MARKET POWER AND DIGITAL BUSINESS ECOSYSTEMS:

ASSESSING THE IMPACT OF ECONOMIC AND BUSINESS COMPLEXITY ON COMPETITION ANALYSIS AND REMEDIES

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I. INTRODUCTION

"Digital business ecosystems" (DBEs) reflect the culmination of progressive changes in business models and organizational structure over the last 40 years. The ubiquity of many large DBEs in our economy, society, and political system is troubling, as is their significant market power, which is the subject of competition investigations in the U.S. and abroad. But the DBE business model, which far surpasses other models and structures in its scope, scale, and complexity, remains largely under-analyzed. DBEs feature unique economic, technological, and business characteristics that increase their opacity to consumers, competition enforcers, and lawmakers. These include information as the currency of exchange and a range of market failures such as positive network effects, information asymmetries around user data and privacy, and data externalities. As the "engine" of commerce and growth in DBEs, cloud computing technology adds further complexity to the analysis of market power. This is particularly true of data analytics, supported by artificial intelligence (AI) and machine learning, which powers the DBE "value proposition" of maximizing user engagement and monetizing user data.

This report examines the unique characteristics of DBEs and assesses their implications for competition enforcement and policy. This analysis raises numerous questions around the adequacy of conventional competition analysis in evaluating market power concerns. The widening gap between the complexity and growth of DBEs—and the likely inadequacy of policy responses to the market power problems they raise—elevates the importance of such questions. However, they cannot be answered by relying solely on a legal-economic framework. We therefore adopt a multidisciplinary approach, incorporating economics, law, and business theory and research in our analysis. Not surprisingly, it reveals important caveats and cautions regarding the application of conventional competition analysis to DBEs, with implications for how competition enforcers and legislators assess market power and design remedies, particularly in the merger and monopolization contexts.[1]

The report begins with the evolution of the DBE business model and its rapid and expansive growth. We then turn to an analysis of the major structural and behavioral features of DBEs. Next are implications for competition analysis, such as how markets are defined, how market power is exercised, and remedies. The final section concludes with recommendations. As public and private antitrust cases against large DBEs mount, the U.S. Department of Justice (DOJ), Federal Trade Commission (FTC), state Attorneys General, and courts will continue to grapple with their unique features. This report provides important analysis, insights, and recommendations for enforcers and policymakers as they explore the full complement of tools available to rein in the market power of DBEs.

II. THE EVOLUTION OF DIGITAL BUSINESS ECOSYSTEMS

Business ecosystems and their digital counterparts reflect the most recent iteration of organizational structures that define business model architectures. Beginning with simple distribution arrangements and evolving to include more complex "vertical marketing systems" (VMSs) and business networks, business ecosystems are the most advanced of these organizational structures in terms of their scope, scale, and complexity. Their presence in the digital domain both defines and enables their unique structure and distinctive features. Application of conventional competition analysis to DBEs is usefully informed by their evolution. This section begins with a review of business models that are relevant to

[1] The American Antitrust Institute (AAI) is an independent non-profit education, research, and advocacy organization. Its mission is to advance the role of competition in the economy, protect consumers, and sustain the vitality of the antitrust laws. For more information, *see,* www.antitrustinstitute.org.

understanding the structure, incentives, and expansion of DBEs. It then traces the DBEs' extraordinary growth trajectory, with a focus on the central role of cloud infrastructure in executing the business model. This lays the groundwork for understanding market power in DBEs and for shaping effective antitrust and regulatory policy responses.

A. FROM VERTICAL MARKETING SYSTEMS TO BUSINESS ECOSYSTEMS

Neoclassical economics and the microeconomic paradigm played an important role in shaping early business thought around intermediaries and channels of distribution.[2] But observed differences between economic and business frameworks led marketing and related business disciplines to depart from the black box theory of the firm that viewed corporations as a production function and defined competition largely through the lens of price.[3] While retaining some core microeconomic assumptions, early-era marketing gave more recognition to the role and importance of intermediaries and distribution channels in the performance of the firm.[4] Namely, channel intermediaries continued to be viewed as independent business entities, loosely coupled through market processes. Manufacturers were considered the dominant party and in these exchanges with interactions between intermediaries and interactions with consumers were viewed as short-term and at arm's-length.

As consumers became more distinct in their preferences, manufacturers began to differentiate their offerings, increasing the need for more complex channels of distribution. The one-way view of exchange thus gave way to the competitive benefits of cooperation and coordination between a manufacturer and its channel intermediaries.[5] The VMS model ranged from the conventional, single, coordinated channel of distribution, to more complex systems involving multiple channels that provided differentiated offerings to customers who possessed different preferences.[6] VMSs were an extension of the manufacturing firm into distribution, creating efficiencies by: matching channels with consumer preferences, adopting standardized operations and processes, coordinating the development and implementation of marketing strategies and tactics within and across channels, and managing intra- and inter-channel conflict and competition.[7]

Even as the foregoing changes evolved, disruptive information technology, globalization of trade, and a more turbulent business environment were altering business practice. The expanding dimensions of markets, innovation, and collaboration became important sources of competitive advantage. These sea changes led to a number of important developments. One was the replacement of a political economy framework in marketing and business with relationship marketing, or the ongoing process of cooperative and collaborative activities with intermediate and end-user customers to enhance mutual value at reduced costs.[8] Second, in conventional distribution channels and VMSs, the centrality of manufacturing diminished as globalization and greater transparency and coordination facilitated outsourcing. Large and powerful retailers also grew to control access to markets and exerted influence over channel strategy and terms of trade.[9]

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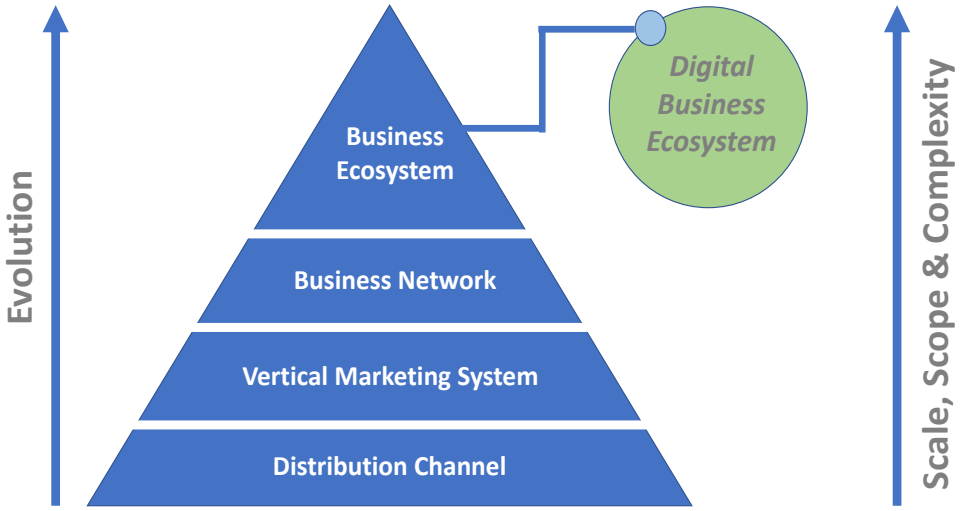
[2] D.F. Dixon, *The Historical Origins of the Channel Concept*, *in* MARKETING CHANNELS: DOMESTIC AND INTERNATIONAL PERSPECTIVES 146 (Michael G. Harvey & Robert Lusch eds., 1982).
[3] Stephen L. Vargo & Fred W. Morgan, *Services in Society and Academic Thought: An Historical Analysis*, 25 J. MACROMARKETING 42 (2005).
[4] Ravi S. Achrol & Gregory T. Gundlach, *Network Organization and Systems Competition: A Marketing Analysis*, ANTITRUST BULL. 4 (2014).
[5] Achrol & Gundlach, *supra* note 4.
[6] Robert W. Little, *The Marketing Channel: Who Should Lead this Extra Corporate Organization*, 34 J. MKTING. 31 (1970).
[7] Barry J. Dickinson, *Symbiotic Marketing: A Network Perspective*, J. OF MGMT. & MKTG. RSCH. 11 (2012).
[8] Achrol & Gundlach, *supra* note 4.
[9] *Id.*

A final development was the advent of more nimble forms of organization, such as business networks.[10] Business networks adopt a hub-and-spoke architecture, featuring strategic partnerships such as upstream suppliers and lateral strategic partners that are reciprocally connected to the focal organization at the hub.[11] Indeed, many manufacturer-centric VMSs evolved into business networks.[12] Rather than market-based forms of interaction and governance, business networks rely—in addition to power, contracts and ownership—on normative principles to define and enforce the rights and obligations of their members.

