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Enhancing Antitrust Analysis of Digital Platforms: What Can We Learn from Recent Economic Research?

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DIGITAL PLATFORMS HAVE INCREASingly attracted the attention of antitrust regulators due to their rapid growth and prominent market positions. Major digital platforms such as Google, Meta, and Amazon are currently under antitrust scrutiny in multiple jurisdictions around the globe. Antitrust enforcement agencies have widely adopted concepts from the economics literature, such as two-sidedness (and multi-sidedness),[1] direct and indirect network effects,[2] economies of scale,[3] and economies of scope.[4] However, many unresolved antitrust economic issues remain and the economics literature on digital platforms continues to grow. Recent developments in this literature, both theoretical and empirical, promise additional valuable tools and insights to antitrust practitioners in the field. In this article, we discuss recent economic research on digital platforms and explore the potential implications of these findings for antitrust enforcement.

Modifying Traditional Economic Analysis Tools to Accommodate Unique Characteristics of Digital Platforms

It is common for a digital platform to charge a zero price on one side of the platform and monetize from only the other side of the platform.[5] Platforms may require users to make a non-monetary "payment" in exchange for the platform's services; for example, a user may be subjected to intermittent advertisements while using the platform.[6] These zero or non-monetary prices in markets involving digital platforms make it difficult to apply the traditional SSNIP (Small but Significant and Non-transitory Increase in Price) test for market definition and the revenue-based market share calculation. Nevertheless, recent literature has shown how to modify traditional market definition tools to accommodate digital platforms.

As indicated by an Organisation for Economic Co-operation and Development (OECD) report, when defining the relevant market, instead of applying an SSNIP test, "[a]n alternative for when non-price competition is important could be a small but significant non-transitory decrease in quality (SSNDQ) test, but this has rarely been applied quantitatively and is demanding in terms of data."[7] In the European Commission (EC)'s 2018 Google Android decision, the EC defined the relevant product market to be "licensable operating systems" based on an SSNDQ test, and found Google's Android mobile operating system to be dominant in this market.[8] On appeal, the EU General Court validated the EC's application of the SSNDQ test—"[i]n the case of a product that was very unlikely to lend itself to the classic hypothetical monopolist test aimed at verifying the market's response to a small but significant and non-transitory increase in the price of an asset (Small but Significant and Non-Transitory Increase in Price)," and further noted that as opposed to the general practice of specifying a hypothetical price increase of 5% or 10% for the SSNIP test, "defining a precise quantitative standard of degradation of quality of the target product cannot be a prerequisite for the application of the SSNDQ test."[9]

To calculate market shares where a zero or non-monetary price is charged, various non-monetary measures could be used such as number of registered or active users, number of page visits, and time spent on the platform.[10] For example, the FTC succeed in convincing the District Court to admit its amended complaint in January 2022 against Facebook for its past acquisitions of Instagram based on evidence that showed that Facebook's market power in the relevant market of personal social networking (after the court had dismissed the FTC's initial complaint in June 2021).[11] Specifically, the FTC calculated market shares based on monthly active users and average daily time spent on Facebook, Instagram, and Facebook's competitors such as Snapchat using

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a commercially available data source. In addition, the FTC used historical events, such as the 2018 Facebook–Cambridge Analytica data scandal, to show that Facebook did not lose a significant number of users after implementing policies that caused significant user dissatisfaction.[12]

It is also possible to modify traditional economic analysis tools for assessing the competitive effects of mergers, such as upward pricing pressure indices and merger simulation to account for the distinctive characteristics of a platform. Affeldt et al. (2013) developed a set of upward pricing pressure indices (UPP and GUPPI) accounting for the indirect network effects for two-sided markets.[13] The authors solved the profit maximization pricing decisions separately for each side of the market assuming all other prices (including own-firm product price on the other side of the market and prices of products in other firms) are unchanged, yielding two UPP formulas, one for each side of the market. Unlike the classic UPP and GUPPI which only depend on one diversion ratio, i.e., the diversion ratio between the two merging firms' products, the UPP formulas for a two-sided market consist of multiple diversion ratios—within and across market sides, and within and across platforms—to account for the fact that an increase in the price charged by merging firm 1 on market side A will not only result in users diverting to merging firm 2 on market side A, but also will lead to consumers departing merging firm 1 on market side B due to (positive) indirect network effects and diverting to merging firm 2. Depending on the direction (i.e., positive or negative) of indirect network effects and because of the complex pricing decisions on the two sides of the market (for example, the price-cost margin can be negative on one side of the market instead of positive), empirical analyses are needed to determine the direction and extent of inaccuracy in the traditional upward pricing pressure indices from ignoring indirect network effects. Cosnita-Langlais et al. (2021) developed a further modified version of upward pricing pressure indices by allowing the firms to simultaneously change prices on both sides of the market.[14] They show that the additional (positive) indirect network effect on cross-side pricing incentives need to be carefully accounted for when evaluating upward pricing pressure. Specifically, they demonstrate that a price increase on one side of the market could place downward pricing pressure on the other side of the market because attracting more consumers through the lower prices could generate increased demand to the side with increased margin, leading to an increased profit. Hence, the upward pricing pressure would typically be overstated if ignoring the (positive) indirect network effects on cross-side pricing incentives.

