:

$$\ln(val)_i = \beta_0 + \beta_1 platform\ type_i + \beta_2 age_i + \beta_3 region_i + \beta_4 industry_i + \varepsilon_i \quad (3)$$

Based on this model, we found an innovation platform premium of approximately 34% over transaction platform unicorns, significant at 0.01%. This is consistent with the raw summary statistics, which also indicated a 34% premium of innovation over transaction platforms. We then ran two variations of this regression, one comparing innovation platforms to non-platforms, and another comparing transaction platforms to non-platforms. We found a 116% innovation platform premium over non-platform unicorns, and a transaction platform premium of 60% over non-platform unicorns (Table 8). We also found that region is not a statistically significant variable in any of these

regressions. Therefore, contrary to what we had done with the platform premium regressions, we did not perform a region-specific analysis.

Table 8: Comparison of Innovation and Transaction Platform Valuations

Average value, Innovation platform	Average value, non-platform	Innovation Platform Premium	
5.4	2.5	116%	Comparing innovation platforms and non-platform unicorns

Average value, Transaction platform	Average value, non-platform	Transaction Platform Premium	
4.0	2.5	60%	Comparing transaction platforms and non-platform unicorns

Average value, Innovation platform	Average value, Transaction platform	Innovation Premium	
5.4	4.0	34%	Comparing innovation platforms and transaction platforms: Innovation platforms have an additional premium of 34% over transaction platforms within the platform space, based on the regression results.

PLATFORM SUBTYPES AND INDUSTRY SECTORS

In addition to checking for an innovation or transaction platform premium, we explored whether there was a premium associated with a specific platform subtype (see Table 2). After checking for endogeneity and concluding that both variables were exogenous, we ran two sets of OLS regressions: one with innovation platform subtype as the primary independent variable, and with company age, B2B/B2C orientation, and product/service orientation as control variables (with robust standard errors). We repeated this same regression with transaction platform subtype as the main independent regressor. In both cases, we found innovation and transaction subtypes to be statistically insignificant. This result suggests that investors did not place a premium on the specific platform subtypes.

We also found that only one industry sector – Internet Software and Services – had a statistically significant premium, based on t-tests and without regression controls,

and that premium was only for innovation platforms. The value of this premium was approximately 41% in this sector. The intuition behind this result is that most innovation platforms (75% – see Table 2) were focused on building high-growth and high-margin software product companies as well as largely automated digital services companies, bolstered by open APIs and third-party ecosystems producing complementary products and services.

DISCUSSION AND CONCLUSIONS

In this paper, we investigated important drivers of unicorn valuations in an era of extraordinary unicorn growth. More private companies were valued at $1 billion or more than at any time in history. This explosion in unicorns around the world reveals a number of surprising empirical and statistical findings. Using 2021 data, we have shed light on the global distribution of platform vs non-platform venture-backed companies, the premium that investors assign to platform vs non-platform businesses, and the premium offered for innovation vs transaction platforms.

We were initially surprised to find that only 42% of all global unicorns were platforms (404 out of 959). In a more casual estimate of approximately 250 unicorns that we reviewed in 2015, we estimated that between 60% and 70% were platforms (Cusumano, Gawer, and Yoffie, 2019: 8). Perhaps this should not be a surprise: As the number of unicorns nearly quadrupled, particularly during the peak of COVID, not every growth opportunity was best served by a digital platform, though many were.

Less surprisingly, North America continued to dominate in the sheer number of unicorn platforms (50%), while APAC came in second (33%), followed by Europe (13%) and the Rest of the World (5%). The enthusiasm for platforms in North America, especially the United States, translated into a much higher premium (129%) for platform vs non-platform businesses. Since public platform companies in North America, such as Apple, Microsoft, Amazon, and Alphabet/Google, have the highest platform valuations in the world, investors seem to have expected that North American platform ventures, on average, would have more upside potential. Yet, while North American premiums were

dramatically higher than in Europe and the APAC region, platform unicorns still generated generous premiums (68% and 39%, respectively) over non-platform businesses. The lack of any premium in the Rest of the World segment may reflect less mature digital economies or capital markets where investors do not expect to see the same platform benefits.

