Platform Competition

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PLATFORM COMPETITION

Analysis of competition in light of the multi-sided nature of digital platforms

Topic (Primary)	Sub-Topic	Title	Author(s)	Year	Summary or Edited Abstract	Peer Reviewed?	Citation
Platform Competition	Multi-Sided Platforms	Multi-Sided Platforms	Andrei Hagiu and Julian Wright	2015	Increasingly, professional service firms are moving away from pure vertically integrated (VI) models in which all client services are provided by their employees (e.g. taxi companies), and towards the multi-sided platform (MSP) model, in which they enable independent contractors or professionals to deal directly with clients (e.g. Uber). In this paper, the authors study the economic trade-offs that drive organizations to position themselves closer to or further away from a MSP model. First, however, they provide a new definition of MSPs with two fundamental features: multi-sided platforms enable direct interactions between two or more distinct sides, and each of those sides is affiliated with the platform. Under this definition, network effects are neither necessary nor sufficient to classify a MSP. In their model, the authors identify a key trade-off between the need to coordinate decisions that generate spillovers across professionals (best achieved by a VI firm) and the need to both motivate unobservable effort by professionals and ensure that they adapt their decisions to private information (best achieved by a MSP). The authors show how this baseline trade-off is impacted by the nature of contracts ("make or buy" VI contracts and "enable or employ" MSP contracts) available to the firm or platform, as well as by professionals' pessimistic expectations (i.e. coordinating to not join) when deciding whether or not to join.	y	Andrei Hagiu and Julian Wright, "Multi-Sided Platforms," *International Journal of Industrial Organization* 43 (2015): 162–174.
Platform Competition	Multi-Sided Platforms	Information Gatekeepers on the Internet and the Competitiveness of Homogeneous Product Markets	Michael R. Baye and John Morgan	2001	This paper examines the equilibrium interaction between a market for price information (controlled by a profit-maximizing "gatekeeper") and the homogenous product market it serves. In the market for price information, consumers often obtain a list of prices charged by various firms for the same product. A traditional gatekeeper might be a newspaper, while more modern gatekeepers include websites like shopper.com that offer a user coupons from many sellers. The gatekeeper charges fees to firms that advertise prices on its website and to consumers who access the list of advertised prices. The level of activity in the market for information directly impacts the competitiveness of the product market, and this in turn affects the willingness of consumers and firms to participate in the market for information. The authors find that gatekeeper profits are maximized in an equilibrium where the product market exhibits the following four properties: price dispersion (variation in prices across sellers); access fees that are sufficiently low so all consumers subscribe; advertising fees that exceed socially optimal levels, thus inducing partial firm participation; and advertised prices that are below unadvertised prices. Introducing the market for information has ambiguous social welfare effects.	y	Michael R. Baye and John Morgan. "Information Gatekeepers on the Internet and the Competitiveness of Homogeneous Product Markets," *American Economic Review* 91 (3) (2001): 454–474.
Platform Competition	Multi-Sided Platforms	Price Disclosure by Two-Sided Platforms	Paul Belleflamme and Martin Peitz	2019	Users of two-sided platforms often do not observe the price charged to users on the other side of the platform. Meanwhile, platforms may decide whether and to what extent to disclose this information. This paper examines how market outcomes are affected if platforms do not inform all users about prices charged to users on other sides of the platform. In particular, the authors focus on the strategic choices of platforms to disclose prices, which users can observe before making their participation decisions. Using standard models of competition between two-sided platforms, the authors find that, in equilibrium, a monopoly platform does not benefit from opaqueness and optimally reveals price information. However, in a two-sided single-homing duopoly, platforms benefit from opaqueness and, thus, do not have an incentive to disclose price information. In competitive bottleneck markets (users on one side single-home while users on the other side can multi-home), results are more nuanced. If one side is fully informed (for exogenous reasons), platforms may decide to inform users on the other side either fully, partially or not at all, depending on the strength of cross-group network effects and the degree of horizontal differentiation between competing platforms.	y	Paul Belleflamme and Martin Peitz, "Price Disclosure by Two-Sided Platforms," *International Journal of Industrial Organization* 67 (2019).
Platform Competition	Multi-Sided Platforms	Platform Competition for Advertisers and Users in Media Markets	Markus Reisinger	2012	This paper analyzes a two-sided market model where platforms compete for advertisers and users. Platforms are differentiated from the user perspective but are homogenous for advertisers. Although there is Bertrand competition for advertisers (platforms competing on price, which typically leads to all platforms pricing at marginal cost and making zero profit), the author shows that platforms obtain positive margins in the advertising market. This is because users dislike advertising, so one platform cannot attract all advertisers by undercutting its competitor's price. Platform profits can increase as users' dislike for advertising increases, even as they spend less time on the platform. A key finding from this model is that factors that directly affect competition in the user market now also indirectly affect the advertiser market. These direct and indirect effects are only apparent when incorporating competition on both sides of a platform into models of platform competition.	y	Markus Reisinger, "Platform Competition for Advertisers and Users in Media Markets," *International Journal of Industrial Organization* 30 (2) (2012): 243–252.
Platform Competition	Multi-Sided Platforms	Media See-Saws: Winners and Losers in Platform Markets	Simon P. Anderson and Martin Peitz	2020	This paper studies two-sided media markets where firms (media platforms), consumers, and advertisers interact. When media are ad-financed and consumers dislike advertising, the authors explore a media "see-saw:" advertiser and platform interests are aligned, while advertiser and consumer interests are opposed. The authors explore the conditions under which this see-saw arises. Platform entry increases consumer surplus, but decreases advertiser surplus if total platform profits decrease with entry. A merger between platforms decreases consumer surplus, but advertiser surplus tends to increase. In contrast, when platforms use two-sided pricing or consumers like advertising, advertiser and consumer interests are often aligned. These results carry over to other two-sided markets, such as digital marketplaces that host shops in different product categories. It is important to note that the authors focus on situations where media consumers "single-home" while advertisers multi-home, and therefore competition is primarily for viewers. When consumers multi-home, see-saws seem unlikely to arise and competition for advertisers plays a stronger role than when consumers single-home.	y	Simon P. Anderson and Martin Peitz, "Media See-Saws: Winners and Losers in Platform Markets," *Journal of Economic Theory* 186 (2020): 1–43.
Platform Competition	Multi-Sided Platforms	Search Engines: Left Side Quality Versus Right Side Profits	Alexander White	2013	Search engines display two main types of results: unpaid or "organic" links to other websites, selected according to the search engine's algorithm, and paid or "sponsored" links belonging to websites who bid to appear when users enter particular search terms. When a user clicks on a sponsored link, the search engine receives a payment; when a user clicks on an organic link, the search engine receives nothing. Side-by-side arrangement of organic and sponsored links generates a potential tradeoff for search engines. While high quality organic links attract more people to use the search engine, these organic links compete with sponsored links and can thus undermine the search engine's profitability. This paper develops a model to clarify this tradeoff facing search engines, in which search engines must choose the quality level of organic results, as well as how much to charge merchants who bid for sponsored slots. The author uses this model to illustrate distortions in market power and quality of search results when there is a profit-maximizing monopoly search engine that chooses a level of search quality to offer its users. In addition, the model examines comparative statics between organic and sponsored links. Finally, the author illustrates the price and quality implications of these comparative statics results in light of Google's 2007 acquisition of DoubleClick, an advertising firm.	y	Alexander White, "Search Engines: Left Side Quality Versus Right Side Profits," *International Journal of Industrial Organization* 31 (6) (2013): 690–701.

Platform Competition	Multi-Sided Platforms	[Focality Advantage in Platform Competition]()	Hanna Halaburda and Yaron Yehezkel	2019	When choosing a platform to join, users form beliefs about the participation decisions of other users; a platform can gain competitive advantage if users expect the platform to attract other users. The authors call these "focal" platforms. Conversely, users may be reluctant to join "non-focal" platforms because they do not expect other users to join. This paper considers platform competition when one of the platforms have a focal position. In particular, the authors ask whether a high-quality, non-focal platform can overcome its disadvantage of being non-focal when competing against a low-quality, focal platform. The authors develop a model to study "partial focality" (user beliefs about focality which provide platforms a partial incumbency advantage) and focality advantage in static and dynamic environments. They find that a low-quality, fully focal platform dominates the market if network effects are more important to users than the quality gap between platforms. When the low-quality platform benefits from only a partial degree of focality, the high-quality platform can dominate the market (even though network effects are more important than the quality gap), as long as the focality advantage of the low-quality platform is below some threshold. Dynamic considerations (e.g. platforms compete in multiple periods and the winning platform gains weak focality) make it more or less likely that the high-quality, non-focal platform wins the market, depending on how user beliefs evolve between periods.	y	Hanna Halaburda and Yaron Yehezkel, "Focality Advantage in Platform Competition," *Journal of Economics & Management Strategy* 28 (1) (2019): 49–59.
Platform Competition	Multi-Sided Platforms	[Competitive Pricing Strategies in Social Networks]()	Ying-Ju Chen, Yves Zenou, and Junjie Zhou	2018	This paper studies pricing strategies of competing firms that sell heterogeneous products to consumers in a social network. Goods are substitutes and there are network externalities between neighboring consumers. The authors show that there is an equilibrium where, in the first stage, firms choose prices, while in the second stage, individuals consume differentiated goods. In equilibrium, firms price discriminate based on network positions and charge lower prices to more central consumers. The authors also show that, under some conditions, firms' equilibrium profits decrease when either the network becomes denser or network effects increase. Though consumers always benefit from being more connected to each other because this increases their utilities, prices decrease due to intensified competition between firms. The authors determine the optimal network structure both for firms and consumers, and compare uniform pricing and discriminatory pricing from the perspectives of firms and consumers.	y	Ying-Ju Chen, Yves Zenou, and Junjie Zhou, "Competitive Pricing Strategies in Social Networks," *The RAND Journal of Economics* 49 (3) (2018): 672–705.
Platform Competition	Multi-Sided Platforms	[Tying and Freebies in Two-Sided Markets]()	Andrea Amelio and Bruno Jullien	2012	To reach an efficient allocation of users on their platform, two-sided platforms need to coordinate among users on both sides. The literature on multi-sided platforms has emphasized the role of price structure in solving coordination problems. For instance, platforms may set "negative prices" (i.e. users benefit without making pecuniary payments) on one side in order to enhance participation on that side. However, when a platform is constrained to set non-negative prices, one alternative is to rely on tying. In this paper, tying is not viewed in the context of entry deterrence or price discrimination. Rather, the purpose of tying is to stimulate demand on one side in order to increase the membership value and profits on the other. The authors develop a model where a platform constrained to set non-negative prices ties the sales of another good with access to the platform as a way to relax the non-negativity constraint. They find that for a monopoly, tying raises participation and benefits consumers on both sides of the platform. In a duopoly, tying on one side makes a platform more or less competitive on the other side depending on externalities. The impact on consumer surplus depends on whether competition is softened or intensified on the profitable side of the platform. Moreover, tying increases total welfare if network effects are strong. From a competition policy perspective, this paper offers a framework for assessing situations in which bundles are offered for free to users of multi-sided platforms.	y	Andrea Amelio and Bruno Jullien, "Tying and Freebies in Two-Sided Markets," *International Journal of Industrial Organization* 30 (5) (2012): 436–446.
Platform Competition	Multi-Sided Platforms	[First-Party Content and Coordination in Two-Sided Markets]()	Andrei Hagiu and Daniel Spulber	2013	Market intermediaries, i.e. two-sided platforms, must attract both buyers and sellers. To solve this coordination problem, many two-sided platforms offer their own content, known as first-party content, to users of the platform in order to make participation more attractive; often, this content is provided for free or as part of a product bundle. (In contrast, third-party content is provided by another group, such as advertisers supplying ad content.) Platforms' first-party content is strategically significant because it is either a substitute for or complement to seller participation in buyer demand. For example, e-commerce sites (Amazon, eBay, Alibaba) provide market information and customer ratings that are complements to the products offered by sellers. This paper studies the interplay between platform investment in first-party content and pricing strategies. The authors find that this interplay is driven by two key factors: the nature of buyer and seller expectations (favorable versus unfavorable) and the nature of the relationship between first-party content and third-party content (complements or substitutes). They conclude with implications for antitrust policies towards mergers and acquisitions among platform firms.	y	Andrei Hagiu and Daniel Spulber, "First-Party Content and Coordination in Two-Sided Markets," *Management Science* 59 (4) (2013): 933–949.
Platform Competition	Multi-Sided Platforms	[Competing by Restricting Choice: The Case of Search Platforms]()	Hanna Halaburda, Mikołaj Jan Piskorski, and Pinar Yildirim	2018	This paper shows that a two-sided platform can successfully compete by limiting the choice of potential matches to consumers while charging higher prices than platforms with unrestricted choice. The authors use a stylized model of online dating where participants with different outside options match based on how much they like each other. First, the authors derive the strength and direction of network effects. They find that increasing the number of potential matches has a positive network effect due to larger choice, but a negative network effect due to competition between participants on the same side. Participants with different valuations for finding a match resolve the trade-off between the two effects differently. For those with a higher desire to find a match, the competitive effect is stronger than the choice effect . Hence, these participants have higher willingness to pay for a platform restricting choice (e.g. eHarmony.com). Those with a lesser desire to find a match prefer a platform offering unrestricted choice (e.g. Match.com). Therefore, the two platforms may coexist without the market tipping. This model may help explain how platforms with different business models coexist in markets.	y	Hanna Halaburda, Mikołaj Jan Piskorski, and Pinar Yildirim, "Competing by Restricting Choice: The Case of Search Platforms," *Management Science* 64 (8) (2018): 3574–3594.

Definition of antitrust markets and implications for competition when consumers are substituting between complements on a given platform and between platforms

Topic (Primary)	Sub-Topic	Title	Author(s)	Year	Summary or Edited Abstract	Peer Reviewed?	Citation
Platform Competition	Multi-Homing	[Platform Competition: Who Benefits from Multihoming?]()	Paul Belleflamme and Martin Peitz	2019	Competition between two-sided platforms is shaped by the possibility of consumers multi-homing. Multi-homing occurs when some users join and use services from both platforms. If, initially, both sides single-home, each platform provides users on one side exclusive access to its users on the other side. If then one side multi-homes, platforms compete on the single-homing side and exert monopoly power on the multi-homing side. This paper explores the allocative effects of such a change from single- to multi-homing. The results challenge the conventional wisdom, which says that the possibility of multi-homing hurts the side that multi-homes, while benefiting the side that does not. The authors find that this is not always true, as the opposite may happen or both sides may in fact benefit from multi-homing.	y	Paul Belleflamme and Martin Peitz, "Platform Competition: Who Benefits from Multihoming?" *International Journal of Industrial Organization* 64 (2019): 1–26.
Platform Competition	Multi-Homing	[The Impact of Consumer Multi-Homing on Advertising Markets and Media Competition]()	Susan Athey, Emilio Calvano, and Joshua S. Gans	2018	This paper studies advertising markets in settings where consumers allocate their attention across multiple publishers. The authors examine how an increase in consumer switching or multi-homing affects advertising prices, publisher profits, and publisher content strategy. They find that switching-induced inefficiencies lead lower-value advertisers to advertise on a limited set of publishers, effectively reducing demand for advertising and thus depressing prices. As the share of multi-homing consumers increases (which might happen if, for example, consumers adopt the Internet for news or increase their use of news aggregators), ad prices fall. Increased multi-homing creates an incentive for publishers to invest in quality and increase their number of unique users because larger publishers are favored by advertisers seeking broader “reach” (more unique users) while avoiding inefficient duplication (impressing the same consumers too much).	y	Susan Athey, Emilio Calvano, and Joshua S. Gans, "The Impact of Consumer Multi-Homing on Advertising Markets and Media Competition," *Management Science* 64 (4) (2018): 1574–1590.

