Comments for the Record

Comments for the Department of Justice's Competition in Television and Digital Advertising Workshop

WILL RINEHART | JUNE 17, 2019

Executive Summary

The Department of Justice's current inquiry into advertising underscores its importance to the digital ecosystem. But advertising needs to be understood within its proper context. Not only is it one, albeit important, method of supporting content online, but advertising also gains its value within a platform setting. Four key lessons are worth remembering:

- The value of platforms comes in bringing together two different groups of users;
- The recent *Ohio v. American Express* case charts an important path for consumer welfare that should be at the core of antitrust analysis for platforms;
- Advertising competition is occurring both in online spaces and traditional channels like TV and radio; and, finally,
- The value of user data generated from platforms isn't as straightforward as many think.

The Value of Ad-Supported Networks

Platforms such as Facebook, Google, Reddit, and Twitter are often derided, but both empirical and anecdotal data indicate that they provide real value to their users. Pew polling finds that most Americans say the Internet has brought benefits in learning, sharing and diversifying the flow of information into their lives. Even with all of the negative press, "74% of Americans say major technology companies' products and services have been more good than bad for them personally."[1] A variety of stories sharpen this perceived reality, indicating that such platforms support meaningful human interactions and have helped to expand access to content. On Facebook, for example, chronic pain sufferers find solace.[2] Widows vent, rage, laugh, and cry without judgement through the Hot Young Widows Club.[3] Reddit, while sometimes a place of outrage, is also where a weight lifter with cerebral palsy became a hero, where those with addiction can find healing, and where respectful disagreement can live.[4][5][6]

These indicators show that these platforms generate value, and indeed, one common way of valuing free services such as Facebook and Google is to calculate the amount of forgone wages. Every hour spent on the site is an hour not spent on other activities. There is an opportunity cost to using online platforms such as Facebook and Reddit. A conservative estimate from a couple years back suggests that users spend about 20 hours a month on Facebook.[7] Since the current average wage is $27.83 (as of May 2019), this calculation indicates that people roughly value the site by about $6,700 over the entire year.[8] A study using data from 2016 using similar methods found that American adults consumed 437 billion hours of content on ad-supported media, worth at least $7.1 trillion in terms of foregone wages.[9]

Multi-sided platforms create value by bringing different economic agents together.[10] They facilitate interaction among these agents and generate welfare for individual agents by reducing transaction costs. Such platforms aren't new. They've been around for decades in industries like video games, credit cards, newspapers, and radio stations. The Twin Cities' Mall of America is as much a platform as Google is. The Internet has only facilitated the creation of such platforms by allowing agents to interact in real time. As will be discussed later, the core concern with platforms is how the price for each side is optimally set.

Platforms create value via two sources. *Usage externalities* stem from the benefits that both sides get when they use the platform. These mostly come from reduced transaction costs. For instance, consumers can save time by using platforms such as OpenTable to reserve tables at restaurants. Restaurants also save time and costs by using an online platform for reservations.

The second source relates to the number of users on each side of the platform. These *membership externalities* are generated by network effects. The value created for users on one side of the platform increases exponentially when more users join the other side of the platform. For example, the value of a credit card for merchants increases as the number of cardholders increase. Similarly, as the number of merchants that accept a certain credit card increases, cardholders benefit from increased acceptability. When an increase in one side of the market affects the value in the other, these changes are known as *indirect network effects*. They serve as the foundation of the platform economy.

Consider a platform with two sides, users and advertisers. If users experience an increase in price or a reduction in quality, then they are likely to exit or use the platform less. Advertisers are on the other side because they can reach users, so in response to the decline in user quality, advertiser demand will drop even if the ad prices stay constant. The result echoes back. When advertisers drop out, the total amount of content also recedes, and user demand falls because the platform is less valuable to them. Demand is tightly integrated between the two sides of the platform. Changes in user and advertiser preferences have far outsized effects on the platforms because each side responds to the other. In other words, small changes in price or quality tends to be far more impactful in chasing off both groups from the platforms as compared to one-sided goods. These are called *demand interdependencies* and are a species of indirect network effect. Research on magazine price changes confirms this theory.[11] The demand on one side of the market is interdependent with demand on the other.

One of the most common arguments against platform power is the worry that they will start excluding producers, retailers, advertisers, and app developers.[12] Platforms, however, have a strong incentive to include all users because the effects reverberate through both sides of the platform. That isn't to say that the pricing structure will be the same, and indeed the optimal pricing strategies for each part of the network is important to understand network behaviors.