Innovation, Product Differentiation, and Multihoming Can Impose Sufficient Competitive Constraint Against Sustained Market Power

Network effects and economies of scale can create barriers to entry and may lead to enhanced market power. However, this does not necessarily lead to sustained market dominance, or what is oftentimes referred to as "tipping" or "winner-take-all."[15] Recent economic literature demonstrates that innovation, product differentiation, and multihoming can impose sufficient competitive constraints that prevent the market from tipping.

First, historical evidence demonstrates that incumbents in markets with network effects have frequently been challenged and replaced by competitors. As Catherine Tucker points out in her paper, "the history of social networks has suggested anything but entrenchment" with Friendster, the first real social network launched in 2002, being quickly replaced by MySpace, which in turn was replaced by Facebook,[16] and more recently TikTok become a strong competitor to Facebook.

The FTC and DOJ have recognized that products and services in digital markets often undergo rapid changes.[17] Rapid change and innovation in digital markets can impose a significant competitive constraint on the incumbent. Jullien and Sand-Zantman (2021) show in their paper that the incumbency advantage can be weakened by dynamic competition.[18] This paper builds a stylized two-period dynamic competition model and finds that the existence of network effects gives a superior-quality forward-looking entrant the incentive to sacrifice more in the early stages to accumulate market position in exchange for future incumbency. In addition to dynamic competition, Jullien and Sand-Zantman note that small niche entrants can be successful by exploiting horizontal product differentiation and heterogeneity in consumer preferences, such as a social network focusing on a small group initially. These small niche competitors can exert dynamic competitive pressure on the incumbent. In addition, as explained by Evans and Schmalensee, despite network effects helping establish a strong market position for the incumbent, "reverse" network effects can also accelerate the growth of an entrant platform and cause rapid decline for the incumbent.[19] These studies indicate that an antitrust analysis may have to place more weight on the competitive constraints provided by new and small entrants than their existing market shares suggest, especially when the small entrants offer products and services differentiated from those of the incumbent and provide a high level of innovation or quality improvement.

Halaburda et al. (2020) in their paper present a dynamic competition model in which the quality of existing platforms changes randomly between periods as a way to capture the real-world phenomenon of constantly changing technologies and offerings in digital platform markets.[20] Under the assumption that the quality of two competing platforms changes randomly from one period to the next, and that each platform observes its own and its competitor's quality at the beginning of each period and then competes by setting prices, this article finds that *either* platform can win the market in any period if its quality in that period is sufficiently high. This result differs from a dynamic

competition model with fixed platform quality in which the same platform dominates the market in all periods, and it provides an explanation for the outcomes in many digital platform markets where incumbents have been displaced by innovative new entrants. This implies that antitrust concerns may be lessened in digital platform markets with more rapid product changes.

Recent literature also demonstrates that when platforms compete in a more fragmented or localized markets, entry is facilitated. Zhu et al. (2021) developed a three-stage competition model and found that when consumers and service providers mostly transact within localized clusters, entrants can choose to enter only certain of the localized markets, and this facilitates entry. For example, ride-sharing firms Juno and Via have sustained competition with Uber and Lyft in New York City but not nationwide.[21] In contrast, it is more difficult in this model for a new entrant to compete with an incumbent whose network is strongly interconnected across local areas (or market segments) because of the significant levels of resources required to establish a full-sized interconnected network. This suggests that, in an antitrust analysis assessing sustained market power, one should consider how interconnected or localized the network is, rather than simply focusing on the total size of the user base.

As for multihoming[22] economists and antitrust practitioners have widely recognized that multihoming can lead to unstable network effects and increased competition, as competing platforms can utilize price reductions or quality improvements to entice users to multihome.[23] However, there is less evidence about whether there are downsides to multihoming.

Several recent articles about multihoming address these issues. Teh et al. (2023) developed a theoretical framework analyzing platform competition and entry allowing both buyers and sellers to multihome, while earlier research on platform competition typically allowed users on only one side of the platform to multihome.[24] Simultaneous multihoming on both sides, despite its modeling complexity, is a reality for many digital platforms such as those for food delivery, ride-sharing, online shopping, and search. Teh et al. (2023) establish the symmetric equilibrium platform pricing in a model where (1) platforms set their transaction fees, (2) buyers and sellers simultaneously decide which platforms to join after observing all platform fees, and (3) buyers decide whether to make any purchase transaction with each seller, and if so, through which platform. The authors then study the effect of new platform entry on equilibrium platform prices utilizing the model they develop. They find that, with multihoming on both sides, platform entry *always* increases competition and reduces the total fee charged to the two sides. In addition, to account for buyer partial multihoming, Teh et al. (2023) presents a more flexible model allowing only a subset of buyers to multihome.[25] The buyer partial multihoming model provides an important insight into the differential effects of increased platform competition on buyers and sellers. When most or all buyers multihome, increased platform competition tends to shift the fee structure *in favor of sellers*, i.e., leading to an increased buyer price. In contrast, when few or no buyers multihome, increased platform competition tends to shift the fee structure *in favor of buyers*. This is because single-homed buyers create higher value for the platform to attract sellers compared to multihomed buyers, and platform subsidize buyer prices to attract more buyers who single-home which in turn helps attract more sellers.

