U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON ENERGY AND COMMERCE

June 12, 2018

TO: Members, Subcommittee on Digital Commerce and Consumer Protection

FROM: Committee Majority Staff

RE: Hearing entitled "Understanding the Digital Advertising Ecosystem"

I. INTRODUCTION

The Subcommittee on Digital Commerce and Consumer Protection will hold a hearing on Thursday, June 14, 2018, at 10:15 a.m. in 2322 Rayburn House Office Building. The hearing is entitled "Understanding the Digital Advertising Ecosystem."

II. WITNESSES

- Dr. Howard Beales, Professor of Strategic Management and Public Policy, George Washington University;
- Rachel Glasser, Global Chief Privacy Officer, Wunderman;
- Michael Zaneis, President and CEO, Trustworthy Accountability Group; and,
- Justin Brookman, Director, Privacy and Technology Policy, Consumers Union.

III. BACKGROUND

According to the consultancy PwC, "[o]ver the past 21 years the Internet has grown from a nascent industry to the largest ad supported media in the United States."[1] During this period, the digital advertising ecosystem has continually redefined and disrupted online content and media businesses, as advertising delivered over the Internet continues to grow in influence and impact. Professors Catherine Tucker and Avi Goldfarb found, in a relatively early study of the ecosystem, "[a]utomated collection of the vast stream of electronic data from consumers' use of the internet represents an opportunity for marketing modelers to target their marketing campaigns better."[2] Enabling ad technology continues to evolve and spread from the desktop to mobile platforms and apps to over-the-top (OTT) services and potentially the consumer-facing Internet of Things. Digital advertising is the lifeblood for ad-supported, and typically reduced

[1] Interactive Advertising Bureau, "IAB Internet Advertising Revenue Report 2017: Full Year Results," May 10, 2018, pg. 3, at https://www.iab.com/wp-content/uploads/2018/05/IAB-2017-Full-Year-Internet-Advertising-Revenue-Report.REV2_.pdf

[2] Avi Goldfarb and Catherine Tucker, "Privacy Regulation and Online Advertising," *Management Science* 57.1 (2011), at https://dspace.mit.edu/openaccess-disseminate/1721.1/64920

cost or free, services and platforms, and now represents among the largest segments of the overall advertising industry in a relatively few number of years.[3]

Twenty years ago, nascent web-based businesses looking to develop meaningful revenue streams sold display or banner inventory paid by advertisers interested in advertising space on a website to display a static or linked banner or logo. The banner ad was a natural format to fill early browsers; "[r]egardless of the location . . . display ads expose the website visitor to the brand featured . . . and provide interested individuals the ability to click on the ad for more information."[4] The first ever banner ad was a small rectangle box purchased by AT&T on HotWired.com in 1994.[5] That banner ad was part of AT&T's "You Will" marketing campaign, which predicted the Internet-powered future. The ad text read "Have you ever clicked your mouse right HERE? YOU WILL." Approximately 44 percent of web visitors who saw the ad clicked on it, and those who did were delivered to AT&T for additional marketing information.

According to Andrew Anker, chief technology officer at Wired (the print affiliate of HotWired.com), who was tasked with developing revenue strategies to pay for the new online publication, there was "really no choice" but to try and monetize empty spaces on the website.[6] Mr. Anker quickly assessed that paid subscriptions or direct payments for the content would not be viable, and at the early stages of the Internet, accepting and securing credit card payments would be technologically challenging. "[A]dvertising became the only option," Mr. Anker concluded;[7] ever since, the business model of most websites primarily revolves around digital advertising.

Digital Advertising for Online Content and Media

In recent years, advertising over the Internet has grown in revenue, variety, format, complexity, quality and relevance. It is a significant source of revenue for online content and media businesses, and increasingly central to the advertising industry. Internet advertising continued to be the leading source of advertising revenue in 2017, growing in share and significance compared to any other media category and leading television advertising by $17.9

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[3] Digital Advertising Alliance, "Study: Online Ad Value Spikes When Data Is Used to Boost Relevance," February 10, 2014, at https://digitaladvertisingalliance.org/press-release/study-online-ad-value-spikes-when-data-used-boost-relevance; see also Howard Beales and Jeffrey Eisenach, "An Empirical Analysis of the Value of Information Sharing in the Market for Online Content." January 2014, at http://www.aboutads.info/resource/fullvalueinfostudy.pdf