Business networks have evolved in their scope, scale, and complexity over time. As shown in Figure 1, the most advanced form of business network today is the business ecosystem, or the highly connected networks of organizations, stakeholders, and consumers involved in exchange, production, innovation, trade, cooperation, and competition that co-evolve in regard to a specific goal or central organization.[13] A business ecosystem is a relatively new strategy for an organization to advance its own interests and improve its overall health and performance.[14] It is widely used, for example, by Microsoft, Intel, and IBM to define alliances and networks and to achieve organizational goals.[15]

Figure 1. Digital Business Ecosystems Versus Other Business Models



As a variant of a business ecosystem, DBEs feature collaborations of entities that co-create value, primarily through digital architectures of information and communication technologies.[16] DBEs involve myriad collaborations between the firm, advertisers, applications developers, data analytics providers, third-party sellers, and users, as shown in Figure 1. Leading examples of DBEs are Facebook (social

[10] Ravi S. Achrol, *Evolution of the Marketing Organization: New Forms for Dynamic Environments*, 55 J. MKTG. 77 (1991). Louis P. Bucklin, VERTICAL MARKETING SYSTEMS (1970).
[11] Håkan Håkansson & David Ford, *How Should Companies Interact in Business Networks?*, 55 J. OF BUS. RSCH. (2002).
[12] Achrol & Gundlach, *supra* note 4.
[13] Angelo Corallo, Giuseppina Passiante & Andrea Precipipe, THE DIGITAL BUSINESS ECOSYSTEM (2007).
[14] Yan-Ru Li, *The Technological Roadmap of Cisco's Business Ecosystem*, 29 TECHNOVATION (2009).
[15] Corallo, et al, *supra* note 13.
[16] Francesco Nachira, Paolo Dini & Andrea Nicolai, *A Network of Digital Business Ecosystems for Europe: Roots, Processes and Perspectives*, EUROPEAN COMMISSION (2007). *See also,* Corallo, et al, *supra* note 13 and Prince Kwame Senyo, Kecheng Liu & John Effah, *Digital Business Ecosystems: Literature Review and a Framework for Future Research*, INTL. J. OF INFO. MGMT. 47 (2019).

networking), Google (search), and Amazon (online retailing). Large DBEs, however, are on the rise in other sectors, including Zillow (online real estate), Optum (digital healthcare technology), and others.[17] They represent a unique and sophisticated form of business organization, tightly tied to the broader business environment and developments in globalization and advanced technology.

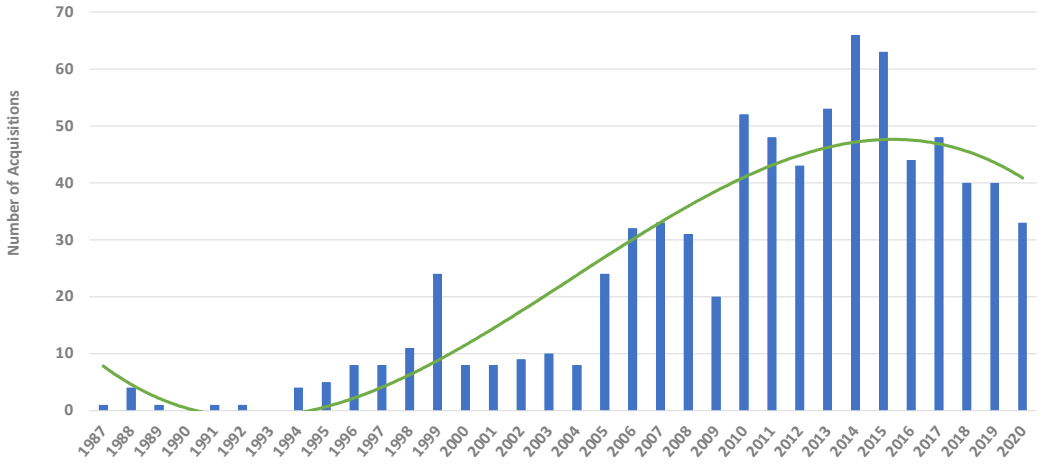
B. EXPANSION OF DIGITAL BUSINESS ECOSYSTEMS

The average age of the largest DBEs—Amazon, Apple, Facebook, Google, and Microsoft—is about 25 years. Even within this relatively short period of time, it is clear that technological advancements have played a role in adjustments to their business models.[18] Their unique development trajectory and ongoing dynamism bears materially on evaluating the dominant role that many have come to play in important markets. These factors should prompt enforcers and policymakers to incorporate new learning in evaluating existing competition issues, but also to ask what *new* DBEs might be emerging. This section examines the unique DBE model of "growth by acquisition" and focuses on the centrality of cloud infrastructure to further expansion.

1. GROWTH BY ACQUISITION AND UNDER-ENFORCEMENT OF MERGERS

To appreciate the magnitude of the five largest DBEs, it is important to examine how they have grown through the acquisition of almost 800 firms over the period 1987-2020.[19] As shown in Figure 2, this history displays cycles of activity. A first cycle began in about 2005, peaked in 2007, and ended in 2009. But a much bigger cycle is obvious beginning in 2010 and peaking in 2014. Over the entire period, the five largest DBEs made just over 20 acquisitions per year, at an average annual rate of increase in acquisitions of almost 20% per year. Google accounted for the largest percentage of total acquisitions (32%), followed by Microsoft (30%), Apple (15%), Amazon (12%), and Facebook (10%).

Figure 2. Acquisitions by the Five Largest Digital Business Ecosystems (1987-2020)



[17] Optum is owned by UnitedHealth Group.

[18] *See* Diana L. Moss, *The Record of Weak U.S. Merger Enforcement in Big Tech*, AM. ANTITRUST INST., Jul. 8, 2019 (Moss (2019)); and Diana L. Moss; and *Update on Digital Technology: The Failure of Merger Enforcement and Need for Reform*, AMERICAN ANTITRUST INST., Mar. 3, 2021 (Moss (2021)).

[19] Moss (2021), *supra* note 18.

Growth through acquisition appears to be the major strategy for implementing the DBE business model. Serial acquisitions reinforce the market position of the "platform" that is often the central hub of a DBE. Perhaps more important, acquisitions expand and diversify the DBE. The capacity of a DBE to host a diverse set of products and services is vast. For example, Figure 3 shows a word cloud based on the industry descriptors for the almost 250 companies acquired by Google since 2001.[20] Such an ecosystem, which is oriented around a mobile digital platform, is comprised of a far greater number of smaller acquisitions than a similarly sized ecosystem in a non-digital sector. For example, the average value of an acquisition by Google over the period 2001-2020 is about $700 million, far lower than the average value of acquisitions made by similarly sized Fortune 500 companies, such as Johnson & Johnson ($3.5 billion) and Visa ($6 billion).[21]

Figure 3. Industry Descriptors for Google's Acquisitions (2001-2020)

The record of merger enforcement in the digital technology sector also helps us understand the growth of the large DBEs. Past AAI reports gathered and analyzed DOJ and FTC merger enforcement data for a major segment of the digital technology sector over the period 2001-2019.[22] We then compared those statistics for merger transactions across *all* sectors. This comparison indicates that the agencies subjected a higher percentage of DBE transactions (as a percentage of all deals cleared to either agency) to review under the second request process, relative to all transactions.[23] This means that the agencies have looked harder at DBE transactions in early-stage reviews, relative to all sectors. However, the rate at which the agencies challenged mergers in digital technology (as a percentage of total clearances) was far lower than the average across all sectors. Indeed, the rate of merger challenges from 2001-2019 was just under 2.5% in digital technology, versus 15% across all sectors.[24] Merger enforcement in the digital

[20] Data on acquisitions and investments sourced from Crunchbase, "a platform for finding business information about private and public companies." *See* CRUNCHBASE.COM.

[21] Crunchbase.com, *id*. *See also*, *Fortune 500*, FORTUNE, 2020 (queried May 24, 2021).

[22] *Hart-Scott-Rodino Annual Report*, filed under Section 7A of the Clayton Act, Hart-Scott-Rodino Antitrust Improvements Act of 1976, years 2001-2019. *See* Table X: Industry Group of Acquiring Person for NAICS Code 518 (internet service providers, web search portals, and data processing services). The five largest digital technology companies operate in a number of NAICS code areas. NAICS code 518 is a primary identifier for Google, Amazon, and Facebook. Only a fraction of the total acquisitions are reportable to the U.S. antitrust agencies under the Hart Scott Rodino Act (HSR) federal premerger reporting requirements.

[23] Moss (2019) and (2021), *supra* note 18.

[24] *Id*.

technology sector is therefore unusually low, with only one acquisition challenged by the agencies over the period—Google's acquisition of ITA Software.[25] This extraordinarily weak record of enforcement stands out, even in light of generally weak antitrust enforcement in the U.S. over the last four decades.

2. ANTICIPATING FUTURE EXPANSION TRAJECTORIES

The DBE business model is particularly conducive to growth. As we look to how this growth might unfold, past cycles of acquisition activity by the largest DBEs provide important clues. For example, the major area of growth in the formative stages of DBE development was in core competencies. In the early years, Amazon established its E-Commerce platform, while Google's focus was on search. Figure 4 shows a word cloud of Amazon's acquisitions during the first cycle of expansion (2004-2009) based on industry descriptors for each acquiree.[26] The focus is on E-Commerce, with secondary emphasis on acquisitions around shopping, publishing, and entertainment. The ecosystem is relatively small and tightly oriented around the core functionality of Amazon's online marketplace.