Antitrust analysis needs to account for this tradeoff between the two sides of the platform when promoting user multihoming to increase competition—an antitrust policy that promotes consumer multihoming may on one hand stimulate platform competition and lower seller prices, but on the other hand may increase consumer prices by shifting the fee structure in favor of sellers, as demonstrated by Teh et al. (2023). More generally, the tradeoffs demonstrated by this study suggest that antitrust interventions may create conflicts of interest between various user groups.

The impact of changing the level of multihoming can be even more complex when the change occurs to an individual platform instead of marketwise. Li and Zhu (2021) [26] empirically studied the effect of one of Groupon's policy changes that prevented deal merchants from multihoming. The authors found that although this policy change decreased deal merchants' multihoming, it also increased market-wide deal variety. This was because, with reduced merchant multihoming, Groupon's competitor competed more intensely for more new merchants and provided more deals to consumer. Given differentiated deal offerings between Groupon and its competitor, Groupon's competitor's strategy led to increased consumer multihoming and a strengthening of its market position. However, the positive impact on installed user base did not fully offset the increase in deal acquisition costs for the competitor, leading to a net negative impact on Groupon's competitor. Therefore, in this study, consumers benefited from increased deal variety, but suppliers' costs increased. Although the empirical results in Li and Zhu (2021) is specific to the studied Groupon's policy change and may not directly apply to other settings, it makes clear that a reduction in user multihoming may lead to a beneficial impact on consumers. One should not assume that a reduction in user multihoming would *always* harm consumer welfare or competition.

Incentives and Consequences of Compatibility Decisions and Self-Preferencing

Platforms reducing compatibility or engaging in self-preferencing often raises antitrust concerns. However, recent economic literature studying platforms' compatibility decisions found that the decision to reduce compatibility can be consistent with profit maximization even in the absence of any foreclosure effect. Adner et al. (2020) developed a game-theoretic model to analyze one-way

compatibility, i.e., one platform hosts a rival's application but not vice versa, such as Kindle willing to make its Kindle Reader app available on Apple's devices without Apple making its iBook available on Kindle devices.[27] This study shows that when the standalone value of a platform's hardware increases, the platform relies more on its hardware profit and less on its software profit. In such cases, the platform maximizes its profit by making its hardware compatible with the competitor's software to attract more hardware sales. However, the platform would have no incentive to allow compatibility between its software and the competitor's hardware, since this may lead to loss of its own hardware consumers to its competitor.

The compatibility incentive would reverse if the platform relied more on its software profit and less on its hardware profit. This type of asymmetric incentive can lead to one-way compatibility between platforms, such as the Apple v. Kindle example above. The results may be applicable to compatibility in more general digital platform settings than just hardware-software, such as whether an operating system is compatible with a competitor's apps and whether a search engine is compatible with a competitor's ad exchange.

Similarly, Padilla et al. (2022) examined platforms' device compatibility decisions in the context of a two-period model.[28] They found that a monopoly device seller with slow or negative demand growth is more likely to foreclose third-party digital service providers—when the demand growth for hardware is stagnant, the platform relies more on profits from its digital service offerings. Therefore, it is more profitable for the platform to make its hardware incompatible with competitors' services to prevent any loss of digital service profit to its competitors. The finding of this study may help antitrust regulators to identify their antitrust focus—fast-growing platforms are less likely to reduce compatibility than platforms with stagnant growth.

As for self-preferencing, several recent studies indicate self-preferencing may not necessarily harm consumers and competition. Zou and Zhou (2021) demonstrate in a theoretical model that search-neutrality, i.e., search results that are comprehensive, impartial, and based solely on relevance, would reduce price competition between first-party (i.e., platform's own) and third-party sellers, which could lead to increased third-party seller prices and a reduction in consumer welfare in the short-run.[29] Specifically, with platform self-preferencing, third-party sellers would compete vigorously with first-party sellers through lower prices to invite search and attract consumer traffic. When self-preferencing is removed, third-party sellers have less incentive to offer significantly lower prices in exchange for search and consumer traffic. Therefore, a prohibition against self-preferencing would lead to consumer harm due to increased product prices, especially for those consumers who prefer third-party products ex-ante. More importantly, in the long-run, search neutrality would decrease third-party sellers' value to the platform due to their higher prices. Accordingly, the platform would have a greater incentive to deter entry by third-party sellers under search neutrality. Hence, antitrust policies aimed at reducing platform self-preferencing may lead to the unintended consequence of reduced third-party seller entry and competition, and increased product prices, which harms consumers.

