THE PRICE OF FREE

Written by Lesley Chiou and Avigail Kifer[1]

I. INTRODUCTION

Offering products for "free" has long been an important tool in business strategy. The U.S. calendar is peppered with days on which consumers can receive treats for free: National Pizza Day (February), National Donut Day (June), and Free Slurpee Day (July), among others.[2] The Yellow Pages have been distributed to consumers free of charge for decades, as have free-to-air television and radio services. Brick-and-mortar retail establishments offer free samples or products to draw people into their storefronts, and companies have also offered branded apparel and "giveaways" in hopes that wearers would help spread brand recognition.

Nevertheless, "free" products have recently been the focus of many antitrust investigations and complaints, both in the U.S. and abroad. "Free" products have gained particular prominence and ubiquity as the digital economy has developed and expanded. Today's consumers regularly use zero-price digital products or services in the form of search engines (Google, Yahoo, Bing), creative content (YouTube, Pinterest), social media (Facebook, Twitter, TikTok), communications products (Skype, Zoom), travel booking sites (Priceline, Kayak), and navigation services (Waze, Apple Maps, Google Maps).

While zero prices have received increased attention because of their frequency among digital products, the related economic issues they raise are neither new nor unique to digital markets. Economists have long studied zero prices in non-digital contexts and have developed analytical frameworks that could be applied broadly, including to digital contexts.[3] Economists broadly acknowledge that "free" goods are particularly interesting because while they deliver clear consumer benefits, they, like other goods, may have the potential to negatively affect both competition and welfare.[4] This dichotomy may occur because firms that offer "free" products profit through a variety of different strategies, including by collecting valuable consumer data, collecting advertising revenue, bundling with a positive price product, and/or charging consumers for premium services.[5] Several government reports and antitrust complaints against firms offering zero price goods have taken issue with some of these strategies, contending that, for example, the collection of valuable consumer data or the bundling of products and services allegedly allowed certain firms to secure and maintain dominance in related markets, such as advertising.[6]

One of the challenges now facing the antitrust community is how to assess whether behavior related to zero-price products is anticompetitive, as many metrics for analyzing competition usually rely on a measure of price. Not surprisingly, regulatory agencies have expressed a keen interest in learning more about how zero-price products have affected competition in the modern economy. In January

2022, for example, the DOJ and FTC issued a Request for Information (RFI) soliciting public input on modernizing the agencies' merger guidelines. A key area of focus was "digital markets," where the agencies specifically referenced "zero-price markets, negative-price markets, or markets without explicit prices" and asked whether "'quality' and other characteristics play the same role as price in market definition."[7]

While it is possible for anticompetitive conduct to exist in markets containing "free" or zero-price products, there are clear procompetitive economic incentives for such pricing arrangements.[8] Understanding these incentives and the mechanisms through which zero-price products are offered, particularly in (but not limited to) the digital space, is critical to understanding the evolving legal and regulatory environment around zero-price products and competition. In this article, we lay out these incentives and mechanisms, and then discuss the role that quality plays in markets with zero-price goods.

II. INCENTIVES AND MECHANISMS THROUGH WHICH "FREE" PRODUCTS ARE OFFERED

A seller that offers only a single product or service would not find it profitable to offer this sole product or service for "free" to *all* customers at all times.[9] In both traditional and digital markets, a "free" product is usually accompanied by a related, paid product. The relationship between the "free" and paid products or services (or between the customer groups paying zero and non-zero prices) is typically what incentivizes firms to offer products or services to certain customers for free in the first place. That is, a firm may find that giving Product A away for free leads to profitable increases in demand for Product B and ultimately higher profitability overall. This could be true whether Product B is an entirely different product from Product A, a higher quality version of Product A, or simply sales of Product A made later in time or sold to a different set of customers.

