



# The Cloud Technology Market

## Storm of Innovation or Rainy Days for Competition?

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## I. Introduction

The rise of cloud technology has been meteoric. Within a relatively short period of time, spanning the early 2000s to mid-2010s, major providers of cloud technology built out massive capabilities. This cloud buildout occurred largely through acquisitions of smaller rivals and startups, but organic growth also played a role. Today’s cloud market features two fundamentally different types of participants. One is the large digital business ecosystem (“DBE”). Cloud technology is one of three fundamental components of the DBE that also includes a platform and constellation of applications.<sup>1</sup> These players include Amazon’s Web Services (AWS), Microsoft Azure, and Google Cloud. But there are also other players in the cloud market that are not DBEs that specialize in cloud technology, including IBM, Oracle, Salesforce, and Tencent.

The evolution of the broader cloud market is marked by distinctive features. First, three providers, all DBEs, collectively account for 65% of the market. A small fringe of other providers account for the remainder. Despite a trajectory of rapid acquisition and expansion of cloud capability, the positioning of the top three firms, AWS, Microsoft Azure, and Google Cloud, has not materially changed over time. Nor is it evident that the smaller fringe players have gained enough market share to even come close to displacing the market leaders. Whether the economic downturn, which has slowed cloud growth, shifts these dynamics remains uncertain,<sup>2</sup> especially since cloud adoption is still at an early stage.<sup>3</sup>

Second, as previous AAI research reveals, the digital sector—in which the cloud market is situated—is home to extraordinarily weak merger enforcement.<sup>4</sup> This record of enforcement has actually deteriorated over time, with the rate of merger challenges in the digital sector falling increasingly below the average across all sectors. This enforcement record is highly relevant to the explosive and rapid trajectory of cloud acquisitions by many of the top cloud providers, which account for 45% of their total acquisitions over the last two and a half decades.

The features of the cloud market raise pressing questions about the nature of competition in cloud and the role of antitrust enforcement and competition policy in promoting it. Structural “stagnation” in the cloud market, coupled with ongoing weak merger enforcement, is seemingly at odds with the technological dynamism and potential for continued innovation in the sector. As cloud providers undoubtedly turn their attention to strategic competition to

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<sup>1</sup> See, e.g., Diana L. Moss, Gregory T. Gundlach, and Riley T. Krotz, *Market Power and Digital Business Ecosystems: Assessing the Impact of Economic and Business complexity on Competition Analysis and Remedies*, AMERICAN ANTITRUST INSTITUTE (Jun. 1, 2021), [https://www.antitrustinstitute.org/wp-content/uploads/2021/06/AAI\\_digital-ecosystems\\_FINALV5.pdf](https://www.antitrustinstitute.org/wp-content/uploads/2021/06/AAI_digital-ecosystems_FINALV5.pdf).

<sup>2</sup> See, e.g., Dan O’Shea, *AWS, Google joint Microsoft in reporting slower cloud growth*, FIERCETELECOM (Feb. 3, 2023, 9:30 AM), <https://www.fiercetelecom.com/cloud/aws-google-join-microsoft-reporting-slower-cloud-growth>.

<sup>3</sup> Glenn Solomon, *The Cloud Is Still a Multibillion-Dollar Opportunity. Here’s Why*, FORBES (Jan. 4, 2023, 12:54 PM), <https://www.forbes.com/sites/glennsolomon/2023/01/04/the-cloud-is-still-a-multibillion-dollar-opportunity-heres-why/?sh=2cbf56947774>.

<sup>4</sup> Diana L. Moss, *The Weak Record of Merger Enforcement in Big Tech*, AMERICAN ANTITRUST INSTITUTE (Jul. 8, 2019), [https://www.antitrustinstitute.org/wp-content/uploads/2019/07/Merger-Enforcement\\_Big-Tech\\_7.8.19.pdf](https://www.antitrustinstitute.org/wp-content/uploads/2019/07/Merger-Enforcement_Big-Tech_7.8.19.pdf); see also Diana L. Moss, *Update on Digital Technology: The Failure of Merger Enforcement and Need for Reform*, AMERICAN ANTITRUST INSTITUTE (Mar. 3, 2021), [https://www.antitrustinstitute.org/wp-content/uploads/2021/03/Merger-Enforcement\\_Big-Tech\\_3.3.21\\_F.pdf](https://www.antitrustinstitute.org/wp-content/uploads/2021/03/Merger-Enforcement_Big-Tech_3.3.21_F.pdf).

protect market positions, enforcers should do the same.<sup>5</sup> However, this report explains why it is crucial to continue to focus on consolidation, rising concentration, and the emergence of dominant firms. As revealed time and again, non-competitive market structures potentially beget anticompetitive incentives, conduct designed to limit competition, and poor market performance.

The report unpacks the structure of the cloud market and its implications for competition. It examines the top players and their business models, areas of cloud where acquisition and investment are particularly focused, and markets shares and concentration. This provides an important reference point for understanding the strategic incentives facing cloud providers. These include how firms make decisions about expanding—organically through internal innovation and growth, or through acquisition; maintaining or extending their market positions; bundling and pricing cloud services; promoting customer switching; and competing on quality (i.e., security); and innovation.