Figure 4. Industry Descriptors for Amazon Acquisitions (2004-2009)

As part of the most recent cycle of acquisition beginning in 2010, most of the large DBEs shifted their focus to the development of cloud infrastructure. Amazon's acquisitions during this large cycle of activity therefore look very different, as compared to earlier stage growth, as shown in Figure 5. The focus is on cloud computing, data storage and management, data analytics, AI, and machine learning. These competencies, amassed largely through buying smaller companies, reinforced Amazon's competency in E-Commerce while also expanding its business ecosystem. Similar examples can be constructed for the other DBEs that show distinctly different emphases across acquisition cycles.

[25] U.S. v. Google, Inc. and ITA Software, Inc., Complaint, Case 1:11-cv-0068 (D.D.C., Apr. 8, 2011).
[26] *Id.* To generate the most complete word cloud, the ubiquitous term "software" was removed from all descriptors.

Figure 5. Industry Descriptors for Amazon Acquisitions (2010-2020)

As discussed in detail later, cloud infrastructure is a unique and defining feature of large DBEs. Cloud infrastructure comprises the suite of technologies necessary to collect, aggregate, and enrich vast caches of user data. The ability to use data has grown significantly through traditional statistical approaches, but also through the emergence of AI and machine learning.[27] Economies of scale in cloud infrastructure allows for cost-effective gathering and processing of data that is essential to creating value by opening new routes to markets and supporting further DBE expansion.[28] Given its enormous value, it comes as no surprise that the largest DBEs embarked on a build-out of cloud infrastructure that began in earnest in about 2013 and remains, as of this writing, in an extended cycle. 2019 was a banner year, with an all-time high of 24 major cloud acquisitions. The average annual rate of growth in cloud acquisitions between 2013-2020 is about 26%, whereas the same rate for all acquisitions over the same period is -1.5%.[29] This pattern reveals an intense focus on developing the cloud infrastructure that is central to fulfilling the DBE value proposition.

With ongoing investment in cloud infrastructure, DBEs are primed to enter further cycles of expansion, potentially creating larger and more powerful entities. Further insight into this expansion is evident in investment patterns.[30] For example, the investment portfolios of the five largest DBEs included almost 450 discrete investments from 1999-2020, including venture, seed, and corporate capital; as well as non-equity assistance, grants, and debt financing.[31] Investment activity has accelerated dramatically since the peak of the second cycle of DBE acquisitions in 2014, signaling exploratory efforts that are likely related to the next wave of expansion into markets such as healthcare, energy, and education technology.

[27] AI models work to infer consumer "likes" based on similarity algorithms.
[28] *What is cloud economics?* VMWARE.COM, queried May 24, 2021.
[29] Crunchbase.com, *supra* note 20.
[30] Gautam Ahuja & Riitta Katila, *Technological Acquisitions and the Innovation performance of Acquiring Firms: A Longitudinal Study*, 22 STRAT. MGMT. J. 197 (2001). Jason Rowley, *A peek inside Alphabet's investing universe*, TECHCRUNCH.COM, Feb. 17, 2018. (Noting that "All in, Alphabet has acquired seven companies in which it had previously invested.")
[31] Crunchbase.com, *supra* note 20.

In light of the rapid growth in cloud capability, it is notable that the roughly 150 cloud acquisitions made by the five largest DBEs since 1998 have proceeded without opposition from antitrust enforcers. Four players now account for almost 65% of the cloud market: Amazon Web Services (31% in 2021), Microsoft Azure (20%), Google Cloud Platform (7%), and Alibaba Cloud (6%).[32] Two of those companies, Amazon and Microsoft, account for over 50% of the market. Consolidation in cloud infrastructure markets prompted an AAI letter to the DOJ, cited in a House Judiciary Committee report, encouraging close scrutiny of Google's 2019 acquisition of Looker, a leading data analytics and business intelligence startup.[33] These developments draw attention to the implications of rising concentration in cloud infrastructure markets, dominated by the largest DBEs.

III. UNPACKING THE STRUCTURE AND BEHAVIOR OF THE DIGITAL BUSINESS ECOSYSTEMS

The previous discussion explores the remarkable complexity, evolution, and expansion of the DBE business model, highlighting the enormity of its current and potential role and influence in today's economy. This analysis sets the stage for evaluating the strategic competitive abilities and incentives that arise in DBEs, and the challenges for competition analysis that supports enforcement action, or new regulatory regimes mandated by law. To advance this analysis, this section takes a closer look at important structural and behavioral features of DBEs. Indeed, their rapid growth and trajectories for further expansion cannot be evaluated without considering the defining features of their structures and the business model that explains their behavior.[34] As the analysis in this section highlights, the novel environment created by DBEs has forced a fundamental re-evaluation of business strategy, alongside more general shifts in trends facing business.[35] For example, DBEs are all but inseparable from the effects of the larger business environment, as they have evolved alongside electronic commerce and electronic globalization, and the increasing sophistication of AI and machine learning.[36] This has resulted in increased scale, scope and complexity of business strategy in DBEs and the rate at which firms must adapt their strategies to a changing environment.[37]

A. KEY STRUCTURAL FEATURES

A number of structural features support the DBE value proposition of engaging users and monetizing their data through advertising and other infomediaries. While relatively simple in concept, these structural factors play an essential role in the ability of DBEs to leverage real-time, "large-scale interconnectivity" and capitalize on "opportunities for demand and supply complementarities."[38] For example, the centrality of the platform in a DBE is well-known. But the platform is too often the sole focus of competition analysis, an approach that misses other but equally, if not more important,

[32] Katy Stalcup, *AWS vs Azure vs Google Cloud Market Share 2021: What the Latest Data Shows*, PARKMYCLOUD.COM, Feb. 10, 2021. Based on cloud infrastructure spending in 2020.
[33] Letter from Am. Antitrust Inst. to U.S. Dept. of Just. *Re:* Antitrust Review of Google's Acquisition of Data Analytics and Business Intelligence Startup Looker, Jul. 8, 2019. *Investigation of Competition in Digital Markets*, MAJORITY STAFF REPORT AND RECOMMENDATIONS, SUBCOMMITTEE ON ANTITRUST, COMMERCIAL AND ADMINISTRATIVE LAW OF THE COMMITTEE ON THE JUDICIARY (2020), at 387.
[34] Richard M. S. Wilson & Colin Gilligan, STRATEGIC MARKETING MANAGEMENT (2012). *See also,* Gary Hamel & C. K. Prahalad, COMPETING FOR THE FUTURE (1994).
[35] Philip Kotler, Hermawan Kartajaya & Iwan Setiawan, MARKETING 4.0 (2017).
[36] Nigel F. Piercy, *Marketing Implementation: The Implications of Marketing Paradigm Weakness for the Strategy Execution Process*, J. OF THE ACAD. OF MKTG. SCI. (1998). *See also,* Colin Campbell, Sean Sands, Carla Ferraro, Hsiu-Yuan Tsao & Alexis Mavrommatis, *From Data to Action: How Marketers Can Leverage AI*, 63 BUS. HORIZONS (2020); Richard M. S. Wilson & Colin Gilligan, STRATEGIC MARKETING MANAGEMENT (2012); and Robert N. Anthony, MANAGEMENT CONTROL FUNCTION (1988).
[37] Jonathan Wareham, Paul B. Fox & Josep Lluís Cano Giner, *Technology Ecosystem Governance*, ORG. SCI. (2014).
[38] Eliana Garces-Tolon, *The Dynamics of Platform Business Value Creation*, CPI ANTITRUST CHRONICLE, Aug. 2017, at 4.

features. These include the complex nature of integration within a DBE and the role of cloud infrastructure in advancing the DBE value proposition. Understanding these structural characteristics paves the way for a more accurate and fulsome assessment of complex DBE behavioral variables.

1. THE CENTRAL ROLE OF THE PLATFORM

A major structural feature of many large DBEs is a platform. This is the digital infrastructure that provides the core functionality for third-party providers to interface and interoperate in order to offer complementary products and services.[39] A platform serves different functions, often bringing together interdependent groups in multi-sided markets. It can be an aggregator that channels information across groups of users, such as Google Search, which connects users searching for information and advertisers that provide information.[40] The platform can also serve as a marketplace, by facilitating transactions between sellers and buyers, such as Amazon's marketplace, Uber's ride-sharing application, or Airbnb's marketplace for lodging.

The platform enables complementarities throughout the DBE. As explained by one expert, the value of the "[i]nformation and connectivity properties of digital markets emerge[s] around and because of a central platform connecting multiple product offerings."[41] These products are offered by third party firms to provide customers with integrated solutions. The platform owner operates, maintains, and invests in the platform, similar to any other network facility, such as an electricity transmission system or rail network. As is well known, in situations where a platform owner competes on its platform with third-party providers, a dominant firm has stronger incentives to exclude rivals.

