

Platform versus Non-Platform Company Performance: Some Exploratory Data Analysis, 1995-2015

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Note: This is a preliminary draft and we will later add additional academic literature references.

INTRODUCTION

For anyone who follows the world of business, it is now common knowledge that the most valuable firms in the world today are what some observers call “platform companies.” If we look at 2017 year-end data, for example, at the top were Apple (\$890 billion), Alphabet – the holding company established in 2015 that owns Google (1998, \$770 billion), Microsoft (1975, \$680 billion), and Amazon (1994, \$590 billion). Also in the top ten was Facebook (2004, \$540 billion). Together, these five companies alone represented well over \$3 trillion in market value. The business press also includes many discussions of platform ventures that have not yet gone public. In a 2017 *TechCrunch* list of 261 “unicorns” – startups with valuations of \$1 billion or more – we estimate that platforms comprised between 60 and 70 percent, led by firms such as Uber and Airbnb.

Numerous publications going back more than twenty years describe some of these firms and their operations in detail. Books include our own *Microsoft Secrets* (Cusumano, 1995), *Competing on Internet Time* (Cusumano and Yoffie, 1998), *Platform Leadership* (Gawer and Cusumano, 2002), *Platforms, Markets, and Innovation* (Gawer, ed., 2009), *Staying Power* (Cusumano, 2010), and *Strategy Rules* (Yoffie and Cusumano, 2015). Other recent books include *Matchmakers* (Evans and Schmalensee, 2016) and *Platform Revolution* (Parker, Van Alstyne, and Choudary, 2016). However, these publications are largely qualitative case studies of specific firms and industries or analyses of general principles and strategies followed by leading platform companies. A few researchers have used econometric analyses to look at the impact of network effects on specific products and markets, such as competition in mobile operating systems and application ecosystems (Boudreau, 2012; Bresnahan, Orsini, and Yin, 2015) and video-game entry (Zhu and Iansiti, 2012). Again, however, none of these researchers have examined the financial performance of a large number of platform companies of different types and over multiple years, or compared their results to non-platform companies.

The purpose of this study is to address this gap in the empirical research. The data and analysis presented in this paper are also part of a book project, scheduled for publication in June 2019 (Cusumano, Gawer, and Yoffie, 2019). We asked some simple exploratory questions, such as: Do publicly listed

platform companies perform better (or worse) in terms of operating profitability compared to non-platform public companies? Are platform companies more highly valued by the market compared to non-platform companies? We also set out to examine whether there are differences among major platform types as well as what seems to drive any differences in performance or valuations among these companies.

DEFINITIONS

These questions are simple to ask but difficult to answer because there is no standard definition of what is a “platform company.” Based on our own work and that of other researchers, for this paper, we have used the following definition: A platform refers to a company-owned business (virtual or physical) that connects individuals and organizations at the level of an industry in order to enable innovations or transactions among users and other market participants, generating direct or indirect network effects in the process. Researchers generally divide network effects into direct or same side (user to user, such as the more users of a social network there are, the more valuable the social network becomes), and indirect or cross-side (such as the more users of a social networking site there are, the more attractive the platform becomes to advertisers or developers of complementary applications). Market participants range from users to advertisers to providers of complementary applications and services.

Some researchers have constructed complex typologies of platform types based on the variety of applications (Gawer, ed., 2009; Parker, Van Alstyne, and Choudary, 2016). To make things simpler for this exploratory analysis, following our initial discussions for this research project going back to May 2015, we divide all platforms into two basic types, depending on their primary function (Exhibit 1).

The first type we call *innovation platforms*. These consist of common building blocks that the platform owner and ecosystem partners can share in order to create “complementary” products and services. By complementary, we mean that these innovations add functionality or add assets to the platform and make the whole system increasingly useful and valuable. The more complements there are, the more attractive the platform becomes to users and other potential market actors. Microsoft Windows, Google Android, Apple iOS, and Amazon Web Services are commonly used operating systems and cloud computing services that serve as innovation platforms for computer and smartphone ecosystems. Other important innovation platforms include the Intel x86 microprocessor line used with Windows to create PC applications, ARM microprocessor designed used to create mobile operating systems and other systems, and the Nvidia microprocessor line used to create high-performance graphical and other applications. The second type we call *transaction platforms*. These make it possible for millions of people to access or buy and sell a variety of goods and services, or to share information. The more participants as well as functions available in transaction platforms, the more valuable and useful they become. Google Search, Amazon Marketplace, the Facebook Social Network, Twitter, and Tencent’s WeChat are examples of commonly used transaction platforms.

There are similarities and differences between the two types of platforms. Those focused on innovation usually create value by facilitating the creation of complementary products and services, sometimes built by the platform owner but mostly by outside firms (the ecosystem). These platform companies usually capture and deliver value (monetize the platform) by directly selling or renting a

product. By contrast, transaction platforms usually create and deliver value by facilitating buying and selling or other interactions, such as encouraging users to create and share content. They usually capture value by charging a transaction fee, such as to place advertisements or enable a transfer of money for particular services, like sharing a ride or a room. Some firms also start with one type of platform and add the second type, or mix the two. We refer to the companies that support both types of platforms as *hybrids*. Prominent hybrid firms include Apple, Google, Microsoft, Amazon, Facebook, Tencent, and Alibaba. They also represent the most valuable platform companies and are among the most valuable companies of any type in the world.

DATA SAMPLE

We began with the Forbes Global 2000 list for 2015 of publicly traded companies, and analyzed the post-IPO data of these companies. We then read through annual reports and public information to identify what seemed to be platform companies. We also realized that there is no standard way for firms to report revenues from their platform versus non-platform business units. In particular, many companies that we think of as platforms (e.g., Apple, Amazon, and Alibaba) also contain traditional non-platform businesses, such as online stores (iTunes, Amazon.com, Taobao).

Our rule of thumb to define a platform company was the following: a firm that had approximately 20 percent or more of its revenues coming from businesses whose growth and profitability seemed heavily impacted by network effects, both direct and indirect. We choose the Forbes Global 2000 list in order to limit the number of firms that we would analyze in this first-cut, exploratory analysis.

We recognize that companies making this list of globally prominent publicly traded firms already represented a high degree of success, regardless of their financial performance in terms of profitability or other metrics. Hence, our sample of both platform and non-platform companies already includes some survivor bias toward higher financial performance.