Zhu and Liu (2018) used data from Amazon.com to examine Amazon's patterns of entry with its own products into seller product spaces and the impact of Amazon entry on third-party sellers and consumers.[30] They found that Amazon is more likely to enter successful product spaces, such as products with higher prices, lower shipping costs, greater demand, and lower service requirements (i.e., fewer consumer questions to answer). In addition, by comparing products affected and unaffected by Amazon's entry, they found that Amazon's entry lowers product shipping costs without increasing product prices to the benefit of consumers. On the other hand, Amazon's entry causes affected third-party sellers to reduce their number of products sold and makes it less likely that an affected third-party seller will develop a closer relationship with Amazon such as using "Fulfillment by Amazon". These results indicate that first-party versus third-party product competition may benefit consumers but hurt third-party suppliers. [31]

Several other studies of platforms entering the market for apps also find beneficial effect on app users but mixed impact on third-party sellers. [32] Foerderer et al. (2018) utilized Google's 2015 entry into the photography app market on its own Android platform as a natural experiment. They compared apps affected by Google's entry with apps not affected by Google's entry.[33] Their results show that Google's entry increased consumers' attention to that market, resulting in overall increased demand and consumer feedback, which in turn led to greater innovation in photo apps especially among larger app developers. Therefore, Google's entry into the photography app market generated positive competitive effects and benefited app users. Different from Foerderer et al. (2018) which examined the *ex-post* effect of Google's entry into an app market, Wen and Zhu (2019) examined third-party developers' *ex-ante* reactions in response to Google's *threat* of entry.[34] Their study shows that Google's entry threats, identified as app types for which Apple had released its own app but Google had not yet released an app, may have discouraged innovation in the affected app types because some affected app developers shifted their innovation efforts to unaffected app categories. Li and Agarwal (2017) analyzed Facebook's integration of Instagram post-acquisition and found that Facebook's promotion of Instagram increased the overall consumer demand for photo-sharing apps, creating positive spillover on large third-party apps while hurting smaller third-party apps. [35] The above findings illustrate self-preferencing or entry into neighboring markets could have different effects on end users vs. third-party suppliers, and the impacts on third-party suppliers could also vary among themselves

depending on the third-party suppliers' characteristics and competitive responses.

Impact of Platforms' Compensation Structure and Commission Fee

The compensation structure and commission fee set by the platform not only affect suppliers' profits, but also may indirectly affect the product prices end consumers pay depending on the level of "pass-through" by suppliers. Therefore, digital platforms' ability to charge supra-competitive platform commission fees have raised antitrust concerns on both sides of the platform. Mobile app stores are at the center of such antitrust scrutiny – both Apple App Store and Google Play Store have been accused of monopolizing their mobile app stores and charging supra-competitive commission fees.[36] Many other digital platforms, such as food delivery platforms, operate under similar business models and could be subject to similar antitrust concerns.[37]

Several recent empirical studies provide insights into the impact of platform commission fee level and structure on suppliers and end consumers. Li and Wang (2021) examined the policy impact of a platform commission fee cap imposed on food delivery from independent restaurants (as opposed to chain restaurants).[38] Using data from the three largest delivery platforms, i.e., DoorDash, Grubhub, and Uber Eats, combined with data containing customers' restaurant visits and bank card transactions, the authors compared independent restaurants, subject to the fee cap, and chain restaurants. Despite the policy being intended to support small businesses and promote restaurant competition, the empirical analysis showed that independent restaurants paying reduced commission fees experienced a decline in orders and revenue. This is due to the food delivery platforms' strategic responses to the policy. Platforms became less likely to recommend independent restaurants and instead more likely to promote chain restaurants paying higher commission fees. Moreover, delivery platforms increased the delivery fees for consumers in regulated cities, recouping the loss on commission fees.

Wu and Zhu (2022) studied how a platform's fee structure, i.e., fixed price vs. revenue sharing, can affect supplier competition and consumer welfare.[39] Based on a natural experiment where a policy change in China induced a massive entry of romance novel authors into an online novel writing platform, this article studied the differential impacts of increased author competition under a fixed price compensation scheme versus a revenue sharing compensation scheme. The researchers' article found that authors under a revenue sharing compensation scheme responded to intensified competition with faster production and increased book novelty, while authors under a pay-by-the-word (i.e., fixed-price) compensation scheme showed limited responses. At the same time, the platform disproportionately promoted the fixed-price books because, having paid the fixed price to the author, the platform captured the entirety of any increased reader purchases from promotion. In contrast, under revenue sharing, the platform would have to share any increased reader purchases from a given promotion with the author. Therefore, consumers did not fully enjoy the benefit of increased book quality from intensified competition, due to the platform's asymmetric promotion strategy. Findings in the above-mentioned articles highlight the importance of considering platforms' strategic responses when designing antitrust policies and remedies.