2. INTEGRATION OF MARKETS WITHIN THE ECOSYSTEM

A second distinguishing feature of a DBE is the relationship between markets within it. These relationships are a microcosm of many forms of integration—horizontal, vertical, and "ecosystem." For example, Facebook acquired the photo/video sharing-based social networking application Instagram (2012), increasing its already dominant position in the market for personal social networking.[42] Google's 2010 acquisition of ITA Software, Inc. combined ITA's airfare pricing and shopping system software with Google's emergent comparative flight search service in what was essentially a vertical acquisition.[43]

Ecosystem acquisitions, however, are not directly in a vertical or horizontal relationship to the acquirer's asset(s). Rather, they are motivated by the co-creation of value between the DBE and third-party providers, largely by capitalizing on innovative technologies that can be integrated with the platform. For example, in acquiring the employment-oriented professional online networking service LinkedIn (2016), Microsoft sought to integrate its functionality with a variety of Microsoft products. This included the video conferencing application (Skype) and enterprise software (Office 365), with the stated goal of "recreat[ing] the connective tissue" for Microsoft's enterprises suite of functionality.[44] Likewise,

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[39] *See, e.g.,* Mathew Shuster, *Platform Engineering*, KOVARUS.COM. *See also*, Jamie Dowie, Stefan Henningsson, Thomas Kude, & Karl Michael Popp, *Merging Platform Ecosystems In Technology Acquisitions: A Governance Perspective*, Proceedings of the 25th European Conference on Information Systems, Jun. 10, 2017.

[40] Carmelo Cennamo, *Competing in Digital Markets: A Platform-Based Perspective*, Jun. 27, 2019 (forthcoming in ACADEMY OF MGMT. PERS.), at 1.

[41] *Id.,* at 1.

[42] Fed. Trade Comm'n. v. Facebook, Inc., Complaint, Case 1:20-cv-03590-JEB (D.D.C., Jan. 13, 2021), at 2.

[43] U.S. v. Google Inc. and ITA Software, Inc., Complaint, Case: 1:11-cv-00688 (D.D.C, Apr. 8, 2011).

[44] *Microsoft to Acquire LinkedIn*, MICROSOFT.COM, Jun. 13, 2016. *See also* Grant Feller, *This Is the Real Reason Microsoft Bought LinkedIn*, FORBES.COM, Jun. 14, 2016.

Google's recent acquisition of Fitbit was an ecosystem acquisition. Arguably, grafting the leading fitness wearables maker into the Google's ecosystem will create opportunities to co-create value through the interconnectivity of health and fitness data and the broader advertising market.

3. THE IMPORTANCE OF CLOUD INFRASTRUCTURE

A third structural feature of large DBEs is the role of cloud infrastructure, or technological capability for driving user engagement and commerce throughout the interconnected set of markets that comprise them. Cloud infrastructure includes three tiers of functionality: infrastructure as a service, software as a service, and platform as a service. It is comprised of physical hardware, software, applications, networking, and customer relationship management functionality, and other technologies. Figure 6 shows the composition of cloud infrastructure acquisitions made by the five largest DBEs between 1998-2020, based on industry descriptors for the roughly 150 companies acquired. It highlights the vast scope of cloud infrastructure capability around various cloud technologies, including data analytics, AI, and machine learning. Figure 6 also highlights the relationship between cloud infrastructure and the broader set of services offered by DBEs, such as digital music, education technology, media, photography, and social networking.

Figure 6. Cloud Infrastructure Acquisitions by Big Tech (1998-2020)

B. KEY BEHAVIORAL FEATURES

The DBE business model has a number of implications for business strategy. For example, technology has permitted access to unprecedented levels of granular consumer data and a more detailed understanding of online consumer behavior. Access to data that facilitates interaction among firms within a DBE, and the monetization of user data is therefore vital to value creation.[45] Data is increasingly

[45] Joe F. Hair, Jr., Dana E. Harrison & Jeffrey J. Risher, *Marketing Research in the 21st Century: Opportunities and Challenges*, 17 BRAZILIAN J. OF MKTG. (2018). Randolph E. Bucklin & Catarina Sismeiro, *Click Here for Internet Insight: Advances in Clickstream Data Analysis in Marketing*, 23 J. OF INTERACTIVE MKTG. (2009). Namugenyi, Nimmagadda & Reiners (2019). Jonathan Wareham, Paul B. Fox & Josep Lluís Cano Giner, *Technology Ecosystem Governance*, ORG. SCI. (2014). Omar Valdez-De-Leon, *How to Develop a Digital Ecosystem: A Practical Framework*, TECH. INNOVATION

collected from smaller and smaller subcomponents of the ecosystem, permitting businesses and their processes to be broken down into smaller parts so as to monitor and ensure maximum performance.[46] Technology has also fostered a focus on long-term outcomes, which is apparent in the steps DBEs have taken to promote growth and expansion.[47] For example, Amazon, Facebook, and Google have been successful in focusing their business strategies on leveraging their DBEs to improve long-term customer orientation.[48] The goals of ever-expanding access to data and leveraging the DBE business model to achieve growth and permanence highlight three major behavioral features of DBEs that are relevant to market power: the value of user data, user engagement and incentives to violate privacy, and algorithmic preference-shaping.

1. THE EXTRAORDINARY VALUE OF USER DATA

The explosive growth of the DBEs is evident in the unprecedented collection and commercial use of user data.[49] Data come from multiple sources, including information given voluntarily in exchange for free services such as internet search and social networking. Data are also collected from various user interactions with DBEs through cookies, tracking web surfing, sensor data; or derived from other data.[50] As DBEs become more sophisticated and enter further cycles of expansion, their expanding base of users will generate significantly more user data that reveal key information, such as their "preferences, their locations, their friends, their political views, and almost all other facets of their lives."[51]

It is well-known that masses of raw user data do not offer much value. Data must be processed and harnessed to realize its full value to the DBE and the commerce within it.[52] This process is described at the most basic level as transforming "disparate pieces of information about a consumer's immediate desires and behavior into insight about the consumer's broader needs."[53] This transformation, in turn, allows sellers to "map a given consumer's data into estimates of his values for products," to produce search results, personalized product recommendations, product ratings, and targeted advertisements.[54] These same concepts are understood in the business literature as "uncovering, appropriating, and cultivating" user data.[55]

Cloud infrastructure is the vehicle for transforming user data into a form that is compatible with the creation of value within a DBE. As noted by one expert, cloud capability has "further boosted the commercial value of data and online connectivity."[56] Moreover, the bigger the ecosystem, the more valuable becomes the value proposition itself. Namely, the expansion of data collection across services allows DBEs to acquire *further* data, making themselves even more valuable for advertisers.[57] This is

MGMT. REV. 9 (2019); and Margherita Pagani, *Digital Business Strategy and Value Creation: Framing the Dynamic Cycle of Control Points,* MIS QUAR. 37 (2013).

[46] Margherita Pagani, *Digital Business Strategy and Value Creation: Framing the Dynamic Cycle of Control Points,* MIS QUAR. 37 (2013).

[47] Praveen K. Kopalle, V. Kumar & Mohan Subramaniam, *How Legacy Firms Can Embrace the Digital Ecosystem Via Digital Customer Orientation*, J. OF THE ACAD. OF MKTG. SCE. (2020).

[48] *Id.*

[49] Dirk Bergemann, Alessandro Bonatti, & Gan Tan, *The Economics of Social Data*, Cowles Foundation Discussion Papers (2019), at 2.

[50] Wolfgang Kerber, *Digital Markets, Data, and Privacy: Competition Law, Consumer Law, and Data Protection*, Gewerblicher Rechtsschutz und Urheberrecht. Internationaler Teil (2016), at 2.

[51] Bergemann, et al, *supra* note 49, at 2.

[52] *See, e.g.,* Daniel Sokol & Roisin Camerford, *Antitrust and Regulating Big Data*, 23 GEORGE MASON L. REV. 1129 (2016).

[53] *Winning in Digital Ecosystems*, DIGITAL MCKINSEY INSIGHTS (Jan. 2018), at p. 12.

[54] Shota Ichihashi, *Online Privacy and Information Disclosure by Consumers, 110* AM. ECON. REV. 569 (2020), at 2.

[55] *Anna Morgan-Thomas, Laurence Dessart, & Cleopatra Veloutsou*, Digital ecosystem and consumer engagement: A socio-technical perspective, 121 J. OF BUS. RES. 713 (Dec. 2020), at 713.

[56] Garces, *supra* note 38, at 2.

[57] Nathan Newman, *Search, Antitrust, and the Economics of the Control of User Data*, 31 YALE J. ON REGUL. 401 (2014), AT 418.

enabled by data analytics which captures "innumerable data points and [turns] them, within milliseconds, into predictive, actionable opportunities for both sellers and buyers."[58] Moreover, while the data derived from different user search services may be relatively comparable, a large DBE like Google can use data from email, video watching, etc. to create a more comprehensive set of data for advertisers.[59]

To be sure, many tout the benefits related to the harnessing of user data. For example, data analytics allow for better predictions about consumer preferences and behavior, thus allowing the DBEs to offer "huge cost reductions for firms as well as new and improved public policies (health, safety, security, and education)."[60] But the flip side is that the DBE value proposition creates a variety of powerful incentives, propagated by the DBE's unique economic, technological, and business characteristics. For example, collection of information from private and public sources creates an "almost unique identity" for each user.[61] Individualized transactions based on this identity enable the DBE to discriminate by tailoring offers and suggestions for services to the specific user. Much like the ability of a seller of specialty products to charge different consumers different prices, discrimination on the basis of user-specific information allows the DBE to appropriate most, if not all, surplus from the consumer.[62]

The market failures that pervade DBEs also have implications for the value of user data. Positive network effects are a demand-side externality that work to make a network more valuable to all users when more users join it. This encourages users to divulge information that they otherwise would not provide and promotes "tipping" to a dominant provider, such as in personal social networking (e.g., Facebook), micro-blogging (e.g., Twitter), and internet search (e.g., Google). This acts to create barriers to entry for smaller DBEs and competitors with less complex business models and that seek to challenge the position of an incumbent DBE.

