EXHIBIT 1

REDACTED

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF VIRGINIA
Alexandria Division

United States of America, *et al.*,

Plaintiffs,

v.

Google LLC,

Defendant.

Case No. 1:23-cv-00108-LMB-JFA

Hon. Leonie H. M. Brinkema

EXPERT REPORT OF ROBIN S. LEE, PHD

December 22, 2023

I. Introduction

I.A. Qualifications

(1) I am an economist, specializing in the field of industrial organization. Industrial organization studies the structure and functioning of markets, and competition among firms. I received my undergraduate and graduate degrees from Harvard University, receiving my AB in Economics in 2003, my AM in Economics in 2005, and my PhD in Business Economics in 2008.

(2) I am a Professor of Economics in the Department of Economics at Harvard University and regularly teach courses in industrial organization to graduate and undergraduate students. Previously, I have served on the faculty at New York University's Stern School of Business where I taught MBA students. I have published thirteen articles in peer-reviewed journals, including the *American Economic Review, Econometrica,* and the *Journal of Political Economy.* My published work has examined issues related to competition in a variety of industries characterized by network effects. I have also coauthored a chapter covering empirical analysis of contracting in vertical markets that appeared in the most recent volume of the Handbook of Industrial Organization (Elsevier, 2021). I have served as a Co-Editor of the *American Economic Journal: Microeconomics* and as an Associate Editor of the *International Journal of Industrial Organization,* both of which are leading journals in the field of industrial organization.

(3) In my academic positions at New York University and Harvard University, I have supervised the thesis research and served on the dissertation committees of 25 economics PhD candidates. I have received several awards of recognition for my academic work, including the Econometric Society's Frisch Medal (an award presented biennially for the best applied paper published in *Econometrica*), the American Antitrust Institute's award for Best Antitrust Article on Mergers, and the Association of Competition Economics' Best Paper Prize.

(4) I have served as an economic expert on several antitrust matters in the past.

(5) My curriculum vitae is Appendix A to this report. It contains additional information about my professional experience, including my publications and prior testifying experience.

I.B. Scope of charge

(6) I have been retained by the United States Department of Justice on behalf of Plaintiffs in this case. Plaintiffs allege that the Defendant, Google, "has used anticompetitive, exclusionary, and unlawful

means to eliminate or severely diminish any threat to its dominance over digital advertising technologies."[1]

(7) I have been asked by counsel at the Department of Justice to undertake certain economic analyses associated with questions of market definition, market power, and competitive effects raised by the allegations of the complaint:

- Determine whether publisher ad servers, ad exchanges, and advertiser ad networks for open-web display advertising, both worldwide (excluding countries like the People's Republic of China that substantially restrict internet access) and in the United States, are relevant antitrust markets for the purpose of evaluating Google's market power and alleged anticompetitive conduct.[2]
- Assess whether Google has possessed market power in those markets and, if so, assess the extent of Google's market power.
- Determine, as a matter of economic principles, whether Google's conduct (i) was or is likely to result in the creation, extension, or maintenance of market power in the publisher ad server, ad exchange, and ad network markets, (ii) was or is harmful to competition, and (iii) was or is likely to result in material harm to open-web publishers, advertisers, and consumers.

I.C. Materials relied upon

(8) In my work on this matter, I was assisted by a staff of expert economists and economic analysts at the consulting firm Bates White LLC. I directed the activities of the team, supervised and made all final decisions concerning economic analyses and their implementation, and prepared this report.

(9) My team and I were provided with access to materials, including documents, data, and deposition transcripts produced in this matter. I instructed my team to identify information relevant for my review including information regarding Google's ad tech products and related markets, the activities of Google and its rivals in those markets, and factors that influenced market outcomes. I instructed my team to identify materials for my review regardless of whether they appeared to support the positions of the Plaintiffs or Google.

(10) In forming my opinions, in addition to my training, teaching, research, and experience, I relied on the materials identified throughout this report. To the extent that I have referenced or relied on documents and testimony in this report, I have done so to ensure that my economic analyses and application of economic principles are based on an understanding of the underlying facts. I do not offer expert opinions on the meaning of individual documents. Appendix B contains a detailed list of materials

[1] Amended Complaint, United States, et al. v. Google LLC, No. 1:23-cv-00108-LMB-JFA (E.D. Va. Mar. 14, 2023) (hereinafter, "Amended Complaint").

[2] Amended Complaint, ¶¶ 279–303.

that I relied upon in forming my opinions. I reserve the right to incorporate new materials or data into my analysis, if and when they become available.

(11) Bates White is compensated at a rate of $765 per hour for my work in this matter. Neither Bates White's compensation nor my compensation is in any way contingent on the outcome of this case.