Through this analysis, we counted 46 platform companies (Exhibit 2). We then created a database going back 21 years to 1995, when mass market browsers such as Netscape Navigator and Windows Internet Explorer first became available and the World Wide Web first began to be used by the general public. In total, our data set consisted of more than 30,000 yearly firm observations from 2005 through 2015 (Exhibit 3). For the total sample, the average firm had a market value of around \$16.4 billion, over 44,000 employees, and an operating margin of 12%. There were also notable differences between the platform and non-platform firms. For example, as summarized in the table, and making no adjustments such as for industry differences, platform companies had higher expenses as well as market values, sales, operating income, price multiples, operating profit margins, and return on equity.

We divided the 46 platform companies into 19 innovation and 27 transaction subtypes based on their primary orientations. For example, we listed Apple as an *Innovation Platform* because most of its revenue comes from products (principally the iPhone but also the iPad and iPod) that rely on the iOS operating system, an innovation platform and the centerpiece of an applications ecosystem with more than two million apps. Apple also has another innovation platform, the Macintosh personal computer

system, and a transaction platform, the Apple App Store. Following Hagiu and Wright (2013), we consider Apple iTunes as an online store rather than a platform. Facebook we categorized as a *Transaction Platform* because it is primarily a social network that enables the exchange of information among users and facilitates sales of advertisements, although Facebook Platform is an applications development environment and an innovation platform in its own right, with several hundred thousand third-party applications. Google we categorized as a *Transaction Platform* because its revenues primarily come from computer and mobile searches and contextual advertisement placements. Google (sometimes now referred to by its parent company, Alphabet, since the 2015 reorganization) also owns the Android operating system, which is an innovation platform given away for free. Amazon we categorized as a *Transaction Platform*. In 2016, according to the company's annual report, more than 67% of its revenues came from the online store, but approximately 17% came from Amazon Marketplace, which matches buyers and sellers. Another 5% came from the Prime Membership Subscription service. Around 9% came from Amazon Web Services, which we consider an Innovation Platform because it includes tools and services that enable the creation as well as hosting of software applications. Note that we also included the older "pre-Internet" credit card companies American Express, Visa, and MasterCard as platform businesses because they are – all exhibit powerful network effects and operate in multi-sided markets.

HYPOTHESES AND DATA ANALYSIS

Initially, we were interested mainly in three areas of performance: operating profit margins (profits divided by sales), market multiples (market value divided by prior year sales or price to earnings ratios), and sales growth rates (current sales divided by prior year sales). The logic and hypotheses went as follows: If network effects and multisided market strategies had a positive impact on performance, then we should see platform companies grow sales faster and more profitably than non-platform companies. We should see relatively lower expenses such as sales and marketing or R&D if the transaction and innovation platforms were able to rely on different market sides to supply complements such as goods to sell or third-party innovations that made the platforms more useful. If investors responded positively to the potential performance advantages of platform companies, then we would also expect the market to place a higher value on platform versus non-platform companies and perhaps on particular types of platform companies. We would see this in market valuations relative to sales or in price-to-earnings ratios.

First, we graphed the results to see whether there seemed to be visual differences in the performance of platform versus non-platform companies on these various dimensions. The visual data did suggest that platform companies had higher operating profit margins and market values, as well as higher absolute sales, but not higher sales growth rates (see Exhibit 4 graphs). Other visual data suggested that, among the platform firms, there were some very strong performers as well as some weak performers.

Second, we conducted simple regressions with fixed effects for year, country, and industry, as well as T-tests to see if the means for a set of variables were statistically different. As seen in the sample of data summarized in the Exhibit 5 tables, the means were significantly different between platform and non-platform companies on several dimensions, most notably the following:

- Operating margins (operating profits divided by sales)
- Market value multiples (ratio of sales to market value and price-to-earnings ratios)
- Sales (absolute levels)

Differences in operating margins between platform and non-platform companies became non-significant when adding R&D expenses, which suggests that these were substantial for platform companies. The high R&D expenditures also seemed to drive sales growth.

As seen in Exhibit 6 tables, summary statistics also suggested notable differences between the innovation and transaction platforms. T-tests confirmed that many of these differences were statistically significant. In particular, Innovation platforms had higher market values, sales, operating income, employee numbers, and R&D as well as sales and marketing expenditures. However, transaction platforms had higher mean market values (price as a multiple of sales).

We also conducted a sensitivity analysis by dropping from the analyses what are today the four largest platform companies in terms of revenues and value (Apple, Google, Amazon, and Microsoft). There were only minor variations in the estimates and no major changes in the results (see Appendix tables).

DISCUSSION

Through this exploratory data analysis, we were able to confirm that at least the sample we constructed of publicly listed platform companies was more profitable and more valuable than non-platform companies during the two decades analyzed, 1995 to 2015. Constructing even this simple data set, however, revealed several problems with conducting this type of study. To guide further research, we would like to highlight those problems in this discussion.

Most challenging measuring the strength or weakness of a platform business and its ability to generate network effects, and then separating this platform position from the strength or weakness of the basic product or service. We found this exercise impossible to do from publicly available data. Most annual reports do not break out revenues from platform versus non-platform businesses, and they usually do not include enough information to analyze the impact of network effects. That type of analysis needs to be done with separate data sources.

Apple provides a good example of this “product or platform muddle.” It tops the list of publicly traded firms in terms of both absolute market value and revenues. But how do we determine precisely how much of Apple’s revenues and profits came from its platform strategy (in particular, network effects generated by the number of complementary applications available in the Apple Store) and how much came from its product strategy (great designs and premium prices)? Can we separate out benefits that come from the sheer size of Apple’s operations (economies of scale) from platform-driven network effects? Economists have also defined network effects as “demand-side economies of scale,” although

this definition does not really explain the dynamics that goes on with cross-side network effects. It is possible using econometrics to tease out the effects of scale economies on some aspects of performance. Again, however, there is much more going on in the case of Apple, with the value of its brand and product designs, and impact from network effects or scale and scope economies associated with the App Store and iTunes.