Platform Competition	Multi-Homing	[Either or Both Competition: A "Two-Sided" Theory of Advertising with Overlapping Viewerships]()	Attila Ambrus, Emilio Calvano, and Markus Reisinger	2016	The traditional framework for competition among media platforms assumes that consumers choose either one outlet or another. This paper proposes a model that allows consumers to choose multiple outlets and uses it to study the effects on advertising levels and the impact of entry and mergers. The authors identify two forces which reflect platform incentives to control the composition of their consumer base (multi-homing or exclusive users). The "duplication effect" induces competing platforms to supply fewer ads, while the "business-sharing effect" induces competing outlets to raise advertising levels. The authors examine how consumer preferences, then advertising technologies affect whether the duplication or business-sharing effect dominates. One finding from this analysis is that when consumers have overlapping preferences (i.e. there are more multi-homing consumers and fewer exclusive consumers), the duplication effect dominates and there is less advertising at equilibrium. The authors test and find support for this theory using data from the U.S. cable TV industry.	y	Attila Ambrus, Emilio Calvano, and Markus Reisinger, "Either or Both Competition: A 'Two-Sided' Theory of Advertising with Overlapping Viewerships," *American Economic Journal: Microeconomics* 8 (3) (2016): 189–222.
Platform Competition	Multi-Homing	[Competition for Advertisers and for Viewers in Media Markets]()	Simon P. Anderson, Øystein Foros, and Hans Jarle Kind	2016	When consumers multi-home, platforms are also competing for advertisers. Platforms compete for exclusive consumers rather than just trying to increase their number of users. Platform competition means that platforms want to differentiate from rivals in order to deliver exclusive consumers to advertisers. In this paper, the authors develop a model of platform competition with multi-homing consumers and show that platforms locate too far apart (i.e. they are too differentiated) if consumers highly value overlapping content, and/or their second impressions have low value. Exclusive consumers are more valuable for the platforms, so their tastes will be strongly represented in platform offerings, while consumers with preferences for overlapping content will be under-weighted. Regarding competitive effects in the presence of multi-homing consumers, this model shows that entry of new platforms decreases advertisement prices, while a merger increases them.	y	Simon P. Anderson, Øystein Foros, and Hans Jarle Kind, "Competition for Advertisers and for Viewers in Media Markets," *The Economic Journal* 128 (608) (2016): 34–54.
Platform Competition	Multi-Homing	[Tying in Two-Sided Markets with Multi-Homing]()	Jay Pil Choi	2010	This paper analyzes the effects of tying on market competition and social welfare in two-sided markets when economic agents can engage in multi-homing by participating in multiple platforms to reap maximal network benefits. In this paper, tying occurs when a platform bundles two products together. The author's model shows that tying induces more consumers to multi-home and makes platform-specific exclusive content available to more consumers, which is beneficial to content providers. As a result, tying can be welfare-enhancing if multi-homing is allowed, even in cases where its welfare impacts are negative in the absence of multi-homing. The analysis thus can have important implications for recent antitrust cases in industries where multi-homing is prevalent. This paper should be read in conjunction with the Corrigendum and Comment (2017) that identifies two issues in the original paper.	y	Jay Pil Choi, "Tying in Two-Sided Markets with Multi-Homing," *The Journal of Industrial Economics* 58 (3) (2010): 607–626. Corrigendum available at [https://onlinelibrary.wiley.com/doi/abs/10.1111/joie.12156.](https://onlinelibrary.wiley.com/doi/abs/10.1111/joie.12156)
Platform Competition	Multi-Homing	[A Theory of Multihoming in Rideshare Competition]()	Kevin A. Bryan and Joshua S. Gans	2019	This paper examines competition among ridesharing platforms where firms compete by choosing both the price of rides and the extent of idleness. Idleness means that drivers receive compensation without picking up passengers, instead acting to reduce passenger wait time (e.g. by idling in a densely populated area). The authors show that when consumers are the only agents who multi-home among ridesharing platforms, idleness is lower in duopoly than when consumers face a monopoly ridesharing platform. When both drivers and consumers multihome, idleness falls to zero as it involves costs for each platform that are appropriated, in part, by their rival. Socially superior outcomes may involve monopoly or competition under various multi-homing regimes, depending on the density of the city, and relative costs of idleness versus consumer disutility of waiting.	y	Kevin Bryan and Joshua Gans, "A Theory of Multihoming in Rideshare Competition," *Journal of Economics & Management Strategy* 28 (1) (2019): 89–96.
Platform Competition	Multi-Homing	[Two-Sided Platform Competition with Multihoming Agents: An Empirical Study on the Daily Deals Market]()	Byung-Cheol Kim, Jeongsik Lee, and Hyunwoo Park	2017	This paper is an empirical study of the U.S. daily deals promotion market, which is characterized by frequent multi-homing of consumers and merchants. In this market, there is intense competition between two major platforms: Groupon and LivingSocial. Consistent with the competitive pressure from prevalent multi-homing on the consumer side, the authors find little inter-platform difference in deal terms such as discount rate offered to consumers. On the merchant side, merchants that performed worse in the first promotion were more likely to switch to a competing platform for the next promotion. However, such platform switching led to little improvement in coupon sales in the next promotion, particularly when the merchant switched from the market leader to a newer platform. Being first in a regional market provided an advantage to the platform in coupon sales, but that advantage quickly attenuated as promotions were repeated. Thus, in the presence of multi-homing agents, the daily deal platforms appear to have difficulty creating a competitive bottleneck on either side of the market. These insights could be extended to other platform markets that serve as information intermediaries.	y	Byung-Cheol Kim, Jeongsik Lee, and Hyunwoo Park, "Two-Sided Platform Competition with Multihoming Agents: An Empirical Study on the Daily Deals Market," *Information Economics and Policy* 41 (2017): 36–53.

Tools and analysis of mergers between platforms

Topic (Primary)	Sub-Topic	Title	Author(s)	Year	Summary or Edited Abstract	Peer Reviewed?	Citation
Platform Competition	Mergers	[Horizontal Mergers in the Presence of Network Externalities]()	Susumu Sato	2020	This paper examines the impact of network effects on the welfare properties of mergers between digital platforms. The author analyzes a model of oligopoly (few firms dominating the market) with multiproduct firms and firm-level direct and indirect network effects. The analysis shows that network effects enlarge the consumer benefits of mergers through network expansion, but there are costs from changes in market power. Network expansion justifies mergers involving small firms, but accompanying changes in market power make mergers between dominant firms more likely to hurt consumers. In two-sided markets, the effect of mergers on consumer surplus depends on pre-merger price structures of merging parties. In particular, when a consumer group on one side of the platform is "subsidized" through two-sided pricing by merging parties (i.e. the subsidized consumer group faces lower prices, while the consumer group on the other side is "subsidizing" and faces higher prices), the subsidized consumers will likely benefit from mergers.	wp	Susumu Sato, "Horizontal Mergers in the Presence of Network Externalities." Working Paper (2020), available at [https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3461769.](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3461769)
Platform Competition	Mergers	[Horizontal Mergers Between Multi-Sided Platforms: Insights from Cournot Competition]()	Joao Correia da silva, Bruno Jullien, Yassine Lefouili, and Joana Pinho	2019	This paper shows that the Cournot model can provide insights into the welfare effects of horizontal mergers between multi-sided platforms. Using a model featuring single-homing consumers and two-sided platforms that offer a homogeneous service and engage in Cournot quantity competition, the authors derive the effects of mergers that do not affect the industry-wide average marginal cost on any side of the market, which they call "average marginal cost preserving" mergers. Comparing the pre-merger externality-adjusted price on each side of the market and the average marginal cost on that side plays a key role in determining the effect of a merger on consumers. When externality-adjusted prices on both sides of the market are above (below) the corresponding average marginal costs, a merger harms (benefits) consumers on both sides. Regarding network effects, the authors find that a merger harms consumers on both sides if total network effects are small, benefits consumers on the higher marginal cost side and harms consumers on the lower marginal cost side if network effects are intermediate (a see-saw effect), and benefits consumers on both sides if network effects are large.	y	Joao Correia da silva and others, "Horizontal Mergers Between Multisided Platforms: Insights from Cournot Competition," *Journal of Economics & Management Strategy* 28 (1) (2019): 109–124.

Platform Competition	Mergers	[Upward Pricing Pressure in Two-sided Markets]()	Pauline Affeldt, Lapo Filistrucchi, and Tobias J. Klein	2013	Measuring upward pricing pressure (UPP) has been proposed by Farrell and Shapiro (2010) as an alternative screening device for horizontal mergers. This paper extends the concept of UPP, which characterizes the incentives to raise the price of a product after a merger, to two-sided markets such as the market for online search, where advertising demand depends on the number of users. The authors derive formulae for UPP to account for the presence of indirect network effects in two-sided markets. These formulae depend on four sets of diversion ratios (fraction of consumers that buys product B when they stop buying product A because A increased price) that can be estimated using market-level demand data or elicited in surveys. Then, the authors apply their formulae to a hypothetical merger in the Dutch daily newspaper market, showing that it is important to consider the two-sidedness of the market when evaluating UPP. The authors acknowledge this approach has shortcomings, such as under- or overestimating incentives to raise prices after a merger because UPP does not account for supply-side responses by competitors. However, they conclude that UPP can be especially useful in the initial screening phase, and may be complemented with a full-fledged merger simulation in a later stage. This paper should be read in conjunction with the Corrigendum (2018) that identifies two issues in the original paper.	y	Pauline Affeldt, Lapo Filistrucchi, and Tobias J. Klein, "Upward Pricing Pressure in Two-Sided Markets," *The Economic Journal* 123 (572) (2013): F505–F523. Corrigendum available at https://academic.oup.com/ej/article/128/610/1331/5069569.
Platform Competition	Mergers	[From Mad Men to Maths Men: Concentration and Buyer Power in Online Advertising]()	Francesco Decarolis and Gabriele Rovigatti	2020	Advertising requires detailed data to target ads and fast algorithms to bid on online auction platforms where ad space is sold. These needs have given rise to a major shift from advertisers' individual bidding to intermediated bidding by specialized and highly concentrated firms. An intermediary can enhance automated bidding and data pooling, but can also lessen competition whenever the intermediary represents competing advertisers. This paper analyzes the impact of intermediary concentration on the allocation of revenues in online sponsored search platforms. Using data on nearly 40 million Google keyword auctions, the authors first apply machine learning algorithms to cluster keywords into thematic groups that serve as relevant markets (e.g. "sleep number bed" and "pink chair" are clustered under "houseware"). Then, using an instrumental variable strategy, they quantify a negative and sizeable impact of intermediary M&A activity on platform's revenues. This finding reveals that technological innovation and countervailing power (e.g. entry of intermediaries) pose a limit to the market power attainable by dominant firms, like Google is in sponsored search.	y	Francesco Decarolis and Gabriele Rovigatti, "From Mad Men to Maths Men: Concentration and Buyer Power in Online Advertising." *American Economic Review.* Forthcoming.
Platform Competition	Mergers	[Internal versus External Growth in Industries with Scale Economies: A Computational Model of Optimal Merger Policy]()	Ben Mermelstein, Volker Nocke, Mark A. Satterthwaite, and Michael D. Whinston	2019	This paper studies merger policy in a dynamic model where firms can reduce costs through investment ("internal growth") or through mergers ("external growth"). Firms invest or propose mergers according to the profitability of these strategies. An antitrust authority can block mergers at some cost. The authors examine the optimal policy for an antitrust authority that cannot commit to its future policy (i.e. merger enforcement guidelines might change) and approves mergers as they are proposed. The authors find that the desirability of approving a merger depends on the investment behavior that will follow if it is or is not approved. In particular, when entrants have higher investment costs than large established incumbents, entering to be bought out by incumbents can impose significant welfare losses and make merger approvals much less attractive for an antitrust authority. In the other direction, investment behaviors can be greatly influenced by firm beliefs about future merger policy. When the antitrust authority adopts a less restrictive policy, this may spur entry for firms seeking to be acquired. In general, antitrust policy can greatly affect firms' investment behavior, and firms' investment behavior can greatly affect the optimal antitrust policy.	y	Ben Mermelstein, Volker Nocke, Mark A. Satterthwaite, and Michael D. Whinston, "Internal versus External Growth in Industries with Scale Economies: A Computational Model of Optimal Merger Policy," *Journal of Political Economy* 128 (1) (2020): 301–341.
Platform Competition	Mergers	[Merger Policy in Digital Markets: An Ex-Post Assessment]()	Elena Argentesi, Paolo Buccirossi, Emilio Calvano, Tomaso Duso, Alessia Marrazzo, and Salvatore Nava	2019	This paper presents a broad retrospective evaluation of mergers and merger decisions in the digital sector. The authors first discuss features of digital markets that have been key determinants for theories of harm in major merger cases, including network effects, multi-sidedness, big data, and rapid innovation. They then analyse the characteristics of almost 300 acquisitions carried out by Amazon, Facebook, and Google between 2008 and 2018. The authors cluster target companies by their area of economic activity and show that they span a wide range of economic sectors. In most cases, their products and services appear to be complementary to those supplied by the acquirers. Moreover, target companies seem to be particularly young, being four-years-old or younger in nearly 60% of cases at the time of acquisition. The authors conclude with case studies of the Facebook/Instagram and Google/Waze mergers presented before UK competition authorities, and offer suggestions for a more effective merger control regime in light of the features of digital platforms.	y	Elena Argentesi and others, "Merger Policy in Digital Markets: An Ex-Post Assessment," Journal of Competition Law and Economics 00 (00) (2020): 1–46.

THE ROLE OF COMPLEMENTS/APPS ON THE PLATFORM

Analysis of competition and foreclosure on a platform between a vertically-integrated complement and a complement that is independent

Topic (Primary)	Sub-Topic	Title	Author(s)	Year	Summary or Edited Abstract	Peer Reviewed?	Citation
Role of Complements	Foreclosing Competition	[A Leverage Theory of Tying in Two-Sided Markets]()	Jay P. Choi and Doh-Shin Jeon	2020	This paper develops a theory of tying in two-sided markets. In this paper, tying provides a mechanism for a monopolist to leverage its monopoly power to monopolize another market where it faces competition. The authors find that, in their model, tying provides a mechanism to circumvent a non-negative price constraint, as the tying firm can engage in negative pricing but the rival firm is limited from an aggressive response by the non-negative pricing constraint; this makes tying even more profitable for the monopolist. Under a model of homogeneous consumers, the authors find that tying is welfare-reducing because rival firms are less incentivized to innovate due to lack of market access. However, there are efficient reasons for tying such as integrating apps, which enable the tying firm to provide better services to consumers. The authors suggest that antitrust investigations should weigh these potential efficiencies against potential harms.	y	Jay Choi and Doh-Shin Jeon, "A Leverage Theory of Tying in Two-Sided Markets," *American Economic Journal: Microeconomics*. Forthcoming.
Role of Complements	Foreclosing Competition	[Upstream Bundling and Leverage of Market Power]()	Alexandre de Cornière and Greg Taylor	2019	This paper presents a rationale for bundling in vertical relations. In many markets, upstream firms compete to be in the best downstream slots (e.g. the best shelf in a retail store or the default application on a platform). The authors suggest a mechanism through which an upstream, multi-product firm can leverage its market power through bundling. The mechanism works in environments with the following three features: downstream firms have a limited number "slots," implying that upstream firms compete to be selected; there are positive externalities among different classes of products, i.e. the presence of product A increases the demand for product B; and upstream firms are willing to pay a slotting fee only if they expect to earn a positive markup from sales. In such environments, bundling by an upstream, multi-product firm can soften competition for slots by reducing rivals' value for them. This strategy does not rely on entry deterrence and can be achieved through contractual or even virtual tying. The authors also study the effects of upstream bundling on the downstream market; by intensifying competition there, bundling can leave consumers better off even when there is foreclosure upstream.	wp	Alexandre de Cornière and Greg Taylor, "Upstream Bundling and Leverage of Market Power." Working Paper No. 17-827 (Toulouse School of Economics, 2019), available at https://www.tse-fr.eu/sites/default/files/TSE/documents/doc/wp/2017/wp_tse_827.pdf.

Role of Complements	Foreclosing Competition	Dominance and Competitive Bundling	Sjaak Hurkens, Doh-Shin Jeon, and Domenico Menicucci	2019	This paper studies how bundling affects price competition between two asymmetric multi-product firms when one firm has symmetric dominance in all of its product markets. In this model, one firm dominates the other when it produces better products more efficiently. The authors find that for low levels of dominance, bundling intensifies price competition and lowers both firms' profits. Conversely, for high levels of dominance, bundling relaxes price competition and raises both firms' profits. For intermediate dominance levels, bundling increases the dominant firm's market share substantially, thereby raising its profit while reducing its rival's profit. Hence, the threat to bundle is then a credible foreclosure strategy. The authors also identify two circumstances in which a firm that dominates only in some markets ("tying good markets") can profitably leverage its dominance to other markets ("tied good markets") by tying all its products: when price competition in tied good markets is sufficiently more fierce than in the tying good market; and when the tying firm leverages dominance from multiple markets. These findings are relevant to antitrust cases and policy that involve the bundling of dominant products.	y	Sjaak Hurkens, Doh-Shin Jeon, and Domenico Menicucci, "Dominance and Competitive Bundling," *American Economic Journal: Microeconomics* 11 (3) (2019): 1–33.
Role of Complements	Foreclosing Competition	Integration and Search Engine Bias	Alexandre de Cornière and Greg Taylor	2014	Competition authorities worry that integration between search engines and publishers could lead to abuses of dominant position. In particular, one concern is that of own-content bias, meaning that a search engine would bias its rankings in favor of the publishers it owns or has an interest in, to the detriment of competitors and users. This paper develops a theoretical framework in which the search engine allocates users across publishers and competes with publishers to attract advertisers. The authors show that the search engine is biased against publishers that display many ads, even without integration. Although integration may lead to own-content bias, it can also reduce bias by increasing the value of a marginal consumer to the search engine. Integration also has a positive effect on users by reducing the nuisance costs due to excessive advertising. The net welfare effects of integration between a search engine and a publisher is therefore ambiguous, and the authors provide conditions for integration to be desirable or not.	y	Alexandre de Cornière and Greg Taylor, "Integration and Search Engine Bias," *The RAND Journal of Economics* 45 (3) (2014): 576–597.
Role of Complements	Foreclosing Competition	Creating Platforms by Hosting Rivals	Andrei Hagiu, Bruno Jullien, and Julian Wright	2020	This paper explores conditions under which a multiproduct firm can profitably turn itself into a platform by "hosting rivals:" by inviting rivals to sell products or services on top of its core product. Examples of platforms that host rivals include Apple's App Store and Salesforce's AppExchange. Hosting eliminates the additional shopping costs to consumers of buying a specialist rival's competing version of the multiproduct firm's non-core product. On the one hand, this makes it easier for the rival to compete on the non-core product. On the other hand, hosting turns the rival from a pure competitor into a complementor: The value added by its product now helps raise consumer demand for the multiproduct firm's core product. As a result, the authors find that hosting can be both unilaterally profitable for the multiproduct firm and jointly profitable for both firms.	y	Andrei Hagiu, Bruno Jullien, and Julian Wright, "Creating Platforms by Hosting Rivals," *Management Science* 66 (7) (2020): 3234–3248.
Role of Complements	Foreclosing Competition	Friends or Foes? Examining Platform Owners' Entry into Complementors' Spaces	Feng Zhu	2019	As platform owners continue to expand their ecosystems, many of them have started to provide consumers with their own complementary applications. These moves position platform owners as direct competitors with their complementors. This paper surveys empirical studies that examine the direct entry of platform owners into complementors' product spaces. The author finds that the impact of such entries on complementors are multi-faceted. In contrast to the theoretical literature, the empirical studies suggest that the motivation behind platform owners' direct entry goes beyond value capture (entering just for profit). For example, platform owners may enter certain product spaces because they are not satisfied with complementors' products and want to incentivize innovation by introducing competition. While none of the studies document harmful effects on platform users, there is mixed evidence on whether platform-owner entry is harmful for complementors. The author identifies a lack of evidence on the long-term effects of platform-owner entry and concludes by noting that platform owners can also use other means to appropriate value to their platforms, such as increasing service fees to capture more value from sellers.	y	Feng Zhu, "Friends or Foes? Examining Platform Owners' Entry into Complementors' Spaces," *Journal of Economics & Management and Strategy* 28 (1) (2019): 23–28.
Role of Complements	Foreclosing Competition	Competing with Complementors: An Empirical Look at Amazon.com	Feng Zhu and Qihong Liu	2018	Platform owners sometimes enter complementors' product spaces and compete against them. Using data from Amazon.com to study Amazon's entry pattern into third-party sellers' product spaces, this paper finds that Amazon is more likely to target successful product spaces. The authors also find that Amazon is less likely to enter product spaces that require greater seller efforts to grow, suggesting that complementors' platform-specific investments influence platform owners' entry decisions. While Amazon's entry discourages affected third-party sellers from subsequently pursuing growth on the platform, entry by Amazon does increase product demand and reduce shipping costs for consumers. To mitigate the risks of being pushed out of markets, third-party sellers could build their businesses by aggregating non-blockbuster products or focusing on products that require significant platform-specific investments to grow. Third-party sellers should also develop capabilities in new product discovery so they can continually bring innovative products to the marketplace.	y	Feng Zhu and Qihong Liu, "Competing with Complementors: An Empirical Look at Amazon.com," *Strategic Management Journal* 39 (10) (2018): 2618–2642.
Role of Complements	Foreclosing Competition	Threat of Platform-Owner Entry and Complementor Responses: Evidence from the Mobile App Market	Wen Wen and Feng Zhu	2019	In platform-based markets, a range of firms called complementors leverage platform resources to offer complementary products or services to prospective end users. Many of these complementors are concerned that platform owners may imitate them and enter their product spaces with similar offerings. For example, with every major update of Apple's iOS operating system, Apple uses its own offerings to compete with many third-party app developers. This paper is an empirical study of the impact of platform-owner entry threat on complementors. The authors examine how app developers on the Android mobile platform adjust value-creation (e.g. innovation efforts) and value-capture strategies (e.g. focusing on short-term profits by raising prices) in response to the threat of Google's entry into their markets. Using a difference-in-difference approach, the authors find that after Google's entry threat increases, affected developers reduce innovation (shifting innovation to unaffected and new apps) and raise prices for affected apps. Overall, Google's entry may have pushed complementors into other areas (which might be less lucrative) and strengthened Google's position in the mobile market. However, Google's entry may have reduced wasteful production efforts in the development of redundant applications. The overall welfare implication is thus ambiguous.	y	Wen Wen and Feng Zhu, "Threat of Platform-Owner Entry and Complementor Responses: Evidence from the Mobile App Market," *Strategic Management Journal* 40 (9) (2019): 1336–1367.
Role of Complements	Foreclosing Competition	Marketplace or Reseller?	Andrei Hagiu and Julian Wright	2015	Intermediaries can choose between functioning as a marketplace (suppliers sell their products directly to buyers) or reseller (purchasing products from suppliers and selling them to buyers). For example, Best Buy allows companies like Apple, Samsung, and Microsoft to launch their own mini stores within Best Buy stores, and also takes ownership over products from other branded suppliers and chooses how to sell them. This paper identifies a fundamental distinction between marketplaces and resellers: allocation of control rights between suppliers and the intermediary over non-contractible decisions about products sold (e.g. prices and advertising). Whether an intermediary acts as a marketplace or a reseller depends on which party (suppliers or intermediary) has more important information about the ideal choice of marketing activities for specific products. The authors show that reseller mode is more prevalent when marketing creates spillovers across products and network effects lead to unfavorable expectations about supplier participation. On the other hand, if the reseller has a variable-cost advantage (disadvantage) relative to the marketplace, then the intermediary shifts toward marketplace mode for unpopular (popular) products. The authors provide a theory of which products an intermediary should offer in each mode and hybrid modes, and an empirical illustration for their theory.	y	Andrei Hagiu and Julian Wright, "Marketplace or Reseller?" *Management Science* 61 (1) (2015): 184–203.