[4] Wendy Moe, "Targeting Display Advertising" in K. Coussement, K.W. De Bock and Scott Neslin, *Advanced Database Marketing: Innovative Methodologies and Applications for Managing Customer Relations*, Gower Publishing (2013), at http://www.terpconnect.umd.edu/~wmoe/Moe%20Banner%20Ad%20Chapter.pdf;

[5] Ross Benes, "'The beginning of a giant industry': An oral history of the first banner ad," *Digiday*, November 8, 2017, at https://digiday.com/media/history-of-the-banner-ad/

[6] Farhad Manjoo, "Fall of the Banner Ad: The Monster That Swallowed the Web," *New York Times*, November 5, 2014, at https://www.nytimes.com/2014/11/06/technology/personaltech/banner-ads-the-monsters-that-swallowed-the-web.html

[7] Id.

billion.[8] By way of comparison, Internet advertising surpassed cable television advertising in 2011.[9] According to Interactive Advertising Bureau data, "Internet advertising has experienced double-digit annual growth in every year except 2009; no other media has experienced double-digit growth in any year."[10]

Banner (or display) advertising and search advertising represent the greatest share of Internet advertising revenue—77 percent—according to IAB full year 2017 results.[11] Banner advertising's representation of 31 percent of total Internet advertising revenue for 2017 showed no adjustment from the previous year; its format revenues totaled $27.5 billion in 2017, up from $22.3 billion in 2016.[12] Search's representation of 46 percent for 2017 is a slight year-over-year decrease from 48 percent in 2016, but search revenues totaled $40.6 billion, up 17.5 percent from $34.6 billion.[13] For 2017, video advertising revenues totaled $11.9 billion, and 14 percent of total share, and "Other" category totaled $8 billion and 9 percent of total share.[14]

Not surprisingly, new data indicates there is ongoing growth in mobile advertising. On a year-over-year basis, mobile online advertising revenue increased 36.2 percent in 2017, to $49.9 billion.[15] According to the Magna Advertising Forecast, "[m]obile advertising now represents almost 60% of digital advertising and almost 30% of total advertising in the US, reflecting the continued growth of mobile media usage in every segment of the population." Marketing agency Zenith predicts 59 percent of Internet advertising expenditure will be mobile in 2018.[16] Finally, there was significant revenue growth for social media advertising in 2017, growing 36 percent from the prior year to $22.2 billion.[17]

Digital Content Consumption

Recent data on digital media shows ongoing growth in digital content consumption including a significant share of consumer time for Google and Facebook properties. Using

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[8] By media type, B2B and magazine advertising ranked third and fourth, respectively, following TV advertising. Interactive Advertising Bureau, "Digital Ad Spend Reaches an All-Time High of $88 Billion in 2017, With Mobile Upswing Unabated, Accounting for 57% of Revenue," May 10, 2018, at https://www.iab.com/news/digital-ad-spend-reaches-all-time-high-88-billion-2017-mobile-upswing-unabated-accounting-57-revenue/; see also Interactive Advertising Bureau, "IAB Internet Advertising Revenue Report 2017: Full Year Results," May 10, 2018, pg. 21, at https://www.iab.com/wp-content/uploads/2018/05/IAB-2017-Full-Year-Internet-Advertising-Revenue-Report.REV2_.pdf

[9] Interactive Advertising Bureau, "IAB Internet Advertising Revenue Report 2012: Full Year Results," April 2013, pg. 20, at https://www.iab.com/wp-content/uploads/2015/05/IABInternetAdvertisingRevenueReportFY2012POSTED.pdf

[10] IAB Internet Advertising Revenue Report 2017: Full Year Results, at pg. 22.

[11] Id. at pg. 12.

[12] Id. IAB defines "Banner" advertising as consisting of Banner, Sponsorship and Rich Media.

[13] Id.

[14] Id. IAB defines "Other" advertising as including Classified, Lead Generation, Audio and Unspecified Other.

[15] Id. at pg. 9; see also Magna Advertising Forecasts, "Digital Advertising Soon To Grab 50% Of All Ad Dollars," March 21, 2018, at https://www.magnaglobal.com/wp-content/uploads/2018/03/MAGNA-US-Advertising-Forecast-March-2018-Summary.pdf

[16] Zenith, "Smartphone penetration to reach 66% in 2018," October 16, 2017, at https://www.zenithmedia.com/smartphone-penetration-reach-66-2018/

[17] Id.