I.D. Summary of opinions

(12) I have reached the following opinions in this matter:

1. Publisher ad servers, ad exchanges, and advertiser ad networks that serve and transact open-web display advertising are relevant antitrust product markets for evaluating Google's market power and the competitive effects of the conduct that is the focus of my report. For each relevant product market, both worldwide (excluding a limited number of countries and regions, including the People's Republic of China) and the United States are relevant geographic markets.
2. Google possesses substantial market power in each of the relevant markets, protected by significant barriers to entry. It has possessed that market power in each of the relevant markets in recent years, and likely since at least 2015.
3. Google has used its market power within and across the relevant markets to exclude competitors from participating in these markets, and to impede their ability to compete for customers. Google has done so by:
   - (1) Providing unrestricted access to Google Ads' advertiser demand exclusively to its AdX ad exchange, and denying comparable access to rival ad exchanges;
   - (2) Providing access to and use of real-time bids from AdX exclusively to its DFP publisher ad server, and denying comparable access to rival publisher ad servers;
   - (3) Providing access to a feature known as "Dynamic Allocation" exclusively to AdX within DFP, granting AdX valuable "first-look" and "last-look" advantages over rival ad exchanges;
   - (4) Eliminating publishers' ability to use variable pricing floors within DFP, impairing their ability to work with rival ad exchanges and exert competitive pressures on AdX;
   - (5) Acquiring an emergent competitor, AdMeld, and eliminating it as a competitive threat to Google's AdX and DFP products.
4. These actions have harmed and continue to harm the ability of rival publisher ad servers, ad exchanges, and advertiser ad networks to compete for advertiser spending and publisher impressions. These actions have also denied scale to Google's rivals in each of the relevant markets, which is important for the competitiveness of ad tech products.

5. Google's actions harm competition and have enhanced and maintained Google's market power in the relevant markets. Google's actions have also harmed open-web display publishers and advertisers, and have also likely harmed consumers.

I.E. Summary of report

(13) Competition encourages firms to provide higher quality and lower priced products, and to innovate and adapt in ways that create customer value. For these reasons, competition policy in the United States seeks to preserve competition by prohibiting firms from using their established dominance to distort or impede competition and block competitive threats from rivals, while preserving incentives to improve products in ways that benefit customers.

(14) *Monopolization* refers to conduct that creates or maintains a firm's substantial market power over its products by harming competition. The most common methods of monopolization undermine the ability of customers to transact freely with rivals, and the ability of rivals to serve those customers' needs. These methods typically exclude rivals from competing for segments of a market by hindering customers from using their products, depriving them of or degrading access to important inputs, raising their costs of operation, or worsening the quality of their products.

(15) In this report, I conduct an economic inquiry into whether Google has engaged in (and continues to engage in) conduct that harmed competition and served to acquire, maintain, or enhance Google's market power over technology products used to transact open-web display advertising on websites ("ad tech products"). The customers potentially impacted by its actions are *open-web publishers* (website operators that do not own and operate their own ad-tech products) and *advertisers* seeking to transact open-web display advertising.

(16) My economic inquiry involves four steps:

1. First, determining whether Google's conduct excluded existing or potential rivals from, or impeded their ability to compete for, publisher impressions and advertiser spending, thereby harming their competitiveness;
2. Second, evaluating whether Google's conduct preserved or enhanced Google's market power;
3. Third, evaluating whether Google's conduct has harmed customers (open-web publishers and advertisers);
4. Last, examining whether pro-competitive justifications for the scrutinized conduct exist. If so, then investigating whether any pro-competitive benefits could have been realized via less-restrictive or less-exclusionary means (in which case such benefits are not specific to the

conduct); and whether such benefits would in any case be otherwise sufficient to eliminate competitive or customer harm from the conduct.

(17) To reach the opinions contained within this report and summarized above, I have relied upon economic theory, the materials identified throughout this report (including public information, documentary evidence and deposition testimony), and economic analyses of data produced in this matter.

I.E.1. Google's market power in the relevant markets

(18) At the outset, I begin in **Sections II and III** by providing relevant background information on open-web display advertising and ad tech products, and introducing important economic concepts for understanding competition among these products. This background is important for understanding how Google's conduct affected competition and customers for open-web display advertising products.

(19) Display ads, sometimes referred to as "banner ads," are image or text-based ads that internet users see on websites. Using ad tech products, web publishers can designate parts of their websites to show display ads so that when a user visits a publisher's website, advertisers can purchase display ads shown to that user (referred to as display ad "impressions"). Products that facilitate the sale of open-web display ads help publishers monetize their online web properties, and help advertisers reach potential consumers for their goods and services. These ad tech products deliver significant value to both publishers and advertisers, which explains their widespread adoption and use.

(20) In Section II, I discuss differences between open-web display advertising and other forms of digital advertising. I also provide a description of products offered by Google and its rivals to transact open-web display advertising, and describe how the sale of display advertising has changed over time.

(21) In Section III, I describe the importance of indirect network effects for ad tech products (whereby the value of a product to one set of customers depends on the usage of that product by others), and explain why a firm offering ad tech products can possess market power as long as either advertisers or publishers do not possess close substitutes for that firm's products.[3]

(22) I also describe the importance of scale for the competitiveness of an ad tech product. The competitive benefits of scale manifest both through what are known as "indirect network effects"—e.g., more advertisers using an ad tech product makes that product more attractive to publishers, and vice versa—and through quality and monetization improvements enabled by additional data collected by

[3] Economists define market power as the ability of a firm to profitably price above a competitive level, often measured by its marginal or incremental costs.

an ad tech product as it handles more transactions. Scale benefits can be reinforcing and lead to durable advantages over rivals over time.