Role of Complements	Foreclosing Competition	[Product Selection in Online Marketplaces]()	Federico Etro	2020	In this paper, the author develops a model where a platform marketplace such as Amazon provides products with different demand functions, and can decide, for each product, whether to monetize sales by third party sellers through linear commissions or become a seller, either by commercializing a private label version or by purchasing from a vendor to resell as a first-party retailer. In particular, the author investigates whether entry by such a platform is underprovided or overprovided (i.e. the platform introduces less or more than the optimal amount, from a consumer's point of view, of its own products). In an environment with competitive sellers (e.g. sellers are ready to sell at marginal cost in order to win the Buy Box in the case of Amazon), the model shows that prices are reduced for consumers and aggregate consumer welfare is maximized when the platform enters, though platform entry may be underprovided or overprovided. Introducing market power of third-party sellers tends to incentivize the provision of private label products by the platform, disincentivize first-party retail, and entry is underprovided. The author also considers how a platform's logistics capabilities (e.g. Fulfillment by Amazon) and advertising affect platform entry. Finally, the author examines how platform entry may impact third-party incentives to invest in innovation of products for the platform.	wp	Federico Etro, "Product Selection in Online Marketplaces." Working Paper (2020).

Analysis of competition on a platform between complements when the complement could grow into a rival of the platform itself

Topic (Primary)	Sub-Topic	Title	Author(s)	Year	Summary or Edited Abstract	Peer Reviewed?	Citation
Role of Complements	Complements Growing Into Rivals	[Controlling vs. Enabling]()	Andrei Hagiu and Julian Wright	2019	In a number of service industries (e.g. home services, taxi companies), online platforms have emerged to take advantage of information and remote collaboration technologies to enable independent professionals to directly connect with customers (e.g. TaskRabbit, Uber). These firms typically differ from their more traditional counterparts by letting professionals control some or all of the relevant decision rights. In this paper, the authors study the optimal allocation of control rights over "transferable" (e.g. marketing of individual professionals) and "non-transferable" (e.g. quality of product or service) decisions, taking into account that revenue sharing affects all decisions. The authors use a principal-agent framework in which both the principal and the agent must be incentivized to carry out investments (or effort) that increase the revenue they jointly create. They develop a model that contains three types of non-contractible decisions: two costly and nontransferable investment decisions—one for the principal and one for the agent—and a set of transferable decisions, each of which can be controlled by either the principal or the agent. The authors also consider the possibility of cost asymmetries between the principal and the agent, spillovers across agents, and the misclassification of principal as employer even though agents are allocated the relevant control rights. Finally, they explain how the "control versus enable" choice and its associated trade-offs differ from the classic "make versus buy" choice.	y	Andrei Hagiu and Julian Wright, "Controlling vs. Enabling," *Management Science* 65 (2) (2019): 577–595.
Role of Complements	Complements Growing Into Rivals	[Innovation, Openness, and Platform Control]()	Geoffrey Parker and Marshall Van Alstyne	2018	An open platform business model offers distinct economic advantages because it allows a firm to harness external innovation as a complement to internal innovation. Suppose that a firm in charge of a business ecosystem is a firm in charge of a microeconomy. To achieve the highest growth rate, how open should that economy be? To encourage third-party developers, how long should their intellectual property interests last? This paper develops a sequential innovation model that addresses the trade-offs inherent in these two decisions. While closing the platform increases the sponsor's ability to charge for access, opening the platform increases developer ability to build upon it. In addition, the longer third-party developers retain rights to their innovations, the higher the royalties they and the sponsor earn, but the sooner those developers' rights expire, the sooner their innovations become a public good upon which other developers can build. The authors use their model to characterize the optimal levels of openness and of intellectual property duration in a platform ecosystem. These findings can inform platform designers as they seek to design optimal contracts for innovation ecosystems, as well as industry regulators as they seek to boost innovation competitiveness and social welfare.	y	Geoffrey Parker and Marshall Van Alstyne, "Innovation, Openness, and Platform Control," *Management Science* 64 (7) (2018): 3015–3032.
Role of Complements	Complements Growing Into Rivals	[Platform Ecosystems: How Developers Invert the Firm]()	Geoffrey Parker, Marshall Van Alstyne, and Xiaoyue Jiang	2017	Apple, Google, and Microsoft are among the world's most valuable companies. Each has an external developer ecosystem. Using a formal model of code spillovers, this paper shows how a rising number of developers can invert the firm. That is, firms will choose to innovate using open external contracts over closed vertical integration and the locus of value creation moves from inside the firm to outside. Digital goods afford firms the chance to optimize spillovers and firms that pursue high risk innovations with more developers can be more profitable than firms that pursue low risk innovations with fewer developers. In addition, more developers might give platform firms more chances at success. The authors show why developers might cause a shift in organizational form and provide a theory of how platform firms optimize their intellectual property regimes.	y	Geoffrey Parker, Marshall Van Alstyne, and Xiaoyue Jiang, "Platform Ecosystems: How Developers Invert the Firm," *Management Information Systems Quarterly* 41 (1) (2017): 255–266.
Role of Complements	Complements Growing Into Rivals	[Protecting Their Digital Assets: The Use of Formal & Informal Appropriability Strategies by App Developers]()	Milan Miric, Kevin J. Boudreau, and Lars Bo Jeppesen	2019	Innovators and entrepreneurs who develop products and compete "on top" of digital platforms face different conditions than those in more traditional industries. In this paper, the authors explore how this affects appropriability strategies using novel data on mobile app developers' appropriability strategies. They find that the many smallest developers in the "long tail" (the vast majority of all developers) do in fact take actions to capture value and to protect their intellectual property, but only do so through informal mechanisms. By contrast, larger developers exploit a combination of both informal mechanisms and formal intellectual property rights, using copyright, patents, and trademarks. Several strategies particular to digital platforms are also documented. The authors link this pattern of different strategies pursued by different competitor types to the structural features of digital competition.	y	Milan Miric, Kevin J. Boudreau, and Lars Bo Jeppesen, "Protecting Their Digital Assets: The Use of Formal & Informal Appropriability Strategies by App Developers," *Research Policy* 48 (8) (2019).
Role of Complements	Complements Growing Into Rivals	[Unpaid Crowd Complementors: The Platform Network Effect Mirage]()	Kevin J. Boudreau and Lars B. Jeppesen	2014	Platforms have evolved beyond just being organized as multi-sided markets, with complementors selling to users. Complementors are often unpaid, working outside of a price system, and driven by heterogeneous sources of motivation, conditions which should affect how they respond to platform growth. Does reliance on network effects and strategies to attract large numbers of complementors remain advisable in such contexts? This paper tests hypotheses related to these issues using data from 85 online multiplayer game platforms with unpaid complementors. The authors find that complementor development responds to platform growth even without sales incentives, but that attracting complementors has a net zero effect on ongoing development and fails to stimulate network effects. The authors also discuss conditions under which a strategy of using unpaid crowd complementors remains advantageous .	y	Kevin J. Boudreau and Lars B. Jeppesenmm, " Unpaid Crowd Complementors: The Platform Network Effect Mirage," *Strategic Management Journal* 36 (12) (2014): 1761–1777.

BEHAVIORAL BIASES AND COMPETITION

The role of behavioral biases in the creation of barriers to entry and market power

Topic (Primary)	Sub-Topic	Title	Author(s)	Year	Summary or Edited Abstract	Peer Reviewed?	Citation

Behavioral Biases	Market Power	Privacy and Human Behavior in the Age of Information	Alessandro Acquisti, Laura Brandimarte, George Loewenstein	2015	This paper summarizes and draws connections between diverse streams of empirical research on privacy behavior. The authors use three themes to connect insights from the social and behavioral sciences: 1) people's uncertainty about the consequences of privacy-related behaviors and their own preferences over those consequences, 2) the context-dependence of people's concern, or lack thereof, about privacy, and 3) the degree to which privacy concerns are malleable (that is, manipulable by commercial and governmental interests). The authors also offer observations about the role of public policy in protecting privacy in the information age.	y	Alessandro Acquisti, Laura Brandimarte, and George Loewenstein, "Privacy and Human Behavior in the Age of Information," *Science* 347 (6221) (2015): 509–514.
Behavioral Biases	Market Power	The Digital Privacy Paradox: Small Money, Small Costs, Small Talk	Susan Athey, Christian Catalini, and Catherine Tucker	2017	This paper uses data from the MIT digital currency experiment to examine consumer behavior regarding commercial, public, and government surveillance. This research setting allows the authors to explore the apparent contradiction that many cryptocurrencies offer people the chance to escape government surveillance, but do so by making transactions themselves public on a distributed ledger or "blockchain". The authors find that the effect of small incentives may explain the privacy paradox, where people say they care about privacy but are willing to relinquish private data quite easily. In addition, small costs introduced during the selection of digital wallets by the random ordering of featured options, have a tangible effect on the technology ultimately adopted, often in sharp contrast with individual stated preferences about privacy. Further, the introduction of irrelevant, but reassuring information about privacy protection makes consumers less likely to avoid surveillance at large.	wp	Susan Athey, Christian Catalini, and Catherine Tucker, "The Digital Privacy Paradox: Small Money, Small Costs, Small Talk." Working Paper No. 23488 (National Bureau of Economic Research, 2017), available at http://www.nber.org/papers/w23488.
Behavioral Biases	Market Power	Competing with Privacy	Ramon Casadesus-Masanell and Andres Hervas-Drane	2015	This paper analyzes the implications of consumer privacy on competition in the marketplace. Firms compete for consumer information and derive revenue both from consumer purchases and from disclosing consumer information in a secondary market. Consumers choose which firm or platform to use and how much personal information to provide it. The authors show that firms maximize profits by focusing on a single revenue source and competing at the extensive (competing for as many consumers as possible) rather than the intensive margin (competing for consumers to spend the most time on their platform). They also show that competition drives the provision of services with a low level of consumer information disclosure (i.e. a high level of privacy). However, higher competition intensity in the marketplace need not improve privacy when consumers have low valuations for it. These findings are relevant to the business models of Internet firms and the regulatory debate on consumer privacy.	y	Ramon Casadesus-Masanell and Andres Hervas-Drane, "Competing with Privacy," *Management Science* 61 (1) (2015): 229–246.
Behavioral Biases	Market Power	Privacy Regulation and Market Structure	James Campbell, Avi Goldfarb, and Catherine Tucker	2015	This paper models how regulatory attempts to protect the privacy of consumers' data affect the competitive structure of data-intensive industries. The results suggest that the commonly used consent-based approach may disproportionately benefit firms that offer a larger scope of services. Therefore, though privacy regulation imposes costs on all firms, it is small firms and new firms that are most adversely affected. The authors then show that this negative effect on small and new firms will be particularly severe for goods where the price mechanism does not mediate the effect, such as the advertising-supported Internet.	y	James Campbell, Avi Goldfarb, and Catherine Tucker, "Privacy Regulation and Market Structure," *Journal of Economics & Management Strategy* 24 (1) (2015): 47–73.
Behavioral Biases	Market Power	Ad Networks and Consumer Tracking	Anna D'Annunzio and Antonio Russo	2020	Platforms have evolved beyond just being organized as multi-sided markets, with complementors selling to users. Complementors are often unpaid, working outside of a price system, and driven by heterogeneous sources of motivation, conditions which should affect how they respond to platform growth. Does reliance on network effects and strategies to attract large numbers of complementors remain advisable in such contexts? This paper tests hypotheses related to these issues using data from 85 online multiplayer game platforms with unpaid complementors. The authors find that complementor development responds to platform growth even without sales incentives, but that attracting complementors has a net zero effect on ongoing development and fails to stimulate network effects. The authors also discuss conditions under which a strategy of using unpaid crowd complementors remains advantageous.	y	Anna D'Annunzio and Antonio Russo, "Ad Networks and Consumer Tracking," Management Science 66 (11) (2020): 5040–5058.
Behavioral Biases	Market Power	Privacy Regulation and Online Advertising	Avi Goldfarb and Catherine E. Tucker	2011	Advertisers use online consumer data to target consumer marketing appeals. This has heightened consumers' privacy concerns, leading governments to pass laws designed to protect consumer privacy by restricting the use of data and restricting online tracking techniques used by websites. This paper uses the responses of 3.3 million survey takers who had been randomly exposed to 9,596 online display (banner) advertising campaigns to explore how privacy regulation in the European Union (EU) has influenced advertising effectiveness. Privacy regulation has restricted advertisers' ability to collect data on Web users in order to target ad campaigns. The authors find that, on average, display advertising became far less effective at changing stated purchase intent after the EU laws were enacted, relative to display advertising in other countries. The loss in effectiveness was more pronounced for websites that had general content (such as news sites), where non-data-driven targeting is particularly hard to do. The loss of effectiveness was also more pronounced for ads with a smaller presence on the webpage and for ads that did not have additional interactive, video, or audio features.	y	Avi Goldfarb and Catherine E. Tucker, "Privacy Regulation and Online Advertising," *Management Science* 57 (1) (2011): 57–71.
Behavioral Biases	Market Power	The Economic Consequences of Data Privacy Regulation: Empirical Evidence from GDPR	Guy Aridor, Yeon-Koo Che, and Tobias Salz	2020	This paper studies the effects of the EU's General Data Protection Regulation (GDPR) on the ability of firms to collect consumer data, identify consumers over time, accrue revenue via online advertising, and predict consumer behavior. Using a novel dataset by an intermediary that spans much of the online travel industry, the authors perform a difference-in-differences analysis that exploits the geographic reach of GDPR. They find a 12.5% drop in the intermediary-observed consumers as a result of the new opt-in requirement of GDPR. At the same time, the consumers who remain can be observed for a longer period of time. The authors observe that the average value of remaining consumers increases, offsetting most of the losses from those who opt out. In addition, the ability to predict consumer behavior by the intermediary's machine learning algorithm does not significantly worsen as a result of the changes induced by GDPR. These results highlight the externalities that consumer privacy decisions have on both other consumers and firms.	wp	Guy Aridor, Yeon-Koo Che, and Tobias Salz, "The Economic Consequences of Data Privacy Regulation: Empirical Evidence from GDPR." Working Paper No. 26900 (National Bureau of Economic Research, 2020), available at https://www.nber.org/papers/w26900.
Behavioral Biases	Market Power	Consumer Search and Retail Market Structure	Andrew Rhodes and Jidong Zhou	2019	A puzzling feature of many retail markets is the coexistence of large firms offering many different products and smaller firms offering relatively few. This paper provides a possible explanation by studying how consumer search frictions influence the structure of retail markets. In this model, single-product firms that supply different products can merge to form a multiproduct firm. Consumers wish to buy multiple products and, due to search frictions, value the one-stop shopping convenience associated with a multiproduct firm. When search frictions are relatively large, the authors find that all firms are multi-product in equilibrium. However, when search frictions are smaller, the equilibrium market structure is asymmetric, with different retail formats coexisting. This allows firms to better segment the market and typically leads to the weakest price competition. When search frictions are low, this asymmetric market structure is also the worst for consumers. Due to the endogeneity of market structure, a reduction in search frictions can increase market prices and harm consumers.	y	Andrew Rhodes and Jidong Zhou, "Consumer Search and Retail Market Structure," *Management Science* 65 (6) (2019): 2607–2623.