Assessing the Harm from Nascent Acquisitions

Nascent acquisitions have increasingly attracted antitrust attention by regulators. For example, the Request for Information on Merger Enforcement published by the FTC and the DOJ in 2022 designates one section specifically to "Potential and Nascent Competition."[40] Officials of the U.S. antitrust agencies have also claimed that nascent acquisition and related antitrust conduct in digital markets can go beyond horizontal or vertical—a nascent competitor can offer a novel or differentiated product in any adjacent market, and take various forms other than foreclosure and exclusion, such as swift integration and rapid scaling of the acquired product, to establish monopoly.[41] Antitrust actions against nascent acquisitions have also been on the rise. The FTC's lawsuit against Facebook alleges that Facebook's past acquisitions of Instagram in 2012 and of WhatsApp in 2014 are anticompetitive and seeks "divestiture of assets, divestiture or reconstruction of businesses (including, but not limited to, Instagram and/or WhatsApp)" together with other remedies.[42] In 2020, the DOJ filed a lawsuit to block Visa's acquisition of Plaid, claiming Plaid to be "a nascent competitor [of Visa] developing a disruptive, lower-cost option for online debit payments."[43] More recently, the FTC filed a lawsuit to block Meta's acquisition of Within, an independent VR app development studio, alleging that the acquisition would enhance Meta's market power in the "VR fitness app market" as well as eliminate existing and potential competition in the "VR dedicated fitness app market" where Meta is a potential entrant.[44]

Recent literature has attempted to assess the potential harm from nascent acquisitions. Latham and Tzanetaki draw parallels between digital platform growth and the "Susceptible, Infected, Recovered" (SIR) pandemic model to explain that incumbent platforms may target competitors at the nascent stage because they can prevent competitors from growing exponentially through network effects.[45] The SIR model accounts for the non-linear growth of digital platforms resulting from network effects and shows that eliminating platform competitors would be the most effective when applied at a nascent stage before the competitors can harness network effects.

Even if the incumbent platform does not undertake any anticompetitive action against entrant firms, i.e., no actual acquisition occurs, a recent study by Kamepalli et al. found that a new entrant can still be harmed as long as nascent acquisition is seen as possible—the authors found that the expectation of the new entrant platform being acquired by an incumbent would make suppliers reluctant to adopt the new platform since they are faced with the switching cost adapting their products to the new platform while such cost may be wasted if the new platform would soon be acquired.[46] The low adoption rate on the supplier side would subsequently deter consumer adoption, reduce the value of the entrant platform, and finally discourage innovation and market entry. This finding points to a new potential source of antitrust harm that may arise from expected nascent acquisition even in the absence of any actual anticompetitive conduct. It also implies that in theory, antitrust enforcement preventing nascent acquisition in general may be able to achieve effective procompetitive effects beyond blocking the acquisition at issue, since it can reduce suppliers' and consumers' reluctance to adopting new entry platforms and thereby stimulate entry and innovation.

Welfare Implication of Native Ads and Consumer Deception

Many digital platforms rely heavily on advertising for monetization— consumers may pay nothing for the goods and services provided by the platforms, but are exposed to ads. Native advertising (i.e., sponsored content) is an area that has attracted regulators' attention for its potential deceptive nature.[47] For example, the FTC has issued a guideline on native advertising imposing requirements on how native ads need to disclose their commercial nature, i.e., self-identifying as an ad, to avoid consumer deception.[48]

The welfare impact of increased native ads on consumers depends on two main factors: (a) consumers' (dis)utility from viewing native ads, which can be heterogeneous across consumers and depend on the information content provided by native ads; and (b) the associated change in platform monetization decisions and its impact on consumers. Since a platform's strategy and pricing on the two sides of the platform are interrelated, whether increased native ads would harm consumers needs to be analyzed accounting for effects on the advertiser side.

Several recent studies assessing the impact of native ads on consumers, advertisers, and platforms provide useful insight. Chatterjee and Zhou (2021) modeled competing platforms' strategic decisions regarding ad format (traditional ads versus native ads) and prices considering both the consumer side and the advertiser side.[49] Their findings suggest that even under the assumption that consumers dislike native ads more than traditional ads, consumers may still be better off when native ads instead of traditional ads are offered by the platforms due to the lower consumer side platform price. This is a unique feature of a two-sided platform where advertisers have a preference for native ads and therefore have a higher willingness to pay for native ads due to the fact that consumers are more likely to view native ads than traditional ads, since the latter are instantaneously recognizable to consumers as a direct promotional message. This incentivizes platforms to lower prices for consumers[50] in exchange for a larger consumer base and the ability to charge higher prices to advertisers. They also found when consumers' disutility for native ads does not exceed that for traditional ads by too much, advertisers may also be better off with native ads under the assumption that advertisers obtain higher marginal utility from native ads than from traditional ads.

In short, consumers may not be harmed and can even benefit from native ads since they are indirectly compensated for their disutility for native ads by higher ads prices and lower consumer prices set by platforms. Sahni and Nair (2020) conducted a randomized experiment on a mobile restaurant search website Zomato to test the impact of different levels of native ads disclosure of its commercial features (no disclosure, typical disclosure, and prominent disclosure) on consumers' behavior.[51] They found that consumers' behavior does not differ between typical disclosure and prominent disclosure, indicating that additional disclosure beyond the typical disclosure level currently adopted by platforms does not provide added clarity to consumers. This finding provides empirical evidence that current ads disclosure format adopted by digital platforms provides sufficient information for consumers to differentiate organic content from ads content and the risk of consumer deception is low.