While geographic differences give us some insights, our analysis shows that sectoral differences are also large. The summary statistics indicate that three sectors dominate platform unicorn investment: Internet Software & Services, E-commerce & Retail, and FinTech. Of the 404 unicorn platforms, these three sectors accounted for 78% (319) of the total. Without any controls, we noted that the average value for a platform was $4.3 billion vs $3.4 billion for a non-platform. At the same time, however, the biggest average valuation premiums appeared in some of the smallest categories: social media and communications had only 19 platform unicorns, but the average valuation was $9.9 billion, and artificial intelligence platforms had only five unicorns, but with an average valuation of $6.2 billion. A small number of companies such as ByteDance seem to be driving these results.

Once we control for platformness, region, unicorn age, and some other factors, we find that unicorn platform companies have a statistically significant premium over non-platforms. Equally important, we determined that the average innovation platform unicorn was valued at 34% more than the average for transaction platforms. While both innovation and transaction platforms provide premiums over non-platform unicorns, this additional innovation platform premium may indicate that innovation platforms are expected to be more valuable than transaction platforms over the long term. Since they are centrally located within innovation ecosystems and potentially positioned for winner-take-all-or-most outcomes, innovation platforms may well be more adept than transaction platforms at surviving unprecedented, systemic macroeconomic shifts, as we experienced before and after the Covid-19 pandemic.

We must note that, since December 31, 2021, several of the platform unicorns in our dataset have gone public or experienced large drops in their valuations. Most notable is FTX. Once valued at $25 billion (see Table 5), as a result of fraud involving

cryptocurrency investing and trading, this transaction platform is now bankrupt and its senior executives were under indictment or they pled guilty to felonies. Other declines in valuations seem to be due more to the bursting of an investment bubble. For example, among European unicorns, Klarna saw its valuation drop as much as 85% after 2021, while the largest North American private platform, Stripe, suffered a 28% cut in valuation in 2022. However, the largest unicorn in Asia (and the world), ByteDance, jumped 300% in early 2022 to $460 billion, only to decline to an estimated $280 billion in late 2022. Political pressure from around the world to limit access to the TikTok application, due to concerns over how the Chinese government may use this type of data, will likely lead to further declines in Bytedance's valuation.

Due to the extraordinary growth in unicorn entries and valuations between 2020-2021, with 509 platforms becoming unicorns in 2021 alone, we will probably look back on 2021 as a financial bubble that was never sustainable. Some 34% of the unicorns in our sample became unicorns between 2018-2020, and an additional 53% reached unicorn status in 2021. In addition, 65% of the dataset (509 companies) entered between 2020-2021, and six of these unicorns were both incorporated and became unicorns in 2021, an astonishingly fast pace. While most financial bubbles are driven by a fear of missing out (FOMO), the experience of 2021 can still help us better understand how entrepreneurs position their start-ups to attract investors and how investors make choices among different business models. In the future, though, investors may not be as generous as they were in 2021.

Another caveat for this study is our limited ability to extract additional inferences from unicorn platform valuation data. We lack substantial supplemental information that venture-backed company founders usually present to investors at the time of fundraising. These data would include pitch materials describing the company's strategy in more detail, the business model, and long-term vision, as well as due diligence analyses, all of which might signal the potential for building a high-growth platform business. At the same time, venture-backed company valuations are not attributable solely to one factor, such as platform potential. Rather, venture capitalists consider multiple company-specific variables (the team, business model, product or service, market or industry size and

structure, and others). There are also other considerations, such as anticipated exit options, valuations of comparable companies, and competitive pressures from other investors seeking to invest in the fundraising round (Gompers, Gornall, Kaplan, Strebulaev, 2016 and 2021).

We believe this paper points to additional opportunities for research. If 2021 turns out to be a valuation bubble, researchers could gain important insights by repeating this analysis when valuations have adjusted to post-bubble realities. Were 2021 *relative* premiums also a bubble, or were investors and entrepreneurs correctly perceiving the longer-term upside of platforms versus non-platforms? We need more longitudinal data to answer this question.

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