The role of behavioral biases on the quality of content experienced by consumers

Topic (Primary)	Sub-Topic	Title	Author(s)	Year	Summary or Edited Abstract	Peer Reviewed?	Citation

Behavioral Biases	Quality	Voluntary Disclosure and Personalized Pricing	S. Nageeb Ali, Gregory Lewis, and Shoshana Vasserman	2019	Firms using consumer data to price discriminate is a central concern for the economics of privacy. A common response is that consumers should have control over their data and the ability to choose how firms access it. Since firms can infer information about consumers based on both the data seen and consumer disclosure choices, the strategic implications of this proposal are unclear. This paper investigates whether such measures improve consumer welfare in monopolistic and competitive environments. The authors find that consumer control can guarantee gains for every consumer type in situations where there is perfect price discrimination as well as no price discrimination. This result is driven by two ideas. First, consumers can use disclosure to amplify competition between firms. Second, consumers can share information that induces a seller—even a monopolist—to make price concessions. Whether consumer control improves consumer surplus depends on the technology of disclosure and market competition. In a competitive setting, simple disclosure technologies such as "track / do-not-track" are enough to guarantee gains in consumer welfare. In a monopolistic market, welfare gains require richer forms of disclosure technology, such as consumers deciding how much information to share.	wp	S. Nageeb Ali, Gregory Lewis, and Shoshana Vasserman, "Voluntary Disclosure and Personalized Pricing," Working Paper (2020), available at https://arxiv.org/abs/1912.04774.
Behavioral Biases	Quality	Online Privacy and Information Disclosure by Consumers	Shota Ichihashi	2020	This paper studies the price and welfare implications of consumer privacy. In this model, a consumer discloses information to a multiproduct seller, which learns about her preferences, sets prices, and makes product recommendations. Although the consumer benefits from accurate recommendations, the seller may use the information to price discriminate. The seller prefers to commit to not use information for pricing in order to encourage information disclosure. However, this commitment hurts the consumer, who could be better off by precommitting to withhold some information. Compared to single-product models, total surplus may be lower if the seller can base prices on information.	y	Shota Ichihashi, "Online Privacy and Information Disclosure by Consumers," *American Economic Review* 110 (2) (2020): 569–95.
Behavioral Biases	Quality	From Generic to Branded: A Model of Spillover in Paid Search Advertising	Oliver Rutz and Randolph Bucklin	2011	In Internet paid search advertising, marketers pay for search engines to serve text advertisements in response to keyword searches that are generic (e.g. "hotels") or branded (e.g. "Hilton Hotels"). Standalone metrics usually show that generic keywords have higher apparent costs to the advertiser than branded keywords, but generic search may create a spillover effect on subsequent branded search. The authors propose a dynamic model to capture the potential spillover from generic to branded paid search. In the model, generic search advertisements expose users to information about the brand's ability to meet their needs, raising awareness that the brand is relevant to the search.This can induce additional future search activity for keywords that include the brand name. Then, the authors apply the model to data from a paid search campaign for a major lodging chain. The results show that generic search activity positively affects future branded search activity through awareness of relevance. However, branded search does not affect generic search, demonstrating an asymmetric spillover. The findings have implications for understanding search behavior on the Internet and the management of paid search advertising.	y	Oliver Rutz and Randolph Bucklin, "From Generic to Branded: A Model of Spillover in Paid Search Advertising," *Journal of Marketing Research* 48 (1) (2011): 87–102.
Behavioral Biases	Quality	Price Salience and Product Choice	Thomas Blake, Sarah Moshary, Kane Sweeney, and Steven Tadelis	2020	Using data from StubHub, this paper studies the effect of price salience on whether a product is purchased and, conditional on purchase, the quality of the product purchased. Consistent with their theoretical predictions, the authors find that making the full purchase price salient (i.e. the full price is displayed up-front versus during the checkout process) to consumers reduces both the quality and quantity of goods purchased. The effect of salience on quality accounts for at least 28% of the overall revenue decline. Evidence shows that the effects persist beyond the first purchase and impact even experienced users. Detailed click-stream data shows that price-obfuscation makes price comparisons difficult and results in consumers spending more than they otherwise would. In addition, sellers respond to the increased price obfuscation by listing higher quality tickets.	wp	Thomas Blake and others, "Price Salience and Product Choice." Marketing Science. Forthcoming, available at http://faculty.haas.berkeley.edu/stadelis/AIP.pdf?_ga=2.253051916.462477783.1611155687-651872163.1609301941.
Behavioral Biases	Quality	Prominence and Consumer Search	Mark Armstrong, John Vickers, and Jidong Zhou	2009	This paper examines the implications of "prominence" in search markets. The authors model prominence by supposing that the prominent firm will be sampled first by all consumers. If there are no systematic quality differences among firms, the authors find that the prominent firm will charge a lower price than its less prominent rivals. Making a firm prominent will typically lead to higher industry profit but lower consumer surplus and welfare. The model is extended by introducing heterogeneous product qualities, in which the firm with the highest-quality product has the greatest incentive to become prominent, and making it prominent will boost industry profit, consumer surplus, and welfare.	y	Mark Armstrong, John Vickers, and Jidong Zhou, "Prominence and Consumer Search," *The RAND Journal of Economics* 40 (2) (2009): 209–33.
Behavioral Biases	Quality	Paying for Prominence	Mark Armstrong and Jidong Zhou	2011	This paper investigates how firms can become "prominent" and influence the order in which consumers consider options. First, firms can affect sales efforts by means of commission payments, through which the salesman steers consumers towards expensive products. Second, sellers can advertise prices on a price comparison website, so consumers investigate the suitability of products in order of increasing price. Here, prices are lower when search costs are higher. Finally, consumers might first consider their existing supplier for subsequent purchases, which suggests a relatively benign rationale for cross-selling in markets such as retail banking.	y	Mark Armstrong and Jidong Zhou, "Paying for Prominence," *The Economic Journal* 121 (556) (2011): F368–F395.
Behavioral Biases	Quality	Consideration Sets and Competitive Marketing	Kfir Eliaz and Ran Spiegler	2011	This paper studies a model in which competing firms use costly marketing devices to influence the set of alternatives that consumers perceive as relevant. The cornerstone of this model is that consumers face an overwhelmingly large variety of products in the modern marketplace and thus using screening criteria (deliberate as well as unconscious) to reduce the number of relevant options. As a result, consumers narrow their options to a potentially smaller set that the authors call a "consideration set." This set is influenced by marketing devices (e.g. advertising content, product positioning, search engine optimization) employed by firms. A key finding from the model is that a consumer who adds a new product to her consideration sets, thanks to active marketing, ends up buying the new product as long as her default option is not the most preferred product in the set. The symmetric equilibria exhibit a strong correlation between persuading a consumer to consider a new product and persuading her to buy it.	y	Kfir Eliaz and Ran Spiegler, "Consideration Sets and Competitive Marketing," *The Review of Economic Studies* 78 (1) (2011): 235–262.
Behavioral Biases	Quality	Online Shopping Intermediaries: The Strategic Design of Search Environments	Anthony Dukes and Lin Liu	2016	An online shopping intermediary is an Internet platform on which consumers and third-party sellers transact. Shopping intermediaries provide a search environment (e.g. through search aids) to lower the search costs incurred by consumers when finding and evaluating sellers' products. This paper studies strategic incentives of an intermediary in the design of its search environment as a means to ease search costs. An important aspect of the analysis is that consumers optimally decide how many sellers to evaluate and how deeply (e.g. number of attributes) to evaluate each of them. The authors find that the equilibrium search environment embeds sufficiently high search costs to prevent consumers from evaluating too many sellers, but not too high to cause them to evaluate sellers' products at partial depth.	y	Anthony Dukes and Lin Liu, "Online Shopping Intermediaries: The Strategic Design of Search Environments," *Management Science* 62 (4) (2016): 1064–1077.
Behavioral Biases	Quality	Consumer Price Search and Platform Design in Internet Commerce	Michael Dinerstein, Liran Einav, Jonathan Levin, and Neel Sundaresan	2018	Platform design, the process that helps potential buyers on the internet navigate toward products they may purchase, plays a critical role in reducing search frictions and determining market outcomes. This paper studies a key trade-off associated with the role of efficient platform design to guide consumers to their most desired product while also strengthening seller incentives to lower prices. The authors combine browsing data from eBay and an equilibrium model of consumer search and price competition to quantitatively assess this trade-off in the particular context of a change in eBay's marketplace design. They find that their model explains many effects of the redesign: a reduction in posted prices, a shift toward lower-priced purchases, and consequently, a reduction in transaction prices. The broader lesson is that platform design can reduce consumer search frictions and also affect seller decisions. In this analysis, the authors focus on price, but similar forces would be at play for other product attributes that can be changed in the short run, such as service quality or information disclosure.	y	Michael Dinerstein and others, "Consumer Price Search and Platform Design in Internet Commerce," *American Economic Review* 108 (7) (2018): 1820–59.

Behavioral Biases	Quality	[Design of Search Engine Services: Channel Interdependence in Search Engine Results]()	Benjamin Edelman and Zhenyu Lai	2016	In this paper, the authors examine prominent placement of search engines' own services and effects on user choices. Evaluating a natural experiment in which different results were shown to users who performed similar searches, the authors find that Google's prominent placement of its Flight Search service increased the clicks on paid advertising listings by more than half while decreasing the clicks on organic search listings by about the same quantity. This effect appears to result from interactions between the design of search results and users' decisions about where and how to focus their attention: users who decide what to click on the basis of relevance were more likely to select paid listings, whereas users who are influenced by visual presentation and page position were more likely to click on Google's own Flight Search listing. The authors consider implications of these findings for competition policy and online marketing strategies.	y	Benjamin Edelman and Zhenyu Lai, "Design of Search Engine Services: Channel Interdependence in Search Engine Results," *Journal of Marketing Research* 53 (6) (2016): 881–900.
Behavioral Biases	Quality	[The Persistence of Broadband User Behavior: Implications for Universal Service and Competition Policy]()	Andre Boik, Shane Greenstein, and Jeffrey Prince	2019	In several markets, firms compete for consumer attention. This paper examines user priorities based on the allocation of their time, using data on user online choice to characterize demand for online services. The dataset covers between 2008 to 2013, during which consumers were introduced to many new and notable sites and new devices on which to access them. In their analysis, the authors assess "how" households supply their attention along various dimensions, such as their concentration of attention across the universe of sites and the amount of attention expenditure per domain visit. Notably, there was no change in "how" households allocated their attention, despite drastically changing where they allocated it. In addition, conditional on total attention expenditure, demographics fail to predict household behavior and its persistence over time. The authors interpret this behavior in light of policy discussions on universal service, data caps, and merger analysis.	y	Andre Boik, Shane Greenstein, and Jeffrey Prince, "The Persistence of Broadband User Behavior: Implications for Universal Service and Competition Policy," *Telecommunications Policy* 43 (8) (2019).
Behavioral Biases	Quality	[Coordination Motives and Competition for Attention in Information Markets]()	Simone Galperti and Isabel Trevino	2020	People seek to learn about world events, but they also seek to learn what others know about those events. Shared knowledge might be useful to coordinate actions among individuals, such as deciding whether to attend a protest. Meanwhile, news sources rely on monetizing people's attention to thrive in the market. In this paper, the authors develop a model which finds that competition for attention leads to a homogeneous supply of information: news sources are equally accurate in reporting events and equally clear in conveying their reports. This occurs even though people would demand different accuracies and clarities. The authors also find that the type of supplied sources (in terms of clarity and accuracy, e.g. the distinction between "soft" or high-clarity, low-accuracy news and "hard" or low-clarity, high-accuracy news) depends on the cost structure of producing information and people's coordination motives. By becoming the "currency" by which people pay for information, attention causes novel market inefficiencies, whose form and size depend on people's coordination motives. The authors investigate supply-side policies, such as introducing sufficiently clear and accurate sources to consumers and eliminating sources that are insufficiently clear and accurate, that tackle such inefficiencies.	y	Simone Galperti and Isabel Trevino, "Coordination Motives and Competition for Attention in Information Markets," *Journal of Economic Theory* 188 (2020): 105039.
Behavioral Biases	Quality	[The Welfare Effects of Social Media]()	Hunt Allcott, Luca Braghieri, Sarah Eichmeyer, and Matthew Gentzkow	2020	The rise of social media has provoked optimism about potential societal benefits, as well as concern about harms such as addiction, depression, and political polarization. In a randomized experiment, this paper finds that deactivating Facebook for the four weeks before the 2018 US midterm election reduced online activity, while increasing offline activities such as watching TV alone and socializing with family and friends; reduced both factual news knowledge and political polarization; increased subjective well-being; and caused a large persistent reduction in post-experiment Facebook use. Deactivation reduced post-experiment valuations of Facebook, suggesting that traditional metrics may overstate consumer surplus from using social media.	y	Hunt Allcott, Luca Braghieri, Sarah Eichmeyer, and Matthew Gentzkow, "The Welfare Effects of Social Media," *American Economic Review* 110 (3) (2020): 629–676.

THE ROLE OF DATA ON COMPETITION

The role of user-specific data in the creation of barriers to entry and market power

Topic (Primary)	Sub-Topic	Title	Author(s)	Year	Summary or Edited Abstract	Peer Reviewed?	Citation
Role of Data	Market Power	[Markets for Information: An Introduction]()	Dirk Bergemann and Alessandro Bonatti	2019	This paper surveys a recent and growing literature on markets for information, offering a view of information markets through an integrated model of consumers, information intermediaries, and firms. The model embeds a large set of applications ranging from sponsored-search advertising to credit scores to information sharing among competitors. The authors then zoom in to a critical element in markets for information: design of information. They distinguish between ex ante sales of information (the buyer acquires an information structure) and ex post sales (the buyer pays for specific realizations), and relate this distinction to the different products that brokers, advertisers, and publishers use to trade consumer information online. The authors discuss the endogenous limits of trading information that are derived from the potential adverse use of information to consumers. Finally, they discuss recommender systems and other information filtering systems that use artificial intelligence to predict ratings or preferences in markets for indirect information.	y	Dirk Bergemann and Alessandro Bonatti, "Markets for Information: An Introduction," *Annual Review of Economics* 11 (2019): 85–107.
Role of Data	Market Power	[Value of Data: There's No Such Thing as a Free Lunch in the Digital Economy]()	Wendy C.Y. Li, Makoto Nirei, and Kazufumi Yamana	2019	The proliferation of "free" digital goods and services pose challenges not only to policymakers who generally rely on prices to indicate a good's value but also to corporate managers and investors who need to know how to value data, a key input of digital goods and services. In this paper, the authors first examine the data activities for seven major types of online platforms based on their underlying business models (characterized by data flow, value creation for consumers, value creation for third parties, and how an online platform company monetizes its data). The authors find that online platform companies can vary in the degree of vertical integration in the data value chain, and the variation can determine how they monetize their data and how much economic benefit they can capture. Unlike R&D that may depreciate due to obsolescence, data can produce new values through data fusion, a unique feature that creates unprecedented challenges in measurements. Their initial estimates indicate that data can have enormous value. For example, in 2017, the value of Amazon's data can account for 16% of Amazon's market valuation and has an annual growth rate of 35%.	wp	Wendy C.Y. Li, Makoto Nirei, and Kazufumi Yamana, "Value of Data: There's No Such Thing as a Free Lunch in the Digital Economy." Discussion Paper (Research Institute of Economy, Trade and Industry, 2019), available at https://www.rieti.go.jp/en/publications/summary/19030027.html.
Role of Data	Market Power	[Attention Oligopoly]()	Andrea Prat and Tommaso M. Valletti	2019	This paper models social media platforms as attention brokers that have proprietary information about their users' product preferences and sell targeted ad space to retail product industries. Retail producers (incumbents or entrants) compete for access to this attention bottleneck. Increased concentration among attention brokers results in a tightening of the attention bottleneck, leading to higher ad prices, fewer ads being sold to entrants, and lower consumer welfare in the product industries. The welfare effect is characterized in terms of patterns of individual usage across platforms. A merger assessment that relies on aggregate platform usage alone can be highly biased.	wp	Andrea Prat and Tommaso M. Valletti, "Attention Oligopoly." Working Paper (2019), available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3197930.