On the supply side, DBE's are home to powerful data externalities. These are revealed in the value of a small number of users' data in predicting the behavior of a larger number of users. This includes how the privacy choices of a smaller number of users affect what sellers can learn about the privacy preferences of others. Data externalities reduce intermediaries' costs of acquiring information but can also induce DBEs to require users to provide more detailed, personal information.[63] DBEs can coerce this provision through lock-in or resource dependence,"[64] potentially resulting in the collection of an excessive amounts of private data.[65]

2. USER ENGAGEMENT AND PRIVACY

We now turn to a key implication of the value of user data in the DBE business model. That is, namely, how consumers *engage* with DBEs in providing their data and information, in exchange for engagement and services. This complexity draws attention to some key economic assumptions that explain consumer behavior and are a key component of competition analysis. This analysis begins with the concept of the

[58] DIGITAL MCKINSEY INSIGHTS, *supra* note 53, at 12.
[59] N. Newman, *supra* note 57.
[60] Kerber, et al, *supra* note 50, at 2.
[61] Nicholas Economides & Ioannis Lianos, *Antitrust and Restrictions on Privacy in the Digital Economy, 2* CONCURRENCES REVIEW 22 (May 2020), at 23.
[62] Gerhard Wagner & Horst Eidenmüller, *Siphoning Rents, Exploiting Biases and Shaping Preferences – the Dark Side of Personalized Transactions*, 86 UNIV. CHICAGO L. REV. 581 (2019), at 28.
[63] Ichihashi, *supra* note 54, at 2.
[64] Economides & Lianos, *supra* note 61, at 23.
[65] Kerber, *supra* note 50, at 7.

rational consumer, or one that makes choices efficiently, in a way that maximizes utility. Those choices pattern into purchasing decisions and provide valuable insight into consumers' preferences.[66] Preferences are established by the value the consumer places on different product attributes, which can include quality or product design, often conveyed through advertising, marketing, and seller disclosure of information.[67]

Whether consumers engage in rational choice is more easily tested when the metric of exchange is price. In many DBE markets, however, users do not pay in monetary currency, but with their attention or information.[68] In these zero-price markets, consumers must decide how much personal information to divulge, in exchange for both private and public benefits. This decision is driven by their preferences for product attributes, such as the quality of their engagement with the DBE, which manifests in *how* personal user data is collected and used, or privacy.[69] Quality effects are, along with price and innovation, within the scope of the consumer welfare standard used to evaluate competition concerns.[70] In its decision on the acquisition of LinkedIn by Microsoft, for example, the European Commission (EC) noted that privacy is an "important parameter of competition and driver of customer choice" in the market for professional social networking services.[71]

To be sure, the value ascribed to the use of personal information varies *across* users. Some users derive significant value, for example, from the positive network effects associated with engagement through Facebook's large social media platform. Others value interconnectivity across devices afforded by an integrated hardware/software ecosystem such as what is offered by Apple. Users in both of these scenarios may be more or less willing to trade off privacy for the benefits of engagement. The observed anomalies around how individual users engage with DBEs, however, pose bigger questions for the assumption that consumers are rational. This "privacy paradox," which is supported by empirical analysis, has two major features.[72]

First, users are observed to make privacy choices based on multiple factors and on a case-by-case basis in their interactions with DBEs.[73] Users may be willing to divulge more personal information in seeking certain services (e.g., social media and locational), but less willing when searching for other services. For example, privacy around personal healthcare data remains a significant concern for consumers that are fearful of increases in their insurance premiums, should their insurer obtain adverse information about their health history or medical conditions.[74] Second, users have little knowledge of the extent to which DBEs collect their data and the behavioral targeting opportunities that are derived from it. Consumers routinely underestimate the extent to which their data is being collected and used to predict their

[66] *See* Paul A. Samuelson, *Consumption Theory in Terms of Revealed Preference* 15 ECONOMICA *243 (1948)*.
[67] This includes the level of demand and possible demand rotations (i.e., changes in the elasticity of the demand curve). *See, e.g.,* Daniel P. O'Brien & Doug Smith, *Privacy in Online Markets: A Welfare Analysis of Demand Rotations*, Federal Trade Commission, Bureau of Economics, Working Paper No. 323, Jul. 2014, at 3 and 11.
[68] John M. Newman, *Antitrust in Zero-Price Markets: Foundations*, 164 U. PENN. L. REV. 174 (2015).
[69] Diane Coyle, *Practical Competition Policy Implications of Digital Platforms*, 82 ANTITRUST LAW J. 835 (2019).
[70] *See, e.g.,* Fed. Trade Comm'n. v. Facebook, Inc., *supra* note 42, at 9.
[71] Regulation (EC) No 139/2004, Merger Procedure, Case M.8124 – Microsoft-LinkedIn, European Comm'n, DG Competition, Jun. 12, 2016, at 77, footnote 330. For more in-depth legal analysis of antitrust and privacy, *see* the following forthcoming AAI report, available on the AAI website (antitrustinstitute.org): Laura Alexander, PRIVACY AND ANTITRUST AT THE CROSSROADS: THE INTERSECTION OF LEGAL DOCTRINES IN BIG TECH.
[72] Kerber, *supra* note 50, at 6.
[73] Agustín Reyna, *The Psychology of Privacy: What can Behavioral Economics Contribute to Competition in Digital Markets?* 8 INT'L. DATA PRIVACY LAW 240 (2018), at 5.
[74] Letter from AM. ANTITRUST INST. to U.S. DEPT. OF JUST., Re: Antitrust Review of UnitedHealth Group's Proposed Acquisition of Change Healthcare, May 5, 2021, and Kenneth David Strang & Zhaohao Sun, *Hidden big data analytics issues in the healthcare industry*, 26 HEALTH INFORMATICS J. 981 (2020).

behaviors,[75] often concluding that it is "too difficult to find out what companies are doing with their data."[76] Moreover, while consumers can tell the quality of the product they are using, differences in how their data is used by different companies can be opaque. The inability to write user-specific contracts for privacy means that privacy policies are standardized, often through notice and/or consent. But even in regard to privacy policies, the majority of customers do not understand what they are agreeing to and what the implications are.[77]

The foregoing features around user data and privacy raise questions about the reliability of the assumption that consumers engage rationally with DBEs. Indeed, empirical work exposes behavioral biases in how users interact with DBEs.[78] For example, a well-informed rational consumer that "always reads the privacy notices" would "always be aware of the risks associated with sharing his or her personal data with firms."[79] However, even when consumers state certain preferences for how they want their data used, when it comes to light that their data was used improperly, they rarely change their behavior.[80] A 2019 study examined the "attitudes" versus "actions" of consumers with respect to privacy, finding that about one-third of privacy "actives" were willing to switch companies over data and data-sharing policies.[81] However, these privacy actives behaved counterintuitively. Namely, when presented with scenarios involving sharing of their data in exchange for benefits, more than twice as many were comfortable with sharing than non-privacy actives.

Economists attribute the misalignment between user attitudes and actions around privacy in the context of DBEs to an information asymmetry between the user and the firm.[82] In other words, while the firm has complete information about user data, the user has little to no information about how much is collected, how it is used, and even the DBEs' policies regarding its use. Moreover, the current tools available to users for understanding and making reasoned and consistent decisions based on DBE privacy policies appears inadequate to correct this significant market failure.

3. ALGORITHMIC PREFERENCE-SHAPING

The previous discussion examines the value of data in the DBE business model and anomalies around how users interact with them. This section closes the loop by turning to how DBEs engage with users, an approach that relies on the deployment of algorithms using data analytics, supported by AI and machine learning, to "shape" consumer preferences. Algorithmic shaping of user preferences involves curating options based on past expressed preferences. Algorithms are continually recalibrated based on information and learning from repeated user interactions. As one expert notes, preference-shaping works to steer users into a "particular consumption pattern, effectively locking them into a lifestyle determined by their past choices and those of likeminded fellows." [83] The continual shaping and re-shaping of preferences through algorithmic recommendations means that consumer preferences may

[75] Kerber, *supra* note 50, at 7.
[76] Thomas C. Redman & Robert M. Waitman, *Do You Care About Privacy as Much as Your Customers Do?* HAR. BUS. REV. (Jan. 28, 2020).
[77] *See, e.g.,* Julie Brill, *The Intersection of Consumer Protection and Competition in the New World of Privacy*, 7 COMPETITION POLICY INT'L (Spring 2011).
[78] Reyna, *supra* note 73, at 3, footnote. [note that behavioral economics "abandon[s] the presumptions of rational choice theory and seek to understand human behaviour by relying on non-economic disciplines such as neuroscience and psychological and sociological methods."]
[79] *Id.*, at 5.
[80] *Id, at 2* [noting "In the aftermath of Facebook's Cambridge Analytica scandal the social media company should have seen a higher number of consumers switching services or closing their accounts, but the outcome was the opposite."]
[81] Redman & Waitman, *supra* note 76.
[82] Economides & Lianos, *supra* note 61 and Kerber, *supra* note 50.
[83] Wagner & Eidenmuller, *supra* note 62, at 3.