As another example, Amazon was successful as an online retail store but it also had a very popular transaction platform (Amazon Marketplace), a popular content delivery platform (the Kindle), and an industry-leading innovation and service platform (Amazon Web Services). In addition, Amazon began as an online book store, not a transaction platform, which it added later. Amazon also later added multiple innovation platforms, now including Echo/Alexa for artificial intelligence applications. It only recently began separating out revenue and profits by these different businesses but does not release complete information, such as the number of Kindle devices sold, or the number of Amazon Prime members. Amazon also continued to add conventional businesses, such as the Whole Foods grocery chain. Moreover, all these businesses are increasingly intermingled, especially through the customer based defined by membership in Amazon Prime (Khan, 2017).

Oracle and SAP pose another problem: They are very successful software product companies and they had at least small innovation platforms and relatively large ecosystems of service providers to install and customize their products. We could argue that Oracle and SAP were primarily successful as product companies, but then we need to ask how many products would they sell without their large ecosystems of service providers, who do a lot of the necessary installation, customization, training, and maintenance? They also have some third-party companies that develop applications for Oracle and SAP database products and application suites, which we could consider as innovation platforms.

If we look at several dozen of the top public platform companies and rank them by sales, we see that nearly all those that lost money in the last few years were transaction platforms, and nearly all were in the second half of our sample ranked by sales (Exhibit 7). Consequently, economies of scale seem to impact profitability. However, some smaller platform companies were extremely profitable. These included ARM (the microprocessor design company recently purchased by Softbank); Yahoo Japan (which, unlike Yahoo, had vibrant Japanese search and telecom businesses); Naver (a South Korean web portal with its own browser, search engine, email, phone, and content services); and Nvidia (a large maker of microprocessors for video games and other graphics as well as artificial intelligence applications, with a reasonably strong and growing ecosystem of third-party software developers).

Another well-known publicly-listed platform company that usually made little or no profit was Salesforce.com, Inc. Founded in 1999, Salesforce.com pioneered Software-as-a-Service (SaaS). This refers to the business model of charging small monthly subscription payments for use of its customer relations management (CRM) software product, rather than charging customers a large upfront license fee. The company later added an innovation platform, the Force.com applications development environment, around its basic product. Then it added a transaction platform, AppExchange, so that other companies could share and sell applications they built to work with the Salesforce CRM product. The 10-K reports

and other analyses in the business press suggest that Salesforce generally lost money or showed little profit not because of its platform strategy but because of its business model: It spent a lot of its revenues to attract and keep customers or replace customers that cancelled because the SaaS subscription contracts did not lock in customers.

Looking at the financial data in more detail, some additional points stand out. One is that Salesforce and some well-known platforms spend large sums of money relative to their revenues on sales, marketing, and administrative expenses. If they do not have vibrant ecosystems of complementors, then they may also spend large sums on R&D to build new features to attract or keep customers. These types of platform businesses are likely to lose money – even if their gross margins are very high due to the digital nature of their businesses. Some of these platforms do not really improve with scale if they rely heavily on subsidies to attract one side of the market. The bigger they get, the more money they seem to lose. Twitter, as well as the non-public Uber, seem to fall into this category. At the same time, platforms seem more likely to be profitable and highly valued by the market if they can drive increasing usage, revenue growth, and monetization opportunities through direct and indirect network effects, without spending massively on sales and marketing, R&D, or subsidies to one or more market sides. Uber, for example loses money by subsidizing both drivers (it pays them a fixed fee in addition to commissions) and riders (it keeps prices artificially below costs to compete with conventional taxis and other platform competitors) (Huet, 2014).

We can also see that a number of companies are really hybrids, offering both innovation and transaction platforms (refer back to Exhibit 1). In fact, we think hybrid is a good future strategy for platform companies because it provides the best of both worlds. Innovation platforms can add transaction platforms to help them distribute products and services, like Apple, Google, Microsoft, and Salesforce.com did with their app stores to help drive demand for Apple and Android smartphones, Windows PCs, or Salesforce’s CRM application. And transaction platforms can add innovation platforms, such as Facebook Platform, to help them increase functionality such as with games or new apps, with minimal in-house investment. This is how Airbnb, for example, was starting to compete more effectively with the bundle of services that hotels offer. Uber was also cultivating third-party applications developers to enhance its ride-sharing services.

ADDITIONAL ANALYSIS: PATTERNS IN PLATFORM FAILURES

To understand why and how platforms fail, we also read through the annual reports of the 46 platform companies. We made a list of which firms they identified as competitors, including public and private platform companies, and tried to determine which firms continued and which did not. The list of 200-plus firms that failed or ceased operations allows us to draw some general conclusions about why platforms struggle. This analysis complements suggestions by Van Alstyne, Parker, and Choudary that platform companies fail for six reasons: 1) failure to optimize “openness; 2) failure to engage developers; 3) failure to share the surplus; 4) failure to launch the right side; 5) failure to put critical mass ahead of money; and 6) failure of imagination (Van Alstyne, Parker, and Choudary 2016).

First, as shown in Exhibits 8 and 9, the most obvious pattern is the predominance of transaction platforms among the failed companies, representing nearly 85% of the sample. In this sample, transaction platforms have a somewhat shorter life as well, averaging 4.6 years, compared to 7.4 and 5.0 years for hybrid and innovation platforms, respectively. The barriers to entry for starting a marketplace seem to be low, and transaction platforms often may fail simply because they fail to generate traction, never generating enough market participants on one or more sides of the platform or other to achieve positive network effects and take off. This was especially true of various sharing economy platforms that emerged in the 2010s. Many of them collapsed within 2-3 years because they ran out of funds. One of the challenges for those firms in the local delivery and services space or in ride-hailing was that the network effects were local, but the only way to rapidly get to scale and build brand recognition was to expand geographically. To do so required channeling investment and having deep enough pockets to go potentially a long time before reaching profitability and positive cash flow.

If there was a need for deep pockets, it should not be surprising that standalone firms tended to have shorter lives than those that were acquired or launched as part of a larger firm or consortium. Overcoming chicken-or-egg problems were apparently much more challenging for standalone firms. Standalone firms had an average duration of only 3.7 years. Acquired firms, which generally had stronger balance sheets, were capable of fighting longer (averaged 7.4 years), while firms that were part of larger entities averaged 4.9 years.

Consolidation was also a common pattern among platforms in the same space. Platforms frequently disappeared because they merged. This was especially true in certain categories. For example, a wave of acquisitions reduced the large number of ISPs/web portals/search engines that emerged in the 1990s down to a few players by the mid-2000s. More recently, peer-to-peer car sharing platforms saw consolidation as two major platforms were acquired by larger rivals. In addition, there was considerable consolidation among business-to-business marketplaces dedicated to specific verticals – such as exchanges for airplane parts, medical supplies, or chemicals – that emerged in the 1990s.