Role of Data	Market Power	The Economics of Social Data	Dirk Bergemann, Alessandro Bonatti, and Tan Gan	2020	A data intermediary pays consumers for information about their preferences, and sells this information to firms who use it to tailor their products and prices. The social dimension of the individual data, whereby an individual's data are predictive of the behavior of others, generates a data externality that reduces the intermediary's cost of acquiring information. In other words, acquiring data about one individual saves the intermediary the cost of acquiring information about similar individuals. This paper derives the intermediary's optimal data policy and shows that it preserves the privacy of the consumers' identities while providing precise information about market demand to the firms. This enables the intermediary to capture the entire value of information as the number of consumers grows large.	wp	Dirk Bergemann, Alessandro Bonatti, and Tan Gan, "The Economics of Social Data." Discussion Paper No. 2203R (Cowles Foundation for Research in Economics, 2020), available at http://cowles.yale.edu/sites/default/files/files/pub/d22/d2203-r.pdf.
Role of Data	Market Power	The Value of Personal Information in Online Markets with Endogenous Privacy	Rodrigo Montes, Wilfried Sand-Zantman, and Tommaso M. Valletti	2018	This paper investigates the effects of price discrimination on prices, profits and consumer surplus, when one or more competing firms can use consumers' private information to price discriminate and consumers can pay a privacy cost to avoid it. While a monopolist always benefits from higher privacy costs, this is not true in the competing duopoly case. In a duopoly, firms' individual profits are decreasing while consumer surplus is increasing in the privacy cost. Under competition, the authors show that the optimal selling strategy for the owner of consumer data is to deal exclusively with one firm in order to create maximal competition between the winner and the loser of data, which brings inefficiencies. These findings suggest that policy makers should focus their attention on exclusivity deals, rather than making it easier for consumers to protect their privacy.	y	Rodrigo Montes, Wilfried Sand-Zantman, and Tommaso M. Valletti, "The Value of Personal Information in Online Markets with Endogenous Privacy," *Management Science* 65 (3) (2018): 955–1453.
Role of Data	Market Power	The Economics of Data Externalities	Shota Ichihashi	2020	The paper uses a model where a firm buys data from consumers to demonstrate that data externalities exist where data of some consumers reveal information about others. Firms collect data from individuals to learn about the uncertain state of the world. The novelty of this paper is its study on general welfare implications through considering a richer class of data externalities and consumer preferences. The paper's results solve an information design problem where the firm chooses what information to collect from consumers to maximize profits. Also, how the initial allocation of resources affects the market outcome is an important question that the paper's results addresses. It emphasizes that we should consider not only how the firm uses collected data but also how the data is initially allocated across customers.	wp	Shota Ichihashi, "The Economics of Data Externalities." Working Paper (2020), available at https://shota2.github.io/research/externality.pdf.
Role of Data	Market Power	Privacy and Personal Data Collection with Information Externalities	Jay Pil Choi, Doh-Shin Jeon, and Byung-Cheol Kim	2019	This paper provides a theoretical model of privacy in which data collection requires consumers' consent and consumers are fully aware of the consequences of such consent. Nonetheless, excessive collection of personal information arises in the monopoly market equilibrium which results in excessive loss of privacy compared to the social optimum. The main mechanism for this result is information externalities and users' coordination failure in which some users' decisions to share their personal information may allow the data controller to infer more information about non-users. Also, the emergence of the data brokerage industry can facilitate the collection and monetization of users' personal data, even in a fragmented market where no individual website has incentive to do so independently due to scale economies in data analytics. The authors discuss policy implications of their analysis in light of the recent EU General Data Protection Regulation.	y	Jay Pil Choi, Doh-Shin Jeon, and Byung-Cheol Kim, "Privacy and Personal Data Collection with Information Externalities," *Journal of Public Economics* 173 (2019): 113–124.
Role of Data	Market Power	The Design and Price of Information	Dirk Bergemann, Alessandro Bonatti, and Alex Smolin	2018	A data buyer (e.g. a lender, advertiser, or health care provider) faces a decision problem under uncertainty. He can augment his initial private information with supplemental data from a monopolist data seller. His willingness to pay for supplemental data is determined by the quality of his initial private information. This study investigates the data seller's revenue-maximizing information policy, i.e. how much information the seller should provide and how she should price access to the data. In order to screen the heterogeneous data buyer types, the seller offers a menu of information products. The paper constructs the optimal menu of information offering, where the type of menu depends on the quality of information sold and the type of buyer.	y	Dirk Bergemann, Alessandro Bonatti, and Alex Smolin, "The Design and Price of Information," *Annual Review of Economics* 108 (2018): 1–48.
Role of Data	Market Power	Pricing Network Effects	Itay P. Fainmesser and Andrea Galeotti	2015	The increase in information that firms can collect or purchase about network effects across consumers motivates these questions: How does a firm's pricing strategy react to detailed information on network effects? Are the availability and use of such information beneficial or detrimental to consumer surplus? This paper develops a model in which a monopolist sells a network good and price discriminates based on information about consumers' influence and consumers' susceptibility to influence. The monopolist optimally offers consumers price discounts for their influence and charges price premia for their susceptibility. The authors determine when, relative to uniform price, consumer surplus increases, and characterize the value of information on network effects for the monopolist.	y	Itay P. Fainmesser and Andrea Galeotti, "Pricing Network Effects," *The Review of Economic Studies* 83 (1) (2016): 165–198.
Role of Data	Market Power	Targeting in Advertising Markets: Implications for Offline Versus Online Media	Dirk Bergemann and Alessandro Bonatti	2011	This paper develops a model with many advertisers (products) and many advertising markets (media). Each advertiser sells to a different segment of consumers, and each medium is targeting a different audience. The authors characterize the competitive equilibrium in the advertising markets and evaluate the implications of ad targeting. An increase in targeting leads to an increase in the total number of consumer-product matches, and hence in the social value of advertising. However, targeting also increases the concentration of firms advertising in each market. The authors find that the equilibrium price of advertisements is first increasing, then decreasing, in the targeting capacity. They trace out the implications of targeting for competing media, distinguishing offline and online media by their targeting ability: low versus high. As consumers' relative exposure to online media increases, the revenues of offline media decrease, even though the price of advertising may increase.	y	Dirk Bergemann and Alessandro Bonatti, "Targeting in Advertising Markets: Implications for Offline Versus Online Media," *The RAND Journal of Economics* 42 (3) (2011): 417–443.
Role of Data	Market Power	Online Advertising: Heterogeneity and Conflation in Market Design	Jonathan Levin and Paul Milgrom	2010	One view of internet advertising is that it will move increasingly toward finer ad targeting, with every impression treated as distinct and unique. The authors ask if this sort of differentiation the best way to organize well-functioning markets, and what are the disadvantages to treating each impression separately. The authors introduce the idea of conflation, in which similar but distinct products are treated as identical in order to make markets thick or reduce cherry-picking. They report some illustrative anecdotes of how excessive ad targeting can work out badly. Finally, they describe trade-offs in designing online advertising markets and the ingredients for a theory of the optimal market organization.	y	Jonathan Levin and Paul Milgrom, "Online Advertising: Heterogeneity and Conflation in Market Design," *American Economic Review* 100 (2) (2010): 603–07.
Role of Data	Market Power	Search Engines and Data Retention: Implications for Privacy and Antitrust	Lesley Chiou & Catherine Tucker	2017	This paper investigates whether larger quantities of historical data affect a firm's ability to maintain market share in Internet search. The authors study whether the length of time that search engines retained their server logs affected the accuracy of subsequent searches. The analysis exploits changes in these policies prompted by the actions of policymakers. The paper finds little empirical evidence that reducing the length of storage of past search engine searches affected the accuracy of search, where search accuracy is measured by the need to repeat searches. The results suggest that the possession of historical data confers less of an advantage in market share than is sometimes supposed. The results also suggest that limits on data retention may impose fewer costs in instances where overly long data retention leads to privacy concerns such as an individual's "right to be forgotten." It is important to note that this paper focuses on blanket data retention policies by firms rather than those on the individual level.	wp	Lesley Chiou and Catherine Tucker, "Search Engines and Data Retention: Implications for Privacy and Antitrust," Working Paper No. 23815 (National Bureau of Economic Research, 2017), available at https://www.nber.org/papers/w23815.pdf.

Role of Data	Market Power	[Online Advertising and Privacy]()	Alexandre de Cornière and Romain de Nijs	2016	This paper studies the decision made by a platform about whether to use the consumer information it has gathered to increase its revenue from advertising. An online platform auctions an advertising slot. Several advertisers compete in the auction, and consumers differ in their preferences. Prior to the auction, the platform decides whether to allow advertisers to access information about consumers (disclosure) or not (privacy). Disclosure improves the match between advertisers and consumers but increases product prices, even without price discrimination. This paper provides conditions under which disclosure or privacy is privately or socially optimal. When advertisers compete on the downstream market, disclosure can lead to an increase or a decrease in product prices depending on the nature of the information.	y	Alexandre de Cornière and Romain de Nijs, "Online Advertising and Privacy," *The RAND Journal of Economics* 47 (1) (2016): 48-72.
Role of Data	Market Power	[Peaches, Lemons, and Cookies: Designing Auction Markets with Dispersed Information]()	Ittai Abraham, Susan Athey, Moshe Babaioff, and Michael D. Grubb	2020	The structure of an advertising auction has a significant impact on the resulting revenue to the publisher. This paper analyzes the effect of informational asymmetries caused by the presence of cookies in an ad auction. In the case of a second-price auction, if the cookie identifies a "lemon" (a low-value impression, such as a web-bot), the bidder who does not have access to this cookie has no incentive to compete in the auction, and the publisher's revenue falls dramatically. On the other hand, in the case of a first-price auction, or if the cookie identifies a high-value impression, the auction revenue remains more robust to informational asymmetry. In auctions that are structured as a waterfall, where one ad exchange views the impression before the others, later bidders suffer from information asymmetry, have no incentive to bid, and the first bidder can thus lower its bid and still win; this leads to severe depression of revenue to the publisher.	y	Ittai Abraham and others, "Peaches, Lemons, and Cookies: Designing Auction Markets with Dispersed Information," *Games and Economic Behavior* 124 (2020): 454–477.

The role of user-specific data on quality of content experienced by consumers

Topic (Primary)	Sub-Topic	Title	Author(s)	Year	Summary or Edited Abstract	Peer Reviewed?	Citation
Role of Data	Quality	[Consumer Information and the Limits to Competition]()	Mark Armstrong and Jidong Zhou	2021	Information travels in both directions between two sides of a platform. Firms obtain information about consumer preferences from data brokers, social media, past interactions with consumers, etc. This can enable them to make personalized offers and price discriminate in a targeted manner. On the other side, consumers obtain information about their preferences for various products from platforms such as search engines and product comparison websites. The precision of consumers' information about products affects both the quality of the consumer-product match and the intensity of competition between firms. In this paper, the authors develop a model and derive signal structures which are optimal for firms and signal structures which are optimal for consumers. The firm-optimal signal structure amplifies product differentiation, thereby relaxing competition, while ensuring that consumers purchase their preferred product, thereby maximizing total welfare. The consumer-optimal structure dampens differentiation, which intensifies competition, but induces some consumers with weak preferences between products to buy their less-preferred product. The analysis sheds light on the limits to competition when the information possessed by consumers can be designed flexibly.	wp	Mark Armstrong and Jidong Zhou, "Consumer Information and the Limits to Competition." Working paper, available at https://drive.google.com/file/d/1V4it9Xk0z8KJk8Iv8IppenZAiJ_1u6XB/view.
Role of Data	Quality	[The Limits of Price Discrimination]()	Dirk Bergemann, Benjamin Brooks, and Stephen Morris	2015	This paper analyzes the welfare consequences of a monopolist having additional information about consumers' tastes, beyond the prior distribution; the additional information can be used to charge different prices to different segments of the market (third degree price discrimination) or, given complete information about buyers' valuations, charge each buyer his valuation (first degree price discrimination). The authors show that the market can be segmented in this way (induced by additional information) to achieve several different combinations of consumer and producer surplus. In each scenario, additional information never hurts the monopolist seller (profits are at least as high as under uniform monopoly price), while social and consumer surplus may increase or decrease. The authors' findings suggest that while market segmentation based on additional information often hurts consumers and favor producers, this is not always the case; the relationship between data collection and efficiency depends on the preferences of those who collect the information, and thus future research should pinpoint which forms of price discrimination arise endogenously and for whose benefit.	y	Dirk Bergemann, Benjamin Brooks, and Stephen Morris,"The Limits of Price Discrimination," *American Economic Review*, 105 (3) (2015): 921-57.
Role of Data	Quality	[Conditioning Prices on Purchase History]()	Alessandro Acquisti and Hal Varian	2005	Many transactions are now computer mediated, making it possible for sellers to condition their pricing on the history of interactions with individual consumers. This paper investigates conditions under which price conditioning will or will not be used. The authors' simplest model involves rational consumers with constant valuations for the good being sold and a monopoly seller who can commit to a pricing policy. In this framework, the seller will not find it profitable to condition pricing on past behavior. The paper considers various generalizations of this model, such as allowing the seller to offer enhanced services to previous customers, making the seller unable to commit to a pricing policy, and allowing competition in the marketplace. All of these generalizations have equilibria with price conditioning.	y	Alessandro Acquisti and Hal Varian, "Conditioning Prices on Purchase History," *Marketing Science* 24 (3) (2005): 367–381.
Role of Data	Quality	[Search Advertising]()	Alexandre de Cornière	2016	Search engines enable advertisers to target consumers based on the query they have entered. Using a framework in which consumers search sequentially after entering a query, this paper shows that such targeting reduces search costs, improves matches, and intensifies price competition. However, profit-maximizing monopolistic search engines impose a distortion by charging high advertising fees, which may negate the benefits of targeting. The search engine also has incentives to provide a suboptimal quality of sponsored links. Competition among search engines can increase or decrease welfare, depending on the extent of multi-homing by advertisers.	y	Alexandre de Cornière, "Search Advertising," *American Economic Journal: Microeconomics* 8 (3) (2016): 156–188.
Role of Data	Quality	[Why Do Intermediaries Divert Search?]()	Andrei Hagiu and Bruno Jullien	2011	This paper analyzes the incentives to divert search for an information intermediary who enables buyers (consumers) to search affiliated sellers (stores). The authors identify two original motives for diverting search, i.e. inducing consumers to search more than they would like: 1) trading off higher total consumer traffic for higher revenues per consumer visit and 2) influencing stores' choices of strategic variables (e.g. pricing) once they have decided to affiliate. The authors characterize the conditions under which there would be no role for search diversion as a strategic instrument for the intermediary, thereby showing that it occurs even when the contracting space is significantly enriched. They then discuss several applications related to online and brick-and-mortar intermediaries.	y	Andrei Hagiu and Bruno Julien, "Why Do Intermediaries Divert Search?" *The RAND Journal of Economics* 42 (2) (2011): 337–362.
Role of Data	Quality	[Position Auctions with Consumer Search]()	Susan Athey and Glenn Ellison	2011	This paper integrates a model of consumer search into a model of auctions for "sponsored-link" advertising slots on search engine results. The authors analyze consumer search strategies, equilibrium bidding, and the welfare benefits of position auctions. Notably, the authors find that click-weighted auctions (where advertisers that receive more clicks pay less to maintain their positions) do not necessarily generate the right selection of ads—general ads may be displayed when it would be more efficient to display ads that serve a narrower population segment well. There can also be welfare losses when asymmetries in the click-through weights make the ordering of the ads less informative about quality. They also note that the introduction of click-weighting can create incentives for firms to write misleading and overly broad text. Finally, the authors discuss implications for reserve prices, as well as a number of other auction design questions.	y	Susan Athey and Glenn Ellison, "Position Auctions with Consumer Search," *The Quarterly Journal of Economics* 126 (3) (2011): 1213–1270.

Role of Data	Quality	[Cream Skimming and Information Design in Matching Markets]()	Gleb Romanyuk and Alex Smolin	2019	This paper studies the information intermediation problem in the context of dynamic matching markets, examples of which include Uber and Lyft for ride-hailing; Airbnb and Craigslist for accomodation rental; and Upwork and TaskRabbit for freelance labor. Typically, short-lived buyers arrive to a platform over time and randomly match with sellers. The sellers stay at the platform and decide whether to accept incoming requests. The platform designs what buyer information the sellers observe before deciding to form a match. The authors argue that full information disclosure leads to a market failure because of excessive rejections by the sellers, who exhibit "cream-skimming" behavior. In short, the authors make a case for using information design as a way to mitigate the adverse effects of cream skimming and improve platform performance.	y	Gleb Romanyuk and Alex Smolin, "Cream Skimming and Information Design in Matching Markets," *American Economic Journal: Microeconomics* 11 (2) (2019): 250–276.