not result from "a 'process of individuation' mastered by the consumer in question."[84] Rather, they reflect the outcome of a "fabricated informational sphere, built in a constant feedback loop," which is created and managed by a commercially motivated DBE.[85]

Firm strategies oriented around preference-shaping contrast with those tailored to more traditional preference-accommodation in less complex business models. Both are observed in commercial and non-commercial contexts. In the political system, for example, preference-accommodation focuses on selecting candidates with platforms that conform to the desires of voters, while preference-shaping involves adjusting political messaging to maintain or change social or voter preferences in ways that are favorable to the party.[86] In the commercial context, business school research reveals that preference-accommodation strategies include "buy what we have" and "responding to customers desires."[87] Both feature the customer's own identification of needs and purchasing options. But businesses respond in the former case by providing high quality offerings at competitive prices and in the latter with a fast, seamless fulfillment process.[88] In contrast, preference-shaping models include curated offerings and coaching behavior. The first features early involvement with the customer, after they establish their needs, but before they determine how to fulfill them, thus steering the customer to products and services through personalized recommendations. The second involves coaching customers as to their needs and nudging them to take steps to meet them.[89]

Business research highlights the problem of algorithm "overdependence" in DBEs. This occurs when consumers "surrender to algorithm-generated recommendations even when the recommendations are inferior."[90] Research concludes that algorithmic-dependent consumers "frequently depend too much on algorithm-generated recommendations, posing potential harms to their own well-being and leading them to play a role in propagating systemic biases that can influence other users."[91] Much like consumer behavior in regard to data and privacy, preference-shaping raises fundamental questions around key assumptions underlying the economic models relied on in competition analysis. Namely, the concept of economic efficiency is based on the "optimal satisfaction of individual preferences."[92] However, when the seller has shaped or manipulated user preferences, based on algorithmic suggestions that reflect what the DBE "thinks" the user wants, it is unclear whether a transaction results in positive welfare effects for the user, or even the seller.[93]

To be sure, there are limits on the extent to which DBEs can exploit market failures and economic anomalies through algorithmic recommendation systems. For example, if "relevance rank" models that are used by DBEs to present results to users repeatedly show users what they do not want, users will choose a different search engine or social networking platform. But these options depend critically on competition from rivals, which may not be present in markets dominated by large DBEs. Users may also switch if they are able to detect that they are being served biased search results or advertising content

[84] *Id.*, at 15.
[85] *Id*.
[86] *See, e.g.,* Rune Stubager, *Preference-shaping: An Empirical Test*, 51 POL. STUDIES 241 (2003).
[87] Nicolai Siggelkow & Christian Terweisch, *The Age of Continuous Connection*, HAR. BUS. REV., May-June 2019.
[88] *Id.*
[89] *Id.*
[90] Sachin Banker & Salil Khetani, *Algorithm Overdependence: How the Use of Algorithmic Recommendation Systems Can Increase Risks to Consumer Well-Being*, 38 J. OF PUB. POL. & MKTING. 500 (2019), AT 500.
[91] *Id.*
[92] Wagner & Eidenmüller, *supra* note 62, at 22.
[93] *Id.*

that withholds a disfavored option, such as a rival's product. Given the opacity of algorithmic recommendation systems, however, this is highly unlikely.

It is also true that the exploitation of user data depends on the type of user engagement. For example, subscription services and advertising models involve different degrees of (and parties involved in) control of user data and the processing of user data. This highlights the difficulty of informing the user about policies governing use of their data, such as explicit consent to allow processing of data, versus implicit consent such as agreeing to terms of service. In sum, the collection, enhancement, and deployment of user data is central to the creation of value across the markets and collaborations that define DBEs. Strong incentives to exploit the unique economic, technological, and business features of DBEs supercharge this value proposition, which manifests in algorithmic preference-shaping as a major behavioral feature these complex business models.

IV. INSIGHTS FOR COMPETITION ANALYSIS AND REMEDIES

Analysis in the previous sections has important implications for key components of competition analysis, including how markets are defined, the evaluation of competitive effects, and remedies designed to restore competition. Indeed, the unique characteristics of DBEs have prompted experts to suggest that the tools of competition enforcement should be revised or updated. One notes that a "[a] deeper knowledge of the functioning and of the specificities that characterize these markets is crucial to adapt old antitrust and competition policy tools to new challenges."[94] Another explains that there is a need to recalibrate traditional tools for these complex platforms.[95] This section highlights key areas of competition analysis that would benefit from a deeper examination of the adequacy of conventional approaches for addressing the challenges posed by DBEs.

A. RETHINKING RELEVANT MARKETS

Defining a market in which an antitrust defendant competes, or potentially competes, is a critical and often pivotal stage of competition analysis. Absent direct evidence of anticompetitive effects, an antitrust plaintiff in merger, and most conduct, cases must establish a relevant market. This is comprised of the set of products or services to which consumers can turn to avoid the exercise of market power through a price increase (in positive-price markets) or a quality decrease (in zero-price markets).[96] Market definition hinges critically on properly identifying the demand for a product or service. And since demand is ultimately a function of consumer preferences, difficulty in establishing those preferences could render estimates of demand inaccurate. The strategy of algorithmic preference-shaping by exploiting market failures and other economic anomalies exacerbates this problem.

The foregoing concerns are important because demand is the ultimate arbiter of market power. The nature of demand bears directly on how consumers will respond to the exercise of market power by switching to competing providers of digital products and services. Inaccurate estimates of demand could therefore affect DBE market definitions, leading to overly broad, or overly narrow, relevant markets and misestimates of the anticompetitive effect of a merger or harmful conduct. In particular, inaccurate estimates of demand could miss important instances where a DBE is itself the relevant market.

[94] Emilio Calvano & Michele Polo, *Market Power, Competition and Innovation in Digital Markets: A Survey,* INFO. ECON. & POL., forthcoming, Dec. 1, 2019, at 27.
[95] Coyle, *supra* note 69, at 12.
[96] Reyna, *supra* note 73, at 10 [citing Gebicka & Heinemann, who suggest a Small but Significant Non-transitory Decrease in the Quality (SSNDQ) test. Aleksandra Gebicka & Andreas Heinemann, *Social Media & Competition Law*, 37 WORLD COMPETITION LAW AND ECONOMICS REVIEW 149 (2014)].

The connectivity of markets within a DBE, anomalies around user data and privacy, and the role of algorithmic preference-shaping in engaging users supports the notion of a DBE as the relevant market. It is increasingly accepted that traditional market definition should focus on a broader view of a platform market ecosystem.[97] While the concept of "inter-system" competition in traditional business models such as telecommunications, agricultural biotechnology and healthcare is not a new idea, the idea of digital "cluster" markets has recently garnered more attention.[98] For example, one expert explains that Facebook "offers a variety of noncompeting services….[d]ifferent subscribers use these things in differing proportions and some may not use certain features at all. But the immediate and ongoing availability of the cluster is itself valuable to customers, as is the ability of existing members to add or drop a particular service."[99]

B. WIDENING THE LENS ON POTENTIAL ANTICOMPETITIVE EFFECTS

The analysis in this report raises novel questions around how DBE's engage in consolidation and conduct designed to limit competition from rivals. The complexity of DBEs, coupled with their unique economic, technological, and business features, give rise to a commensurately diverse set of potential strategies for excluding rivals to reinforce a dominant market position, or to leverage market power into other markets within the DBE. For example, ownership of a dominant platform, on which the DBE competes with third-party providers, increases incentives to limit competition from rivals. Recent antitrust complaints frame a number of strategies for exercising market power to reinforce dominance. For example, the 2020 state complaint against Facebook alleges the firm "selectively enforce[d] its policies to cut off API access to companies Facebook worried might one day threaten its monopoly."[100]

Likewise, platforms can limit competition by demoting third party offerings in search or shopping results. In 2012, the FTC investigated whether "Google unfairly promoted its own vertical properties through….the introduction of the 'Universal Search' box, which prominently displayed Google vertical search results in response to certain types of queries."[101] And in 2020, the EC investigated whether Amazon favored its own retail offers and those of sellers that used Amazon's logistics and delivery services" in calibrating which sellers appear in Amazon's 'Buy Box' and are eligible to participate in its Prime loyalty program.[102]

DBEs can also engage in other, less recognized, forms of exclusionary conduct. For example, cloud infrastructure provides the critical functionality for executing the DBE value proposition. Control of cloud technology therefore equates to control of an essential input, necessary for rivals to do business within a DBE. Economies of scale in cloud infrastructure and other unique features of DBEs directly affect incentives to engage in strategic anticompetitive conduct.[103] As discussed earlier, high concentration in cloud markets exacerbates these concerns. Given these considerations, It is therefore

[97] *See, e.g.,* Coyle, *supra* note 69, at 12.
[98] *See, e.g.,* Gregory Gundlach & Diana L. Moss*, Systems Competition and Challenges to Antitrust Thinking: An Introduction*, 56 ANTITRUST BULL. (Spring 2011).
[99] Herbert Hovencamp, Digital Cluster Markets, COL. BUS. L. REV. (2021) (forthcoming), at 6.
[100] Complaint, FTC v. Facebook, No. 1:20-cv-03590 (D.D.C. filed Dec. 9, 2021).
[101] *See* Statement of the Federal Trade Commission Regarding Google's Search Practices 3, n.2, In the Matter of Google Inc., FTC File No. 111-0163, Jan. 3, 2013.
[102] Commission Sends Statement of Objections to Amazon for the Use of Non-Public Independent Seller Data and Opens Second Investigation into Its E-commerce Business Practices, European Commission, Nov. 10, 2020.
[103] Calvano & Polo, *supra* note 94, at 27. *See also,* Marc Bourreau, *Some Economics of Digital Ecosystems,* Hearing on Competition Economics of Digital Ecosystems, Directorate for Financial and Enterprise Affairs Competition Committee, OECD, Nov. 13, 2020, at 4.

troubling that the strategic competitive implications of cloud infrastructure have largely been overlooked in competition analysis involving the DBEs.