The report lays the groundwork for assessing the competitive evolution of the cloud market. It tees up fundamental questions. For example, do the structural characteristics of the cloud market raise concerns about the trajectory of competition and how much weight should be given to the role of technological dynamism and innovation to ensure that critical cloud services are delivered competitively? How aggressively should enforcers monitor consolidation and the structure of the cloud market? At the same time, how can they get ahead of the ball on strategic firm conduct that could be designed to limit competition? Major takeaways from the analysis include:

- **The cloud market has grown exponentially, with cloud-related acquisitions accounting for 45% of total acquisitions by the top cloud providers. Market structure is stagnant across the largest providers and smaller fringe players, despite the underlying dynamism inherent in cloud technology. Incentives to defend market positions could shape entry moving forward and foster practices designed to entrench market power and limit competition.**
- **Expansion of cloud capability by the top cloud providers occurs through, acquisition, investment, and organic growth. How firms deploy these strategies is becoming clearer. The roles of economic control of cloud assets and the competitive incentives resulting from different types of firm integration are important for how firms position themselves to grow and the types of competitive strategies they employ.**
- **The buildout of cloud technology that occurred from the early 2000s to mid-2010s appears to be maturing. It bears little resemblance to broader M&A cycles. This is likely a function of explosive growth in the digital sector and the drive to catch up with**

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<sup>5</sup> *Solicitation for Public Comments on the Business Practices of Cloud Computing Providers*, Docket No. FTC-2023-0028, FED. TRADE COMM’N (Mar. 22, 2023), <https://www.regulations.gov/docket/FTC-2023-0028/document>.

rivals that rely more on organic, versus acquisitive, growth. The dynamics of growth are likely to continue to affect how firms compete in the cloud market.

- **The cloud market contains a mix of dominant, DBE cloud providers and non-DBE fringe players. Different business models and degrees of integration will affect how firms compete in selling cloud services. These include the DBE’s strategies for maintaining their positions in platform and applications markets. Other types of cloud players may not have these same incentives, which will complicate analysis of merger and monopolization cases.**
- **Weak merger control remains a serious competition concern for the digital sector. Without more scrutiny of cloud consolidation, including acquisitions of smaller and nascent rivals, any competition enforcement program will increasingly lag behind. The first line of defense to anticompetitive conduct resulting from higher concentration and dominant firms is strong merger enforcement.**

## **II. The Top Cloud Providers: Markets Shares and Market Concentration**

Cloud infrastructure, or a complete cloud computing system, consists of an interconnected set of technologies designed to allow users to access storage, files, software, and servers remotely through devices connected to the internet. These technologies include hardware, virtual resources, storage, networks, operating systems, middleware, automation, management, and containers.<sup>6</sup> There are different types of cloud computing, depending on the needs of users. These include software as a service (SaaS), platform as a service (PaaS), and infrastructure as a service (IaaS).<sup>7</sup>

The implications of cloud technology are vast.<sup>8</sup> Businesses can more easily access software and information technology (IT) to become more efficient, expand, and compete, without making large technology investments.<sup>9</sup> Cloud technology offers users tools such as Big Data, analytics, aided by embedded machine learning, and artificial intelligence (AI), to engage in the “digital transformation” that is now a central feature of economic growth in the modern economy.<sup>10</sup>

In mid-2018, the cloud market was predicted to grow at over 10% annually over the next eight years.<sup>11</sup> This growth rate has been realized, if not exceeded, over the last few years. Further growth is expected, with global spending on cloud infrastructure increasing by an estimated

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<sup>6</sup> See, e.g., *What is Cloud Computing?* SALESFORCE, <https://www.salesforce.com/ca/cloud-computing/> (last visited June 20, 2023); see also *What is cloud infrastructure?* RED HAT (May 28, 2019), <https://www.redhat.com/en/topics/cloud-computing/what-is-cloud-infrastructure>.

<sup>7</sup> *Id.*

<sup>8</sup> See, e.g., *Closing the cloud strategy, technology, and innovation gap: Deloitte US Future of Cloud Survey Report*, DELOITTE, <https://www2.deloitte.com/content/dam/Deloitte/us/Documents/consulting/us-future-of-cloud-survey-report.pdf> (last visited June 20, 2023).

<sup>9</sup> *Id.*

<sup>10</sup> *Cloud market share Q4 2018 and full year 2018*, CANALYS (Feb. 4, 2019), <https://www.canalys.com/newsroom/cloud-market-share-q4-2018-and-full-year-2018>.

<sup>11</sup> Evgeniy Altynpara, *Future of the Big Data and the Top 7 Successful Companies Which Already Use It*, CLEVERROAD, (Jan. 30, 2018), <https://www.cleveroad.com/blog/top-7-big-data-startups-to-help-you-start-your-super-project->

13%, year-over-year, through 2026.<sup>12</sup> Table 1 shows estimates of the top cloud providers and their market shares. It reveals a moderately concentrated global cloud market with the top two players – AWS and Microsoft’s Azure accounting for 55%, by revenue.<sup>13</sup> Adding Google Cloud brings the share of the top three players to 65%. Lagging behind with much smaller market shares are Alibaba Cloud, IBM Cloud, Salesforce, Oracle, and Tencent Cloud. Together, the eight top players account for about 80% of the market, with market concentration at about 1,700 HHI.<sup>14</sup>