Pricing Structure in Platforms

In work fundamental to his 2003 Nobel Prize, economist Jean Tirole found that prices charged by platforms are fundamentally different from those of traditional businesses.[13] Three basic assumptions, which hold in the real world, help to set the stage for this conclusion. First, there are two distinct customer groups connected by the platform. Second, positive externalities exist between members of those groups. And finally, a two-sided platform provides a good or service that facilitates exchange of value in the face of these externalities. Altogether, Tirole helped to prove that an increase in marginal cost on one side of the platform doesn't necessarily increase prices on that side. Thus, the profit-maximizing price for one side may be below the marginal cost or even negative. Here, negative prices mean that the consumer is getting a benefit without paying for it.

For example, OpenTable gives consumers bonuses for signing up while charging restaurants fees for having them on their network. In this structure, the network effects, or the *membership externalities,* of having consumers use OpenTable increases value for restaurants as they have access to a larger user base. OpenTable then charges fees to the restaurants in order to recover costs. This price structure is common: One entity is given discounts or charged no fee and the other side is charged fees greater than the marginal cost. Indeed, the cost structure of Twitter, Facebook, and Google only make sense through this lens.

In the last two decades, economics has been adapting to the insights and the challenges of platforms. In the case of a one-sided business, such as a laundromat or a mining company, there is one downstream or upstream consumer, so demand is fairly straightforward. But platforms are more complex since value must be balanced across the different participants in a platform, which leads to demand interdependencies, as explained earlier.

In an article cited in the Supreme Court's *Ohio v. American Express* (or *Amex*) decision—which focused on the ability of credit-card companies, as platforms, to prevent merchants from "steering" purchasers toward a particular kind of credit card—economists David Evans and Richard Schmalensee explained the importance of the integration of platform economics into competition analysis: "The key point is that it is wrong as a matter of economics to ignore significant demand interdependencies among the multiple platform sides" when defining markets.[14] If they are ignored, then the typical analytical tools will yield incorrect assessments.

While it didn't employ the language of demand interdependencies in its *Amex* decision, the Supreme Court did agree with that general assessment:

> To be sure, it is not always necessary to consider both sides of a two-sided platform. A market should be treated as one sided when the impacts of indirect network effects and relative pricing in that market are minor. Newspapers that sell advertisements, for example, arguably operate a two-sided platform because the value of an advertisement increases as more people read the newspaper. But in the newspaper-advertisement market, the indirect networks effects operate in only one direction; newspaper readers are largely indifferent to the amount of advertising that a newspaper contains. Because of these weak indirect network effects, the market for newspaper advertising behaves much like a one-sided market and should be analyzed as such.

How the Court reached that conclusion is worth exploring. In contrast to newspapers, credit card payment platforms "cannot make a sale unless both sides of the platform simultaneously agree to use their services," so, "two-sided transaction platforms exhibit more pronounced indirect network effects and interconnected pricing and demand." The Court seems to connect two-sidedness with the simultaneity requirement. But it isn't the simultaneous nature of credit cards that makes them two-sided markets, but their demand interdependencies. Newspapers also have strong demand interdependencies even though they may not feature the simultaneity of credit cards, in contradistinction to the *Amex* decision. Yet, the Court was correct in defining the market as a

transactional one, where cardholders and merchants are intimately connected.

Justice Breyer's dissent in *Amex* offers one path to understand optimal pricing. As he wrote,

> But while the market includes substitutes, it does not include what economists call complements: goods or services that are used together with the restrained product, but that cannot be substituted for that product. See id., ¶565a, at 429; Eastman Kodak Co. v. Image Technical Services, Inc., 504 U. S. 451, 463 (1992). An example of complements is gasoline and tires. A driver needs both gasoline and tires to drive, but they are not substitutes for each other, and so the sale price of tires does not check the ability of a gasoline firm (say a gasoline monopolist) to raise the price of gasoline above competitive levels. As a treatise on the subject states: "Grouping complementary goods into the same market" is "economic nonsense," and would "undermin[e] the rationale for the policy against monopolization or collusion in the first place." 2B Areeda & Hovenkamp ¶565a, at 431.