Evidence from behavioral economics provides further rationalization for the zero-price choice. Studies suggest that there can be a discontinuous change in demand when a product is priced at zero. In other words, demand for a product can jump sharply when its price is lowered to zero. When this discontinuity is present, firms have an additional incentive to offer free products.[10] An example often cited relates to one online retailer's introduction of free shipping in several countries, which triggered a dramatic increase in orders. In contrast, because the price of shipping in yet another country was mistakenly reduced to one cent rather than zero, the number of orders there remained relatively flat.[11]

There are several different types of economic arrangements in which the price of one product is free. These arrangements differ in terms of the relationship between the free and paid products, whether the consumers of the free and paid products overlap, and whether the zero prices are sustainable in the long run.

A. MULTI-SIDED PLATFORMS

The first type of product that is frequently offered for free is "access" to one side of a multi-sided platform. Economists use the term "multi-sided platform" to refer to a business or firm that adds value by acting as an intermediary between two or more distinct types of agents or customers whose demands for access to the platform (which facilitates interactions or transactions) are interdependent.[12] For example, social media platforms connect users and advertisers; streaming services connect content creators, content consumers, and advertisers; credit cards connect consumers and merchants; health insurers connect patients and healthcare providers.

A multi-sided platform may offer "free" access to one side while charging the other side because the demand from one group is directly or indirectly related to the demand from the other group: the value that customers on at least one side of the platform place on the platform will depend upon the demand for the network by customers on the other side. Economists refer to this form of demand

interdependency as "indirect network effects" between the customer groups, or "cross-side effects." For example, in the case of credit cards, the demand by merchants on one side and cardholders on the other is interdependent: the card is worth more to the cardholder when it is accepted by a greater number of merchants, and the value to the merchant of accepting payment cards from a particular brand is higher when more cardholders prefer to pay with cards from that brand. Similarly, the larger the audience on a streaming service, the more valuable the platform is to content creators and advertisers. The greater the variety in content, the more valuable the platform is to listeners or viewers.

Indirect network effects have important implications for how platforms price access to their services to each side of the platform and for overall consumer welfare. Demand interdependency means that a platform can increase the total usage of its platform and its profits by charging relatively more to the less price-sensitive group of customers and relatively less to the more price-sensitive group of customers.[13] In some cases, this can also increase the utility of both customer groups. Thus, in equilibrium, a platform will have an incentive to charge the less price-sensitive group of customers a higher price than the more price-sensitive group of customers, which may optimally result in the more price-sensitive group paying a zero price.[14] For example, a social networking site that allows consumers to join for free would attract more consumers than if it charges an access fee. In turn, the additional consumers would increase the site's value to advertisers, possibly even to the point where the increase in advertising profits more than covers any profits that would have come from charging consumers an access fee. A platform may have a further incentive to offer the more price-sensitive customers access for "free," as opposed to a cost slightly above zero, if transaction costs exist.

Note that for zero-priced platforms, at least one customer group is paying a non-zero price to the platform, which may come in the form of a subscription fee, a fixed fee per listing or sale, or a percentage of the transaction price, among other arrangements. For example, service providers pay a monthly fee to Booksy, a beauty and wellness appointment booking service, while consumers may book the appointments for free.[15] In addition to charging restaurants a subscription fee, OpenTable charges them a booking fee for every reservation made, while the diners that make the reservations do not pay the platform.[16]

While a platform may elect to not charge certain customers a positive monetary access fee, these customers may offer something of value that allows the platform to increase its own value to both sides of the platform. These non-monetary payments may take a number of forms, depending on the platform's monetization strategy. Some of the more common non-monetary payment types, particularly when the paid side of the platform involves advertisers, are characterized as the consumer's "attention" and "data." In return for accessing the platform's product for a zero price, the consumer implicitly agrees to exchange his attention (a valuable commodity for advertisers) or data (also valuable, as they may reveal his preferences and facilitate targeted advertisements). A consumer's data may include his contact information, social network, location, device ID, web browser history, past purchases, interactions with a business's website, and other metrics. A platform can then use this information to sell high-quality advertisement opportunities to advertisers, in which advertisers can identify target audiences or consumers most likely to purchase their products, personalize ads and ad content to users, measure ad effectiveness, and increase their return-on-investment.[17] The more value advertisers place on interactions with consumers, the greater the value they place on consumer attention and data, which help them improve the success rates of those interactions. In other words, the value of such non-monetary payments increases with the strength of the indirect network effects.