**Table 1**  
**Market Shares of the Top Eight Cloud Providers (2022)**

Company	Market Share	Annual Growth in Share (2018-22)	Company	Market Share	Annual Growth in Share (2018-22)	Concentration
AWS	32%	1%	IBM Cloud	3%	-18%	8-Firm Share – 79%
Azure	23%	20%	Salesforce	3%	Declining	3-Firm Share – 65%
Google Cloud	10%	21%	Oracle	2%		2-Firm Share – 55%
Alibaba Cloud	4%	.50%	Tencent Cloud	2%		HHI – 1,695

The expanding value and role of cloud technology has driven rapid consolidation and organic growth. Cloud acquisitions by the top providers range from small transactions, many of which fall under the federal Hart Scott Rodino Act (HSR) antitrust reporting guidelines,<sup>15</sup> to some worth almost \$20 billion.<sup>16</sup> In 2014, for example, Microsoft purchased Capptain, a French startup specializing in a mobile app management platform. The acquisition, valued at \$9.3 billion, expanded Azure.<sup>17</sup> In 2019, Google’s bought data analytics startup, Looker, for \$2.6 billion.<sup>18</sup> The acquisition of Looker followed on the heels of Google’s purchase of data analytics firm Alooma, a cloud data migration provider<sup>19</sup> and Cask Data, a data pipelining tool, in 2018.<sup>20</sup>

<sup>12</sup> See, e.g., *Annual spending on cloud IT infrastructure worldwide from 2013 to 2026*, STATISTA,

<https://www.statista.com/statistics/503686/worldwide-cloud-it-infrastructure-market-spending/> (last visited June 20, 2023).

<sup>13</sup> See *Big Three Dominate the Global Cloud Market*, STATISTA (Apr. 28, 2023), <https://www.statista.com/chart/18819/worldwide-market-share-of-leading-cloud-infrastructure-service-providers/>; *Cloud Spending Growth Rate Slows But Q4 Still Up By \$10 Billion from 2021; Microsoft Gains Market Share*, SYNERGY RESEARCH GROUP (Feb. 6, 2023), [https://www.srgresearch.com/articles/cloud-spending-growth-rate-slows-but-q4-still-up-by-10-billion-from-2021-microsoft-gains-market-share#:~:text=New%20data%20from%20Synergy%20Research,in%20the%20market%20growth%20rate;Q1%20Cloud%20Spending%20Grows%20by%20Over%20\\$10%20Billion%20from%202022;the%20Big%20Three%20Account%20for%2065%20of%20the%20Total](https://www.srgresearch.com/articles/cloud-spending-growth-rate-slows-but-q4-still-up-by-10-billion-from-2021-microsoft-gains-market-share#:~:text=New%20data%20from%20Synergy%20Research,in%20the%20market%20growth%20rate;Q1%20Cloud%20Spending%20Grows%20by%20Over%20$10%20Billion%20from%202022;the%20Big%20Three%20Account%20for%2065%20of%20the%20Total), <https://www.srgresearch.com/articles/q1-cloud-spending-grows-by-over-10-billion-from-2022-the-big-three-account-for-65-of-the-total>.

<sup>14</sup> U.S. DEP’T OF JUSTICE & FED. TRADE COMM’N, *Horizontal Merger Guidelines* (Aug. 19, 2010), <https://www.justice.gov/atr/horizontal-merger-guidelines-08192010>.

<sup>15</sup> *Steps for Determining Whether an HSR Filing is Required*, FED. TRADE COMM’N., <https://www.ftc.gov/enforcement/premerger-notification-program/hsr-resources/steps-determining-whether-hsr-filing> (last visited June 20, 2023).

<sup>16</sup> Data on acquisitions and investments (including dates, values, and descriptors) by the cloud providers cited in this report are obtained from company-specific search queries on Crunchbase.com. See also *Non-HSR Reported Acquisitions by Select Technology Platforms, 2010-2019: An FTC Study*, FED. TRADE COMM’N. (Sep. 15, 2021), <https://www.ftc.gov/system/files/documents/reports/non-hsr-reported-acquisitions-select-technology-platforms-2010-2019-ftc-study/p201201technologyplatformstudy2021.pdf>.

<sup>17</sup> Ingrid Lunden, *Microsoft Buys Mobile App Management Platform Capptain To Beef Up Azure*, TECHCRUNCH (May 28, 2014, 9:50 AM), <https://techcrunch.com/2014/05/28/microsoft-buys-capptain-a-mobile-app-management-platform-based-in-paris/>.

<sup>18</sup> Ron Miller, *Google closes \$2.6B Looker acquisition*, TECHCRUNCH (Feb. 13, 2020, 11:35 AM), <https://techcrunch.com/2020/02/13/google-closes-2-6b-looker-acquisition/>.

<sup>19</sup> Amit Ganesh & Dominic Preuss, *Google announces intent to acquire Alooma to simplify cloud migration*, GOOGLE CLOUD (Feb. 19, 2019), <https://cloud.google.com/blog/topics/inside-google-cloud/google-announces-intent-to-acquire-alooma-to-simplify-cloud-migration>.