> Here, the relationship between merchant-related card services and shopper-related card services is primarily that of complements, not substitutes. Like gasoline and tires, both must be purchased for either to have value. Merchants upset about a price increase for merchant related services cannot avoid that price increase by becoming cardholders, in the way that, say, a buyer of newspaper advertising can switch to television advertising or direct mail in response to a newspaper's advertising price increase.

Still, it isn't the case that "both must be purchased for either to have value." That is perfect complementarity, which is rare. When the price of gasoline increases, then the demand for tires is likely to decrease as well. This relation doesn't need to run the other way, however. When the price of tires decreases, the demand for gasoline doesn't typically inch up. This kind of asymmetric demand relationship is counter to the kind of relationship on platforms where demand is linked on both sides.

Justice Breyer buries the lede. Attributing a price increase to firms in the tire market might be wrong if demand fluctuations in the adjacent gasoline market partially caused those prices changes. In other words, the reason why complementary demand matters in the first place is to ensure that the court's analysis is correct. Going back to Evans and Schmalensee, "The key point is that it is wrong as a matter of economics to ignore significant demand interdependencies among the multiple platform sides" when defining markets. If you do, you get the assessments wrong.

To his credit, Breyer does rightly point out the thin definition offered by the majority,

> I take from that definition that there are four relevant features of such businesses on the majority's account: they (1) offer different products or services, (2) to different groups of customers, (3) whom the "platform" connects, (4) in simultaneous transactions.

Having simultaneous transactions isn't the defining feature of two-sidedness, and if the lower courts come to rely on this feature to define platforms, then some assessments of competitive effects are likely to be wrong. Instead, the courts should be focused, as they have been for some time, on consumer welfare.

Consumer Welfare and Antitrust

The courts have long interpreted Section 2 of the Sherman Act to focus on enforcement of conduct rather than mere outcomes. Starting with *Alcoa*, Justice Hand's opinion made it clear that "The Act does not mean to

condemn the resultant of those very forces which it is its prime object to foster: finis opus coronat."[15] This idea was reaffirmed by Justice Scalia in *Trinko* who noted that "the possession of monopoly power will not be found unlawful unless it is accompanied by an element of anticompetitive conduct."[16] While some boosters of market intervention might want to change this standard, this focus on consumer welfare shouldn't change. It's important to note that a focus on conduct doesn't preclude antitrust enforcement of platforms.

In a piece in the *New York Times* in April, legal scholar Lina Khan worried that this case would "effectively [shield] big tech platforms from serious antitrust scrutiny."[17] Law professor Tim Wu followed up with an op-ed in the *New York Times* expressing similar concern about the ability of agencies and courts to go after bad platform actors:

> To reach this strained conclusion, the court deployed some advanced economics that it seemed not to fully understand, nor did it apply the economics in a manner consistent with the goals of the antitrust laws. Justice Stephen Breyer's dissent mocks the majority's economic reasoning, as will most economists, including the creators of the "two-sided markets" theory on which the court relied. The court used academic citations in the worst way possible — to take a pass on reality.[18]

As *Amex* stands, Google, Facebook, and other platforms more evidently fall into the newspaper category than the payments category under the majority's opinion, meaning its holding doesn't apply directly to them. Yet the opinion didn't define what "weak indirect network effects" actually mean in practice, so this case doesn't leave Google and Facebook untouched by any means. Here, the Court made an error. If these two companies do face scrutiny, then they should be subjected to the platform standard that *Amex* has begun to outline.

Economists and antitrust scholars have been actively working to extend traditional antitrust analysis to apply it to platform businesses.[19] The Court agreed; the totality of the platform needs to be understood. As such, the Department of Justice should work to extend the analysis first begun by the Supreme Court and pioneered by organizations such as the OECD.[20] To understand the competitive nature within the digital advertising space properly, the Department should consider how each side responds to incentives, prices, and demand from the other side, as well as, how the participants in the platform compete with other, more traditional offerings.