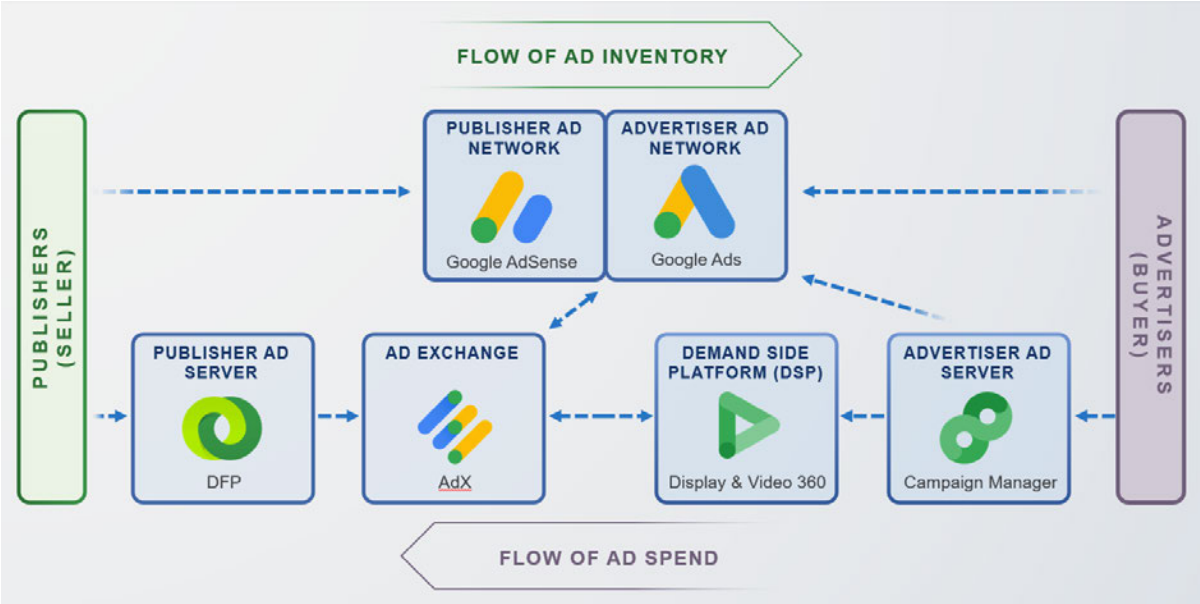
(23) Next, having provided that background, I evaluate in **Section IV** the relevant antitrust markets alleged by the Plaintiffs. Defining relevant markets involves identifying a set of products over which a hypothetical monopolist could possess and profitably exercise significant market power. Market definition is a useful tool for analyzing monopolization claims, as it assists with the assessment of market power and helps focus attention on areas where potential competitive effects from the conduct at issue are most likely to occur.

(24) In this Section, I explain why *publisher ad servers*, *ad exchanges*, and *advertiser ad networks* for open-web display advertising are relevant product markets, where:

- *Publisher ad servers* are software products used by open-web publishers to manage and sell display ad "inventory" (i.e., website ad space), both through transactions that are directly negotiated with advertisers in advance, and through "indirect" transactions that are sold in "real-time" whenever a user visits a website and new display ad impressions become available for sale;
- *Ad exchanges* are software products that run real-time auctions for publishers' display ad inventory among advertisers; and
- *Advertiser ad networks* are software products that advertisers use to purchase display ad inventory from publishers.

(25) Figure 1, based on a June 2020 Google presentation, provides a simplified depiction of various ad tech products and the transactions that they facilitate. Publishers (i.e., sellers) are on the left-hand side, advertisers (i.e., buyers) are on the right-hand side, and ad tech products are in the middle. The diagram shows different sets of ad tech products, including those belonging to the relevant product markets: publisher ad servers, ad exchanges, and advertiser ad networks. The diagram also depicts Google's ad tech products.

Figure 1. Illustration of Google's ad tech products



Source: Chart created using information from GOOG-DOJ-AT-01510462, at -469 and -471 (06/2020).

(26) I also explain why there are at least two relevant geographic markets for purposes of this matter, based on the location of customers of ad tech products (open-web publishers and advertisers): the whole world excluding certain regions (specifically the People's Republic of China and some additional areas), and the United States.

(27) Because these relevant antitrust markets comprise products that serve and transact open-web display advertising, I initially describe why open-web display advertising is a distinct and valuable form of advertising for open-web publishers and advertisers. Display advertising monetizes different types of digital inventory and offers different reach and targeting than other forms of digital advertising, including search and instream video advertising. Publishers and advertisers that use open-web display advertising have a limited ability to substitute away from open-web display advertising to other forms of advertising, and thus have a commensurately limited ability to substitute away from the products that are used to transact open-web display advertising.

(28) For each of the relevant product markets, I then discuss why products outside of each relevant market are not close enough substitutes to constrain a monopolist of the products in each of these markets from exercising significant market power. Importantly, I explain why direct evidence that Google possesses substantial and sustained market power with its publisher ad server (DFP), ad exchange (AdX), and advertiser ad network (Google Ads) indicates that these are proper relevant markets and can be profitably monopolized. The reason why is the following: because Google was able to

profitably exercise market power in these markets, a hypothetical monopolist that controlled Google's products as well as rival products would also find it profitable to do so.