The measurement of quality in light of zero money prices and implications for quality-adjusted prices

Topic (Primary)	Sub-Topic	Title	Author(s)	Year	Summary or Edited Abstract	Peer Reviewed?	Citation
Role of Data	Measuring Quality	[The Specialness of Zero]()	Joshua S. Gans	2020	This paper analyzes the conditions under which a monopolist firm decides to set a price at zero and finds that this outcome can be socially optimal, even when compared to a competitive market. Two conditions for a zero price are negative costs and the existence of a "mass point" of consumers, who have zero utility for the good. The authors present cases when the monopolist prices at zero and supplies to the mass point given zero, small, and heterogenous transactional costs (these change the default purchase decision of an indifferent consumer). The author then assesses if, given monopolist pricing at zero, welfare would be increased with the advent of competition (which often leads to negative prices). He finds that no matter the consumer's purchasing default, competition may not increase social welfare compared to a monopoly zero price. This result suggests that monopoly markets (as opposed to competitive markets) might require different antitrust enforcement and regulations.	wp	Joshua S. Gans, "The Specialness of Zero." Working Paper, available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3486964.
Role of Data	Measuring Quality	[Too Much Data: Prices and Inefficiencies in Data Markets]()	Daron Acemoglu, Ali Makhdoumi, Azarakhsh Malekian, and Asuman Ozdaglar	2020	When a user shares their data with an online platform, they typically reveal relevant information about other users. This paper models a data market in which one or multiple platforms estimate a user's type with data acquired from all users. Some of these users value privacy. The model shows that data externalities depress the price of data. Once a user's information is leaked by others, they have less reason to protect their data and privacy. These depressed prices lead to excessive data sharing. Under certain conditions, shutting down data markets may improve (utilitarian) welfare. In addition, competition between platforms does not redress the problems of low prices for data and too much data sharing, and may further reduce welfare. Finally, the authors propose a scheme based on mediated data-sharing that improves efficiency.	wp	Daron Acemoglu and others, "Too Much Data: Prices and Inefficiencies in Data Markets." Working Paper, available at http://economics.mit.edu/files/19835.
Role of Data	Measuring Quality	[GDP-B: Accounting for the Value of New and Free Goods in the Digital Economy]()	Erik Brynjolfsson, Avinash Collis, W. Erwin Diewert, Felix Eggers, and Kevin J. Fox	2019	The welfare contributions of the digital economy, characterized by the proliferation of new and free goods, are not well-measured in our current national accounts. This paper derives explicit terms for the welfare contributions of these goods and introduces a new metric, GDP-B, which quantifies their benefits, rather than costs. The authors apply this framework to several empirical examples including Facebook and smartphone cameras, and estimate their valuations through incentive compatible choice experiments. For example, including the welfare gains from Facebook would have added between 0.05 and 0.11 percentage points to GDP-B growth per year in the US.	wp	Erik Brynjolfsson and others, "GDP-B: Accounting for the Value of New and Free Goods in the Digital Economy." Working Paper No. 25695 (National Bureau of Economic Research, 2019), available at [https://www.nber.org/papers/w25695.](https://www.nber.org/papers/w25695)

The role of machine learning and use of big data

Topic (Primary)	Sub-Topic	Title	Author(s)	Year	Summary or Edited Abstract	Peer Reviewed?	Citation
Role of Data	Machine Learning	[Competition in Pricing Algorithms]()	Zach Brown and Alexander MacKay	2021	Retailers have increasing access to better pricing technology, especially in online markets. Pricing algorithms allow retailers to commit to pricing strategies that depend on the prices of competitors. This paper develops a model in which firms choose algorithms, rather than prices. The competitive equilibria in this scenario (with firms choosing algorithms) tend to have higher prices than the competitive equilibrium in which firms set prices simultaneously. Using hourly prices of over-the-counter drugs from five major online retailers, the authors find evidence that these retailers use different pricing technologies. The model also suggests that pricing algorithms lead to meaningful increases in markups, especially for firms whose algorithms change prices quickly in response to changes in rivals' price changes.	wp	Zach Brown and Alexander MacKay, "Competition in Pricing Algorithms." Working paper (2021), available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3485024.
Role of Data	Machine Learning	[An Empirical Analysis of Algorithmic Pricing on Amazon Marketplace]()	Le Chen, Alan Mislove, and Christo Wilson	2016	In this paper, the authors develop a method for detecting algorithmic pricing, and use it empirically to analyze the prevalence and behavior of dynamic pricing algorithms on Amazon Marketplace. The authors explore the characteristics of these sellers on Amazon and characterize the impact of these strategies on the dynamics of the marketplace. They observe that algorithmic sellers appear to be more successful than non-algorithmic sellers, offering fewer products but receiving significantly higher amounts of feedback, which suggests that they have higher sales volumes. Algorithmic sellers also "win" the Buy Box (the Buy Box features a product that is sold my many sellers), which may further contribute to their feedback scores. However, the authors also observe that the lowest price and the Buy Box for products with algorithmic sellers are significantly more volatile than for products without any algorithmic sellers.	y	Le Chen, Alan Mislove, and Christo Wilson, "An Empirical Analysis of Algorithmic Pricing on Amazon Marketplace," *Proceedings of the 25th International Conference on World Wide Web* (2016): 1339–1349.
Role of Data	Machine Learning	[Who Benefits from Surge Pricing?]()	Juan Camilo Castillo	2020	Technological develops in digital industries have allowed firms to quickly update their prices in response to market conditions. This pricing practice is known as real-time pricing. This paper considers a leading example of real-time pricing: surge pricing in the ride-hailing industry, whose leaders are Uber and Lyft. Under surge pricing, the price of a ride varies across time depending on local supply and demand conditions. This contrasts with uniform pricing under which prices depend only on the distance and duration of a ride. The paper assesses the effects of surge pricing on the welfare of both riders and drivers and on ride-hailing platforms' profitability. The first part of its analysis involves using data from Uber to estimate a model of spatial supply and demand for rides. The paper then uses these estimates to compare rider and driver welfare in an equilibrium with surge pricing to an equilibrium with uniform pricing. The main findings are that surge pricing increases overall welfare due to a positive effect on riders' welfare. Drivers and Uber, however, are made worse off by surge pricing.	wp	Juan Camilo Castillo, "Who Benefits from Surge Pricing?" Working Paper (2019), available at [https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3245533.](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3245533)
Role of Data	Machine Learning	[Auditing Radicalization Pathways on YouTube]()	Manoel Horta Ribeiro, Raphael Ottoni, Robert West, Virgílio A. F. Almeida, and Wagner Meira	2019	Non-profits, as well as the media, have hypothesized the existence of a radicalization pipeline on YouTube, claiming that users systematically progress towards more extreme content on the platform. Yet, there is to date no substantial quantitative evidence of this alleged pipeline. This paper conducts a large-scale audit of user radicalization on YouTube. The authors analyze 330,925 videos posted on 349 channels, which they broadly classify into four types: Media, the Alt-lite, the Intellectual Dark Web (I.D.W.), and the Alt-right. According to the aforementioned radicalization hypothesis, channels in the I.D.W. and the Alt-lite serve as gateways to fringe far-right ideology, here represented by Alt-right channels. Processing 72M+ comments, the authors show that the three channel types indeed increasingly share the same user base, that users consistently migrate from milder to more extreme content, and that a large percentage of consumers of Alt-right content had consumed Alt-lite and I.D.W. content in the past.	y	Manoel Horta Ribeiro and others, "Auditing Radicalization Pathways on YouTube," *Proceedings of the Conference on Fairness, Accountability, and Transparency* (2020), available at [https://dl.acm.org/doi/abs/10.1145/3351095.3372879.](https://dl.acm.org/doi/abs/10.1145/3351095.3372879)

Role of Data	Machine Learning	Toward Controlling Discrimination in Online Auction Ads	L. Elisa Celis, Anay Mehrotra, and Nisheeth K. Vishnoi	2019	Online advertising platforms thrive on offering customizable audiences to advertisers. However, recent studies show that advertisements can be discriminatory and may cross ethical and legal boundaries. This paper proposes a constrained ad auction framework that maximizes platform revenue while distributing the audience across gender, race, and other characteristics. The authors present an optimal ad auction mechanism for a large class of fairness constraints. Empirical results on the A1 Yahoo! dataset demonstrate that the algorithm can achieve uniform coverage across different user types at a minor loss to platform revenue and to the size of audience reached.	y	L. Elisa Celis, Anay Mehrotra, and Nisheeth K. Vishnoi, "Toward Controlling Discrimination in Online Ad Auctions," *Proceedings of the 36th International Conference on Machine Learning* (2019), available at http://proceedings.mlr.press/v97/mehrotra19a/mehrotra19a.pdf.
Role of Data	Machine Learning	Controlling Polarization in Personalization: An Algorithmic Framework	L. Elisa Celis, Sayash Kapoor, Farnood Salehi, and Nisheeth Vishnoi	2019	Personalization individualizes the most relevant content for each user, which leads to higher user efficiency and higher platform revenue. Recent studies suggesting that personalization can propagate systemic biases and polarize opinions have led to calls for regulation. This paper proposes a versatile framework that allows users to constrain the distribution from which they select content. The authors illustrate this framework on a curated dataset of online news articles that are conservative or liberal and show that it can control polarization. They then examine the trade-off between decreasing polarization and revenue loss. Further, the authors test this framework on a political news dataset and a movie ratings dataset.	y	L. Elisa Celis and others, "Controlling Polarization in Personalization: An Algorithmic Framework," *Proceedings of the Conference on Fairness, Accountability, and Transparency* (2019), available at https://dl.acm.org/doi/10.1145/3287560.3287601.
Role of Data	Machine Learning	Algorithmic Bias? An Empirical Study into Apparent Gender-Based Discrimination in the Display of STEM Career Ads	Anja Lambrecht and Catherine Tucker	2019	This paper explores data from a field test of how an algorithm delivered ads promoting job opportunities in the science, technology, engineering and math fields. This ad was explicitly intended to be gender neutral in its delivery. Empirically, however, fewer women saw the ad than men. This happened because younger women are a prized demographic and are more expensive to show ads to. An algorithm that simply optimizes cost-effectiveness in ad delivery will deliver ads that were intended to be gender neutral in an apparently discriminatory way, because of crowding out. The authors show that this empirical regularity extends to other major digital platforms.	y	Anja Lambrecht and Catherine Tucker, "Algorithmic Bias? An Empirical Study of Apparent Gender-Based Discrimination in the Display of STEM Career Ads," *Management Science* 65 (7) (2019): 2947–3448.
Role of Data	Machine Learning	Marketing Agencies and Collusive Bidding in Online Ad Auctions	Francesco Decarolis, Maris Goldmanis, and Antonio Penta	2020	The transition of the advertising market from traditional media to the Internet has induced a proliferation of marketing agencies that bid in online ad auctions. This paper analyzes how collusive bidding can emerge from bid delegation to a common marketing agency, and how this can undermine the revenues and allocative efficiency of both the generalized second-price auction (GSP, used by Google, Microsoft Bing, and Yahoo!) and the Vickrey-Clarke-Groves mechanism (VCG, used by Facebook). Despite its well-known susceptibility to collusion, the VCG mechanism outperforms the GSP auction in terms of both revenues and efficiency. The authors introduce an empirical exercise to show how their model can be used with data. These findings point to the anticompetitive potential of certain algorithms: the use of deep learning techniques can make algorithms particularly effective at bolstering the revenues of agency clients. Implementing the type of collusion discussed in this paper simply requires an agency to use a bidding algorithm that optimizes joint profits.	y	Francesco Decarolis, Maris Goldmanis, and Antonio Penta, "Marketing Agencies and Collusive Bidding in Online Ad Auctions," *Management Science* 66 (10) (2020): 4433–4454.
Role of Data	Machine Learning	Artificial Intelligence, Algorithmic Pricing, and Collusion	Emilio Calvano, Giacomo Calzolari, Vincenzo Denicolo, and Sergio Pastorello	2020	Pricing algorithms are increasingly replacing human decision making in real marketplaces. To inform the competition policy debate on possible consequences, the authors run experiments with pricing algorithms powered by artificial intelligence in controlled environments, i.e. computer simulations. In particular, they study the interaction of Q-learning algorithms, standard learning algorithms that adapt their behavior past on past experience, in the context of an oligopoly model of repeated price competition. They find that the algorithms converge in equilibrium to supra-competitive prices without communicating with each other, instructions to collude, or knowledge of the environment in which they operate. They obtain a sizable extra-profit compared to static Nash equilibrium in the competitive setting. This finding is robust to asymmetries in cost or demand and to changes in the number of players. Although empirical evidence of algorithmic collusion has not widely been gathered, algorithmic pricing could heighten the risk that tolerant antitrust policy is failing to recognize collusive behavior by pricing algorithms.	y	Emilio Calvano and others, "Artificial Intelligence, Algorithmic Pricing, and Collusion," *American Economic Review* 110 (10): 3267–3297.
Role of Data	Big Data	The Effect of Big Data on Recommendation Quality: The Example of Internet Search	Maximilian Schaefer, Geza Sapi, and Szabolcs Lorincz	2018	This paper is the first to use real search engine query logs to empirically investigate how data drives the quality of internet search results. It finds evidence that the quality of search results improves with more data on previous searches. Moreover, the type of data matters as well: personalized information is particularly valuable as it massively increases the speed of learning. The authors also provide some evidence that factors not directly related to data, such as the general quality of the applied algorithms, play an important role. The suggested methods to disentangle the effect of data from other factors driving the quality of search results can be applied to assess the returns to data in various recommendation systems in e-commerce, including product and information search. The authors discuss the managerial, privacy, and competition policy implications of their findings.	wp	Maximilian Schaefer, Geza Sapi, and Szabolcs Lorincz, "The Effect of Big Data on Recommendation Quality: The Example of Internet Search." DICE Discussion Paper No. 284 (Düsseldorf Institute for Competition Economics, 2018), available at https://ssrn.com/abstract=3149323.
Role of Data	Big Data	The Impact of Big Data on Firm Performance: An Empirical Investigation	Patrick Bajari, Victor Chernozhukov, Ali Hortaçsu, and Junichi Suzuki	2019	Using proprietary panel retail sales data obtained from Amazon, this paper examines the impact of "Big Data" on firm performance in the context of forecast accuracy: with more data, firms can produce better forecasts. This allows the firms to better serve customers, which leads to more data (the "data feedback loop"). The authors measure the accuracy of forecasts in two relevant dimensions: the number of products (N), and the number of time periods for which a product is available for sale (T). The authors calculate how fast the forecast errors diminish. Empirical results also indicate gains in forecast improvement in the T dimension (though subject to diminishing returns, agreeing with the theory), but essentially flat N effects. This finding is inconsistent with the naive "data feedback loop" theory, where the addition of new products always results in better models; rather, the finding shows that having "Big Data" across a large array of products has little value in improving model accuracy, perhaps due to diminishing effects. Furthermore, "Big Data" across a growing variety of products is often viewed as an engineering challenge rather than benefit. It is important to note that these results are limited to the scope of demand forecasting.	y	Patrick Bajari, Victor Chernozhukov, Ali Hortaçsu, and Junichi Suzuki, "The Impact of Big Data on Firm Performance: An Empirical Investigation," *American Economic Association Papers and Proceedings* 109 (2019): 33–37.

POTENTIAL COMPETITION

Tools to assess the impact of potential competitors and nascent competition on competition in and for digital markets

Topic (Primary)	Sub-Topic	Title	Author(s)	Year	Summary or Edited Abstract	Peer Reviewed?	Citation

Potential Competition	Entry	[The Value of Incumbency When Platforms Face Heterogeneous Customers]()	Jacques Crémer and Gary Biglaiser	2020	This paper studies a dynamic model of competition between an incumbent platform and potential entrants in an industry featuring network externalities, i.e. an industry in which consumers prefer to use the same platform as other consumers. Network externalities attract consumers toward the market's most popular platform and can therefore lead an industry to be dominated by a single platform. Although competition in a market with network externalities may lower prices, it can lead consumers to choose different platforms and hence reduce the network externalities that they would enjoy if the consumers were all to choose a single platform. The paper uses its model to assess how the possibility of entry into a market with network externalities affects outcomes in that market. One major finding is that the presence of potential entrants increases social welfare in the market by lowering prices and thus leading more consumers to join any platform at all, which increases consumers' enjoyment of network externalities.	y	Gary Biglaiser and Jacques Crémer, "The Value of Incumbency When Platforms Face Heterogeneous Customers," *American Economic Journal: Microeconomics* 12 (4) (2020): 229–269.
Potential Competition	Entry	[Migration Between Platforms]()	Gary Biglaiser, Jacques Crémer, and André Veiga	2020	This paper studies incumbency advantage in markets with positive consumption externalities. Users of an incumbent platform receive random opportunities to migrate to an entrant. They can accept a migration opportunity or wait for a future opportunity. In some circumstances, users have incentives to delay migration until others have migrated. If they all wait, no migration takes place, even when migration would have been a more efficient outcome. The paper develops a model where the incumbent advantage emerges endogenously and assess the impacts of various types of migration opportunities and strategies on the incumbency advantage. They add that the possibility of multi-homing decreases, but does not eliminate, incumbency advantage.	wp	Gary Biglaiser, Jacques Crémer, and André Veiga, "Migration Between Platforms." Working Paper No. 19-1038 (Toulouse School of Economics, 2020), available at [https://www.tse-fr.eu/sites/default/files/TSE/documents/doc/wp/2019/wp_tse_1038.pdf.](https://www.tse-fr.eu/sites/default/files/TSE/documents/doc/wp/2019/wp_tse_1038.pdf)
Potential Competition	Entry	[Peer-to-Peer Markets]()	Liran Einav, Chiara Farronato, and Jonathan Levin	2016	Peer-to-peer markets such as eBay, Uber, and Airbnb allow small suppliers to compete with traditional providers of goods or services. This paper views the primary function of these markets as making it easy for buyers to find sellers and engage in convenient, trustworthy transactions. The authors discuss elements of market design that make this possible, including search and matching algorithms, pricing mechanisms, and reputation systems. They then develop a simple model of how these markets enable entry by small or flexible suppliers, and how they impact existing firms. The model highlights how peer entry can lead to changes in market structure, allow for trade in new services, and generate lower consumer prices. Finally, the authors consider the regulation of peer-to-peer markets and the economic arguments for different approaches to licensing and certification, data, and employment regulation.	y	Liran Einav, Chiara Farronato, and Jonathan Levin, "Peer-to-Peer Markets," *Annual Review of Economics* 8 (2016): 615–635.
Potential Competition	Entry	[Platform Envelopment]()	Thomas Eisenmann, Geoffrey Parker, and Marshall van Alstyne	2011	Due to network effects and switching costs in platform markets, entrants generally must offer revolutionary functionality in order to win substantial market share. This paper explores another entry path: platform envelopment. Through envelopment, a provider in one platform market enters another platform market by combining its own functionality with the target's in a multi-platform bundle that leverages shared user relationships. Envelopers capture market share by foreclosing an incumbent's access to users. In doing so, they harness the network effects that previously had protected the incumbent. The authors characterize different types of envelopment attacks based on whether platform pairs are complements (e.g. Microsoft bundling Media Player with its Windows operating system), weak substitutes (e.g. Blockbuster bundling DVD-by-mail service with store rentals), or functionally unrelated (e.g. Apple iPhone bundling smartphone with iPod). They then analyze the conditions for these types of attacks to succeed.	y	Thomas Eisenmann, Geoffrey Parker, and Marshall van Alstyne, "Platform Envelopment," *Strategic Management Journal* 32 (12) (2011): 1270–1285.
Potential Competition	Entry	[Harnessing Platform Envelopment in the Digital World]()	Daniele Condorelli and Jorge Padilla	2020	This paper revisits the economics of platform envelopment: a dominant platform (the enveloper) operating in a multi-sided market (the origin market) enters a second multi-sided market (the target market) by leveraging data obtained from its shared user relationships. In particular, the authors analyze the strategy of "privacy policy tying," in which the enveloper requests consumer consent for combining their data in both origin and target markets. This may allow the enveloper to fund services offered to all sides of the target market by monetizing data in the origin market; monopolize the target market; and entrench its dominant position in the origin market. The authors conclude by considering a range of possible policy interventions that may limit potential anticompetitive effects, while preserving the efficiencies generated by conglomerate platforms.	y	Daniele Condorelli and Jorge Padilla, "Harnessing Platform Envelopment in the Digital World," *Journal of Competition Law & Economics* 16 (2) (2020):143–187.