Importantly, these data can, and are also used to, improve the user experience offered by the platform itself. Platforms that incorporate consumer data can improve recommendation algorithms for video

and music streaming services for search engines, for news feeds, and more.[18] They can also use that data to learn about the limitations or potential of a product, and devise strategies to address those limitations or expand the product's potential more efficiently.

B. FREEMIUM OFFERINGS

The freemium strategy is characterized by the offer of a free, but basic, product or service, alongside a higher quality product with enhanced functionality or features. In this arrangement, the free and companion products are intertemporal complements (i.e., goods that are consumed together but at different times)[19] of different qualities purchased by the same consumers. Firms' incentives to employ this pricing structure lie in the fact that consumers are more likely to engage with the free product at first, which can then stimulate demand for the paid product. This demand may come both from (i) consumers buying the paid product sooner than they would have, had they not engaged with the free product; and from (ii) consumers that would not have otherwise bought the paid product, had it not been for the free version.

Freemium offerings exist in many contexts, including in multi-sided platforms. Key to the success of a freemium model is the likelihood that the revenues from the consumers of premium paid products will cover the costs of production for all the consumers. For example, in many instances, providers of online storage or music streaming services will offer a limited version of their service to consumers at no cost, but then charge a premium price for access to more space, a greater music library, the ability to curate playlists, etc. Mobile apps often have free and paid versions, where the paid version includes more features and functions. Online newspapers may offer a certain number of articles for free and require paid subscriptions from consumers who want to access more content. In fact, studies have shown that in some cases, offering a free product (via a freemium strategy) may be more effective at increasing revenues than offering a free trial.[20]

Such a business model is common among (but not exclusive to) providers of digital goods, as the low marginal costs of production may mean that even low volumes of sales of the paid product can compensate for losses on the free product.[21] Freemium business models are often well-suited for "experience goods," where consumers may be unable to assess the quality of (or their demand for) a product without "experiencing" it first. The option to experience a good for free has been shown to reduce the impact of product reviews in some settings, providing further incentive for companies to follow a freemium strategy. For example, while a paid mobile app's ratings affect the number of times it is purchased and downloaded, the ratings have a smaller effect on downloads for apps that offer free versions than for those that do not.[22]

C. BUNDLED PRODUCTS

Another economic arrangement in which "free" goods are found is in products that are explicitly or implicitly bundled. In this arrangement, the free and companion products are in related markets and are purchased by the same customers. For example, some travel packages offer a paid product alongside a "free" component, such as hotel room bookings that come with free breakfast. Experimental evidence indicates that consumers may even shift their demand towards a cheaper, less preferred hotel precisely due to the free breakfast option.[23] As another example, smartphones are often offered for "free" with the purchase of a cellular plan. This scenario differs from the travel example in that the marginal cost of a phone or device is significant (particularly in comparison to the marginal cost of a breakfast). The buyer of the smartphone "internalizes the impact of his purchase on the demand and surplus attached to" the cellular plan.[24] In other words, the buyer accepts a higher price for the plan (sometimes in the form of a long-term contract) in exchange for the free phone.[25]

As above, the rationale behind this pricing structure is that increasing demand for one product (by setting its price to zero) can increase demand for the bundled product, allowing the firm to at least break

even on both.[26] In other words, when the demand for two products is related (such as a smartphone and a cellular plan, or lodging and food), adjusting the relative prices for those products may increase total sales and profits, even if one of the products is nominally sold below cost or even for "free." As in the arrangements discussed above, in some cases, consumers may benefit from the free offering.[27]

D. OTHER ARRANGEMENTS

For completeness, we note that there are other arrangements where one good has zero price. These include arrangements where the production of the zero-price good is motivated by altruism or funded by charitable donations (e.g., Wikipedia, Linux software), or where the offer of a zero price is temporary and part of a promotional period or free trial (e.g., some subscription services or memberships).[28]

Note that zero price products may be offered simultaneously through multiple arrangements. It is not uncommon, for example, to pair a freemium strategy with a multi-sided platform, such that the free product is supported both by a paid version and by advertisers on the other side of the platform.