In a relatively small number of platform spaces, failure was a function of a competitor becoming a genuine winner-take-all or winner-take-most. Mobile OS and social networking were prime examples. No third mobile operating system gained significant share since the market tipped to iOS and Android, despite the fact that competitors like Blackberry, Windows, and Symbian entered the market first and had significant resources at their disposal. Similarly, in social networking, Facebook displaced earlier rivals like MySpace, Friendster, and GeoCities as the market tipped.

Social networking illustrated another pattern: failing platforms sometimes sought out a niche in order to survive. The results, however, were mixed. For example, ello pivoted from a general social network to a niche social network as a space for creative collaboration where artists could display their work and receive feedback from other artists. Though iVillage failed, it survived for a long time (18 years) with a focus on women, admittedly a very large niche. Disney's Club Penguin survived for 12 years until 2017 with a focus on kids, while Path tried a geographic focus on Asia. On the other hand, Kinly, a private social network for families, never took off and folded after 2 years.

Failure as a platform did not necessarily mean failure as a company. A number of online marketplaces (especially B2B) that failed to generate sufficient trading volume pivoted into adjacent businesses. For example, many marketplaces provided industry data or logistics support as part of their service, and some abandoned the marketplace but continued to provide those complementary services. In a number of cases, the marketplaces had developed technology for processing transactions or for integration with the purchasing systems of one side of the platform. If they failed as marketplaces and platforms, they shifted to become supply chain or order management solution providers for the industry.

Other failed platforms faced challenges that were common to many businesses. A number of platforms emerged before the underlying infrastructure was available to sustain them. For instance, several broadcast streaming or online gaming platforms, including Mpath, broadcast.com, and globalmedia.com launched around the turn of the century before broadband was widely available. More recently, two digital asset exchanges failed after a short time due to low trading volumes, as the number of people wishing to exchange bitcoin for other currencies remained too small. Because platforms often brought a new model and structure to existing businesses, they often ran into problems with the legal and regulatory regimes. Uber and Airbnb have famously tangled with local regulators in various cities where they have done business. Other platform companies did not survive regulatory scrutiny. For example, AirPooler and Flytenow, aviation ride-sharing platforms that connected passengers with private pilots who had empty seats on their planes, both shutdown in 2015 after the FAA ruled they were engaged in commercial aviation and would have to be regulated as such. In San Francisco, the on-demand valet service Vatler ran afoul of local permitting regulations and had to shut down after barely a year of existence.

CONCLUSIONS

We have attempted in this paper to bring some data and empirical analysis to the study of platform companies and comparisons with non-platform companies, and look at a relatively large sample of firms. We do see some significant differences in performance, which suggests that platform companies may well have some superior characteristics. Platform businesses are distinct, to a large degree, by their reliance on network effects across multiple sides of a market. At the same time, we find that platform companies have a mixture of businesses, which make the measurement of network effects difficult using public data.

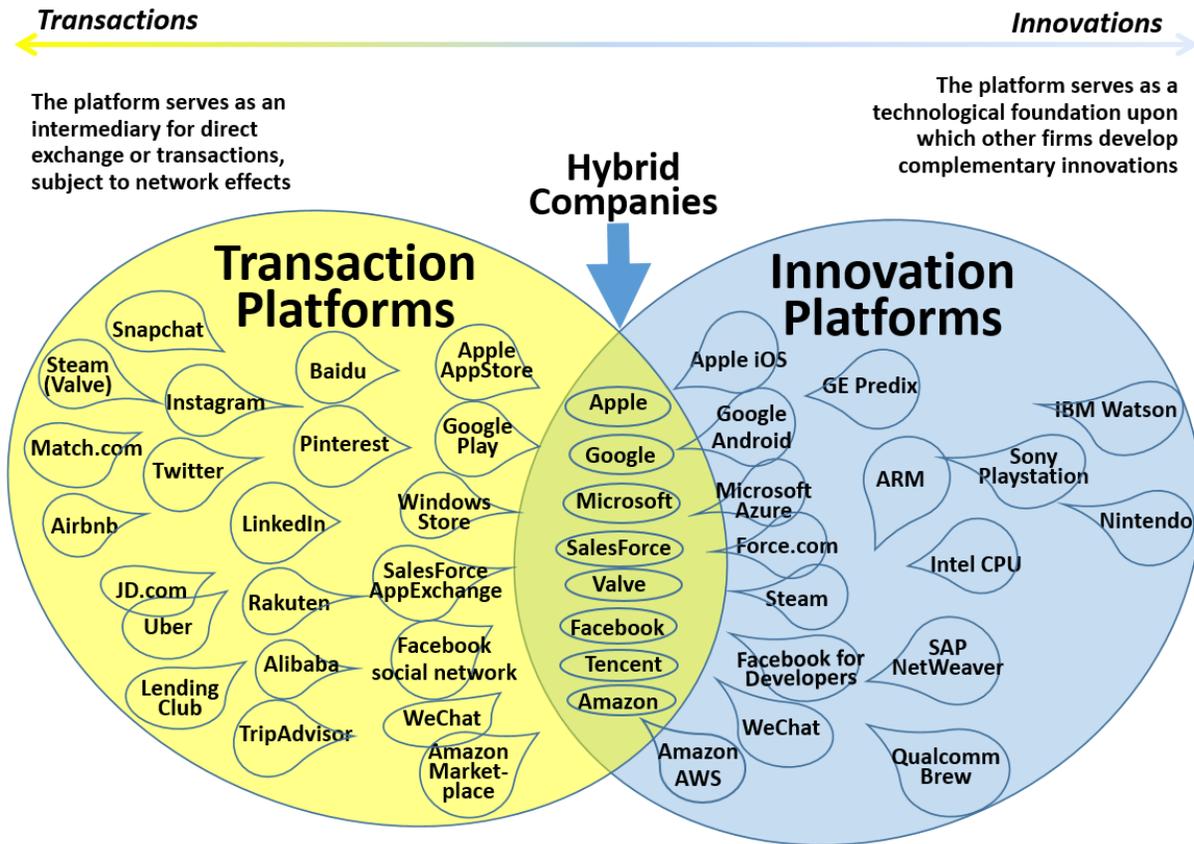
We also noted that some platform companies, ranging from Twitter to Uber, also have problematic business models. For some of these firms, the larger they become, the more money they lose – maybe because there are insufficient economies of scale to cover their operational costs or other factors. Although not in our database because it only recently went public, Snapchat is a good example of this. It tripled its revenues over the past year but only with a ten-fold increase in expenses (Wells, 2017).