In 2019, Salesforce acquired Tableau, a startup specializing in analytics, AI, cloud computing, and other markets, for almost \$17 billion.<sup>21</sup>

As shown in Table 1, AWS's year-over-year growth in cloud market share has remained essentially flat. Microsoft's Azure and Google Cloud both reveal significant year-over-year growth from 2018-2022. While Microsoft's Azure reportedly made gains on AWS, stealing about 2% of share from the cloud giant only recently, it remains in second place.<sup>22</sup> Google Cloud remains in a solid third place. The other fringe cloud players show growth that is either flat (e.g., Alibaba Cloud), or declining (e.g., IBM and others), leaving little prospect of leapfrogging any of the top three players, at least in the near future.

In sum, there has been tremendous growth in the cloud market over time. But the rank order of the top cloud providers has not changed over the last few years. The implications of what appears to be structural stagnation in the cloud market, despite the dynamism inherent in cloud technology, are important. Together with the other major competitive features of the cloud market discussed below, this stagnation could affect the rates and success of firm entry and jockeying for market share. But it will also shape how large incumbents and small fringe player compete, including practices designed to entrench market power and limit competition.

### III. Expanding Cloud Capability: Acquisition and Investment by the Top Providers

To evaluate the underlying structure of, and growth, in the cloud market, we identified and evaluated the acquisitions and investments made by the top eight cloud providers.<sup>23</sup> The distinction between acquisition and investment is important, especially as it pertains to a firm's intertemporal optimization problem and dynamic growth objectives.<sup>24</sup> Acquisition of other firms adds expands the acquirer's capital stock and is critical for gaining economic control of an asset. Investment, on the other hand, involves purchasing capability, through a variety of financial mechanisms. These pathways have potential different implications for strategic competition.<sup>25</sup>

We sorted on key word descriptors of the top eight providers' acquisitions and investments for a variety of commonly referenced cloud terms. These include, among others: information technology (IT), Big Data, analytics, cloud computing, SaaS, artificial intelligence (AI), business

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<sup>20</sup> Tom Baer, *Google buys Looker for \$2.6 billion, aims to extend its analytics reach, support multiple clouds*, ZDNET (June 6, 2019), <https://www.zdnet.com/article/google-buys-looker-for-2-6-billion-aims-to-extend-its-analytics-reach-support-multiple-clouds/>.

<sup>21</sup> See *Salesforce*, CRUNCHBASE, <https://www.crunchbase.com/organization/salesforce#section-overview> (last visited June 20, 2023) (providing a data overview); *Tableau*, CRUNCHBASE, <https://www.crunchbase.com/organization/tableau> (last visited June 20, 2023) (detailing a data overview). See also Adam Selipsky, *Salesforce Signs Definitive Agreement to Acquire Tableau*, TABLEAU (June 10, 2019), <https://www.tableau.com/about/blog/2019/6/blog-1-110508>.

<sup>22</sup> Ron Miller, *Even as cloud infrastructure market growth slows, Microsoft continues to gain on Amazon*, TECHCRUNCH (Feb. 6, 2023, 2:39 PM), <https://techcrunch.com/2023/02/06/even-as-cloud-infrastructure-market-growth-slows-microsoft-continues-to-gain-on-amazon/>.

<sup>23</sup> Crunchbase.com, *supra* note 16.

<sup>24</sup> See, e.g., Hiroaki Hayakawa and Suez Ishizawa, *The fundamental principle of intertemporal optimization: Consumer behavior under recursive preferences*, 41 *ECONOMICS LETTERS* 273 (1993).

<sup>25</sup> See, e.g., Evrim Akdoğan and Peter MacKay, *Investment and Competition*, 43 *J. FINANCIAL AND QUANTITATIVE ANALYSIS* 299 (Jun. 2008).

intelligence, machine learning, and database. Sorts included both individual and combined key word descriptors. Since some terms are more encompassing than others (e.g., IT includes many of the individual terms listed above), the various searches collectively sketched out a more complete picture of the attributes of acquisitions and investments by the top cloud providers.

The analysis reveals that IT ranks first, accounting for about 23% and 25% of total acquisitions and investments, respectively. Acquisitions of data assets rank second, below IT, or about 11% of total cloud acquisitions. However, data-related investments are minimal. Similarly, analytics-related acquisitions rank highly (about 10%) but investment in analytics was significantly lower. The same is true of AI-related acquisitions and investments. For example, AI accounts for only about 6% of cloud acquisitions but 19% of investments—a three-fold difference. SaaS acquisitions and investments rank equally—and in the middle of the pack—at about 5% and 9%, respectively. Finally, machine learning ranks low in both categories, at about 4% of total acquisitions and investments.