Regardless of the type of arrangement, however, zero prices for categories of goods do not indicate that firms are not competing. Competition between and with zero price products often takes the form of vigorous competition on quality, particularly in the multi-sided platform context.

III. QUALITY COMPETITION IN ZERO-PRICE PRODUCTS

As antitrust concerns targeting firms that offer zero price products continue to make headlines, understanding and appreciating competition on quality takes on significant import. In general, quality is a complex concept that is challenging to measure: there are many different dimensions of quality along which firms compete. Importantly, competition on the quality of the zero-price offering does not preclude competition on the quality of the related non-zero price offering.[29] Due to the indirect network effects, any improvements in quality that attract more users to the zero-price side of a platform may also increase the attractiveness of that platform (and thus its competitive position) for customers on the other sides.

The quality of a zero-priced product or service can be affected by the features of the service and by the degree to which the service develops innovative new features or improvements. For example, the quality of a search engine (from the consumer—or the zero price side—point of view) may be related to the speed at which it produces search results, the relevance of those search results, and the degree of personalization vs. privacy offered.[30] Some academics and antitrust practitioners have increasingly been focusing on data privacy in antitrust work, and have recommended treating data privacy as another aspect of competition on quality.[31] The quality of a social media site may be related to the content formats offered (text, images, videos), the options available to interact with users and the content they post, and the algorithm that presents this content to users. The quality of a news aggregation platform may be related to the customization options it offers and its ability to identify high quality news that is local or relevant to the user: empirical research has found that whether or not users research news materials in depth can be influenced by the degree to which an aggregator presents local or high quality news.[32] These are all examples where consumers are generally *consuming* the platform's product and thus their demand for the platform may depend on the product that the platform is offering them.

In cases where the platform acts as a matchmaker, the quality of the platform may additionally be affected by the sheer numbers of customers on each side of the platform. For example, the quality of a credit card network may be related to the travel perks offered, access to a dedicated concierge or customer service, and fraud protection features. It is also closely related to, in consumers' eyes, the number of merchants that accept the cards, and, in merchants' eyes, the number of consumers carrying

the cards. The quality of a streaming site may be related to its discovery features (e.g., the algorithm through which it recommends and curates new content) and audio quality offered. It is also closely related to, in consumers' eyes, the content available and the content creators on the platform, and, in content creators' eyes, the size of the audience. The content available, in fact, may be a meaningful differentiating factor for multi-sided platforms, which may find that signing exclusive arrangements with suppliers can enhance the competitiveness of the platform. In other words, differentiation can encourage consumers to multi-home across platforms in order to access a variety of content, which in turn stimulates competition among platforms for both consumers and the suppliers.

For digital platforms, the quality is also affected by features such as its user interface: Is the service easy to use? If the service includes online ads, do they create clutter?[33] Are they relevant for the user? While some posit that ads may be viewed as unwelcome or disruptive in some contexts, others suggest that ads may help users discover new brands and thus enhance the platform's value to consumers.[34]

Firms that offer zero-priced products may also compete by continually improving their products' features. For example, social media sites have developed user verification options, content that disappears after a set time, new ways to organize content, and a variety of engagement opportunities (likes, retweets, reactions, replies, shares).[35] They have worked to detect deepfakes[36] and to protect users from harmful or false content.[37] Similarly, search engines have been improving the artificial intelligence powering the search algorithms to better understand misspelled words, interpret very specific search phrases, or even conduct an image search. They have also experimented with the ways in which results are displayed, including by recognizing when a chart or graph may better serve a search request and processing the relevant data in order to do so, or by generating infographics.[38] In fact, for platforms that compete for user attention (the degree to which users engage with and spend time on the platform) in addition to the number of users, the incentives for such innovation are clear: platforms need to ensure their users are engaged.[39] Innovation that improves a platform's ability to create value for consumers may strengthen indirect network effects, and strengthen a platform's competitive position.