(29) In **Section V,** I discuss evidence of Google's market power in each of the relevant markets.[4]

(30) Indirect evidence that Google possesses substantial and sustained market power includes Google's high market shares for its publisher ad server, ad exchange, and advertiser ad network products,[5] and high barriers to entry and expansion. Key barriers in the relevant markets include the direct costs of developing new ad tech products, attracting customers who face significant switching or multihoming costs, and overcoming indirect network effects enjoyed by existing incumbents.

(31) Direct evidence of Google's market power over its products in the relevant markets is demonstrated by Google's ability to (a) persistently charge and maintain fees that exceed competitive levels; (b) adjust its bidding or pricing behavior across ad tech products in a manner that disadvantaged its own customers and increased its profits; and (c) impose restrictions on the use of its products that lower their value to customers without losing significant sales.[6]

(32) I thus conclude that in each of the relevant markets, Google possesses substantial and sustained market power protected by significant barriers to entry and expansion.

I.E.2. The competitive effects of Google's conduct

(33) Establishing that Google possesses substantial and sustained market power in the relevant markets is an important predicate for determining whether Google's conduct harmed competition. Certain conduct, such as engaging in exclusive dealing or tying products together, may pose little if any risk to competition if undertaken by a firm with limited market power. However, the same conduct can have significant deleterious effects on competition if undertaken by a firm with substantial market power. In this matter, Google is armed with substantial market power over its products in the relevant markets. Google thus possesses the ability to meaningfully affect adoption of, and the volume of

[4] My conclusions about market power do not depend on whether the relevant geographic market is worldwide excluding certain areas or the United States.

[5] In the publisher ad server market, since 2018 Google's DFP had a market share exceeding 91% of worldwide open-web display impressions and 86% of open-web display impressions from US publishers among a set of publisher ad servers that produced data. In the ad exchange market, since 2018, I estimate that Google's AdX had a 54–65% share of worldwide impressions and a 46–56% share of impressions served to US users. In the advertiser ad network market, since 2018 Google Ads consistently maintained a share above 85% of worldwide impressions and impressions served to US users among a set of products that produced data. Google also has a high share of fees in all three relevant products and both relevant geographic markets.

[6] In the publisher ad server market, Google does not appear to earn profit from its market power solely through high DFP prices. Instead, there is significant evidence that Google earns profit from publishers' increased usage of DFP through their increased use of AdX and Google Ads, where Google charges significant margins. The economics of this strategy are analogous to the familiar add-on or razor/razor-blade pricing model whereby a firm extracts profits on a complementary good (razor blades) while pricing the primary good (razors) close to or even below its nominal cost.

transactions that occur through, its own and rival ad tech products via its actions—and, hence, it possesses the ability to harm competition through its conduct.

(34) The rest of my report evaluates the competitive effects of Google's conduct.

(35) In **Section VI**, I lay out the four-step framework discussed above that I use to conduct my inquiry. To assist with my analysis, I describe two well-established categories of conduct that the economics literature has recognized that, when employed by a firm with substantial market power, can harm competition:

- **Foreclosure**. A firm with substantial market power can harm the competitiveness of rivals and entrants by withholding, degrading (e.g., reducing the quality of or raising the costs for), or otherwise limiting access to an important input or resource. The economics literature has referred to this withholding, degrading, or limiting behavior as *foreclosure*. Through foreclosure, a firm can enhance its own market power by worsening the attractiveness of rivals' products (e.g., by diminishing their qualities or inducing their prices to increase). Such conduct tends to harm competition by weakening rivals' ability to discipline prices and encourage innovation, and can be particularly impactful in markets that exhibit strong network effects where initial competitive disadvantages can be persistent and grow over time.
- **Impeding customers from working with rivals.** Firms with substantial market power can also exclude competition by eliminating or impeding customers' abilities to transact with rivals. One approach is to implement policies that limit customers' ability to send more of their business to rivals, thereby precluding rivals from obtaining sales that could enhance their competitiveness. Another approach is by acquiring current or potential rivals, and merging their competing products into existing ones or eliminating them altogether.

(36) I perform the first step of the framework in **Section VII**, where I explain that Google has undertaken actions that fall within the two categories of conduct listed above, and that by foreclosing rival ad exchanges' and publisher ad servers' access to important inputs and by impeding customers' ability to work with rival exchanges, Google excluded those rivals from competing for advertiser spending and publisher impressions. In doing so, Google also deprived and denied those rivals scale and associated quality and cost benefits, further reducing their competitiveness.

(37) I start in Section VII.A by providing background context regarding Google's ad tech strategy, the importance of DFP, and Google's historical responses to threats to its market power in the relevant markets. I then explain how Google's actions fall under the two standard categories of conduct described above that can lead to competitive harm. I then show that Google has used its market power in one market to **foreclose** and diminish the competitiveness of rivals' products in another by:

- (1) Providing unrestricted access to Google Ads' advertiser demand exclusively to AdX (Section VII.B);
- (2) Providing access to and use of real-time bids from AdX exclusively to DFP (Section VII.C); and
- (3) Providing Dynamic Allocation features and associated first- and last-look benefits exclusively to AdX within DFP (Section VII.D.1).