Nielsen digital content consumption ratings, involving digital media on handsets, tablets, desktop computers, and other personal devices within the U.S. by audiences 18 years of age and older, industry research indicates Google's YouTube, Google, and Waze combined to account for 27.4 percent of all time spent on digital media.[18] The Facebook Platform, as well as Facebook's Messenger, Instagram, and WhatsApp, ranks second at 16.3 percent share of total digital consumptions.[19] Verizon-owned properties such as Yahoo and AOL held relatively constant sequentially at a 5.5 percent share of consumption.[20] Amazon, including Twitch, accounted for 2.1 percent.[21]

"Total digital consumption amounted to approximately 31 [billion] person-hours (or 27 [billion] excluding YouTube), which compares with the approximately 44 [billion] hours of total video consumption across all devices that occurred during the same period, or around 35 [billion] of conventional live + time-shifted TV set-based consumption among the same audience," research analyst Brian Wieser recently wrote.[22]

Mobile devices, including smartphones and tablets, accounted for 70 percent of global time spent using the Internet in 2017, up from 65 percent in 2016, according to the "Mobile Advertising Forecasts 2017" report released by marketing agency Zenith.[23] The Zenith report also forecasts that mobile devices will account for 73 percent of Internet consumption in 2018.[24]

Digital Ad Tech

According to Howard Beales and Jeffrey Eisenach, in "An Empirical Analysis of the Value of Information Sharing in the Market for Online Content," the digital advertising marketplace "is both dynamic, in the sense that new technologies and business models are constantly emerging, and complex, in the sense that some individual firms frequently perform multiple functions (i.e., they are vertically integrated)."[25]

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[18] Laurie Sullivan, "Google, Others Cut Into Facebook Share of Consumer Time," *MediaPost*, April 11, 2018, at https://www.mediapost.com/publications/article/317449/google-others-cut-into-facebook-share-of-consumer.html. Google's YouTube continues to grow more than 20% year-over-year monthly; other affiliated properties expanded by more than 33%. The measurements include time spent with content tagged with a Google URL, which would also include AMP-delivered content for other publishers' properties.
[19] Id.
[20] Id.
[21] Id. With regard to Amazon sites, comScore recently analyzed global data and found that Amazon was gaining ground on the much-cited duopoly of Google and Facebook. It found that in 8 out of 13 markets, Amazon saw proportionally faster growth in total digital population than both, although it must of course be noted that this was often from a lower base. comScore, "Global Digital Future in Focus: 2018 International Edition," March 6, 2018, at https://www.comscore.com/Insights/Presentations-and-Whitepapers/2018/Global-Digital-Future-in-Focus-2018
[22] Laurie Sullivan, "Google, Others Cut Into Facebook Share of Consumer Time," *MediaPost*, April 11, 2018, at https://www.mediapost.com/publications/article/317449/google-others-cut-into-facebook-share-of-consumer.html
[23] Zenith, "Smartphone penetration to reach 66% in 2018," October 16, 2017, at https://www.zenithmedia.com/smartphone-penetration-reach-66-2018/
[24] Id.
[25] Howard Beales and Jeffrey Eisenach, "An Empirical Analysis of the Value of Information Sharing in the Market for Online Content." January 2014, at http://www.aboutads.info/resource/fullvalueinfostudy.pdf

In order to connect and facilitate transactions between the ultimate buyer (i.e., advertiser/marketer) and the ultimate seller (i.e., publisher/media owner), there is a complex array of vendors and intermediaries, involving agencies, retargeting, verification and privacy, data suppliers, measurement and analytics, mobile, social and sharing, that power a sophisticated, often targeted and automated digital advertising system that operates on a continual 24/7 basis.[26] Where third party-mediated transactions are involved—as compared to publisher directed advertising, where ad inventory is sold directly by the publisher—they are increasingly facilitated through automated placements.

Advertising impressions served in this manner are called "programmatic advertising," and it can be applied to anything from banner/display to mobile/apps to OTT and voice, with computers and algorithms using various data to decide which digital ads to buy (or sell) and how much to pay (or demand) for them, often in real time.[27] Finally, one aspect of programmatic advertising is guaranteed impressions, aided by consumer-related data and information in an attempt to personalize and target digital ads in a relevant way for consumers.