In sum, we have much more to learn about platform companies and their financial performance. They seem to have some advantages, such as the ability to perform well in sales, profits, and market

values. But platform businesses are not so unique that they will all make money easily. Moreover, they must still must offer a compelling product or service that is superior to the competition and do so with operations that are scalable and efficient.

As the aggregate data also suggests, sources of failure are numerous. The bottom line is that platform firms have to avoid what we believe to be the most common, devastating mistakes: mispricing on one side of the platform; failure to develop trust with users and partners; dismissing the competition; and entering too late, that is, after a market with very strong network effects has tipped (Cusumano, Gawer, and Yoffie, 2019).

Exhibit 1



Source: This graphic was originally designed by Annabelle Gawer in consultation with Michael Jacobides and Carmelo Cennamo, and further expanded with Michael Cusumano and David Yoffie for use in a forthcoming book, M. A. Cusumano, A. Gawer, and D. B. Yoffie The Business of Platforms: Strategy in the Age of Digital Competition, Innovation, and Power (Harper Business, June 2019).

Exhibit 2

19 Innovation Platforms	Country	Industry
Qihoo 360	China	Internet Software and Services
SAP	Europe	Application Software
Nintendo	Japan	Home Entertainment Software
Sony	Japan	Consumer Electronics
MediaTek	Taiwan	Semiconductors
ARM	United Kingdom	Semiconductors
Apple	United States	Technology Hardware, Storage and Peripherals
Cisco	United States	Communications Equipment
IBM	United States	IT Consulting and Other Services
Intel	United States	Semiconductors
Kakao	United States	Systems Software
Microsoft	United States	Systems Software
Nvidia	United States	Semiconductors
Oracle	United States	Systems Software
Qualcomm	United States	Semiconductors
Red Hat	United States	Systems Software
Salesforce	United States	Application Software
Vmware	United States	Systems Software
Workday	United States	Application Software

27 Transaction Platforms	Country	Industry
Alibaba	China	Internet Software and Services
Baidu	China	Internet Software and Services
JDCOM	China	Internet Retail
Tencent	China	Internet Software and Services
Netease	China	Internet Software and Services
Rakuten	Japan	Internet Retail
YahooJap	Japan	Internet Software and Services
Naver	Korea	Internet Software and Services
Amazon	United States	Internet Retail
American Express	United States	Consumer Finance
Expedia	United States	Internet Retail
Facebook	United States	Internet Software and Services
Google	United States	Internet Software and Services
Groupon	United States	Internet Retail
Lending Tree	United States	Thriffs and Mortgage Finance
LinkedIn	United States	Internet Software and Services
MasterCard	United States	Data Processing and Outsourced Services
Paypal	United States	Data Processing and Outsourced Services
Priceline	United States	Internet Retail
TripAdvisor	United States	Internet Retail
Twitter	United States	Internet Software and Services
Visa	United States	Data Processing and Outsourced Services
Yahoo	United States	Internet Software and Services
Yelp	United States	Internet Software and Services
Zillow	United States	Internet Software and Services
eBay	United States	Internet Software and Services
Mail.ru Group Ltd.	Russia	Internet Software and Services

Exhibit 3 Summary Statistics: Platform, Non-Platform, and Total Data Set

	Mean	Min	Max
Not Platform			
S&M + G&A (M\$)	2,204.97	-545.52	93,169.00
R&D (M\$)	746.35	0.00	13,563.90
Market Value (M\$)	15,564.89	0.85	706,903.50
Sales (M\$)	13,228.70	-61,512.00	485,651.00
Operating Income (M\$)	1,571.55	-63,719.00	92,907.57
Employees	44,569.00	3.00	2,200,000.00
Sales Per Employee (T\$)	799.14	-181,765.45	396,609.25
Price Multiple of Sales	4.65	-317.13	31,065.58
Gross Margin	0.37	-2.68	52.13
EBIT Margin	13.99	-284.62	429.03
Operating Profit Margin	0.12	-453.89	29.65
Share S&M + G&A of Sales	0.26	-27.38	418.75
Share R&D of Sales	0.13	0.00	81.01
Return on Equity	14.35	-5,819.08	10,418.18
Price to Earnings, Trailing	25.25	0.01	298.88
Platform			
S&M + G&A (M\$)	3,639.81	11.39	23,362.00
R&D (M\$)	1,907.08	0.52	12,540.00
Market Value (M\$)	64,445.96	19.55	654,159.25
Sales (M\$)	17,794.14	3.14	233,715.00
Operating Income (M\$)	3,738.58	-1,204.00	71,230.00
Employees	42,416.09	138.00	434,246.00
Sales Per Employee (T\$)	523.06	9.62	3,460.71
Price Multiple of Sales	8.76	0.11	192.47
Gross Margin	0.63	-1.31	1.00
EBIT Margin	19.86	-220.19	65.40
Operating Profit Margin	0.17	-7.69	0.65
Share S&M + G&A of Sales	0.33	0.03	5.87
Share R&D of Sales	0.14	0.00	0.89
Return on Equity	21.73	-460.83	3,505.26
Price to Earnings, Trailing	49.27	7.42	281.26
Total			
S&M + G&A (M\$)	2,233.29	-545.52	93,169.00
R&D (M\$)	830.46	0.00	13,563.90
Market Value (M\$)	16,457.61	0.85	706,903.50
Sales (M\$)	13,312.14	-61,512.00	485,651.00
Operating Income (M\$)	1,611.13	-63,719.00	92,907.57
Employees	44,520.07	3.00	2,200,000.00
Sales Per Employee (T\$)	792.86	-181,765.45	396,609.25
Price Multiple of Sales	4.73	-317.13	31,065.58
Gross Margin	0.38	-2.68	52.13
EBIT Margin	14.11	-284.62	429.03
Operating Profit Margin	0.12	-453.89	29.65