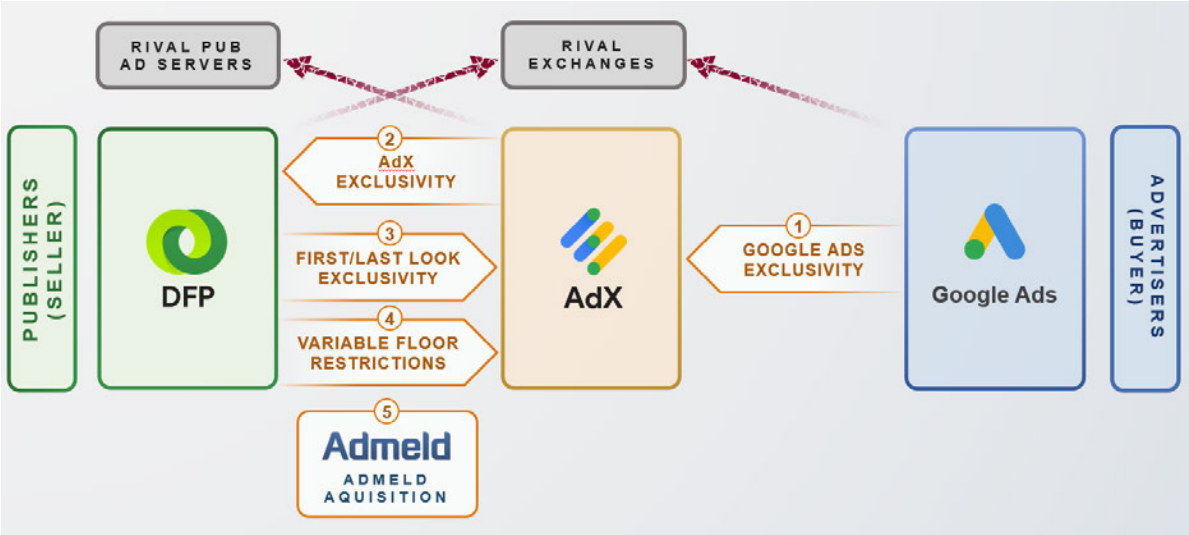
(38) In all three cases, Google foreclosed to rivals an important asset or input that Google controlled , and required that customers use its own products in the ad exchange or publisher ad server markets in order to obtain unrestricted access to this input. That is, Google foreclosed rival ad exchanges from both unrestricted Google Ads' advertiser demand and the ability to compete in real-time against AdX within DFP; and Google foreclosed rival publisher ad servers from the unrestricted access to and use of real-time bids from AdX that it provided DFP.

(39) I also explain how Google impeded customers from working with rivals by:

- (4) Preventing publishers from setting variable pricing floors within DFP, weakening competitive pressures on AdX and impeding publisher's ability to sell impressions through rival exchanges (Section VII.D.2).
- (5) Acquiring AdMeld in response to a perceived competitive threat from yield managers, and eliminating an option available to publishers for accessing and managing multiple exchanges and demand sources (Section VII.E).

(40) Figure 2 depicts each of these five acts, and how Google's actions leveraged market power in one relevant market to impose restraints that strengthen its own products and foreclose rivals in an "adjacent" relevant market within the ad tech stack.

Figure 2. Diagram of Google's exclusionary conduct



Notes: Diagram depicts Google's exclusionary conduct examined in this report. Solid white arrows denote the direction in which market power possessed by one product was used to enhance the market power of another, and broken red arrows denote the rivals that were foreclosed. For example, "Google Ads Exclusivity" represents Google providing unrestricted access to Ads' advertiser demand to AdX and foreclosing such access to rival ad exchanges.

(41) I then show that, in each of the relevant markets, Google's conduct harmed rivals' competitiveness by materially impeding their ability to compete for advertiser spending and/or publisher impressions and denying them scale (Section VII.F). Importantly, Google's conduct that harmed the competitiveness of rival ad exchanges had the additional effect of also reducing the competitiveness of, and increasing entry barriers for, rival publisher ad servers. This is because publisher ad servers work alongside exchanges to facilitate open-web display transactions, and publisher ad server competitors are weakened without viable ad exchange partners.

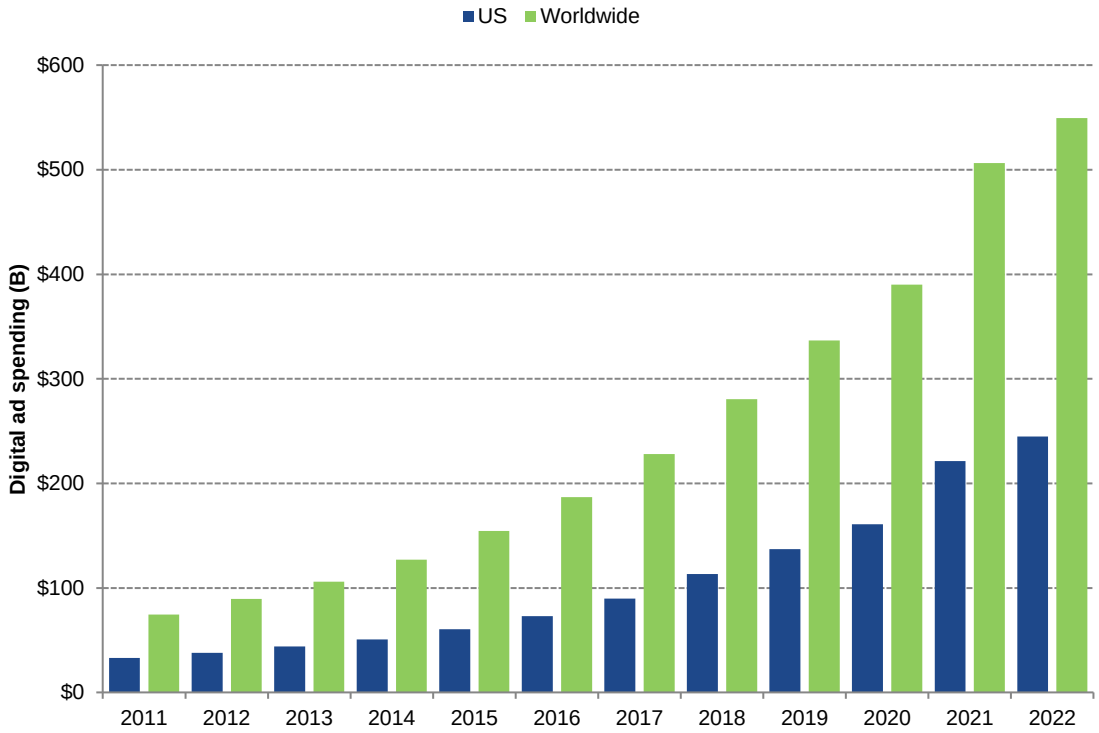
(42) I then conduct Steps 2 and 3 of my economic analysis in **Section VIII**.