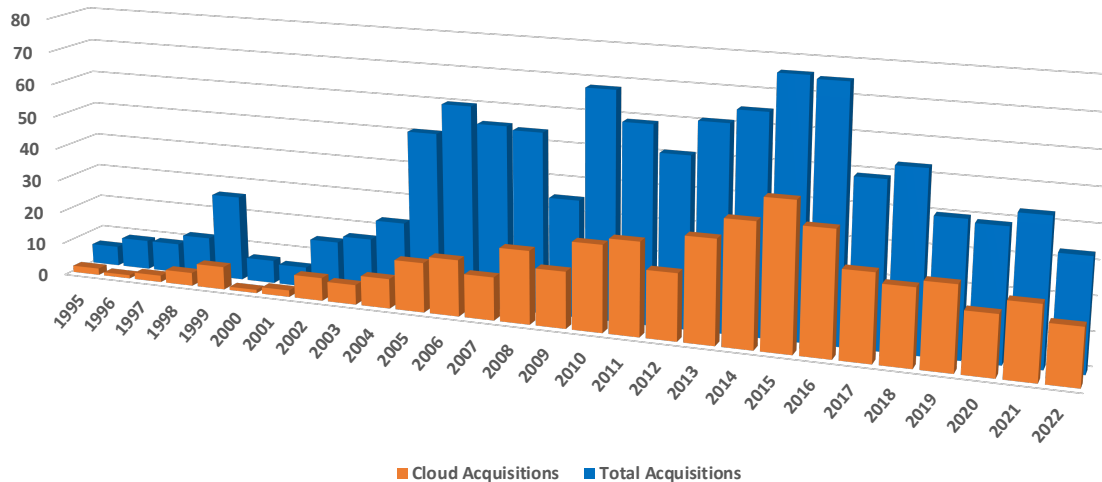
The forgoing observations about acquisition and investment activity for key areas of cloud technology are important. For example, that data and analytics capabilities are expanded more through acquisition than investment by the top cloud providers may say something about how firms view the importance of obtaining more economic control of assets in these areas of cloud technology. AI is also a burgeoning area of investment, but not the target of much acquisition activity by the top cloud providers. This may signal that cloud providers are less sanguine about acquiring specialized firms because of uncertainty about innovation and deployment of AI, integration of AI into other integrated markets and cloud offerings, and other factors.

Moving forward, how the top cloud providers think about acquisition versus investment strategies for different types of cloud technologies will become clearer. This will be important for understanding how firms meet their goals around market positioning and strategic growth. Undoubtedly, these factors will have a direct effect on how cloud providers compete, at the same time they impose both limitations and opportunities on control of economic assets in the integrated cloud market.

#### **IV. Rapid Acquisition, “Catch-Up,” and the Mature Cloud Buildout**

The cloud-related acquisitions of the top eight cloud providers over the 27-year period 1995-2022 are shown in Figure 1. For comparison purposes, *all* acquisitions made by the top cloud providers over the same period are also shown. The firms made about 1100 acquisitions from 1995-2022, about 480 of which were cloud assets, or almost 45% of total acquisitions. Moreover, the proportion of total acquisitions accounted for by cloud-related deals increased, on average, at about 10% year-over-year for the period. Therefore, expansion in cloud took strong precedence in the overall acquisition portfolios for the top cloud providers over the last two and half decades.

**Figure 1**  
**Cloud Acquisitions V. All Acquisitions by Major Cloud Providers (1995-2022)**



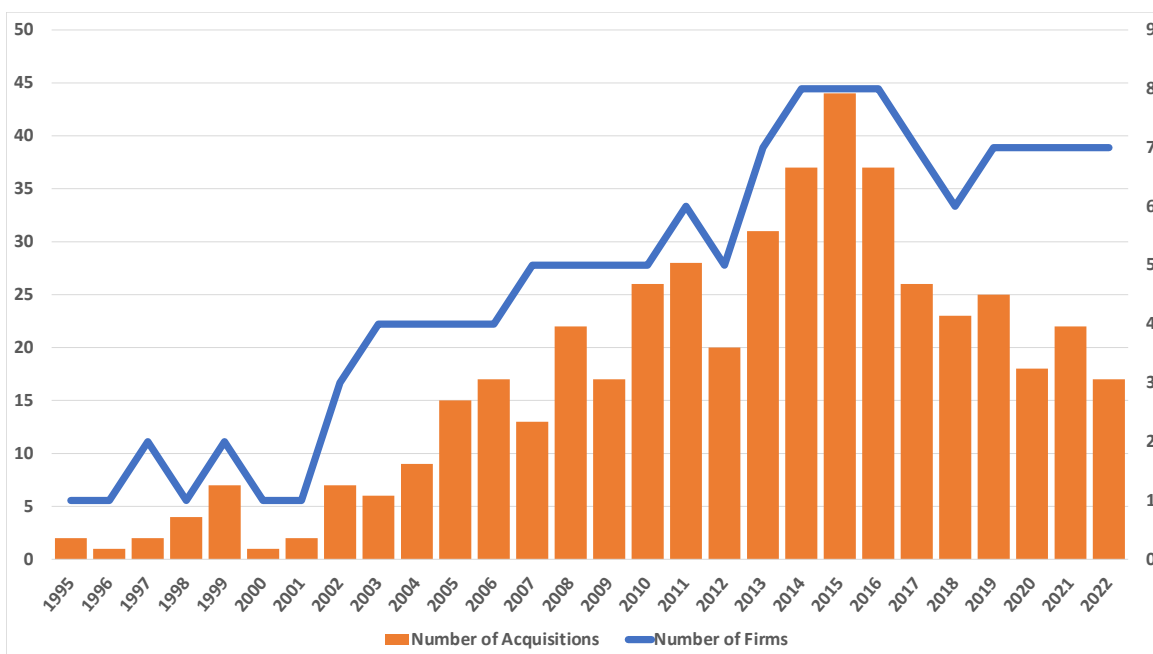
The profile of cloud acquisitions made by the top eight providers also offers a useful perspective. Beginning around 2002, acquisitions ramped up, and increased over about a 15-year period to a peak in 2015. Since 2015, cloud acquisitions have been on a steady, even precipitous, decline. This massive cycle of cloud acquisitions generally does not correspond to broader merger cycles over the period 1995-2022.<sup>26</sup> For example, the financial crisis of 2008 triggered a significant downturn in M&A that extended into the early 2010s, which is not apparent in the cycle of cloud acquisitions. The seven-year drop-off in cloud acquisitions from 2015-2022 is mirrored in all acquisitions by the top cloud providers. But this decline shows little resemblance to the M&A cycles we see over the same period.