In their 2014 empirical survey, Beales and Eisenach describe the market-making process for digital advertising as such:

> Advertising sold through auctions may go through at least two types of intermediaries: Sell-Side Platforms (SSPs) and Demand-Side Platforms (DSPs). First, publishers may pass availabilities through SSPs (or "yield managers"). SSPs contract with publishers on a commission basis, taking a fee for their services and passing the remaining revenue to the publisher. The seller provides information about, among other things the page, location, browser information, the IP address, and the SSP's unique ID for that user. The SSP may augment the information with its own information about the user, based on either purchased data or its own knowledge of the user's browsing history. SSPs then pass this information to potential bidders. Third party cookies are integral to the SSP process.
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> Second, advertisers may contract with a DSP (or "demand-side platform") to purchase advertising availabilities in the auction market. Using third party cookies, the DSP can match an SSP's user ID to its own user ID to further augment the information available about the user, combining the data from the SSP with its own user-specific data. The DSP will then determine bids for the availability for each participating advertiser. Each advertiser may also have information about the particular user; if so, that information is also incorporated in determining the advertiser's bid. In some instances, a DSP is unable to match a particular user to any other information. Bids for these users would reflect the bids that would be expected in a market without third party cookies.

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[26] Display LUMAscape, at https://www.lumapartners.com/luma-institute/lumascapes/display-ad-tech-lumascape/
[27] Charlotte Rogers, "What is programmatic advertising? A beginner's guide," *Marketing Week*, March 27, 2017, at https://www.marketingweek.com/2017/03/27/programmatic-advertising/

> When the DSP submits a bid to the SSP, it includes the URL of the advertisement that the advertiser wants to serve to that user. Generally the DSP will pass bids from all of its participating advertisers, rather than narrowing bids to the top bid, because the bid density is important to the efficient functioning of the auction market. The SSP aggregates the bids from all participating DSPs and provides the information to the seller. The seller selects the winning bidder, and serves the advertisement as part of the page.[28]

Value of Data and Information Sharing

A review of prior studies and research evidences that digital advertising has been "an important source of revenues for online content providers and as such have played a critical role in supporting the free content provided on the Internet."[29] An early study, undertaken by Scott Anderson, Mike Silver, and Rich Gordon of Northwestern University Kellogg School of Management noted that "[a]dvertising networks are increasingly defining the future of the online content business," and with "technologies that enable ads to be served dynamically based on previous consumer behavior and real-time feedback, networks are helping make online advertising more measurable, accountable and personalized."[30] With regard to targeting based on consumer characteristics, Anderson, et al. observed a "driving force in the growth of online ad networks is their capacity to target advertising based on individual users' behavior rather than content topics or a site's overall demographics."[31]

In another early study on the effect of behaviorally targeted advertising,[32] it was discovered that "[a]dvertising rates are significantly higher for behaviorally targeted ads," such ads are "more successful than standard run of network advertising, creating greater utility for consumers from more relevant advertisements and clear appeal for advertisers from increased ad conversion," and the targeting approach is "an important source of revenue for online content and service providers as well as third party ad networks."[33]

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[28] Howard Beales and Jeffrey Eisenach, "An Empirical Analysis of the Value of Information Sharing in the Market for Online Content." January 2014, at http://www.aboutads.info/resource/fullvalueinfostudy.pdf

[29] Wendy Moe, "Targeting Display Advertising" in K. Coussement, K.W. De Bock and Scott Neslin, *Advanced Database Marketing: Innovative Methodologies and Applications for Managing Customer Relations*, Gower Publishing (2013), at http://www.terpconnect.umd.edu/~wmoe/Moe%20Banner%20Ad%20Chapter.pdf; see also John Deighton and Peter Johnson, "The Value of Data 2015: Consequences for Insight, Innovation & Efficiency in the U.S. Economy," Data-Driven Marketing Institute (2015), at http://thedma.org/wp-content/uploads/Value-of-Data-Summary.pdf

[30] Scott Anderson, et al., "Online Ad Networks: Disruption – and Opportunity – for Media Businesses," Media Management Center, Medill School Kellogg School of Management (2009).

[31] Id.

[32] Behavioral targeting is one of several online advertising targeting approaches, including targeting based on consumer characteristics, geotargeting to locations based on the IP address of a computer, and contextual targeting which serves ads based on the content of a particular website. Wendy Moe, "Targeting Display Advertising" in K. Coussement, K.W. De Bock and Scott Neslin, *Advanced Database Marketing: Innovative Methodologies and Applications for Managing Customer Relations* (2013).