The Changing Nature of Advertising Competition

Many are quick to mark online advertising as a submarket within advertising, but a closer look tells of a dynamic ecosystem where traditionally distinct markets have come into direct competition with one another. The proliferation of outlets, both online and offline, and the convergence of content mean that advertisers have increasingly shifted their resources to target audiences across multiple media channels like radio, TV, and social media.[21] The Association of National Advertisers has charted the rise of this multi-channel advertising scheme throughout the past decade and finds that most marketers now use an integrated marketing method.[22] The spread of messages across numerous channels means that some lower value advertisers continue to advertise on a limited set of publishers, which has the effect of reducing demand for advertising and thus ad prices.[23] In other words, more outlets generally translates into lower ad prices as knowledgeable advertisers pick and choose specific channels. Indeed, as research has found, concentration in the online ad market leads to less revenue for those platforms because it allows for a more efficient targeting of keywords through superior information.[24]

A number of studies into the effect of TV ads on online behavior fundamentally challenge the belief that the two worlds are separate. Studies of financial services advertising through television find that Google searches are

affected.[25] Similarly, TV ads for trucks have been shown to increase both the company's search numbers and their competitors as well.[26] Research has also shown that "television advertising does influence online shopping and that advertising content plays a key role."[27]

While Google and Facebook are the biggest players in the online advertising space, the rise of new players indicate it hasn't stultified. Amazon has grown from just 2 percent of the market in 2016 to around 9 percent this year. Projections put Amazon on a track for serious growth, suggesting the retailer could make up as much as 14 percent of the segment in just five years.[28] Already, the other players have felt the squeeze. The cost per click on Google, an important metric of ad cost, dropped 29 percent from last year.[29]

Amazon isn't the only threat on the horizon. While it hasn't deployed its ad tech, GIFY, the company that places gifs on web sites and phones, could become a major powerhouse.[30] Fortnite is also a looming competitor. In its 2018 annual report, Netflix explained that its biggest threat wasn't other traditional content outlets like FX or Disney, but a completely new platform, saying, "We compete with (and lose to) Fortnite more than HBO."[31] Fortnite has hit a wall in terms of revenue, however, but it could continue to grow if it worked to integrate more promotions within its platform, a plan they seem to be undertaking.[32] Spotify is another unusual competitor in this space, but has found a niche with its ability to analyze songs as people listen and target based on perceived mood.[33]

There are limits to the ad-supported ecosystem, however, because there is only so much attention in the attention economy. The research firm Midia put a fine point on this when they said earlier this year that "engagement has declined throughout the sector, suggesting that the attention economy has peaked. Consumers simply do not have any more free time to allocate to new attention seeking digital entertainment propositions, which means they have to start prioritising between them."[34] Disappointing quarterly results from a few of the major games publishers could portend a change for the rest of the players in the attention economy. As Midia analyst Karol Severin observed, "competition within the attention economy is now more intense than ever before."

The Value of Data

Like any other asset, the value of data lies in its ability to earn revenue, but the relationship between revenue and user data isn't straightforward.[35] Most valuations of big data simply divide the total market capitalization or revenue of a firm by the total number of users.[36] In its 2018 annual report, Facebook calculated that the average revenue per user was around $112 in the United States and Canada.[37] Antonio Garcia-Martinez recently used this data point in *Wired* magazine to place an upper limit to the value of data.[38] And Douglas Melamed argued in a recent Senate hearing that the upper-bound value should at least be cognizant of the acquisition cost for advertisements—putting the total user value at around $16 (although he cautiously noted that this estimate was likely inaccurate).[39] Similarly, when Microsoft bought LinkedIn, for example, reports suggested that they were buying monthly active users at a rate of $260.[40]

Yet it is misstep to equate the advertising dollars going to tech platforms with the value of user data. Understanding multi-sided platforms requires understanding the goods traded on the user side and the advertiser side. Advertisers spend money on platforms because people are there, just as advertisers spend money on TV, print, and radio because people watch television, read newspapers, and listen to the radio. On Google, Facebook, Instagram, Twitter, and Reddit, user demand comes as a result of the shared content, which is an experience good.[41] Advertiser demand in turn relies upon total user demand, since they are trying to get their messages to users. For advertisers, the *inference data* explain which groups of people—sorted by age, gender, or location—clicked on a web site, liked a page, shared it, or left the platform.

The demand for users is tightly coupled with demand for advertisers, leading to demand interdependencies, which were explored by the American Action Forum last year.[42] As noted then,

> Demand is tightly integrated between the two sides of the platform. Changes in user and advertiser preferences have far outsized effects on the platforms because each side responds to the other. In other words, small changes in price or quality tends to be far more impactful in chasing off both groups from the platforms as compared to one-sided goods.

While data is important to the overall maintenance of the platform, much of this data is valuable only within the platform's relationships.