IV. CONCLUSION

The types of situations in which zero-price products are encountered have proliferated and evolved, raising questions about the effects of these products on the dynamics of competition. As producers of zero-price goods and services have developed new ways to deliver value and earn payment, the antitrust community has begun to re-evaluate traditional metrics for assessing market power and identifying anticompetitive practices.

As we discuss in this article, firms have numerous economic and strategic incentives for providing zero-price products. Understanding the incentives and mechanisms underlying these products is essential for understanding how, and the extent to which, zero prices can affect competition. Similarly, understanding the role that product quality plays is critical for assessing allegations of harm to competition and consumer welfare. The ways in which firms offering zero-priced products compete can take on a number of forms, which themselves may continue to evolve as digital markets grow.

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1. Lesley Chiou is the Laurence de Rycke Professor of Economics at Occidental College. Avigail Kifer is a Principal at Cornerstone Research. The views expressed herein are solely those of the authors, who are responsible for the content, and do not necessarily represent the views of Cornerstone Research.

2. *National Donut Day*, The Salvation Army, https://salvationarmypotomac.org/national-donut-day; Joseph Lamour, *How to Get a Free Slurpee from 7-Eleven Today*, Today.com (July 11, 2022), https://www.today.com/food/restaurants/free-slurpee-day-7-eleven-rcna37661; Aly Walansky, *11 Freebies and Discounts for National Pizza Day*, Today.com (Jan. 26, 2022), https://www.today.com/food/national-pizza-day-2022-where-get-free-pizza-deals-t245786.

3. *See* Lesley Chiou, Nathaniel E. Hipsman, Jeffrey T. Prince, & Sachin Sancheti, Comment on the January 2022 DOJ and FTC RFI on Merger Enforcement: Issues Related to Digital Markets (Mar. 5, 2022), https://www.regulations.gov/comment/FTC-2022-0003-0267.

4. Michal S. Gal & Daniel L. Rubinfeld, *The Hidden Costs of Free Goods: Implications for Antitrust Enforcement*, 80 Antitrust L.J. 521 (2016).

5. *See* Alessandro Bonatti, Anindya Ghose, Avi Goldfarb, Daniel G. Goldstein, Anja Lambrecht, Randall Lewis, Anita Rao, Navdeep Sahni, & Song Yao, *How Do Firms Make Money Selling Digital Goods Online?*, 25 Mktg. Letters 331 (2014); John M. Yun, *Overview of Network Effects & Platforms in Digital Markets*, *in* The Global Antitrust Institute Report on the Digital Economy 2 (Joshua D. Wright & Douglas H. Ginsburg eds., 2020).

6. Whether or not this dominance—and resulting harm—exists depends on the facts of each case. Such an assessment is beyond the scope of this article. See, for example, Matthew Perlman, *Google Hit With Landmark Antitrust Suit*, Law360 (Oct. 20, 2020), https://www.law360.com/articles/1321121; *United States v. Google LLC*, No. 1:20-cv-03010 (D.D.C.); Dave Simpson, *House Report Slams Big Tech's Abuse of Monopoly Power*, Law360 (Oct. 6, 2020), https://www.law360.com/articles/1317483; Subcomm. on Antitrust, Commercial & Admin. Law of the Comm. on the Judiciary, 116th Cong., Investigation of Competition in Digital Markets: Majority Staff Report and Recommendation (2020).

7. U.S. Dep't of Just. & U.S. Fed. Trade Comm'n, Request for Information on Merger Enforcement (Jan. 18, 2022), https://www.regulations.gov/document/FTC-2022-0003-0001.

8. *See* John M. Newman, *Antitrust in Zero-Price Markets: Applications*, 94 Wash. U. L. Rev. 49 (2016).