Tools to assess the impact of potential competitors and nascent competition on consumer welfare

Topic (Primary)	Sub-Topic	Title	Author(s)	Year	Summary or Edited Abstract	Peer Reviewed?	Citation
Potential Competition	Consumer Welfare	[Consumer Surplus in the Digital Economy: Estimating the Value of Increased Product Variety at Online Booksellers]()	Erik Brynjolfsson, Yu (Jeffrey) Hu, and Michael D. Smith	2003	While efficiency gains from increased competition significantly enhance consumer surplus (for example, by leading to lower average selling prices), this paper shows that increased product variety made available through electronic markets can be a significantly larger source of consumer surplus gains. One reason for increased product variety on the Internet is the ability of online retailers to catalog, recommend, and provide a large number of products for sale. For example, the number of book titles available at Amazon.com is more than 23 times larger than the number of books on the shelves of a typical Barnes & Noble superstore, and 57 times greater than the number of books stocked in a typical large independent bookstore. The authors' analysis indicates that the increased product variety of online bookstores enhanced consumer welfare by $731 million to $1.03 billion in the year 2000, which is between 7 and 10 times larger than the consumer welfare gain from increased competition and lower prices in this market. This analysis could be extended to other products available through electronic markets, such as music, movies, and consumer electronics.	y	Erik Brynjolfsson, Yu (Jeffrey) Hu, and Michael D. Smith, "Consumer Surplus in the Digital Economy: Estimating the Value of Increased Product Variety at Online Booksellers," *Management Science* 49 (11) (2003): 1580–1596.
Potential Competition	Consumer Welfare	[Match Quality, Search, and the Internet Market for Used Books]()	Glenn Ellison and Sara Fisher Ellison	2018	This paper examines the effect of the Internet on markets in which match quality is important, including an analysis of the market for used books. The authors develop a model in which sellers of unusual objects wait for high-value buyers to arrive. The model brings out match quality and competition effects through which improved search technologies may increase both price dispersion and social welfare. A reduced-form empirical analysis supports a number of more nuanced predictions of the model in the context of the used book market, exploiting cross-sectional differences across books and time-series differences in the wake of Amazon's acquisition and incorporation of a large used book marketplace. The estimates suggest that the shift to Internet sales substantially increased both seller profits and consumer surplus.	wp	Glenn Ellison and Sara Fisher Ellison, "Match Quality, Search, and the Internet Market for Used Books." Working Paper No. w24197 (National Bureau of Economic Research, 2018), available at [https://www.nber.org/papers/w24197.](https://www.nber.org/papers/w24197)
Potential Competition	Consumer Welfare	[The Impact of Aggregators on Internet News Consumption]()	Susan Athey, Mark Mobius, and Jeno Pal	2017	Do news aggregators such as Google News decrease or increase traffic to online news sites? In this paper, the authors use Spain as a natural experiment because Google News shut down in December 2014, in response to copyright reform that allowed newspapers to charge aggregators for linking to news snippets. The authors compare the news consumption of a large number of Google News users with a synthetic control group of similar non-Google News users. They find that the shutdown of Google News reduces overall news consumption by about 20% for treatment users, and it reduces page views on publishers other than Google News by 10%. This decrease is concentrated around small publishers while large publishers do not see significant changes in their overall traffic. The authors further find that when Google News shuts down, its users are able to replace some but not all of the types of news they previously read. Post-shutdown, users read less breaking news, hard news (low-clarity, high accuracy), and news that is not well covered on their favorite news publishers. These findings shed light on the consumer welfare implications for digital intermediaries such as news aggregators.	wp	Susan Athey, Mark Mobius, and Jeno Pal, "The Impact of News Aggregators on Internet News Consumption." Working Paper No. 3353 (Stanford Graduate School of Business, 2017), available at [https://www.gsb.stanford.edu/faculty-research/working-papers/impact-news-aggregators-internet-news-consumption-case-localization.](https://www.gsb.stanford.edu/faculty-research/working-papers/impact-news-aggregators-internet-news-consumption-case-localization)

Potential Competition	Consumer Welfare	Do Digital Platforms Reduce Moral Hazard? The Case of Taxis and Uber	Meng Liu, Erik Brynjolfsson, and Jason Dowlatabadi	2020	Digital platforms have created a variety of technology-enabled tools that enhance market transparency, including real-time monitoring, ratings of buyers and sellers, low-cost complaint channels, and new pricing schemes. How do these innovations affect service quality and moral hazard (i.e. situations where people increase their own risk because they do not bear the full cost of the risk)? This paper compares driver routing choices and efficiency at Uber with traditional taxis. The authors find that taxi drivers detour on airport routes by an average of 7.4%, with non-local passengers on airport routes experiencing even longer detours; taxi drivers, overall, drive at higher speeds than Uber drivers; and Uber drivers are more likely to detour during periods of high surge pricing. This model shows that technology platforms and pricing schemes can reduce driver moral hazard behavior in situations where taxi moral hazard return is high.	y	Meng Liu, Erik Brynjolfsson, and Jason Dowlatabadi, "Do Digital Platforms Reduce Moral Hazard? The Case of Uber and Taxis," *Management Science*. Forthcoming.
Potential Competition	Consumer Welfare	Peer-to-Peer Rental Markets in the Sharing Economy	Samuel P. Fraiberger and Arun Sundararajan	2017	Will the sharing economy create long-run economic value? This paper develops a dynamic model of peer-to-peer Internet-enabled rental markets for durable goods. In this model, consumers may trade their durable assets in traditional secondary markets (e.g. Airbnb allows consumers to rent their living space to others for short periods); transaction costs and depreciation rates may vary with usage intensity; and consumers are heterogeneous in their price sensitivity and asset utilization rates. The authors calibrate their model with U.S. automobile industry data and 2 years of transaction-level data obtained from Getaround, a large peer-to-peer car rental marketplace that enables car owners to supply their vehicles as short-term rentals. The analysis shows that peer-to-peer rental markets significantly changes the allocation of goods, substituting rental for ownership and lowering used-good prices while increasing consumer surplus. Consumption shifts and economic impact are more pronounced for below-median income users, who also provide a majority of rental supply. The results suggest that these below-median income consumers will enjoy a disproportionate fraction of eventual welfare gains from this kind of "sharing economy" through broader inclusion, higher quality rental-based consumption, and new ownership facilitated by rental supply revenues.	wp	Samuel P. Fraiberger and Arun Sundararajan, "Peer-to-Peer Rental Markets in the Sharing Economy." Working Paper (NYU Stern School of Business, 2017), available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2574337.
Potential Competition	Consumer Welfare	The Rise of the Sharing Economy: Estimating the Impact of Airbnb on the Hotel Industry	Georgios Zervas, Davide Proserpio, and John Byers	2017	Peer-to-peer markets, collectively known as the sharing economy, have emerged as alternative suppliers of goods and services that have traditionally been provided by long-established industries. This paper explores the economic impact of the sharing economy on incumbent firms by studying the case of Airbnb, a prominent platform for short-term accommodations. The authors analyze Airbnb's entry into the state of Texas. They estimate that in Austin, where Airbnb supply is highest, the causal impact on hotel revenue is in the (negative) 8 to 10 percent range. Moreover, the impact is non-uniform, most severely affecting lower-priced hotels and hotels not catering to business travelers. The impact is primarily manifested through less aggressive hotel room pricing, which benefits all consumers, not just participants in the sharing economy. The price response is especially pronounced during periods of peak demand, such as during the South by Southwest festival, and is due to a differentiating feature of peer-to-peer platforms: enabling instantaneous supply to scale to meet demand. Lower hotel prices is also evidence that competition by Airbnb is potentially harder for incumbent hotel firms to adapt to, who face higher fixed costs and offer less personalized products than peer-to-peer platforms.	y	Georgios Zervas, Davide Proserpio, and John Byers, "The Rise of the Sharing Economy: Estimating the Impact of Airbnb on the Hotel Industry," *Journal of Marketing Research* 54 (5) (2017): 687–705.

Tools and analysis of innovation harms

Topic (Primary)	Sub-Topic	Title	Author(s)	Year	Summary or Edited Abstract	Peer Reviewed?	Citation
Potential Competition	Innovation	Antitrust and Innovation: Welcoming and Protecting Disruption	Giulio Federico, Fiona M. Scott Morton, and Carl Shapiro	2019	The goal of antitrust policy is to protect and promote a vigorous competitive process. Effective rivalry spurs firms to introduce new and innovative products, as they seek to capture profitable sales from their competitors and to protect their existing sales from future challengers. In this fundamental way, competition promotes innovation. This paper applies this basic insight to the antitrust treatment of horizontal mergers and exclusionary conduct by dominant firms. A merger between rivals internalizes business-stealing effects that arise from their parallel innovation efforts and thus tends to depress innovation incentives. Merger-specific synergies, such as the internalization of involuntary spillovers or an increase in the productivity of R&D, may offset the adverse effect of a merger on innovation. The authors describe the possible effects of a merger on innovation by referencing recent examples from the U.S. and EU. In addition, a dominant firm may engage in exclusionary conduct to eliminate threats from disruptive firms. This suppresses innovation by foreclosing disruptive rivals and reducing the pressure to innovative on the incumbent. The authors apply this broad principle to possible exclusionary strategies by dominant firms.	y	Giulio Federico, Fiona M. Scott Morton, and Carl Shapiro, "Antitrust and Innovation: Welcoming and Protecting Disruption," *Innovation Policy and the Economy* 20 (2019): 125–190.
Potential Competition	Innovation	Kill Zone	Sai Krishna Kamepalli, Raghuram Rajan, and Luigi Zingales	2020	This paper studies why high-priced acquisitions of entrants by an incumbent do not necessarily stimulate more innovation and entry in industries where customers face switching costs and enjoy network externalities. As described by venture capitalists, there is a "kill zone" in the space of startups where new ventures are not worth funding. The authors construct a model that rationalizes this kill zone, showing that the prospect of an acquisition by the incumbent platform undermines early adoption by customers, which reduces prospective payoffs to new entrants. This then reduces an entrant's incentives to innovate and an venture capitalist's incentives to invest in the entrant. The authors test their predictions using data on investments in startups. Empirical estimates show that, after Facebook and Google made large acquisitions, venture capitalists significantly reduced the number of deals and amount of money they invested in markets close to those where the acquisitions were made. While allowing incumbent platforms to acquire new entrants enhances ex-post efficiency, ex-ante incentives to innovate may be reduced and the authors provide interventions to address these potential harms to innovation.	wp	Sai Krishna Kamepalli, Raghuram Rajan, and Luigi Zingales, "Kill Zone." Working Paper No. 27146 (National Bureau of Economic Research, 2020), available at https://www.nber.org/papers/w27146.
Potential Competition	Innovation	Cost of Experimentation and the Evolution of Venture Capital	Michael Ewens, Ramana Nanda, and Matthew Rhodes-Kropf	2018	This paper studies how technological shocks to the cost of starting new businesses have led to changes in venture capital investment strategies. The introduction of cloud computing services by Amazon, through Amazon's Web Services or AWS in early 2006, lowered the initial cost of starting internet and web-based startups. The authors provide a framework to understand changes in investment strategies in light of such a shock. In particular, there is an increased prevalence of a "spray and pray" approach: investors provide little funding and limited governance to an increased number of startups they are more likely to abandon, and initial "experiments" to evaluate the viability of startups significantly inform beliefs about the future potential. The entry of new financial intermediaries such as AWS has led to a disproportionate rise in innovations where information on future prospects is revealed quickly and cheaply. In turn, there is less innovation in complex technologies where initial experiments cost more and reveal less. These findings document the feedback between technological change and financial intermediaries: technological shocks to investment opportunities require adaptation by investors, but this adaption has consequences for the future trajectory of innovation.	y	Michael Ewens, Ramana Nanda, and Matthew Rhodes-Kropf, "Cost of Experimentation and the Evolution of Venture Capital," *Journal of Financial Economics* 128 (3) (2018): 422–442.
Potential Competition	Innovation	Killer Acquisitions	Colleen Cunningham, Florian Ederer, and Song Ma	2020	This paper argues that incumbent firms may acquire innovative targets solely to discontinue the target's innovation projects and preempt future competition. The authors call these acquisitions "killer acquisitions" and develop a model to illustrate this phenomenon. Using pharmaceutical industry data, the authors show that acquired drug projects are less likely to be developed when they overlap with the acquirer's existing product portfolio, especially when the acquirer's market power is large due to weak competition or distant patent expiration. Conservative estimates indicate 5.3 percent to 7.4 percent of acquisitions in the sample are killer acquisitions. These acquisitions disproportionately occur just below thresholds for antitrust scrutiny. The findings from this paper may be relevant in examining past and future startup acquisitions by large digital platforms.	y	Colleen Cunningham, Florian Ederer, and Song Ma, "Killer Acquisitions," *Journal of Political Economy*. Forthcoming.

Potential Competition	Innovation	[Antitrust Limits on Startup Acquisitions]()	Kevin A. Bryan and Erik Hovenkamp	2020	Should there be limits on startup acquisitions by dominant firms? The principle of efficiency requires startups to sell their technology to the right incumbents; develop the right technology; and invest the right amount in R&D. Using a model of differentiated oligopoly (i.e. a market structure with few firms producing similar products), this paper shows distortions along all three of these margins if there are no limits on startup acquisition. In part, leading incumbents make acquisitions to keep lagging incumbents from catching up technologically. When startups can choose what technology they invent, they are biased toward inventions which improve the leader's technology, rather than those which help the laggard incumbent catch up. When the leading incumbent obtains a pure monopoly, their marginal willingness to pay for new technologies falls abruptly, which diminishes private returns on future innovations. The authors consider antitrust measures that could help mitigate these problems.	y	Kevin A. Bryan and Erik Hovenkamp, "Antitrust Limits on Startup Acquisitions," *Review of Industrial Organization* 56 (4) (2020): 615–636.
Potential Competition	Innovation	[Innovation: The Bright Side of Common Ownership?]()	Miguel Anton, Florian Ederer, Mireia Gine, and Martin C. Schmalz	2018	A firm's incentives to innovate deteriorate when other firms benefit from its R&D activities without incurring a cost. This paper examines the conditions under which common ownership of firms can mitigate this impediment to corporate innovation. The authors test their model's empirical predictions using data from S&P's Compustat, a database of market information for global firms. Empirical estimates show that common ownership increases R&D when technological spillovers (measured by how closely firms are related in terms of capacity to innovate) are large relative to product market spillovers (measured by how closely firms are related in terms of competitors in a product market). Otherwise, costly innovation leads to more business stealing which is detrimental for common owners. These results help inform the debate about the drivers of declining corporate R&D and the welfare effects of increased levels of common ownership among U.S. firms.	wp	Miguel Anton, Florian Ederer, Mireia Gine, and Martin C. Schmalz, "Innovation: The Bright Side of Common Ownership?" Working Paper (IESE Business School, 2018), available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3099578.

LEGAL PAPERS

Platform competition

Topic (Primary)	Sub-Topic	Title	Author(s)	Year	Summary or Edited Abstract	Peer Reviewed?	Citation
Platform Competition	Multi-Sided Platforms	Antitrust in Digital Markets	John M. Newman	2019	Antitrust law has largely failed to address the challenges posed by digital markets. Economic theory, empirical research, and extant judicial and regulatory authority all contradict prevailing views regarding power, conduct, and efficiencies in digital markets. Far from being self-correcting, digital markets facilitate the creation and maintenance of uniquely durable market power. Digital markets are conducive to complex anticompetitive strategies that have largely escaped regulatory scrutiny. Perhaps most importantly, conduct in digital markets tends to lack significant offsetting efficiencies. As a result, digital markets do require a different approach, but it must be uniquely interventionist, not unusually laissez-faire. This paper concludes by offering a set of doctrinal and policy proposals towards a more robust, vigilant, and welfare-enhancing digital antitrust enterprise.	y	John M. Newman, "Antitrust in Digital Markets," *Vanderbilt Law Review* 72 (5) (2019): 1497–1561.
Platform Competition	Multi-Sided Platforms	Is There a Market for Organic Search Engine Results and Can Their Manipulation Give Rise to Antitrust Liability?	James D. Ratliff and Daniel L. Rubinfeld	2014	In recent years Google has been accused of manipulating its organic search results to favor its own services. This paper explores possible choices of relevant antitrust markets that might make various antitrust allegations meaningful. The authors argue that viewing Internet search in isolation ignores the two-sided nature of the search advertising platform and the feedback effects that link the provision of organic search results to consumers and the sale of advertising slots to businesses. They conclude that the relevant market in which Google competes with respect to Internet search is at least as broad as a two-sided search-advertising market. The authors also ask whether Google has a duty to provide organic search results that are neutral with respect to whether the displayed listing is for a Google rather than a non-Google business. They articulate and apply a standard that asks whether various practices related to Google's organic search results would harm competition that would have otherwise occurred.	y	James D. Ratliff and Daniel L. Rubinfeld, "Is There a Market for Organic Search Engine Results and Can Their Manipulation Give Rise to Antitrust Liability?" *Journal of Competition Law & Economics* 10 (3) (2014): 517–541.
Platform Competition	Mergers	Vertical Mergers and Entrepreneurial Exit	D. Daniel Sokol	2018	Entrepreneurial exit is critical to a well-functioning entrepreneurial ecosystem, as the possibility of entrepreneurial exit via vertical merger is now the most usual form of liquidity event/exit for founders and venture capitalists. Vertical merger policy that would unduly restrict large tech firms from undertaking acquisitions in industries as diverse as finance, pharmaceuticals, medical devices, technology hardware, and internet platforms would hurt incentives for innovation in the economy by chilling business formation in start-ups. Increased difficulty in the exit for founders and venture capitalists makes investment in such ventures less likely, since the purpose of such investment is to reap the rewards of scaling a venture to exit. Thus, a general inference that makes vertical acquisitions, particularly in tech, more difficult to undertake leads to direct contravention of antitrust's role in promoting competition and innovation. This paper explores how entrepreneurial exit for founders and venture capitalists is best served by promoting a robust vertical merger policy, though one that intervenes in cases of specific anticompetitive harm.	y	D. Daniel Sokol, "Vertical Mergers and Entrepreneurial Exit," *Florida Law Review* 70 (2018): 1357–1378.
Platform Competition	Mergers	Data Privacy in European Merger Control: Critical Analysis of Commission Decisions Regarding Privacy as a Non-Price Competition	Samson Esayas	2019	Given the central role that personal data plays in mergers between data-rich firms and associated privacy concerns for users, competition authorities have started to experiment with ways to incorporate privacy into merger assessment. One approach is to factor in privacy as a non-price competition parameter. In its merger decisions involving Facebook/WhatsApp and subsequently Microsoft/LinkedIn, the European Commission held that data privacy constitutes a key parameter of non-price competition in the market for consumer communications and for professional social networks. This paper provides a critical analysis of these decisions regarding competition in privacy and Privacy Enhancing Technologies (PETs). The analysis is conducted from two angles. One looks at the Commission's approach in defining the market, particularly on how competition in privacy and PETs is manifested and when two firms are considered competitors based on these parameters and thereby of interest to competition law. The second angle looks at the competitive assessment and the theories of harm, particularly when a merger is considered to lead to reduction in privacy as a non-price competition parameter. The author maintains that the Commission's decision in Microsoft/LinkedIn represents a step forward in the discussion of privacy as a non-price (quality) competition parameter and the use of market power to harm such competition.	y	Samson Esayas, "Data Privacy in European Merger Control: Critical Analysis of Commission Decisions Regarding Privacy as a Non-Price Competition," *European Competition Law Review* 40 (4) (2019): 166–181.