The bankruptcy proceedings for Caesars Entertainment, a subsidiary of the larger casino company, offer a unique example of this problem. As the assets were being priced in the selloff, the Total Rewards customer loyalty program got valued at nearly $1 billion, making it "the most valuable asset in the bitter bankruptcy feud at Caesars Entertainment Corp."[43] But the ombudsman's report acknowledged that it would be a tough sell because of the difficulties in incorporating it into another company's loyalty program. Although it was Caesars' most valuable asset and helpful in it generating cash flow for that company, its value to an outside party in generating cashflow was an open question. The data itself, apart from the company's systems, was not obviously valuable at all.

Some businesses have tried to separate out data from the broader information ecosystem, but they have met with little success. The pay-to-surf business model was popular in the late 1990s until the dot-com crash swept the companies under.[44] Owen Thomas recalled what happened in the San Francisco Chronicle: "AllAdvantage, a Hayward company that exemplified the approach, had to yank its initial public offering and auction off its assets after blowing through millions of dollars."[45] Later, both Handshake and Datacoup began offering payments for data.[46] But Handshake went under while Datacoup isn't taking new users. *Wired* editor Gregory Barber went another route and became his own data entrepreneur. He sold his location data, Apple Health data, and Facebook data, and all he got was a paltry 0.3 cents.[47]

Data Innovation

Why couldn't Barber sell his data for a large sum? Data is often valued within a relationship, but practically valueless outside of it. There is a term for this phenomenon, as economist Benjamin Klein explained: "Specific assets are assets that have a significantly higher value within a particular transacting relationship than outside the relationship."[48] Since data is a highly specific asset, granting platforms control should be a more efficient outcome.

How then should ownership of those assets be allocated? A broader legal and economic discussion—with its

origin in the merger between Fisher Body, an automobile parts provider in Detroit, and General Motors in 1926—has sprung up around this question. Before the deal, GM bought car bodies directly from Fisher and then mounted them on frames and sold the completed cars to consumers. In this sense, the car bodies were intermediate goods, in much the same way that data is an important intermediate good. But what if Fisher Body, after signing a long-term contract with GM, decided to ask for more money for their parts? Final production would cease, leading to what is known as the holdup problem.[49]

Much research into contracts, mergers, and the control of assets developed as a result of this scenario, and in 2016, Oliver Hart received the Nobel for Economics as a direct result of this work. As one review of his work explained,

> [T]he optimal allocation of property rights—or governance structure—is one that minimizes efficiency losses. Thus, in a situation where party A's investment is more important than party B's investment, it is optimal to allocate property rights over the assets to party A, even if this discourages investment by party B. [50]

Even if data is jointly created, joint control isn't the most efficient outcome. When one party's investment in the data does not boost the total value that much, then it is better for the other person to own both assets. In the parlance of economics, the party with higher marginal returns from investment should be given control, which is why platforms, and not users, spend so much time and effort to understand what is happening on the platform. Some politicians might want to change this ownership division, but it makes sense from an efficiency standpoint. Changing it would result in less efficiency.

Conclusion

Consumers already benefit tremendously from ad-supported platforms. And policies meant to rebalance an already unequal relationship where consumers win is likely to harm the ecosystem to their detriment. Competitive analysis fails when it doesn't correctly capture the importance of the various players in multi-sided platforms.

---

[1] Pew, *Americans Feel Better Informed Thanks to the Internet*, https://www.pewinternet.org/2014/12/08/better-informed/.

[2] Toni Bernhard, In Defense of Facebook, https://www.psychologytoday.com/us/blog/turning-straw-gold/201201/in-defense-facebook.

[3] Lucy Rock, *The Hot Young Widows Club is out to change the way we grieve*, https://www.theguardian.com/lifeandstyle/2018/feb/24/the-hot-young-widows-club-is-out-to-change-the-way-we-grieve.

[4] Reddit, *Adaptive athlete with cerebral palsy performs a 70kg power clean*, https://www.reddit.com/r/GetMotivated/comments/7jc48d/image_adaptive_athlete_with_cerebral_palsy/

[5] Reddit, *Ex-addicts of reddit, what was your rock bottom?*, https://www.reddit.com/r/AskReddit/comments/5pb2u4/exaddicts_of_reddit_what_was_your_rock_bottom/.

[6] Bryan Clark, *Reddit's r/changemyview is a template for how all online discussion should be*, https://thenextweb.com/socialmedia/2019/01/23/reddits-model-community-offers-a-prototype-for-controversial-discussions/

.