Figure 2 superimposes the “count” of the top eight cloud providers that were active in acquiring cloud assets in each year. Over almost 480 cloud acquisitions were made between 1995-2022. The count of actively acquiring companies is strongly, positively correlated with deal counts over the period, indicating the entry and continued participation of both DBE and non-DBE fringe providers. Both the acquisition and firm counts rise relatively steadily through the peak of the cycle of acquisitions in 2015. Since then, as deal counts fell off, the number of firms active in acquiring cloud assets level off at around seven, signaling that virtually all players remain active in acquiring (albeit fewer) cloud assets.

<sup>26</sup> U.S. *Deals 2023 outlook*, PwC, <https://www.pwc.com/us/en/services/consulting/deals/outlook.html> (last visited June 20, 2023) (noting that the PwC data shows M&A activity from 1990-2022, which is inclusive of the period for which we examined acquisitions by the top cloud providers).



**Figure 2**  
**Counts of Cloud Acquisitions Acquiring Cloud Providers (1995-2022)**



The analysis of acquisitions by the major cloud providers supports the notion that the buildout of cloud technology that began in force in the early 2000s has matured. The largest cloud players, including major DBEs and other fringe cloud providers, established their cloud capability within a relative short period of time. All firms appear to have remained in the market. This frenetic acquisition cycle does not align closely with broader M&A cycles. Instead, it is likely explained by two major factors. One is the meteoric evolution of the digital sector, which has grown primarily through acquisition.<sup>27</sup> A second is the drive to “catch up” with players that engage in organic (versus acquisitive) growth. As the cloud market enters what is likely to be the next phase of development, these factors will bear directly on how firms compete strategically.

## V. Diversity in Cloud Business Models, Entry, and Growth

DBEs are a modern version of the “business network” construct. AAI research examines the three major hallmark components of the model: a platform, or multi-sided market that brings together providers and users, cloud infrastructure, and a constellation of applications.<sup>28</sup> Platform markets include, for example, eCommerce, social media, and search and advertising. Cloud infrastructure houses the “engine” for realizing the value proposition of the DBEs, or monetizing user data through the use of cloud technologies (e.g., data analytics, artificial

<sup>27</sup> See Diana L. Moss and David Hummel, *Anticipating the Next Generation of Powerful Digital Players: Implications for Competition Policy*, AMERICAN ANTITRUST INSTITUTE (Jan. 18, 2022), <https://www.antitrustinstitute.org/work-product/new-aa-i-analysis-unpacks-acquisitive-growth-by-digital-firms-warns-of-next-wave-of-expansion-and-need-for-sector-wide-approach-to-competition-policy/>.

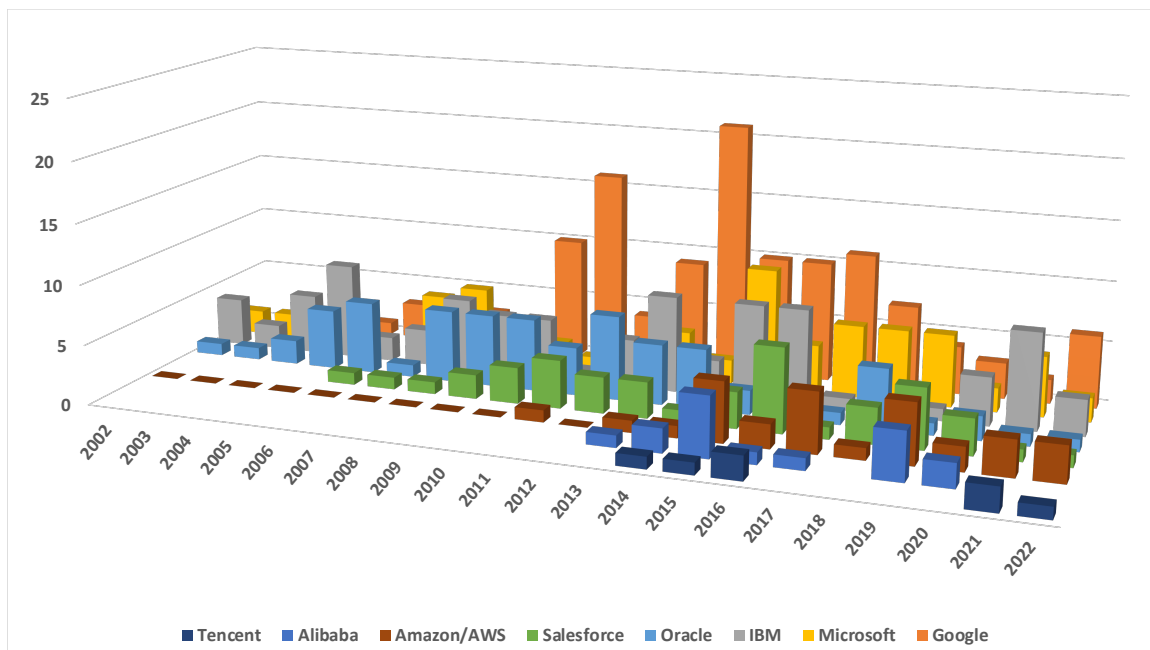
<sup>28</sup> See Moss, Gundlach, & Krotz, *supra* note 1.