Exhibit 4 Graphs of Platform vs. Non-Platform Companies

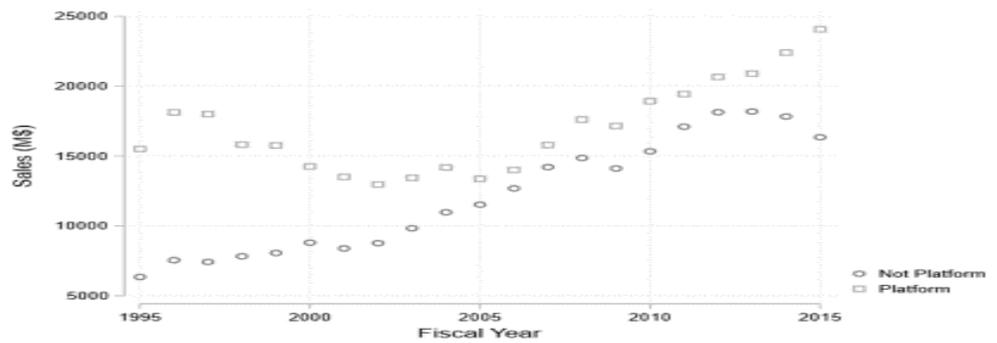
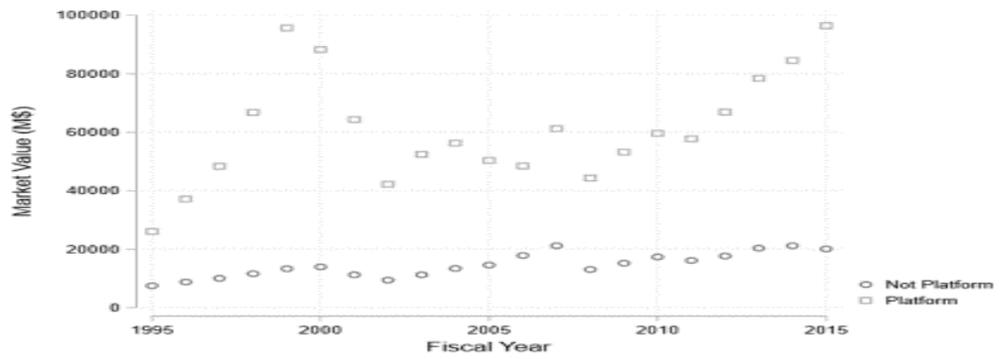
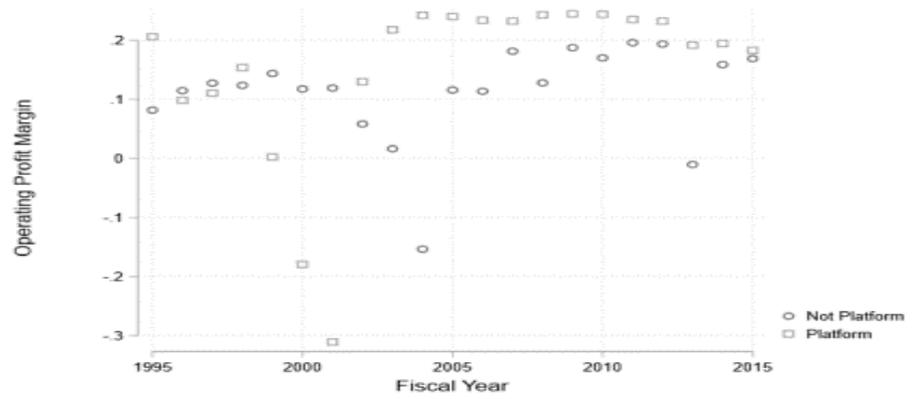


Exhibit 5: Performance Tables

Focus on operating margin

	(1) Operating Profit Margin	(2) Operating Profit Margin	(3) Operating Profit Margin	(4) Operating Profit Margin
Is Platform	0.135** [0.0572]	0.0682 [0.0568]	0.0666 [0.0733]	-0.136 [0.237]
Operating Income (\$M)		0.0000172***		
R&D (\$M)		[0.00000417]	0.0000484*** [0.0000177]	
Price Multiple of Sales				-0.0139*** [0.000943]
Constant	0.182* [0.105]	0.0978 [0.120]	0.0939 [0.0772]	0.302*** [0.0914]
Fiscal Year FE	X	X	X	X
Industry FE	X	X	X	X
Country FE	X	X	X	X
N	30202	30202	5671	30202
Deg. of Freedom	29963	29962	5525	29962
Adj. R-Squared	0.00810	0.00830	0.0237	0.508

Standard errors in brackets
Robust errors
* p<0.10, ** p<0.05, *** p<0.01

Focus on market value

	(1) Market Value (\$M)	(2) Market Value (\$M)	(3) Market Value (\$M)
Is Platform	60079.6*** [5012.5]	39158.9*** [4941.9]	35156.7*** [2870.2]
R&D (\$M)		20.39*** [0.782]	
Operating Income (\$M)			6.396*** [0.264]
Constant	45397.6*** [1348.9]	22232.1*** [2804.0]	13997.3*** [1433.9]
Fiscal Year FE	X	X	X
Industry FE	X	X	X
Country FE	X	X	X
N	30225	5672	30222
Deg. of Freedom	29986	5526	29982
Adj. R-Squared	0.254	0.616	0.668

Standard errors in brackets
Robust errors
* p<0.10, ** p<0.05, *** p<0.01

Focus on Sales

	(1) Sales (\$M)	(2) Sales (\$M)	(3) Sales (\$M)	(4) Sales (\$M)
Is Platform	15454.5*** [1584.4]	1091.9 [1260.7]	-1081.6 [1121.0]	3864.8*** [1051.7]
R&D (\$M)		10.53*** [0.333]		
Operating Income (\$M)			4.244*** [0.177]	
S&M + G&A (\$M)				3.826*** [0.0944]
Constant	23100.7*** [850.3]	-8281.0*** [1364.2]	2261.4** [993.1]	-1636.4** [712.4]
Fiscal Year FE	X	X	X	X
Industry FE	X	X	X	X
Country FE	X	X	X	X
N	30204	5672	30202	27789
Deg. of Freedom	29965	5526	29962	27549
Adj. R-Squared	0.328	0.616	0.601	0.632