Conclusion

Interactions between the two sides of a digital platform (i.e., the indirect network effects) bring additional complexities and challenges to antitrust analyses of digital platform markets as compared to traditional markets. The good news is that recent economic research demonstrates traditional economic analysis tools can be modified to accommodate the unique characteristics of digital platforms. The rich datasets collected by digital platforms have facilitated a flood of recent empirical economic literature investigating the impacts of various policy changes. Findings from this literature illustrate the complexity of interactions between the various sides of the platforms, and potential differences among the incentives and strategic responses of consumers, suppliers, and platforms. The literature demonstrates that antitrust policies intended to have pro-competitive effects may in fact have adverse unintended consequences—even reducing competition and consumer welfare. Thus, antitrust regulators need to make a careful evaluation of the overall impact of the policy instead of only focusing on the targeted side of the platform alone. ■

[1] Multi-sided platforms share similar characteristics with two-sided platforms. It refers to the fact that the platform serves as an intermediary that connects two groups of users and that, accordingly, the decisions of the platform owner and users on one side affect the outcomes for the platform owner and users on the other side. We focus on discussions of two-sided platforms hereafter but note that all discussions of two-sided platforms apply to multi-sided platforms as well. *See, e.g.*, Jean-Charles Rochet & Jean Tirole, *Platform Competition in Two-Sided Markets*, 1 J. Eur. Econ. Ass'n 990 (2003).

[2] Direct network effects refer to the increased benefits of users on one side of the platform arising from having more users on the same side. Indirect network effects arise when the value to users on one side of the platform increases with a larger number of users on the other side of the platform. The economics literature on network effects dates back at least to the mid-1980s. *See* Michael L. Katz & Carl Shapiro, *Network Externalities, Competition, and Compatibility*, 75 Am. Econ. Rev. 424 (1985). For a review of key contributions to the economics of network effects and two-sided markets, *see* Paul Belleflamme & Martin Peitz, *Platforms and Network Effects*, 2 Handbook Game Theory & Indus. Org. 286 (2018).

[3] Digital platforms typically face relatively high fixed costs and relatively low variable costs. Therefore, expansion of the user base results in decreased average costs, i.e., economies of scale, for many types of digital platforms. *See, e.g.*, Geoffrey Parker et al., Digital Platforms and Antitrust, THE OXFORD HANDBOOK INST. INT'L ECON. GOVERNANCE AND MKT. REGUL. (2022).

[4] A digital platform may have economies of scope with respect to data it collects. Advanced analytical tools based on machine learning and artificial intelligence algorithms can be applied to the data to improve product quality and expand the platform's services into new areas. *See, e.g.,* Georgios Petropoulos, *Competition Economics of Digital Ecosystems* (Dec. 3, 2020), https://one.oecd.org/document/DAF/COMP/WD(2020)91/en/pdf.

[5] *See, e.g.*, Jean-Charles Rochet & Jean Tirole, *Platform Competition in Two-Sided Markets*, 1 J. Eur. Econ. Ass'n 990 (2003).

[6] Fiona Scott Morton et al., Committee for the Study of Digital Platforms Market Structure and Antitrust Subcommittee Report 6-7 (2019), https://research.chicagobooth.edu/-/media/research/stigler/pdfs/market-structure-report.pdf.

[7] OECD, Abuse of Dominance in Digital Markets 16 (2020), www.oecd.org/daf/competition/abuse-of-dominance-in-digital-markets-2020.pdf.

[8] Case T-604/18, Google L.L.C. and Alphabet, Inc. v. Comm'n, ¶¶130, 141 (Sept. 14, 2022), https://curia.europa.eu/juris/document/document.jsf?-text=&docid=265421&pageIndex=0&doclang=en&mode=lst&dir=&occ=-first&part=1&cid=2637.

[9] *Id.*

[10] Filippo Lancieri & Patricia Morita Sakowski, *Competition in Digital Markets: A Review of Expert Reports*, 26 Stan. J. L. Bus. & Fin., 65 (2021).

[11] *FTC's Facebook Antitrust Case Survives 2nd Dismissal Bid*, L. 360 (Jan. 11, 2022), https://www.law360.com/articles/1454616/ftc-s-facebook-antitrust-case-survives-2nd-dismissal-bid.

[12] First Amended Complaint, Fed. Trade Comm'n v. Facebook, Inc., No. 1:20-cv-03590 (D.D.C. Aug. 19, 2021).

[13] Pauline Affeldt et al., *Upward Pricing Pressure in Two-Sided Markets*, 123 Econ. J. F505 (2013).

[14] Andreea Cosnita-Langlais et al., *Upward Pricing Pressure in Two-Sided Markets: Incorporating Rebalancing Effects*, 74 Int'l J. Indust. Org. 102692 (2021).