(43) I first explain why Google's conduct harmed competition and enhanced and preserved its substantial market power in the relevant markets. Google's actions materially worsened the competitiveness of rivals and made it less likely that customers would turn to alternative options, thereby lessening the competitive pressures that Google's own products faced.

(44) Next, I describe how Google's conduct has harmed open-web publishers and advertisers through three channels:

- Google's conduct supported higher take rates and fees and steered more transactions through Google's more expensive ad tech products in the relevant markets. This led to higher costs of transacting open-web display advertising for advertisers and lower payouts for publishers than would have prevailed in more competitive markets.

Figure 4. US and worldwide digital advertising spend trends (2011–2022)[9]



Source: Worldwide digital ad spending data (eMarketer) at tab "Total, Digital, and Mobile," rows 73, 86 (2022)
Notes: Includes advertising that appears on desktop and laptop computers as well as mobile phones, tablets, and other internet-connected devices. Source: Worldwide digital ad spending data (eMarketer) at tab "Total, Digital, and Mobile," rows 73, 86 (2022).
Notes: According to eMarketer, a market research company, digital ad spending includes advertising that appears on desktop and laptop computers as well as mobile phones, tablets, and other internet-connected devices; and includes banner ads and other (static display ads such as Facebook's News Feed Ads and Twitter's Promoted Tweets), classified ads, email (embedded ads only), mobile messaging (SMS, MMS, and P2P messaging), rich media (including in-stream and outstream video ads), search ads (including contextual text links, paid inclusion, paid listings, and SEO), sponsorships, lead generation (referrals).

(49) Industry participants often divide digital advertising into different segments, including display, search, instream video, and native (as well as other smaller categories). I briefly describe these segments below:

1. **Display**: Digital display advertising refers to image or text-based advertisements (ads) that internet users see online.[10] Display ads include "banner ads," which the IAB, an online-

[9] Trends reflect actual values through 2022. Letter from D. Pearl to M. Freeman (09/08/2023).

[10] *See*, e.g., IAB, "Internet Advertising Revenue Report: Full-year 2022 results," https://www.iab.com/wp-content/uploads/2023/04/IAB_PwC_Internet_Advertising_Revenue_Report_2022.pdf. Display ads may include static images as well as "rich media," which can include video components. Google, "What is rich media?" Studio Help, accessed December 14, 2023, https://support.google.com/richmedia/answer/2417545?hl=en (Google defines rich media as "a digital advertising term for an ad that includes advanced features like video, audio, or other elements that encourage viewers to interact and engage with the content").). Videos that are contained as part of display ads (e.g., a video that is part of a banner ad at the top of a website) are referred to as "outstream" or "in-display" video