Standard errors in brackets
Robust errors
* p<0.10, ** p<0.05, *** p<0.01

Exhibit 6 Comparison of Innovation and Transaction Platforms

	Mean	Min	Max
Innovation			
S&M + G&A (M\$)	5,147.15	18.90	23,362.00
R&D (M\$)	2,496.97	9.82	12,128.00
Market Value (M\$)	87,348.98	271.37	654,159.25
Sales (M\$)	27,502.66	54.38	233,715.00
Operating Income (M\$)	5,822.51	-1,204.00	71,230.00
Employees	66,926.78	248.00	434,246.00
Sales Per Employee (T\$)	494.31	97.30	2,597.82
Price Multiple of Sales	7.07	0.25	169.28
Gross Margin	0.58	0.10	0.96
EBIT Margin	18.73	-105.33	50.69
Operating Profit Margin	0.19	-1.05	0.51
Share S&M + G&A of Sales	0.24	0.03	0.87
Share R&D of Sales	0.15	0.02	0.47
Return on Equity	18.95	-64.15	124.00
Price to Earnings, Trailing	45.93	9.10	238.32
Transaction			
S&M + G&A (M\$)	2,070.84	11.39	15,183.00
R&D (M\$)	952.74	0.52	12,540.00
Market Value (M\$)	40,869.32	19.55	528,447.56
Sales (M\$)	7,800.08	3.14	107,006.00
Operating Income (M\$)	1,593.37	-1,062.21	19,360.00
Employees	16,317.67	138.00	230,800.00
Sales Per Employee (T\$)	553.68	9.62	3,460.71
Price Multiple of Sales	10.50	0.11	192.47
Gross Margin	0.69	-1.31	1.00
EBIT Margin	21.14	-220.19	65.40
Operating Profit Margin	0.16	-7.69	0.65
Share S&M + G&A of Sales	0.42	0.04	5.87
Share R&D of Sales	0.13	0.00	0.89
Return on Equity	24.68	-460.83	3,505.26
Price to Earnings, Trailing	53.25	7.42	281.26

Difference Between Platform Types

	Innovation - Transaction	
S&M + G&A (M\$)	3076.3***	[428.6]
R&D (M\$)	1544.2***	[256.2]
Market Value (M\$)	46479.7***	[7617.0]
Sales (M\$)	19702.6***	[2280.2]
Operating Income (M\$)	4229.1***	[575.3]
Employees	50609.1***	[6328.6]
Sales Per Employee (T\$)	-59.37	[38.88]
Price Multiple of Sales	-3.433**	[1.309]
Gross Margin	-0.117***	[0.0199]
EBIT Margin	-2.414	[1.999]
Operating Profit Margin	0.0300	[0.0418]
Share S&M + G&A of Sales	-0.179***	[0.0324]
Share R&D of Sales	0.0232*	[0.00936]
Return on Equity	-5.729	[13.19]
Price to Earnings, Trailing	-7.322	[3.978]
Observations	552	

Standard errors in brackets
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Exhibit 7:

Comparison of the Largest Platform Companies by Market Value (2015 Financial Performance)

1	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Company	Type	Country	\$B Sales	Prior Yr+/-	\$B Mkt Val	Multiple	Gross Mgn	Op Profit	Employees	Sales/Emp	S&M,G&A	R&D	Other Costs	FY End
2	Apple	innovation	USA	\$233.7	28%	\$608	3	40%	30%	110,000	\$2,220k	6%	3%	1%	Sep-15
3	Amazon	Transaction	USA	\$107.0	20%	\$143	1	33%	2%	230,800	\$460k	6%	12%	12%	Dec-15
4	Microsoft	Innovation	USA	\$93.6	8%	\$345	4	65%	19%	118,000	\$800k	22%	13%	11%	Jun-15
5	IBM	Innovation	USA	\$81.7	-13%	\$160	2	50%	19%	377,757	\$216k	25%	6%	nil	Dec-15
6	Google	Transaction	USA	\$75.0	14%	\$522	7	62%	26%	61,814	\$1,200k	20%	16%	nil	Dec-15
7	Intel	Innovation	USA	\$55.4	-1%	\$167	3	62%	25%	107,300	\$500k	14%	22%	nil	Dec-15
8	Cisco	Innovation	USA	\$49.2	4%	\$140	3	60%	20%	70,000	\$700k	24%	13%	2%	Jul-15
9	Oracle	Innovation	USA	\$38.2	0%	\$137	4	80%	36%	132,000	\$290k	23%	14%	7%	May-15
10	JDCo	Transaction	China	\$28.0	57%	\$47	2	13%	-4%	101,000	\$270k	6%	2%	9%	Dec-15
11	Qualcomm	Innovation	USA	\$25.3	-5%	\$80	3	59%	23%	33,000	\$760k	9%	22%	5%	Sep-15
12	SAP	Innovation	Europe	\$22.7	18%	\$85	4	68%	20%	76,986	\$295k	31%	14%	3%	Dec-15
13	Facebook	Transaction	USA	\$17.9	44%	\$300	17	84%	35%	12,691	\$1,400k	22%	27%	nil	Dec-15
14	Tencent	Transaction	China	\$15.0	18%	\$184	12	61%	37%	27,690	\$470k	28%	**	nil	Dec-15
15	Alibaba	Transaction	China	\$12.3	39%	\$209	17	69%	30%	34,985	\$350k	21%	14%	4%	Mar-15
16	Baidu	Transaction	China	\$10.2	35%	\$78	8	59%	18%	E60,000	E\$270K	26%	15%	nil	Dec-15
17	Priceline	Transaction	USA	\$9.2	9%	\$65	7	93%	35%	15,500	\$600k	36%	1%	16%	Dec-15
18	Paypal	Transaction	USA	\$9.2	15%	\$44	5	50%	16%	16,800	\$550k	17%	10%	7%	Dec-15
19	eBay	Transaction	USA	\$8.6	-2%	\$33	4	79%	26%	11,600	\$740k	39%	11%	3%	Dec-15
20	Rakuten	Transaction	Japan	\$5.9	19%	\$17	3	81%	13%	12,981	\$450k	14%	3%	51%	Dec-15
21	Salesforce	Innovation	USA	\$5.4	31%	\$36	7	81%	-3%	16,000	\$310k	69%	16%	nil	Jan-15
22	Yahoo	Transaction	USA	\$5.0	8%	\$32	6	58%	-96%	10,400	\$480k	36%	24%	112%	Dec-15
23	Nvidia	Innovation	USA	\$5.0	7%	\$10	2	56%	15%	6,566	\$760	12%	27%	2%	Jan-16
24	YahooJap	Transaction	Japan	\$3.6	5%	\$23	6	80%	46%	7,034	\$500k	34%	nil	nil	Mar-15
25	Groupon	Transaction	USA	\$3.1	3%	\$2	1	45%	-3%	9,872	\$320k	46%	nil	nil	Dec-15
26	LinkedIn	Transaction	USA	\$3.0	35%	\$30	10	86%	-5%	9,372	\$320k	51%	26%	14%	Dec-15
27	Naver	Transaction	Korea	\$2.8	19%	\$15	5	74%	23%	4,000	\$700k	10%	3%	5%	Dec-15
28	Twitter	Transaction	USA	\$2.2	58%	\$16	7	67%	-24%	3,900	\$570k	51%	36%	4%	Dec-15
29	Red Hat	Innovation	USA	\$1.8	15%	\$15	8	97%	16%	7,900	\$230k	58%	23%	3%	Feb-16
30	ARM	Innovation	UK	\$1.5	15%	\$22	15	96%	42%	3,975	\$377k	25%	29%	nil	Dec-15
31	TripAdvisor	Transaction	USA	\$1.5	20%	\$12	8	96%	16%	3,008	\$500k	60%	14%	6%	Dec-15
32	Zillow	Transaction	USA	\$0.7	98%	\$5	7	90%	-23%	2,400	\$290k	74%	31%	9%	Dec-15
33	Yelp	Transaction	USA	\$0.5	46%	\$4	8	91%	-4%	3,826	\$144k	70%	20%	nil	Dec-15