[15] The concept that network effects may lead to market dominance was first explained in Michael L. Katz & Carl Shapiro, *Network Externalities, Competition, and Compatibility*, 75 Am. Econ. Rev. 424 (1985). For more discussion on factors affecting the likelihood of "tipping" or "winner-take-all", *see* Marc Rysman, The Economics of Two-Sided Markets, 23 J. Econ. Persp. 125 (2009). Also, a widely cited conclusion is that markets with strong network effects are under competition "for the market" instead of "in the market" and exhibit strong incumbency advantages. *See, e.g.*, Joseph Farrell & Paul Klemperer, *Coordination and Lock-in: Competition with Switching Costs and Network Effects*, 3 Handbook Indust. Org. 1967 (2007).

[16] Catherine Tucker, *Network Effects and Market Power: What Have We Learned in the Last Decade?* 2018 Antitrust 72.

[17] *Request for Information on Merger Enforcement*, U.S. Dep't. of Just. & U.S. Fed. Trade Comm'n. (Jan. 18, 2022), https://www.justice.gov/opa/press-release/file/1463566/download.

[18] Bruno Jullien & Wilfried Sand-Zantman, *The Economics of Platforms: A Theory Guide for Competition Policy*, 54 Info. Econ. & Pol'y 100880 (2021).

[19] David S. Evans & Richard Schmalensee, *Why Winner-Takes-All Thinking Doesn't Apply to the Platform Economy*, Harvard Bus. Rev. (May 2016), https://hbr.org/2016/05/why-winner-takes-all-thinking-doesnt-apply-to-silicon-valley.

[20] Hanna Halaburda et al., *Dynamic Competition with Network Externalities: How History Matters*, 51 RAND J. Econ. 3 (2020).

[21] Feng Zhu et al., *Network Interconnectivity and Entry Into Platform Markets*, 32 Info. Sys. Rsch. 1009 (2021).

[22] Multihoming refers to users joining multiple platforms at the same time. For example, a consumer may have both Lyft and Uber installed on their phones and compare their prices when requesting a ride share, and a driver may register with both Lyft and Uber and choose ride requests between the two platforms. For some digital platforms, the switching cost between platforms can be quite small and users on one or all sides of a platform may frequently multihome.

[23] Catherine Tucker, *Network Effects and Market Power: What Have We Learned in the Last Decade?* 2018 Antitrust 72. *See also*, Feng Zhu & Marco Iansiti, *Why Some Platforms Thrive and Others Don't*, Harvard Bus. Rev. (January 2019), https://hbr.org/2019/01/why-some-platforms-thrive-and-others-dont. It is also recognized in the OECD 2020 report that conducts limiting consumers' multi-homing can lead to the tipping of a market into monopoly. OECD, Abuse of Dominance in Digital Markets 16 (2020), www.oecd.org/daf/competition/abuse-of-dominance-in-digital-markets-2020.pdf.

[24] Tat-How Teh et al., *Multihoming and Oligopolistic Platform Competition*, Am. Econ. J. Microeconomics (forthcoming 2023).

[25] Multihoming buyers can still end up choosing to only join or make transaction on one platform ex-post. However, single-homing buyers only consider joining at most one platform ex-ante.

[26] Hui Li & Feng Zhu, *Information Transparency, Multihoming, and Platform Competition: A Natural Experiment in the Daily Deals Market*, 67 Mgmt. Sci. 4384 (2021).

[27] Ron Adner et al., *Frenemies in Platform Markets: Heterogeneous Profit Foci as Drivers of Compatibility Decisions*, 66 Mgmt. Sci. 2432 (2020).

[28] Jorge Padilla et al., *Self-Preferencing in Markets with Vertically Integrated Gatekeeper Platforms*, 70 J. Indust. Econ. 371 (2022).

[29] Tianxin Zou & Bobby Zhou, *Search Neutrality and Competition Between First-Party and Third-Party Sellers*, 1 (Working Paper, 2021), https://ssrn.com/abstract=3987361.

[30] Feng Zhu & Qihong Liu, *Competing with Complementors: An Empirical Look at Amazon.com*, 39 Strategic Mgmt. J. 2618 (2018).

[31] We note that the boundary of protecting consumers and competitors become less clear in a two-sided platform setting, since end consumers and sellers are both "consumers" on the two sides of the platform. This tension adds complexity to antitrust analyses, especially when both end consumers and sellers are seeking antitrust protection against the same platform and conduct.

[32] For a summary of related studies, see Feng Zhu, *Friends or Foes? Examining Platform Owners' Entry into Complementors' Spaces*, 28 J. Econ. & Mgmt. Strategy 23 (2019).

[33] Jens Foerderer et al., *Does Platform Owner's Entry Crowd Out Innovation? Evidence from Google Photos*, 29 Info. Sys. Rsch. 444 (2018).

[34] Wen Wen & Feng Zhu, *Threat of Platform-Owner Entry and Complementor Responses: Evidence from the Mobile App Market*, 40 Strategic Mgmt. J. 1336 (2019).

[35] Zhuoxin Li & Ashish Agarwal, *Platform Integration and Demand Spillovers in Complementary Markets: Evidence from Facebook's Integration of Instagram*, 63 Mgmt. Sci. 3438 (2017).