9. As described below, a platform may have an incentive to offer access to its services to one side of the platform at a price of zero. However, in order to make profits, it will likely charge at least one side of the platform a positive price.

10. *See* Mehdi T. Hossain & Ritesh Saini, *Free Indulgences: Enhanced Zero-Price Effect for Hedonic Options*, 32 Int'l J. Rsch. Mktg. 457 (2015); Kristina Shampanier, Nina Mazar, & Dan Ariely, *Zero as a Special Price: The True Value of Free Products*, 26 Mktg. Sci. 742 (2007).

11. Shampanier et al., *supra* note 10, at 756.

12. David S. Evans & Richard Schmalensee, *Markets With Two-Sided Platforms*, *in* 1 Issues in Competition Law and Policy 667 (2008).

13. Jean-Charles Rochet & Jean Tirole, *Two-Sided Markets: A Progress Report*, 37 RAND J. Econ. 648 (2006).

14. It may even be profit-maximizing for a platform to charge a price below marginal cost to one group of customers in order to increase their participation, while recouping the platform's loss through a higher price on the less price-sensitive side.

15. *About Us–Booksy*, Booksy, https://booksy.com/en-us/p/about; *Pricing*, Booksy, https://booksy.com/biz/en-us/pricing.html.

16. *How OpenTable Works for Restaurants*, OpenTable (Nov. 19, 2010), https://blog.opentable.com/2010/how-opentable-works-for-restaurants.

17. The platform may also sell the data to third parties.

18. Mallika Rangaiah, *How Spotify Is Using Big Data to Enhance Customer Experience*, Analytic Steps (Jan. 6, 2021), https://www.analyticssteps.com/blogs/how-spotify-using-big-data; Barrack Diego, *How Is Big Data Impacting Search Engine Optimization*, Reflective Data (June 28, 2019), https://reflectivedata.com/how-is-big-data-impacting-search-engine-optimization.

19. Two goods are complements when a decrease in the price of the first good increases the quantity demanded of the second good. The goods are intertemporal complements if the second good is demanded at a different point in time (i.e., the goods are not consumed concurrently).

20. Liu, Charles Zhechao, Yoris A. Au, & Hoon Seok Choi, *Effects of Freemium Strategy in the Mobile App Market: An Empirical Study of Google Play*, 31 J. Mgmt. Info. Sys. 326 (2014).

21. David Evans, *The Antitrust Economics of Free*, Competition Pol'y Int'l (May 20, 2011), https://www.competitionpolicyinternational.com/the-antitrust-economics-of-free; John M. Newman, *Antitrust in Zero-Price Markets: Foundations*, 164 U. Pa. L. Rev. 149 (2015).

22. Charles Zhechao Liu, Yoris A. Au, & Hoon Seok Choi, *Effects of Freemium Strategy in the Mobile App Market: An Empirical Study of Google Play*, 31 J. Mgmt. Info. Sys. 326 (2014).

23. Juan L. Nicolau & Ricardo Sellers, *The Free Breakfast Effect: An Experimental Approach to the Zero Price Model in Tourism*, 51 J. Travel Rsch. 243 (2012).

24. Jean-Charles Rochet & Jean Tirole, *Platform Competition in Two-Sided Markets*, 1 J. Eur. Econ. Ass'n 994 (2003).

25. Shampanier et al., *supra* note 10.

26. Evans, *supra* note 21.

27. David S. Evans & Michael Salinger, *Why Do Firms Bundle and Tie? Evidence from Competitive Markets and Implications For Tying Law*, 22 Yale J. on Regul. 37 (2005).

28. Newman, *supra* note 21, at 157–58.

29. The 2010 Horizontal Merger Guidelines already advise practitioners to consider quality effects when assessing mergers: "Enhanced market power can also be manifested in non-price terms and conditions that adversely affect customers, including reduced product quality. . . . Such non-price effects may coexist with price effects, or can arise in their absence." U.S. Dep't of Just. & Fed. Trade Comm'n, Horizontal Merger Guidelines 2 (2010), https://www.justice.gov/atr/horizontal-merger-guidelines-08192010; *see also* John Asker, Kostis Hatzitaskos, Bob Majure, Ana McDowall, Nathan Miller, & Aviv Nevo, Comments on the January 2022 DOJ and FTC RFI on Merger Enforcement at 12, 33 (Apr. 20, 2022), https://www.regulations.gov/comment/FTC-2022-0003-1847.