[7] Zeynep Tufecki, *Mark Zuckerberg, Let Me Pay for Facebook*, https://www.nytimes.com/2015/06/04/opinion/zeynep-tufekci-mark-zuckerberg-let-me-pay-for-facebook.html.

[8] Economic News Release: Table B-3. Average hourly and weekly earnings of all employees on private nonfarm payrolls by industry sector, seasonally adjusted https://www.bls.gov/news.release/empsit.t19.htm.

[9] David S. Evans , *The Economics of Attention Markets*, https://www.competitionpolicyinternational.com/the-economics-of-attention-markets/.

[10] David S. Evans, *The Antitrust Economics of Multi-Sided Platform Markets*, http://digitalcommons.law.yale.edu/cgi/viewcontent.cgi?article=1144&context=yjreg.

[11] Minjae Song, *Estimating Platform Market Power in Two-Sided Markets with an Application to Magazine Advertising*, http://www.simon.rochester.edu/fac/MSONG/papers/Song-twosided.pdf.

[12] Lina M. Khan, *What Makes Tech Platforms So Powerful?*, https://promarket.org/wp-content/uploads/2018/04/Digital-Platforms-and-Concentration.pdf#page=15.

[13] Jean-Charles Rochet and Jean Tirole, *Platform Competition in Two-sided Markets*, http://www.rchss.sinica.edu.tw/cibs/pdf/RochetTirole3.pdf.

[14] David S. Evans and Richard Schmalensee, *The Antitrust Analysis of Multi-Sided Platform Businesses*, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2214252.

[15] Justice Learned Hand, *United States v Aluminium Company of America, et. al.*, http://www.tcd.ie/Economics/staff/masseyp/term1lecture7.htm.

[16] Justice Antonin Scalia, *Verizon Communications Inc. v. Law Offices of Curtis V. Trinko, LLP*, https://www.justice.gov/atr/competition-and-monopoly-single-firm-conduct-under-section-2-sherman-act-chapter-1#N_7_.

[17] Lina M. Kahn, *The Supreme Court Case That Could Give Tech Giants More Power*, https://www.nytimes.com/2018/03/02/opinion/the-supreme-court-case-that-could-give-tech-giants-more-power.html.

[18] Tim Wu, *The Supreme Court Devastates Antitrust Law*, https://www.nytimes.com/2018/06/26/opinion/supreme-court-american-express.html.

[19] David S. Evans, *The Antitrust Economics of Multi-Sided Platform Markets*, http://digitalcommons.law.yale.edu/cgi/viewcontent.cgi?article=1144&context=yjreg.

[20] Organisation for Economic Co-operation and Development, *Rethinking Antitrust Tools for Multi-Sided Platforms*, http://www.oecd.org/daf/competition/Rethinking-antitrust-tools-for-multi-sided-platforms-2018.pdf.

[21] Ad Age, *ANA survey says marketers make progress with integrated programs*, https://adage.com/article/btob/ana-survey-marketers-make-progress-integrated-programs/285466

.

[22] Nielsen, *ANA and Nielsen study reveals multi-screen advertising to rise dramatically*, https://www.nielsen.com/us/en/press-room/2013/ana-and-nielsen-study-reveals-multi-screen-advertising-to-rise.html.

[23] Susan Athey, Emilio Calvano, and Joshua S. Gans, *The Impact of Consumer Multi-homing on Advertising Markets and Media Competition*, https://pubsonline.informs.org/doi/10.1287/mnsc.2016.2675.

[24] Francesco Decarolis and Gabriele Rovigatti, *Concentration and Internet Advertising: The Rise of Buyer Power*, http://papers.nber.org/conf_papers/f112403/f112403.pdf.

[25] Mingyu Joo, Kenneth C. Wilbur, Bo Cowgill, and Yi Zhu , *Television Advertising and Online Search*, https://pubsonline.informs.org/doi/10.1287/mnsc.2013.1741.

[26] Rex Yuxing Du, Linli Xu, and Kenneth C. Wilbur, *Immediate Responses of Online Brand Search and Price Search to TV Ads*, https://journals.sagepub.com/doi/abs/10.1177/0022242919847192.

[27] Jura Liaukonyte, Thales Teixeira, Kenneth C. Wilbur, *Television Advertising and Online Shopping*, https://pubsonline.informs.org/doi/abs/10.1287/mksc.2014.0899.