intelligence, and machine learning, and others) to attract, engage and retain users in the ecosystem.

The buildout of cloud capability for the large DBEs such as Google, Microsoft, and AWS was accompanied by other acquisition activity.<sup>29</sup> For example, they also focused on fortifying dominant positions in platform markets and adding applications to their ecosystems, including fintech, education, gaming, healthcare, and others. Nevertheless, the DBEs dominate the cloud market. Aside from the large DBEs, other cloud players have been in the market for some time, while some have more recently entered the market.

Figure 3 shows annual acquisitions by the top eight cloud providers from 2002-2022.<sup>30</sup> Google has been the most acquisitive in cloud, followed by IBM, and Microsoft. Both Oracle and IBM were both active throughout the period acquiring cloud assets. But players such as Salesforce entered toward the late 2000s with significant cloud acquisitions. New players like Tencent and Alibaba Cloud have been actively acquiring cloud assets only over the last decade.

**Figure 3**  
**Annual Acquisitions of Major Cloud Providers (2002-2022)**



The inherent acquisitiveness of digital companies, and acquisition trajectories for the major cloud providers over the last two and half decades prompts the question: is acquisitiveness related to market position? As shown in Table 2, acquisitiveness has, in fact, little to do with the

<sup>29</sup> See, e.g., Diana L. Moss, *Letter from AAI to Honorable Makan Delrahim re: Antitrust Review of Google’s Acquisition of Data Analytics and Business Intelligence Startup Looker*, AMERICAN ANTITRUST INSTITUTE 1, 3 (July 8, 2019), [https://www.antitrustinstitute.org/wp-content/uploads/2019/07/AAI-Ltr-to-DOJ\\_Google-Looker\\_7.8.19.pdf](https://www.antitrustinstitute.org/wp-content/uploads/2019/07/AAI-Ltr-to-DOJ_Google-Looker_7.8.19.pdf).

<sup>30</sup> Crunchbase.com, *supra* note 16.

market share of cloud providers.<sup>31</sup> For example, Google has been the most acquisitive, with about 27% of all cloud acquisitions. But it is the third largest player, with 10% of the cloud market. This is followed by IBM, which accounts for 20% of acquisitions but has only a 3% market share. Microsoft is the third most acquisitive firm, accounting for 18% of cloud acquisitions, but is the second-ranked cloud player, with 23% of the market. Oracle ranks fourth in acquisitions, with 15% of the total, but has only 2% of the cloud market.

**Table 2**  
**Acquisition and Market Shares of Top Cloud Providers**

Firm	Share of Cloud Acquisitions	Market Share
Google Cloud	27.4%	10%
IBM	20.0%	3%
Microsoft Azure	17.8%	23%
Oracle	14.9%	2%
Salesforce	9.1%	3%
AWS	6.2%	32%
Alibaba Cloud	3.2%	4%
Tencent	1.5%	2%

AAI research indicates that relative to non-digital business models, DBEs grow primarily through acquisition.<sup>32</sup> This effect is observable for the cloud acquisition trajectories for both Google and Microsoft. But it is not for AWS. Indeed, AWS presents the starkest example of the disconnect between acquisitiveness and cloud market share. As the leader in cloud, with 32% of the market, AWS has made only 6% of cloud acquisitions. This confirms observations that AWS has grown its cloud capability largely organically, with relatively few acquisitions to obtain new cloud functionalities.<sup>33</sup>

A major takeaway from the analysis of cloud business model, growth, and entry is that the cloud market is a mix of the dominant DBE cloud providers and non-DBE fringe players. These different business models and varying profiles of horizontal and vertical integration will undoubtedly affect how they compete in selling cloud services. This includes the DBE's strategies for maintaining or extending their market positions in platform and applications markets. Other types of cloud players may not have these incentives, which will complicate analysis of competition in cloud. This is likely to complicate the analysis of competition in antitrust merger and conduct cases.

<sup>31</sup> Crunchbase.com, *supra* note 16.

<sup>32</sup> See Moss and Hummel, *supra* note 27, pp. 4-7.

<sup>33</sup> Alex Hickey, *Build vs. buy: How AWS balances organic growth and strategic acquisitions*, CIODIVE (Jan. 18, 2019), <https://www.ciodive.com/news/aws-amazon-cloudendure-tso-logic-backup-acquisition/546417/> (noting that "with few acquisitions, the cloud leader tends to rely on organic growth of new functionalities"); See also, Chetan Woodun, *Amazon's AWS Growth Strategy Is Probably More Sustainable Than Oracle's*, SEEKING ALPHA (Jan. 03, 2023, 6:37 PM), <https://seekingalpha.com/article/4567646-amazons-aws-growth-strategy-is-probably-more-sustainable-than-oracles>.