Exhibit 8: Failed Platforms: Overall Duration

Average: 4.9 years; median: 3 years.

Total Number of Firms: 209

Duration by category

Category	Average (yrs.)	Median (yrs.)	No. of firms
Social Media/Networks/Online communities	6.4	5	26
Mobile OS	10.2	10	5
ISP/Web Portal/Search Engines	9.5*	9	21
Information/content sites/news aggregators	5.6	4	7
Media Streaming/online broadcasting	6	6	4
Ride Sharing (air and car)	3.7	2	12
Excluding air	4.2	2	9
Car Sharing	3.1	3	7
On-demand economy (delivery, services, etc.)	2.9	2	29
Online marketplaces	3.8	3	16
B2B industry marketplaces	2.2	2	41
Online marketing/advertising platforms	6.1	5	9
Career sites	6	4.5	4
Web Browsers	2.9	3	14
Other	6.5	4	14

Exhibit 9: Duration by failed platform type:

Type	Average	Median	No. of firms
Transaction	4.5	3	174
Hybrid	7.4	6	14
Innovation	5.0	4	21

APPENDIX TABLES (analyses minus Apple, Microsoft, Google, and Amazon)

	(1) Market Value (M\$)	(2) Market Value (M\$)	(3) Market Value (M\$)
Is Platform	42849.2*** [3265.0]	24538.5*** [3019.4]	26492.7*** [2418.3]
R&D (M\$)		17.67*** [0.521]	
Operating Income (M\$)			6.133*** [0.260]
Constant	44621.4*** [1299.6]	28503.0*** [2375.1]	14822.5*** [1408.5]
Fiscal Year FE	X	X	X
Industry FE	X	X	X
Country FE	X	X	X
N	30152	5599	30149
Deg. of Freedom	29913	5453	29909
Adj. R-Squared	0.250	0.633	0.662

Standard errors in brackets

Robust errors.

* p<0.10, ** p<0.05, *** p<0.01

	(1) Operating Profit Margin	(2) Operating Profit Margin	(3) Operating Profit Margin	(4) Operating Profit Margin
Is Platform	0.128** [0.0606]	0.0799 [0.0600]	0.0616 [0.0807]	-0.157 [0.256]
Operating Income (M\$)		0.0000179*** [0.00000437]		
R&D (M\$)			0.0000552** [0.0000214]	
Price Multiple of Sales				-0.0139*** [0.000943]
Constant	0.182* [0.104]	0.0954 [0.120]	0.0774 [0.0861]	0.302*** [0.0912]
Fiscal Year FE	X	X	X	X
Industry FE	X	X	X	X
Country FE	X	X	X	X
N	30129	30129	5598	30129
Deg. of Freedom	29890	29889	5452	29889
Adj. R-Squared	0.00809	0.00829	0.0234	0.508

Standard errors in brackets

Robust errors.

* p<0.10, ** p<0.05, *** p<0.01

	(1)	(2)	(3)	(4)
	Sales (M\$)	Sales (M\$)	Sales (M\$)	Sales (M\$)
Is Platform	12698.5***	-783.9	1163.8	1599.2***
	[1275.8]	[840.5]	[938.5]	[556.5]
R&D (M\$)		10.95***		
		[0.351]		
Operating Income (M\$)			4.325***	
			[0.188]	
S&M + G&A (M\$)				3.818***
				[0.0950]
Constant	22926.6***	-9704.1***	1906.5*	-1784.7**
	[846.2]	[1395.7]	[1026.4]	[706.7]
Fiscal Year FE	X	X	X	X
Industry FE	X	X	X	X
Country FE	X	X	X	X
N	30131	5599	30129	27716
Deg. of Freedom	29892	5453	29889	27476
Adj. R-Squared	0.329	0.617	0.601	0.633

Standard errors in brackets

Robust errors.

* p<0.10, ** p<0.05, *** p<0.01

	Innovation - Transaction	
S&M + G&A (M\$)	2793.8***	[444.0]
R&D (M\$)	1767.4***	[222.8]
Market Value (M\$)	34240.0***	[5010.3]
Sales (M\$)	18684.9***	[1929.0]
Operating Income (M\$)	2833.3***	[354.9]
Employees	57074.4***	[7151.3]
Sales Per Employee (T\$)	-100.2*	[39.67]
Price Multiple of Sales	-3.663*	[1.490]
Gross Margin	-0.153***	[0.0200]
EBIT Margin	-5.211*	[2.195]
Operating Profit Margin	0.0105	[0.0478]
Share S&M + G&A of Sales	-0.207***	[0.0366]
Share R&D of Sales	0.0249*	[0.0108]
Return on Equity	4.378	[2.873]
Price to Earnings, Trailing	-4.252	[4.353]
Observations	479	

Standard errors in brackets

* p < 0.05, ** p < 0.01, *** p < 0.001

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