[28] Audrey Schomer, *THE RISE OF AMAZON ADVERTISING: This is exactly what Amazon is doing to siphon billions of ad dollars from Google and Facebook and why brands love it*, https://www.businessinsider.com/the-rise-of-amazon-advertising-2019-5.

[29] Sara Salinas, *The most important numbers from Alphabet's Q4 earnings report — and why they sent the stock down*, https://www.cnbc.com/2019/02/05/alphabet-q4-earnings-all-the-important-numbers.html

[30] Nicole Laporte, *In Six Seconds, Giphy Could Make Billions*, https://www.fastcompany.com/40474454/in-six-seconds-giphy-could-make-billions.

[31] Netflix, *Q4 Results and Q1 Forecast*, https://s22.q4cdn.com/959853165/files/doc_financials/quarterly_reports/2018/q4/FINAL-Q418-Shareholder-Letter.pdf.

[32] George P. Slefo, *Fortnite emerges as a social media platform for Gen Z*, https://adage.com/article/digital/fortnite-emerges-social-media-platform-gen-z/2176301

[33] Liz Pelly, *Big Mood Machine*, https://thebaffler.com/downstream/big-mood-machine-pelly

[34] Karol Severin, *Major games publishers are feeling impact of peaking attention*, https://www.midiaresearch.com/blog/major-games-publishers-are-feeling-the-impact-of-peaking-attention/.

[35] Ajay Agrawal, Joshua Gans, and Avi Goldfarb, *The Simple Economics of Machine Intelligence*, https://hbr.org/2016/11/the-simple-economics-of-machine-intelligence.

[36] Russell Walker, *What is Your Data Worth? On LinkedIn, Microsoft, and the Value of User Data*, https://www.kdnuggets.com/2016/06/walker-linkedin-microsoft-value-user-data.html

[37] Facebook, *Facebook Q4 2018 Results*, https://s21.q4cdn.com/399680738/files/doc_financials/2018/Q4/Q4-2018-Earnings-Presentation.pdf.

[38] Antonio Garcia Martinez, *No, data is not the new oil*, https://www.wired.com/story/no-data-is-not-the-new-oil/?fbclid=IwAR2CLLvmAX_RpVKQDanqZzZrNXOPWRUT-W4zG_50e3WZAjdTtRTLQTB4YGQ.

[39] A. Douglas Melamed, *Testimony of A. Douglas Melamed*, https://www.judiciary.senate.gov/meetings/does-america-have-a-monopoly-problem-examining-concentration-and-competition-in-the-us-economy.

[40] James E. Short and Steve Todd, *What's Your Data Worth?*, https://sloanreview.mit.edu/article/whats-your-data-worth/.

[41] Rani Molla, *Mary Meeker's 2018 internet trends report: All the slides, plus analysis*, https://www.vox.com/2018/5/30/17385116/mary-meeker-slides-internet-trends-code-conference-2018.

[42] Will Rinehart and Pranjal Drall, *Platform Competition and the Implications of Amex*, https://www.americanactionforum.org/comments-for-record/platform-competition-and-the-implications-of-amex/.

[43] Kate O'Keeffe, *Real Prize in Caesars Fight: Data on Players*, https://www.wsj.com/articles/in-caesars-fight-data-on-players-is-real-prize-1426800166.

[44] Wikipedia, *Pay to surf: PTS Companies*, https://en.wikipedia.org/wiki/Pay_to_surf.

[45] Owen Thomas, *Gov. Gavin Newsom wants to give you a 'data dividend.' Good luck with that*, https://www.sfchronicle.com/business/article/Gov-Gavin-Newsom-wants-to-give-you-a-data-13621447.php.

[46] Sam, Harrison, *Can you make money selling your data?*, http://www.bbc.com/capital/story/20180921-can-you-make-money-selling-your-data.

[47] Gregory Barber, *I Sold My Data for Crypto. Here's How Much I Made*, https://www.wired.com/story/i-sold-my-data-for-crypto/.

[48] Benjamin Klein, *Asset specificity and holdups*, http://masonlec.org/site/files/2012/05/WrightBaye_klein-b-asset-specificity-and-holdups.pdf.

[49] Philippe Aghion and Richard Holden, *Incomplete Contracts and the Theory of the Firm: What Have We Learned over the Past 25 Years?*, https://www.aeaweb.org/articles?id=10.1257/jep.25.2.181.

[50] *Ibid.*