## VI. Weak Merger Enforcement Continues to Characterize the Digital Sector

In 2019, AAI produced the first empirical work tracking the record of merger enforcement in the digital sector. The July 2019 white paper, *The Record of Weak U.S. Merger Enforcement in Big Tech*, gathered and evaluated enforcement data on rates of clearances, second requests, and challenges in the digital sector for the largest DBEs.<sup>34</sup> The analysis concluded that for the period 2001-2017, digital transactions were “cleared” to either the FTC or the U.S. Department of Justice (DOJ) for early-stage review and received second requests at rates that were above average for all sectors. However, the rate of merger challenges was only 3%, far below the 13% average challenge rate across all sectors.

In March 2021, AAI issued an update to the 2019 white paper, *Update on Digital Technology: The Failure of Merger Enforcement and Need for Reform*.<sup>35</sup> The analysis included data from 2001-2019. The analysis concluded that digital deals were still cleared to either the FTC or the DOJ for early-stage review and received second requests for information at above-average rates, relative to all sectors. However, the rate of merger challenges fell to 2.5%, even farther below the 15% average challenge rate across all sectors—an even wider gap than observed in the 2019 white paper.

In this report, AAI has again updated merger enforcement statistics to include data from 2001-2021, the most recent HSR reporting year. We find that the rate of clearance for digital deals increases somewhat relative to earlier time periods analyses. This means that the agencies are taking even harder early stage looks at proposed mergers and acquisitions.<sup>36</sup> The rate of second requests also remains higher than average. However, the rate of merger challenges in digital has fallen even further, to 2%, relative to the all-sector average of 15%. This is largest gap observed over the three analyses that AAI has performed for enforcement statistics for the digital sector.

Weak merger control remains a serious concern for the digital sector. As noted earlier, cloud acquisitions account for a significant proportion of acquisitions by the top cloud providers. These firms built out cloud infrastructure in a startlingly rapid period of time, with little to no intervention by antitrust enforcers. In the meantime, the structure of the market remains virtually unchanged around the three major providers over the last few years, raising questions about the ease entry by new firms and the competitive evolution of the cloud sector. This fact pattern should raise as many questions about the static structure and entrenchment of a supposedly dynamic cloud market as it does about how the top cloud providers’ competitive incentives and strategic conduct affect their business practices.

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<sup>34</sup> Moss, *The Weak Record of Merger Enforcement in Big Tech*, *supra* note 4.

<sup>35</sup> Moss, *Update on Digital Technology: The Failure of Merger Enforcement and Need for Reform* *supra* note 4.

<sup>36</sup> See *Legal Library: Early Termination Notices*, FED. TRADE COMM’N, <https://www.ftc.gov/enforcement/premerger-notification-program/early-termination-notices> (last visited June 20, 2023) (archiving Early Termination Notices, queried for each of the Big Tech companies and their holding companies). The rates of clearance to an agency for initial review were obtained from annual HSR reports.

## VII. Conclusions

The analysis of the cloud market, top players, growth, and expansion has important implications for how antitrust enforcers approach competition issues in the sector. When considered against a weak record of merger enforcement in the digital sector, structural stagnation in the cloud market highlights the potential for the top cloud providers to shift their attention to strategic competition. Enforcers should, therefore, continue to closely monitor consolidation, as well as get ahead of potential harmful conduct.

- **The cloud market has grown exponentially, with cloud-related acquisitions accounting for 45% of total acquisitions by the top cloud providers. Market structure is stagnant across the largest providers and smaller fringe players, despite the underlying dynamism inherent in cloud technology. Incentives to defend market positions could shape entry moving forward and foster practices designed to entrench market power and limit competition.**
- **Expansion of cloud capability by the top cloud providers occurs through, acquisition, investment, and organic growth. How firms deploy these strategies is becoming clearer. The roles of economic control of cloud assets and the competitive incentives resulting from different types of firm integration are important for how firms position themselves to grow and the types of competitive strategies they employ.**
- **The buildout of cloud technology that occurred from the early 2000s to mid-2010s appears to be maturing. It bears little resemblance to broader M&A cycles. This is likely a function of explosive growth in the digital sector and the drive to catch up with rivals that rely more on organic, versus acquisitive, growth. The dynamics of growth are likely to continue to affect how firms compete in the cloud market.**
- **The cloud market contains a mix of dominant, DBE cloud providers and non-DBE fringe players. Different business models and degrees of integration will affect how firms compete in selling cloud services. These include the DBEs' strategies for maintaining their positions in platform and applications markets. Other types of cloud players may not have these same incentives, which will complicate analysis of merger and monopolization cases.**
- **Weak merger control remains a serious competition concern for the digital sector. Without more scrutiny of cloud consolidation, including acquisitions of smaller and nascent rivals, any competition enforcement program will increasingly lag behind. The first line of defense to anticompetitive conduct resulting from higher concentration and dominant firms is strong merger enforcement.**