[33] Howard Beales, "The Value of Behavioral Targeting" (2010), at https://www.researchgate.net/publication/265266107_The_Value_of_Behavioral_Targeting

Professors Catherine Tucker and Avi Goldfarb analyzed the responses of 3.3 million survey-takers who had been randomly presented 9,596 online display (banner) advertising campaigns to explore how privacy regulation in the European Union (EU) had influenced advertising effectiveness. They observed that advertising effectiveness dropped 65 percent in the EU relative to the rest of the world.[34] The Tucker-Goldfarb findings suggested "that, while there may be many reasons to enact privacy regulation, such regulation may reduce ad effectiveness, particularly for plain banner ads and for general interest websites. Speculatively, this may change the number and types of businesses sustained by the advertising-supported Internet."[35]

Finally, industry surveys provide some indication that American consumers prefer ad-supported online services. According to a 2016 Zogby Poll, commissioned by the Digital Advertising Alliance, over 85 percent of survey respondents preferred a digital ad-supported Internet model instead of paying for online content, and three-quarters said they would reduce their online activities "a great deal" if they had to pay for those services and content. Respondents assigned a value of nearly $1,200 per year to the free, ad-supported services and content currently available to them on computers and mobile devices.

However, following revelations that Cambridge Analytica and other third-parties accessed and stored data associated with Facebook users' and the users' friends, recent polling found most U.S. adults are not willing to share personal data for advertisements to keep online content and services free.[36] A May 2018 Morning Consult poll showed that 63 percent of all U.S. adults said they would not be willing to give a "company access to their personal data for targeted advertising to a keep a service free."[37] For adults between the ages of 18-29, a 48 percent plurality said they would not be willing to give up their data, while 32 percent would be willing; the "older the respondent, the more likely they were to say they are unwilling to give access to their data."[38]

Imperative for Enhanced Transparency, Control and Security

As the impact and influence of digital advertising grows, and its use of consumer-related data and information to personalize and target ads evolves, especially in the area of programmatically bought audiences, new questions and concerns about the business models supporting online ad-supported services are arising. These concerns range from privacy, political advertising, fraud in digital ad supply chain to competition in ad tech, and how ad tech and algorithms may target or disadvantage certain content and voices in favor of others, including illegitimate content.

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[34] Avi Goldfarb and Catherine Tucker, "Privacy Regulation and Online Advertising," *Management Science* 57.1 (2011), at https://dspace.mit.edu/openaccess-disseminate/1721.1/64920
[35] Id.
[36] Sam Sabin, "Most U.S. Adults in Poll Unwilling to Share Personal Data for Ads to Keep a Service, *Morning Consult*, May 25, 2018, at https://morningconsult.com/2018/05/25/most-us-adults-unwilling-share-personal-data-ads-keep-service-free/
[37] Id.
[38] Id.

Sophisticated targeting technology and programmatic advertising meant to facilitate ad-supported, data-driven services and platforms may give way to skepticism about the business model by consumers forced to re-evaluate their compact with online businesses and the trade-offs they are willing to accept. Additionally, there have been media reports about use of location-information to target and reach audiences,[39] and even devices that collect audio information after a "trigger" phrase is uttered and, in some instances, devices that collect "non-triggered" data.[40]

Digital ad technology designed to bring greater value, efficiency, and return on investment to advertisers, publishers, and ultimately consumers, continues to respond with self-regulatory initiatives to address "fake news," automated bots, fake accounts and non-human traffic that have permeated the ecosystem. Digital ad fraud and Internet piracy undermine trust in the current online advertising ecosystem, and contribute to significant economic harm for consumers and industry. For example, bot fraud is at an all-time high with the Association of National Advertisers predicting that it will cost advertisers $6.5 billion in 2017.[41] According to a 2015 research paper, by the cybersecurity firm Oxford Biochronometrics, over "a 7 day period in early January 2015, using the advertising platforms of Google, Yahoo, LinkedIn and Facebook . . . showed that between 88 and 98 percent of all ad-clicks were by a bot of some kind, with over 10 percent of those bots being of a highly advanced type, able to mimic human behavior."[42]

"Fake news" and fake accounts created on Twitter, Facebook, YouTube, or Soundcloud, to name a few, can adversely influence human audiences, but anonymous bot networks are selling followers, likes, shares, and retweets in bulk.[43] Digiday disclosed statistics last year quantifying the size of the fake account/influencer problem: "a single day's worth of posts tagged #sponsored or #ad on Instagram contained more than 50 percent fake engagement; out of 118,007 comments, only 20,942 were not made by bot accounts; bot comments are responsible for over 40 percent of total comments for more than 500 of 2,000 sponsored posts made each day."[44]