At a minimum, for example, high concentration in cloud raises barriers to entry to smaller DBEs that lack access to cloud capability on the scale necessary to challenge the market position of an incumbent. This fact should feature prominently in competition investigations involving DBEs. Control of cloud opens a number of doors to strategic conduct. A DBE can deny rivals' access to cloud technology, or grant access only on discriminatory terms and conditions. DBEs can also deploy cloud technology to favor a DBE's proprietary products and services and disadvantage rivals through algorithmic recommendations that steer users to proprietary services, at the expense of rivals.[104] DBEs can also manipulate firewalls that cordon off rivals' cloud data from the data specific to the DBE's proprietary interests. Given the lack of transparency in the use of cloud technology, these strategies would work to lock users into a proprietary system, thus limiting their ability to switch to a DBE that offers a similar service or cluster of services. Such conduct is likely to be difficult for rivals to detect, in comparison to more transparent exclusionary tactics.

In the merger context, acquisitions designed to expand DBE cloud capability should draw attention to increased control of an essential input and extension of market power to other parts of an ecosystem. For example, the DOJ noted in Google's acquisition of Admeld (2011), that the acquisition would enable Google to extend its market power in Internet search to the display advertising market.[105] Likewise, the European Commission's (EC's) concern in Google's acquisition of fitness wearables maker, Fitbit, was the potential extension of Google's enhanced market power in the market for health and fitness data to the broader ad-tech market.[106] Enforcers' recognition of these competitive concerns is a step in the right direction. However, given the significant and unrestrained expansion of cloud capability and the hundreds of unopposed acquisitions made by the five largest DBEs over the last 25 years, it is clear that enforcement activity lags far behind.

Needless to say, any efficiencies justifications for anticompetitive mergers or conduct in DBE markets would have to account for their unique features. For example, given the strategic competitive importance of cloud infrastructure, the alleged benefits of any cost savings resulting from enhanced economies of scale through horizontal acquisition should be viewed with extreme skepticism. Moreover, promises to deliver new and better products as the result of DBE acquisitions would need to be accompanied by hard evidence that such innovation does not rely on exploiting the economic anomalies of the DBEs that contribute to market power concerns.

C. HYBRID REMEDIES AND COMPLEMENTARY ANTITRUST AND REGULATION

The analysis above illustrates the unique economic, technological, and business features of DBEs and the challenges they pose for conventional competition analysis. We ask now how these same factors are likely to affect the relative success of remedies that, to be effective, must restore competition lost by harmful conduct and consolidation. These include both antitrust and regulatory approaches, and

[104] For in-depth legal analysis of self-preferencing conduct, *see* the following forthcoming AAI reports, available on the AAI website (antitrustinstitute.org): Randy Stutz, ANTITRUST LAW AND DOMINANT-FIRM BEHAVIOR IN THE DIGITAL TECHNOLOGY SECTOR: TOWARD AN ACTIONABLE AGENDA FOR POLICYMAKERS; Randy Stutz, ANTITRUST, DOMINANT FIRMS, AND PUBLIC POLICY PROBLEMS: A FRAMEWORK FOR MAXIMIZING SUCCESS BY MINIMIZING UNCERTAINTY.

[105] U.S. Dept. of Just., Statement of the Department of Justice's Antitrust Division on Its Decision to Close Its Investigation of Google Inc.'s Acquisition of Admeld Inc., Dec. 2, 2011.

[106] Mergers: Commission clears acquisition of Fitbit by Google, subject to conditions, European Commission, Dec. 17, 2020.

structural and behavioral remedies. Structural remedies include antitrust divestitures and large scale, legislated structural separations (i.e., breakups). They have been proposed to address competitive concerns that are the focus of the recent monopolization cases against Google and Facebook, and to unwind past harmful transactions, such as Facebook's acquisitions of Instagram and WhatsApp.

Behavioral remedies include antitrust conduct remedies or legislated regulatory regimes. However, antitrust remedies that limit anticompetitive conduct through requirements and prohibitions are disfavored by competition advocates.[107] They preserve the firm's market power, create incentives to circumvent the remedies, and require enforcers and the courts to act as monitors—a task for which they are ill suited. This is best illustrated by Live Nation-Ticketmaster's highly publicized, problematic violation of conduct remedies contained in the 2010 consent decree and concerns over similarly constrained post-merger conduct by Comcast and NBCU.[108] Moreover, antitrust conduct remedies are not an efficient tool for addressing the depth and breadth of problems at issue in DBEs that give rise to dominance and anticompetitive incentives. Much of the harmful conduct that could be proscribed in a consent order would be undetectable by rivals and consumers and difficult for the courts to enforce. As a result, a better "home" for conduct remedies may be as part of a legislated digital regulatory regime that governs the conduct of DBEs.

A discussion of effective remedies begins by asking how they address the unique features of DBEs that give rise to competition concerns. This critical analysis is largely missing from the debate over the market power of the large DBEs. For example, proposals for large scale breakups are based largely on past examples such as the AT&T (1984) and Standard Oil (1901) antitrust cases. These sectors feature different forms of economic organization and business models—without the pervasive market failures and other unique economic, technological, and business features—than what we see in DBEs. [109] Breakup proposals also lack important detail and granularity, leaving many unanswered questions. These include the size thresholds for mandated structural DBE separations and criteria for determining the viability of buyers for highly specialized, divested DBE assets.[110] Problems with either of these critical assessments could create unintended consequences or failures.

The efficacy of structural remedies in restoring competition lost by anticompetitive mergers or conduct rests on the fact that dominant firms have strong incentives to engage in conduct that constrains competition and harms consumers. Structural remedies offer permanent fixes by reducing the firm's ability or incentive to exercise market power. For example, experts have considered the use of structural remedies to address competitive problems arising around user data and privacy in DBEs. Indeed, economic modeling reveals that in the absence of competition, a monopolist will provide a less than socially optimal level of privacy[111] and the "insufficient provision of privacy options for fulfilling the different privacy preferences of users."[112]

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[107] *See, e.g.*, John Kwoka & Diana Moss, *Behavioral Merger Remedies: Evaluation and Implications for Antitrust Enforcement*, 57 ANTITRUST BULL. 979 (2011).
[108] Letter from AM. ANTITRUST INST. to U.S. DEPT. OF JUST., Re: Amended Final Judgment: U.S v. Ticketmaster Entertainment, Inc., and Live Nation Entertainment, Inc. (Feb. 4, 2020).
[109] *See, e.g.,* Diana L. Moss, *Breaking Up Is Hard to Do: The Implications of Restructuring and Regulating Digital Technology Markets*, 19 ANTITRUST SOURCE (October 2019).
[110] *Id.*
[111] O'Brien & Smith, *supra* note 67, at 26.
[112] Kerber, *supra* note 50, at 7.

One structural approach may therefore be to assign property rights to data, create a separate market for it, and rely on market forces to determine its value.[113] This raises a number of questions. For example, how should property rights to data such as medical information be allocated when a number of market participants enrich it and thus claim a right to it? And how would allocations of property rights among advertisers, infomediaries, and third-party vendors affect transaction costs?[114] A different structural approach to addressing the problem around user data and privacy is to break up a dominant DBE into smaller parts. More rivalry might increase incentives for smaller players to differentiate their services by providing greater privacy protection.[115]

Both of the foregoing scenarios, however, do not answer key questions about how effective structural remedies would be in addressing the unique economic, technological, and business characteristics of the DBEs. For example, analysis in this report has exposed the market failures and incentives to exploit user data and privacy as powerful drivers of the DBE value proposition and a central source of market power. Incentives to exploit these unique features (e.g., network effects and data externalities) would likely persist post-breakup. As one expert noted, in fact, more competition could "easily promote more intense efforts to obtain personal data."[116] Because competitive problems in DBEs are often the product of unique features, it is not clear that structural remedies alone would be effective in restoring competition lost by harmful mergers or conduct.

Another application of a structural remedy to address competitive problems in DBEs is to separate affiliated businesses from the platform to reduce incentives to exclude rivals. Post-separation, the platform would provide only an essential network service, much like a rail network or electric transmission system operator. Without affiliated businesses as part of the multiproduct DBE firm, a structural separation of this type fundamentally alters the DBE value proposition, eliminating the incentive to foreclose rivals from the platform, or to otherwise limit emergence of competitors that could threaten the dominance of an incumbent DBE. In theory, rivals would operate on a more level playing field, out of the shadow of a DBE's affiliated businesses, and no longer the target of discriminatory conduct.