30. Some search engines, such as DuckDuckGo, advertise their policy of not collecting or sharing a user's personal information (see, e.g., duckduckgo.com). Others offer personalized search results, based on data such as a user's search history or physical location. See, for example, Bryan Horling & Matthew Kulick, *Personalized Search for Everyone*, Google Blog (Dec. 4, 2009), https://googleblog.blogspot.com/2009/12/personalized-search-for-everyone.html; Aidan Crook & Sanaz Ahari, *Making Search Yours*, Microsoft Bing Blogs (Feb. 10, 2011), https://blogs.bing.com/search/2011/02/10/making-search-yours.

31. D. Daniel Sokol & Roisin Comerford, *Antitrust and Regulating Big Data*, 23 Geo. Mason L. Rev. 1129 (2016); Allen P. Grunes & Maurice E. Stucke, *No Mistake About It: The Important Role of Antitrust in the Era of Big Data*, Antitrust Source 1 (2015).

32. See, for example, Lesley Chiou & Catherine Tucker, *Content Aggregation by Platforms: The Case of the News Media*, 26 J. Econ. & Mgmt. Strat. 782 (2017).

33. Empirical research has shown that ads and ad content may affect consumer search patterns. *See* Lesley Chiou & Catherine Tucker, *How Does The Use of Trademarks by Third-Party Sellers Affect Online Search?*, 31 Mktg. Sci. 819 (2012).

34. *See About Discovery Campaigns*, Google, https://support.google.com/google-ads/answer/9176876; Aaron Barr, *Nearly Half of Consumers Will Try New Brands if the Ad is Relevant*, Mktg. Dive (Sep. 28, 2020), https://www.marketingdive.com/news/nearly-half-of-consumers-will-try-new-brands-if-the-ad-is-relevant/585972.

35. Twitter, *Help Us Shape Our New Approach to Verification*, Twitter Blog (Nov. 24, 2020), https://blog.twitter.com/en_us/topics/company/2020/help-us-shape-our-new-approach-to-verification; Joshua Harris and Sam Haveson, *Fleets: A New Way to Join the Conversation*, Twitter Blog (Nov. 17, 2020), https://blog.twitter.com/en_us/topics/product/2020/introducing-fleets-new-way-to-join-the-conversation; Rose Yao, *Improvements to Timeline*, Facebook (Mar. 13, 2013), https://about.fb.com/news/2013/03/improvements-to-timeline.

36. Deepfakes use advanced artificial intelligence techniques to create realistic-looking but fake, misleading, and counterfeit videos and other digital content.

37. Xi Yin, *Detecting the Models Behind Deepfakes*, Facebook (Jun. 16, 2021), https://about.fb.com/news/2021/06/detecting-the-models-behind-deepfakes; Amit Chowdhry, *Facebook Launches A New Tool That Combats Fake News*, Forbes (Mar. 5, 2017), https://www.forbes.com/sites/amitchowdhry/2017/03/05/facebook-fake-news-tool.

38. Prabhakar Raghavan, *How AI is Powering a More Helpful Google*, Google Blog (Oct. 15, 2020), https://blog.google/products/search/search-on; Microsoft Bing, *Microsoft Bing Delivers More Visually Immersive Experiences That Save You Time*, Microsoft Bing Blogs (Mar. 4, 2021), https://blogs.bing.com/search/2021_03/Microsoft-Bing-delivers-more-visually-immersive-experiences-that-save-you-time.

39. *See* David S. Evans, *Attention Rivalry Among Online Platforms*, 9 J. Competition L. & Econ. 313 (2013).