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[39] Brian Krebs, "Mobile Giants: Please Don't Share the Where," *Krebs on Security*, May 22, 2018, at https://krebsonsecurity.com/2018/05/mobile-giants-please-dont-share-the-where/

[40] Sam Nichols, "Your Phone Is Listening and it's Not Paranoia," *Vice*, June 4, 2018, at https://www.vice.com/en_au/article/wjbzzy/your-phone-is-listening-and-its-not-paranoia; Niraj Chokshi, "Is Alexa Listening? Amazon Echo Sent Out Recording of Couple's Conversation," *New York Times*, May 25, 2018, at https://www.nytimes.com/2018/05/25/business/amazon-alexa-conversation-shared-echo.html

[41] Association of National Advertisers, "New ANA and White Ops Study Indicates War on Global Digital Ad Fraud Is Winnable," May 24, 2017, at http://www.ana.net/content/show/id/44668

[42] Oxford Biochronometrics, "Over 88% of Digital Ad Clicks Deemed Fraudulent, New Study by Oxford BioChronometrics Suggests," February 3, 2015, at https://www.prnewswire.com/news-releases/over-88-of-digital-ad-clicks-deemed-fraudulent-new-study-by-oxford-biochronometrics-suggests-300030097.html; https://oxford-biochron.com/downloads/OxfordBioChron_Quantifying-Online-Advertising-Fraud_Report.pdf; see also Alexandra Buell, "Fraudulent Web Traffic Continues to Plague Advertiser, Other Businesses," Wall Street Journal, March 28, 2018, at https://www.wsj.com/articles/fraudulent-web-traffic-continues-to-plague-advertisers-other-businesses-1522234801

[43] Nicholas Confessore, Gabriel Dance, Richard Harris, and Mark Hansen, "The Follower Factory," *New York Times*, January 27, 2018, at https://www.nytimes.com/interactive/2018/01/27/technology/social-media-bots.html

[44] Shareen Pathak, "Cheatsheet: What you need to know about influencer fraud," *Digiday*, November 3, 2017, at https://digiday.com/marketing/cheatsheet-need-know-influencer-fraud/

Digital fraud goes beyond bots and fake accounts. It also includes online ads that have little chance of being seen by human audiences on a variety of Internet and social media platforms, phantom inventory, cookie bombed attribution models, as well as geolocation fraud. Fraudulent digital ad traffic may undermine the effectiveness of digital ads, misrepresent audience interest and measurement, undermine transparency and credibility, and ultimately impact financial bottom-lines.

Concerns and questions have also been expressed about whether website owners and advertisers have sufficient options for selling and buying digital ad inventory, and have the ability to innovate with different businesses, technology solutions and platforms for their unique needs. According to public sources, Google and Facebook have significant market share in the digital advertising ecosystem, with reports of the majority share of U.S. digital advertising, as well as ongoing revenue growth, attributed to the two companies.[45]

IV. ISSUES

The following issues may be examined at the hearing:

- What are the online advertising technologies, platforms, and business models currently in use?
- What is the value of information sharing in online advertising, and what role does consumer-related data play in personalizing and targeting digital advertisements?
- What concerns are raised about the use of consumer-related data and the practice of automated ad targeting?
- What are the economic benefits of the use of consumer data and information in support of online ad-supported platforms and service, as well as the potential concerns and harms?
- What are the self-regulatory policies and practice in place currently, and being developed, to safeguard consumer-related data and information and to give consumers enhanced control over data about them?

V. STAFF CONTACTS

If you have any questions regarding this hearing, please contact Melissa Froelich or Paul Jackson of the Committee staff at (202) 225-2927.

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[45] Cale Weissman, "Witness Google's and Facebook's insane digital ad dominance in these two charts," *Fast Company*, December 27, 2017, at https://www.fastcompany.com/40512141/witness-google-and-facebooks-insane-digital-ad-dominance-in-these-two-charts; Sarah Sluis, "Digital Ad Market Soars To $88 Billion, Facebook And Google Contribute 90% Of Growth," *Ad Exchanger*, May 10, 2018, at https://adexchanger.com/online-advertising/digital-ad-market-soars-to-88-billion-facebook-and-google-contribute-90-of-growth/