Regardless of what competitive problems structural remedies are designed to address, policymakers will need to consider a number of issues. For example, the growing record of failed antitrust divestitures raises the real possibility that buyers of highly specialized DBE assets could fail to maintain them and eventually exit the market. Also important is the fact that a DBE's incentive to maintain and invest in its platform is driven both by competition with third-party rivals on the platform *and* the risk of losing users to competing DBEs. Without this incentive, structural separation could weaken such incentives, leading to an overall decay in the quality of the platform, especially cloud infrastructure, access to which is essential for rivals to compete effectively post-separation. Such spillover effects on third-party providers could threaten the increased choice and innovation that a structural remedy is designed to deliver. These effects are generally illustrated by the spinoff of the British railway system to an independent operator in the 1990s, which was followed by safety problems and modifications to the original ownership and operation scheme.[117]

[113] *See, e.g.,* Brill, *supra* note 77.
[114] Mark MacCarthy, *Privacy Is Not A Property Right In Personal Information*, FORBES.COM, Nov. 2, 2018.
[115] Eugene Kimmelman, Harold Feld, & Agustín Rossi, *The Limits of Antitrust in Privacy Protection*, 8 INT'L. DATA PRIVACY L. 270 (2018).
[116] *Id. See also,* Frank Pasquale, Privacy, Antitrust, and Power, 20 GEO. MASON L. REV. 1009 (2013).
[117] Russell Pittman, *Structural Separation and Access Pricing in the Railways Sector: Sauce for the Goose Only?* Oct. 15, 2004.

Similar questions arise around the effectiveness of conduct remedies that are embedded in a broader regulatory regime. For example, increasing users' control of their own data could, in theory, enable better alignment of their preferences for privacy with how they actually behave in DBEs. This includes data portability requirements that allow users to move or transfer their data from one DBE to another, thus easing switching and encouraging multi-homing between competing bundles of DBE services, and reducing lock-in effects that constrain competition. Providing users with more transparency around a DBE's use of their information is also a potential behavioral remedy. This could take the form of clearer, tiered opt-out provisions, presented to the user at the time of an interaction or transaction, or when the user is deciding to provide more data.

While conduct remedies designed to increase user control of data are a move in the right direction, the unique features of DBEs may likely compel stronger restrictions to rein in exploitative and anticompetitive conduct. For example, in addition to platform interoperability standards, some suggest regulating DBE algorithms to remove bias against rivals.[118] Others suggest that in problematic acquisitions involving DBE assets, regulatory approvals be conditioned on requirements that the parties keep their databases separate post-merger, or establish firewalls between the datasets of a DBE and its rivals.[119] Yet others suggest that a regulatory conduct regime include requirements that DBEs share user data with rivals operating within their ecosystem.

In sum, proposed regulation of DBEs is likely to address, in some form, a number of elements. These include: access to a platform through interoperability standards and nondiscriminatory terms and conditions for third-party access to cloud infrastructure; an actionable and effective set of data and privacy controls for users; and controls on the acceptable use and enrichment of data, including data sharing requirements, firewalls, and algorithms. However, many such restrictions would be met with significant resistance. DBEs would likely oppose any outside access to algorithms and invoke First Amendment protection to prevent it.[120] Combining datasets and cloud capability are likely to be a major motivation for many DBE acquisitions, so requirements that they be kept separate would debilitate claims that scale economies would lower costs. Mandatory data-sharing raises questions about what and how much data should be shared between the DBE and rivals in order to minimize incentives to exclude them. Moreover, given the stark information asymmetry between enforcers and DBEs, it is not clear how enforcers, courts, and regulators could (or would) alter and monitor algorithms to eliminate bias against rivals.

This report is not intended to provide the contours of an effective regulatory regime for the digital technology sector. However, a major takeaway from the foregoing analysis is that any regulatory regime that ultimately governs the conduct of DBEs will likely be the product of an imperfect process of bargaining and rent-seeking. As such, it will contain imperfect restrictions on conduct that will be subject to gaming and ongoing legal challenges. The discussion above also highlights the inherent limitations on ability of structural remedies to address the unique characteristics of DBEs that give rise to competition concerns. In combination, these forces create enormous pressure for competition enforcers and policymakers to consider a hybrid structural-conduct remedial approach.

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[118] Coyle, *supra* note 69, at 7.

[119] *See, e.g.,* In the matter of Google/Double Click, Dissenting Statement of Commissioner Pamela Jones Harbour (F.T.C. File No. 071-0170, Dec. 20, 2007). *See also*, Inge Graef, *Blurring Boundaries of Consumer Welfare: How to Create Synergies between Competition, Consumer and Data Protection Law in Digital Markets*, Dec. 7, 2016.

[120] Randy M. Stutz, *An Examination of the Antitrust Issues Posed by Google's Acquisition of ITA,* AM. ANTITRUST INST. (Feb. 18, 2011), at 22.

While there are numerous models upon which to base a regulatory regime, such a system would be relatively novel and require a regulator capable of implementing regulation in complex business organizations and dynamic markets. Significant thought should be given to the appropriate role of antitrust enforcement, as a mechanism of law enforcement, in addressing competitive concerns raised by the DBEs. Perhaps more important is how antitrust and regulation will work in a complementary way (rather than conflict) in promoting competition in the sector. This includes avoidance of any statutory or judicially created exemptions, which could imperil the vital role of antitrust enforcement.

V. IMPLICATIONS AND RECOMMENDATIONS

The body of scholarship and policy analysis surrounding the competition problems raised by DBEs is relatively saturated. Many countries are now actively framing public policy solutions and are poised to act through some combination of legislation and competition enforcement. This study fills an important void in the body of competition research on DBEs through multidisciplinary analysis of their unique economic, technological, and business characteristics. These include significant market failures on both the demand and supply sides, and other economic anomalies. Because they have an outsized effect on the analysis of competition and remedial approaches involving DBEs, these features should receive important attention from policymakers. The conclusions outlined below inform the debate over proposals to regulate the digital technology sector, antitrust agency guidance on digital technology markets, potential FTC rulemakings involving the digital sector, or other mechanisms that would affect how the antitrust agencies, the courts, and a potential sector regulator assess competitive issues involving DBEs.

- **In light of the distinct economic, technological, and business features exhibited by the DBEs, agency guidance on how enforcers will evaluate competition concerns involving them is urgently needed.** The antitrust agencies have issued guidance over the years on a number of specific issues and sectors, including healthcare and others. This report reveals how those unique features challenge conventional competition analysis, as applied to DBEs. The public, consumers, and businesses would thus be well served by dedicated agency guidance on how enforcers propose to address competition issues raised by DBEs.

- **The centrality of data to the DBE business model reveals the under-recognized but strategic importance of cloud infrastructure as the engine of DBE growth and expansion.** Analysis in this report fully reveals the centrality of data analytics, supported by AI and machine learning, to the DBE value proposition and associated market power concerns. Significant and unrestrained growth in the large DBEs' cloud infrastructure over the last decade has reinforced this capability, reinforcing platforms, setting the stage for further expansion, and enhancing incentives to extend market power throughout larger DBEs. Antitrust enforcers should more closely scrutinize cloud infrastructure acquisitions by the large DBEs.

- **Consumers do not engage with DBEs in ways that accurately reflect their preferences for privacy, with significant implications for conventional competition analysis.** Consumers lack information regarding how DBEs collect and deploy their data, creating a misalignment between users' preferences and actions. This information asymmetry strains key economic assumptions that underpin conventional analysis of consumer behavior. The vital role of demand as the ultimate arbiter of market power amplifies this concern. Antitrust enforcers should consider how these

features affect critical issues such as market definition and competitive effects in cases involving DBEs.

- **Unique characteristics of DBEs shift the mode of interaction between the firm and consumers to algorithmic preference-shaping, with significant implications for conventional competition analysis.** The DBE value proposition is driven by maximizing user engagement throughout an interconnected, multiproduct ecosystem. DBEs exploit numerous market failures and economies of scale to create value through algorithmic preference-shaping. But users' choices based on curated, personalized algorithmically generated suggestions may be inferior. Moreover, DBEs can use such algorithms to steer users to the services provided by their affiliated or preferred providers, at the expense of rivals operating on a platform. Antitrust enforcers should consider the mechanisms through which such conduct occurs, and the evidence needed to support a showing of adverse effects.

- **Policymakers should consider the need for "hybrid" remedies and close coordination between competition enforcement and regulation to address market power problems raised by DBEs.** Structural remedies do not entirely address the unique economic, technological, and business characteristics of DBEs that give rise to market power problems. Post-breakup, DBEs could be expected to continue to exploit anomalies and potentially re-emerge as dominant market players. Disrupting the DBE value proposition with conduct regulation will likely lead to imperfect regulation. As such, a hybrid structural-behavioral approach to reining in the market power of DBEs is likely to emerge as the best policy approach. This should be implemented through a broader regulatory regime, with careful thought given to how antitrust and regulation will coordinate, not conflict.