[36] For antitrust lawsuits against Apple App Store, see Epic Games, Inc. v. Apple, Inc., No. 4:20-cv-05640 (N.D. Cal.); *In re* Apple iPhone Antitrust Litigation, No. 4:11-cv-06714 (N.D. Cal.). For antitrust lawsuits against Google Play Store, see Epic Games, Inc. v. Google L.L.C., No. 3:20-cv-05671 (N.D. Cal.); Match Group L.L.C. v. Google L.L.C., No. 3:22-cv-02746 (N.D. Cal.); *In re* Google Play Consumer Antitrust Litigation, No. 3:20-cv-05761 (N.D. Cal.); State of Utah v. Google L.L.C., No. 3:21-cv-05227 (N.D. Cal.). Both Apple and Google have settled with their classes of developers. All other cases are pending.

[37] For example, see consumer class action against food delivery platforms, Mariam Davitashvili v. GrubHub, Inc., No. 1:20-cv-03000 (S.D.N.Y.). This case is pending decision.

[38] Zhuoxin Li & Gang Wang, *Regulating Powerful Platforms: Evidence from Commission Fee Caps in On-Demand Services*, 1 (Working Paper, 2021), https://ssrn.com/abstract=3871514.

[39] Yanhui Wu & Feng Zhu, *Competition, Contracts, and Creativity: Evidence from Novel Writing in a Platform Market*, 68 Mgmt. Sci. 8515 (2022).

[40] *Request for Information on Merger Enforcement*, U.S. Dep't. of Just. & U.S. Fed. Trade Comm'n. (Jan. 18, 2022), https://www.justice.gov/opa/press-release/file/1463566/download.

[41] *Assistant Attorney General Jonathan Kanter Delivers Keynote at CRA Conference,* Dep't of Just. (Mar. 31, 2022), https://www.justice.gov/opa/speech/assistant-attorney-general-jonathan-kanter-delivers-keynote-cra-conference; *Remarks of Chair Lina M. Khan*, Fed. Trade Comm'n (Mar. 31, 2022), https://www.ftc.gov/system/files/ftc_gov/pdf/CRA%20speech.pdf.

[42] First Amended Complaint, Fed. Trade Comm'n v. Facebook, Inc., No. 1:20-cv-03590 (D.D.C. Aug. 19, 2021).

[43] *Justice Department Sues to Block Visa's Proposed Acquisition of Plaid*, Dep't of Just. (Nov. 5, 2020), https://www.justice.gov/opa/pr/justice-department-sues-block-visas-proposed-acquisition-plaid. Visa and Plaid abandoned the merger after DOJ filing its lawsuit.

[44] *FTC Seeks to Block Virtual Reality Giant Meta's Acquisition of Popular App Creator Within*, Fed. Trade Comm'n (July 27, 2022), https://www.ftc.gov/news-events/news/press-releases/2022/07/ftc-seeks-block-virtual-reality-giant-metas-acquisition-popular-app-creator-within. FTC lost its challenge against the Meta-Within deal and the transaction went through in February 2023.

[45] Oliver Latham & Chara Tzanetaki, *R You Being Foreclosed?* 18 Eur. Competition J. 328 (2021).

[46] Sai Krishna Kamepalli et al., *Kill Zone*, 1 (NBER Working Paper No. 27146, 2020), https://www.nber.org/papers/w27146.

[47] Native advertising refers to content that is similar to the non-promotional content such as news, feature articles, product reviews, and other material that is published on the platform which consumers may not be able to identify its promotional nature. For example, promoted listings on online shopping websites, sponsored search results and social media newsfeed are common forms of native ads whose advertising identity is less identifiable to consumers than traditional ads such as banner ads and display ads that pop up on webpages.

[48] *See, e.g.*, *Native Advertising: A Guide for Businesses*, Fed. Trade Comm'n (Dec. 2015), https://www.ftc.gov/business-guidance/resources/native-advertising-guide-businesses. "Under the FTC Act, an act or practice is deceptive if there is a material misrepresentation or omission of information that is likely to mislead the consumer acting reasonably in the circumstances. A misrepresentation is material if it is likely to affect consumers' choices or conduct regarding an advertised product or the advertising for the product … A basic truth-in-advertising principle is that it's deceptive to mislead consumers about the commercial nature of content. Advertisements or promotional messages are deceptive if they convey to consumers expressly or by implication that they're independent, impartial, or from a source other than the sponsoring advertiser – in other words, that they're something other than ads."

[49] Prabirendra Chatterjee & Bo Zhou, *Sponsored Content Advertising in a Two-Sided Market*, 67 Mgmt. Sci. 7560 (2021).

[50] Lower consumer price can take various forms depending on the context. For example, it can be lower consumer subscription price for online news platforms, platform offered consumer discounts in online marketplaces, and non-monetary price such as better user features and service quality of search engine or social network platforms.

[51] Navdeep S. Sahni & Harikesh S. Nair, *Sponsorship Disclosure and Consumer Deception: Experimental Evidence from Native Advertising in Mobile Search*, 39 Mktg Sci. 5 (2020).