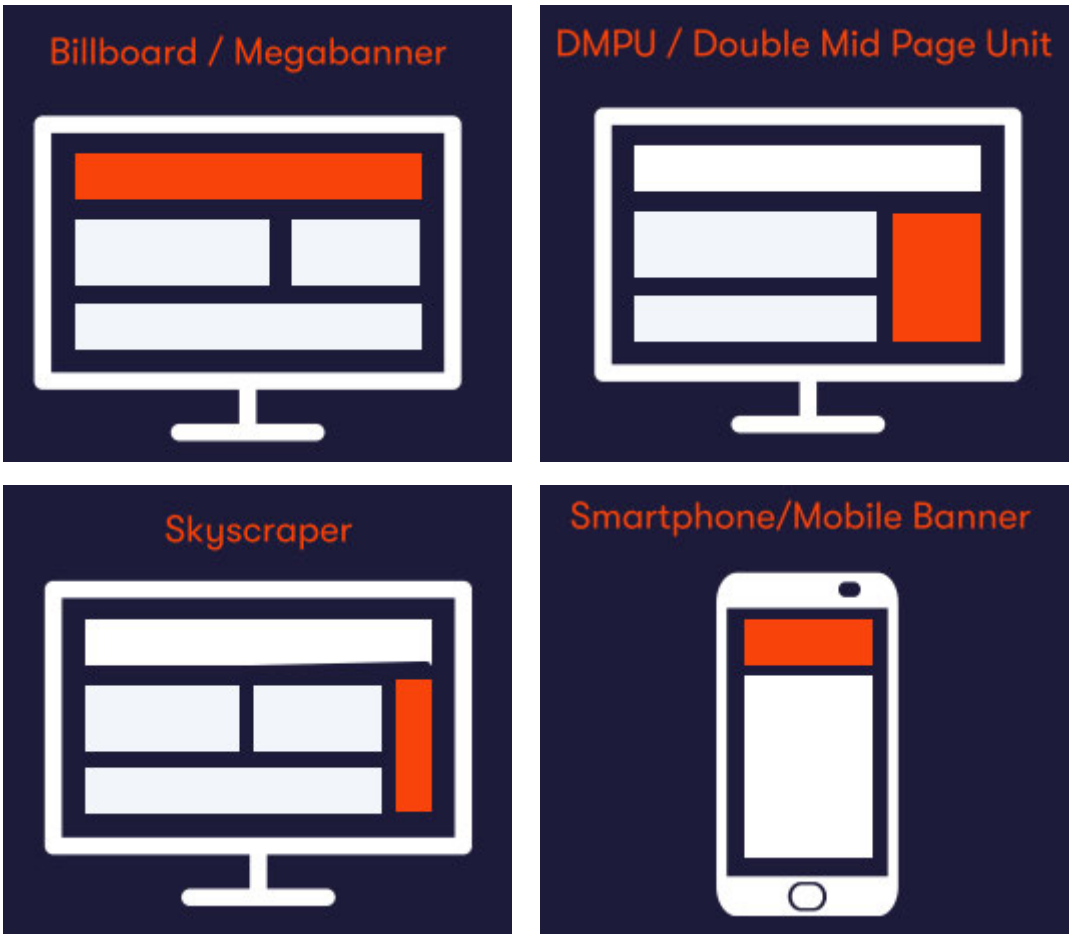
advertising trade organization, calls "one of the most dominant forms of advertising on the internet."[11] Display ads may include items such as text, images, video, audio, and often come in a set of predetermined formats and sizes.[12] Figure 5 below shows examples of common placements of display ads on websites and Figure 6 shows an example of how display ads may appear for a user when visiting two different websites.

advertisements. Video ads may also be shown in video players included on websites. These are referred to as "instream video" ads and may play before, during, or after dedicated video content. *See* Section II.A and Section IV for further discussion.

[11] IAB, "Internet Advertising Revenue Report: Full-year 2022 results," IAB, April 2023, p. 22 https://www.iab.com/wp-content/uploads/2023/04/IAB_PwC_Internet_Advertising_Revenue_Report_2022.pdf.

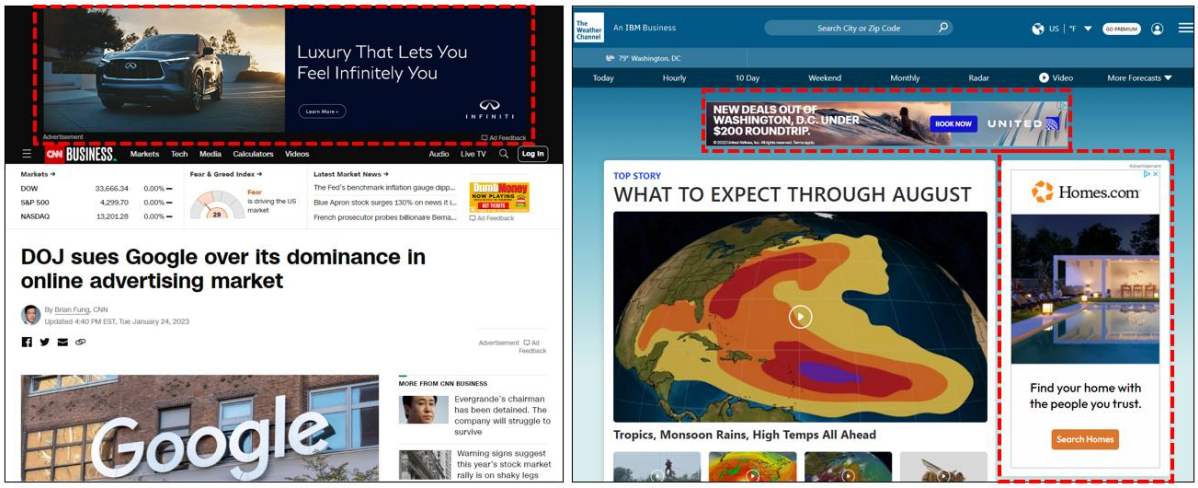
[12] IAB UK, "Jargon Buster," IAB UK, https://www.iabuk.com/jargon-buster?letter=33&title=&page=1. IAB UK, "Introduction to digital display advertising for media owners", IAB UK, last modified (06/June 2021), https://www.iabuk.com/sites/default/files/public_files/Introduction-to-digital-display-advertising-for-media-owners_0.pdf.

Figure 5. Examples of common display ad locations as specified by the Internet Advertising Bureau (IAB)



Source: IAB UK, "Introduction to digital display advertising for media owners", IAB UK, last modified (06/2021) https://www.iabuk.com/sites/default/files/public_files/Introduction-to-digital-display-advertising-for-media-owners_0.pdf.