The role of complements/apps on the platform

Topic (Primary)	Sub-Topic	Title	Author(s)	Year	Summary or Edited Abstract	Peer Reviewed?	Citation
Role of Complements	Foreclosing Competition	The Separation of Platforms and Commerce	Lina Khan	2019	A handful of digital platforms mediate a growing share of online commerce and communications. By structuring access to markets, these firms function as gatekeepers for billions of dollars in economic activity. One feature dominant digital platforms share is that they have integrated across business lines such that they both operate a platform and market their own goods and services on it. This structure places dominant platforms in direct competition with some of the businesses that depend on them, creating a conflict of interest that platforms can exploit to further entrench their dominance, thwart competition, and stifle innovation. This paper argues that the potential hazards of integration by dominant tech platforms invite recovering structural separations. Traditionally applied to critical networks and essential infrastructure, structural separations prohibited entry in certain markets and prevented dominant intermediaries from directly competing with the businesses reliant on their services. Neglecting structural remedies results in both substantive harms and institutional misalignments—effects that are especially pronounced in digital platform markets.	y	Lina M. Khan, "The Separation of Platforms and Commerce," *Columbia Law Review* 119 (4) (2019): 973–1093.
Role of Complements	Complements Growing Into Rivals	Uber as for-Profit Hiring Hall: A Price-Fixing Paradox and Its Implications	Sanjukta M. Paul	2017	If the members of a hiring hall, run by a labor union or directly by workers, were independent contractor service providers, they would be engaging in impermissible price-fixing under the conventional interpretation of antitrust law. Yet Uber has thus far been permitted to engage in precisely this sort of price coordination between independent contractors, for its own economic benefit rather than workers'. Uber is operating a virtual, for-profit hiring hall, and it is doing so on terms that would not be allowed to workers themselves. It has thus far been permitted to do so simply because it is organized as a business firm. This paper shows that, in a contemporary service economy, the firm exemption in fact leads to a regulatory inconsistency. This problem can be remedied by permitting independent contractor service providers, such as Uber drivers, to engage in collective action with regard to their bargains with the firm that sets prices for the services they perform. The author furnishes an argument in favor of collective bargaining rights for this group of workers that relies on a simple principle of consistency in applying existing price-fixing norms. In making this argument, the author draws upon two recent, high-profile antitrust cases involving Uber, Uber drivers, and Uber consumers.	y	Sanjukta M. Paul, "Uber as For-Profit Hiring Hall: A Price-Fixing Paradox and its Implications," *Berkeley Journal of Employment and Labor Law* 38 (2) (2017): 233–264.

Behavioral biases and competition

Topic (Primary)	Sub-Topic	Title	Author(s)	Year	Summary or Edited Abstract	Peer Reviewed?	Citation

Behavioral Biases	Market Power	[The Antitrust Case Against Facebook: A Monopolist's Journey Towards Pervasive Surveillance in Spite of Consumers' Preference for Privacy]()	Dina Srinivasan	2019	The Facebook social network plays an important role in the lives of over two billion people across the world. Though the market was highly competitive in the beginning, it has since consolidated in Facebook's favor. Today, using Facebook means to accept a product linked to broad-scale commercial surveillance—a paradox in a democracy. This paper argues that Facebook's ability to extract this qualitative exchange from consumers is a form of monopoly rents. The history of early competition, market entry, and subsequent rise tells the story of Facebook's monopoly power. However, the history which explains this firm's dominance also presents a story of anticompetitive conduct. A pattern of false statements and misleading conduct induced consumers to trust and choose Facebook, to the detriment of market competitors and consumers' own welfare.	y	Dina Srinivasan, "The Antitrust Case Against Facebook: A Monopolist's Journey Towards Pervasive Surveillance in Spite of Consumers' Preference for Privacy," *Berkeley Business Law Journal* 16 (1) (2019): 39–101.

The role of data on competition

Topic (Primary)	Sub-Topic	Title	Author(s)	Year	Summary or Edited Abstract	Peer Reviewed?	Citation
Role of Data	Market Power	[Search, Antitrust, and the Economics of the Control of User Data]()	Nathan Newman	2014	This paper argues for reorienting many antitrust investigations (and, more generally, regulatory approaches) to focus on how control of personal data by corporations can entrench monopoly power in an economy shaped by the power of "big data." What is largely missed in analyses defending Google from antitrust action is how Google's ever expanding control of user personal data and its critical value to online advertisers creates an insurmountable barrier to entry for new competition. The authors argue that Google did not just inherit that business advantage through its innovation in search engine technology. Rather, Google has aggressively expanded its control of user data both by moving into new product sectors to collect additional user data and by invading users' privacy.	y	Nathan Newman, "Search, Antitrust, and the Economics of the Control of User Data," *Yale Journal on Regulation* 31 (2) (2014): 401–454.
Role of Data	Market Power	[Self-Regulation and Competition in Privacy Policies]()	Florencia Marotta-Wurgler	2018	This paper investigates alternative explanations for the content of privacy policies. Under one model of self-regulation, firms signal their privacy protections to consumers by highlighting compliance with third-party guidelines. However, in a sample of 249 policies, only 27 percent claim compliance with a specific guideline, and the policies that do claim compliance with at least one guideline are generally inconsistent with its requirements. Alternatively, under a market-based mechanism, firms incorporate consumers' preferences directly. Consistent with this influence, there are several intuitive differences in terms across markets. Adult sites, none of which claim certification, are much more likely to give concise and clear notice of privacy practices and limit data sharing with third parties, while cloud-computing sites are particularly likely to follow stringent data security standards. Overall, privacy policy content appears to be shaped at least as much by market forces as by a self-regulatory regime based on external guidelines.	y	Florencia Marotta-Wurgler, "Self-Regulation and Competition in Privacy Policies," *The Journal of Legal Studies* 45 (3) (2018): 13–40.
Role of Data	Market Power	[The Limits of Antitrust in Privacy Protection]()	Eugene Kimmelman, Harold Feld, and Agustín Rossi	2018	In the 21st century, it has become virtually impossible to meaningfully participate in society without revealing our personal data. Consumers in the USA, the European Union, and elsewhere want more control over their data and they demand privacy protection. This paper agrees that antitrust regulation encourages non-price competition and can be a remedy for fighting the anticompetitive hoarding of personal data. However, the authors argue that antitrust should not be the sole tool used to analyze privacy harms. Instead, a comprehensive approach to consumer protection is needed.	y	Eugene Kimmelman, Harold Feld, and Agustín Rossi, "The Limits of Antitrust in Privacy Protection," *International Data Privacy Law* 8 (3) (2018): 270–276.
Role of Data	Market Power	[Antitrust and Costless Verification: An Optimistic and a Pessimistic View of the Implications of Blockchain Technology]()	Christian Catalini and Catherine Tucker	2019	Blockchain technology allows a network of individuals, institutions or devices to coordinate economic activity on a global scale ("internet-level consensus") without assigning the same degree of control to the intermediary operating and facilitating transactions in the marketplace. This allows for the creation of new types of decentralized digital platforms where the benefits of network effects are separated from the traditional costs they entail in terms of market power. This paper discusses both the opportunities and challenges blockchain technology involves from an antitrust perspective. In particular, the authors discuss how it can be used to facilitate the creation of extremely efficient and competitive digital markets, as well as to facilitate collusion and make antitrust enforcement more difficult.	y	Christian Catalini and Catherine Tucker, "Antitrust and Costless Verification: An Optimistic and a Pessimistic View of the Implications of Blockchain Technology," *Antitrust Law Journal* 82 (3) (2019): 861–872.
Role of Data	Market Power	[The Hidden Costs of Free Goods: Implications for Antitrust Enforcement]()	Michal S. Gal and Daniel L. Rubinfeld	2016	Most of the economic literature on free goods has focused on two-sided markets in which the free good is provided in exchange for attention or information. In this paper, the authors analyze the welfare effects of additional cases that are becoming commonplace in the economy. They stress the need to evaluate pricing strategies of firms that offer free goods, in light of new research about the "irrational" response of consumers faced with a free option. This welfare analysis serves as a basis for exploring the antitrust implications for providing free goods. Indeed, free goods raise significant issues for antitrust enforcement, which run the gamut from market definition to market power to the evaluation of the competitive effects of mergers, and, more generally, to strategic business behavior. The authors use examples from diverse jurisdictions and markets, particularly focusing on three case studies: free search services, free internet browsers and free newspapers.	y	Michal S. Gal and Daniel L. Rubinfeld, "The Hidden Costs of Free Goods: Implications for Antitrust Enforcement," *Antitrust Law Journal* 80 (3) (2016): 521–562.
Role of Data	Machine Learning	[Sustainable and Unchallenged Algorithmic Tacit Collusion]()	Ariel Ezrachi and Maurice E. Stucke	2020	Algorithmic collusion has the potential to transform future markets, leading to higher prices and consumer harm. And yet, algorithmic collusion may remain undetected and unchallenged, particularly when it is used to facilitate conscious parallelism. The risks posed by such undetected collusion have been debated within antitrust circles in Europe, the US, and beyond. Some economists, however, downplay algorithmic tacit collusion as unlikely, if not impossible, arguing that future prices will remain competitive. This paper explores the rise of algorithmic tacit collusion and responds to those who downplay it, by pointing to new emerging evidence and the gap between law and this particular economic theory. The authors explain why algorithmic tacit collusion is not only possible but warrants the increasing concerns of many enforcers.	y	Ariel Ezrachi and Maurice E. Stucke, "Sustainable and Unchallenged Algorithmic Tacit Collusion," *Northwestern Journal of Technology and Intellectual Property* 17 (2) (2020): 217–260.
Role of Data	Big Data	[The Role of Big Data and Digital Privacy in Merger Review]()	Maria C. Wasastjerna	2018	This paper examines the implications of big data for competition law, with a focus on personal data and the concerns that data may give rise to in merger review. One of the biggest challenges for competition authorities in the digital age is how to deal with data and privacy issues in their competitive analysis. An emerging issue is the role of competition in protecting consumers from potential privacy risks flowing from the increasing number of mergers in digital markets. The author considers how personal data in the digital economy are considered a currency in exchange for online offerings, and how a loss of privacy can be factored into quality competition. The author concludes by addressing some of the challenges with incorporating privacy as a non-price parameter in competition analysis.	y	Maria C. Wasastjerna, "The Role of Big Data and Digital Privacy in Merger Review," *European Competition Journal* 14 (2-3) (2018): 417–444.

Potential competition

Topic (Primary)	Sub-Topic	Title	Author(s)	Year	Summary or Edited Abstract	Peer Reviewed?	Citation
Potential Competition	Entry	[Blind Spot: The Attention Economy and the Law]()	Tim Wu	2019	An increasingly large and important sector of the economy, including well known firms like Google and Facebook, now depends on attentional markets. This development has created a blind spot that affects the antitrust and consumer protection laws, which are premised on cash markets and monetary harms. As a correction, this paper introduces a new means of assessing competition in attentional markets centered on "attention brokerage." In antitrust, it gives a better sense of the market power of contemporary firms like Facebook, whose power is mainly in attentional markets. In the realm of consumer protection, it provides regulators with a paradigm for protecting captive audiences from cognitive impairments caused by non-consensual seizure of attention.	y	Tim Wu, "Blind Spot: The Attention Economy and the Law," *Antitrust Law Journal* 82 (3) (2019): 771–806.

Potential Competition	Consumer Welfare	Amazon's Antitrust Paradox	Lina M. Khan	2017	Amazon has positioned itself at the center of e-commerce and now serves as essential infrastructure for a host of other businesses. Elements of the firm's structure and conduct pose anticompetitive concerns, yet it has escaped antitrust scrutiny. This paper argues that the current framework in antitrust, specifically its pegging of competition to "consumer welfare" (defined as short-term price effects), is unequipped to capture the architecture of market power in the modern economy. The author argues that current doctrine underappreciates the risk of predatory pricing and how integration across distinct business lines may prove anticompetitive. These concerns are heightened in the context of online platforms for two reasons. First, the economics of platform markets create incentives for a company to pursue growth over profits, a strategy that investors have rewarded. Under these conditions, predatory pricing becomes highly rational, even as existing doctrine treats it as irrational and therefore implausible. Second, because online platforms serve as critical intermediaries, integrating across business lines positions these platforms to control the essential infrastructure on which their rivals depend. This dual role also enables a platform to exploit information collected on companies using its services to undermine them as competitors.	y	Lina M. Khan, "Amazon's Antitrust Paradox," *The Yale Law Journal* 126 (3) (2017): 710–805.
Potential Competition	Innovation	Anticompetitive Product Design in the New Economy	John M. Newman	2012	Claims alleging anticompetitive product design and redesign lie at the core of one of antitrust law's most challenging dilemmas: the intersection between innovation and regulation, invention and intervention. For over three decades, courts and scholars have struggled to determine the proper analytical framework within which to address such cases. Meanwhile, the very industries in which challenged conduct occurs have been undergoing fundamental changes. As demonstrated by the ongoing and recent antitrust litigation involving high technology firms Apple, Intel, and Microsoft, distinctive features characterize most product markets in what has been called the "New Economy," which increasingly has become, simply, "the economy." Many of these features not only incentivize anticompetitive, design-related conduct but also render such conduct susceptible to antitrust scrutiny. Accordingly, this paper supplies a proper understanding of code-based product markets and, perhaps more importantly, provides a structured, efficient, and rational method for analyzing design-related conduct in those markets.	y	John M. Newman, "Anticompetitive Product Design in the New Economy," *Florida State University Law Review* 39 (3) (2012): 681–734.
Potential Competition	Innovation	Information, Innovation, and Competition Policy for the Internet	Howard A. Shelanski	2013	Antitrust agencies around the world are increasingly focusing on digital industries. Critics have justifiably questioned the ability of competition agencies to make beneficial enforcement decisions given the complexity and rapid pace of change in online markets. This paper discusses those criticisms and addresses the argument that, because the error costs of overenforcement of antitrust laws in digital markets would be much higher than the error costs of underenforcement, courts and antitrust agencies should presume against antitrust intervention in digital industries. While acknowledging that there is often good reason for such modesty in enforcement, the author discusses several ways in which competition policy can adjust to better account for potential costs and benefits of enforcement in digital platform markets. The author argues that nonprice effects related to information and innovation are particularly important to the performance of online platforms, and may hold the key to a better understanding of the costs of antitrust underenforcement and the assessment of the competitive effects of conduct and transactions in digital industries.	y	Howard A. Shelanski, "Information, Innovation, and Competition Policy," *University of Pennsylvania Law Review* 161 (6) (2013): 1663–1705.
Potential Competition	Innovation	Predatory Innovation: The Definite Need for Legal Recognition	Thibault Schrepel	2018	It is widely recognized that the process of competition generally encourages companies to lower their prices, which benefits consumers. Yet, in certain specific cases, antitrust rules intend to sanction predatory prices because they eliminate the competitive process itself. A similar situation applies to innovation. Innovation is one of the main bases for competition between companies and is beneficial to consumers who enjoy new products that are better suited to their needs. But certain innovative behaviors are also considered predatory and are punished accordingly, despite the fact that no legal concept specifically addresses this issue. This absence of a legal category specifically dedicated to anticompetitive practices disguised as innovation leads judges to create numerous type I and II errors. The jurisprudence has not yet generalized the etiquette of predatory innovation, which nevertheless answers some of the problems encountered by antitrust law with high tech market development. The apparent lack of interest in that notion by courts has led the doctrine to devote few studies to the subject, which has accentuated judges' reluctance to use it, and so on. This paper seeks to substantiate the value of the notion of predatory innovation, which covers a wide range of practices, many of which are not reached by actual antitrust rules.	y	Thibault Schrepel, "Predatory Innovation: The Definite Need for Legal Recognition," *SMU Science and Technology Law Review* 21 (1) (2018): 19–73.
Potential Competition	Innovation	Does Sharing Mean Caring? Regulating Innovation in the Sharing Economy	Sofia Ranchordás	2015	Sharing economy practices have become increasingly popular in recent years. Although Uber, Airbnb, and other online platforms have democratized access to a number of services and facilities, concerns have been raised as to public safety, health, and limited liability of these sharing economy practices. In addition, these innovative activities have been contested by professionals offering similar services who claim that the sharing economy is opening the door to unfair competition. Regulators are at a crossroads: on the one hand, innovation in the sharing economy should not be stifled by excessive and outdated regulation; on the other hand, there is a real need to protect the users of these services from fraud, liability, and unskilled service providers. This paper analyzes the challenges of regulating the sharing economy from an "innovation law perspective," by arguing that these innovations should not be stifled by regulation, but should also not be left unregulated. The author closes by suggesting that innovation in the sharing economy requires fewer, but broader rules that do not stifle innovation, but also impose a minimum of legal requirements that take into account the specificities of innovative sharing economy practices, and that are open for future developments.	y	Sofia Ranchordás, "Does Sharing Mean Caring? Regulating Innovation in the Sharing Economy," *Minnesota Journal of Law, Science & Technology* 16 (1) (2015): 413–475.