Figure 6. Examples of display ads shown on websites



Source: CNN, captured September 29, 2023, www.cnn.com. The Weather Channel, captured July 31, 2023, www.weather.com.
Notes: Red dashed lines highlight display ads.

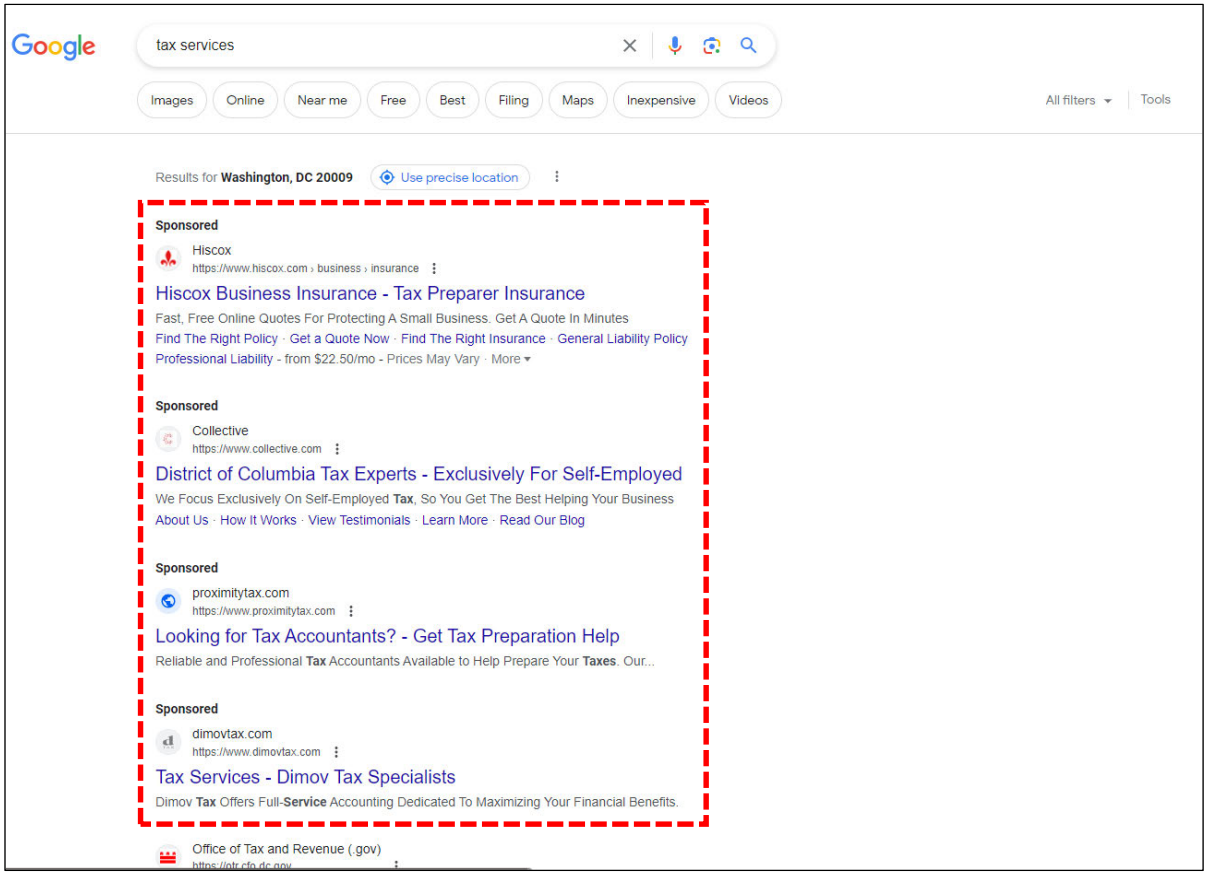
2. **Search**: Search ads are ads shown alongside search results from a search engine and are often linked to a certain search word or phrase. Advertisers generally bid on search advertising slots that are relevant to certain keywords[13] and pay for these advertisements on a cost-per-click ("CPC") basis.[14] These paid listings may appear as "sponsored" links at the top or side of search results.[15] Figure 7 below shows an example of how paid listings may appear alongside standard search results.

[13] Google, "The ad auction," Google Ads Help, accessed December 15, 2023, https://support.google.com/google-ads/answer/1704431.

[14] Google, "Actual cost-per-click (CPC): Definition," Google Ads Help, accessed December 15, 2023, https://support.google.com/google-ads/answer/6297?sjid=15864561118467767985-NA ("Your actual cost-per-click (actual CPC) is the final amount you're charged for a click.").

[15] IAB, "Internet Advertising Revenue Report: Full-year 2022 results," IAB, April 2023, https://www.iab.com/wp-content/uploads/2023/04/IAB_PwC_Internet_Advertising_Revenue_Report_2022.pdf, at 23. Google also distinguishes between search ads, display content, in-stream video content, and in-app ads. *See*, e.g., GOOG-DOJ-AT-02199478, at -485 (06/2019).

Figure 7. Examples of search ads



Source: Google, captured on August 30, 2023, www.google.com.
Note: Red dashed lines highlight search ads. Ads shown on the Google Search result page are identified with a "Sponsored" label at the top of the ad.

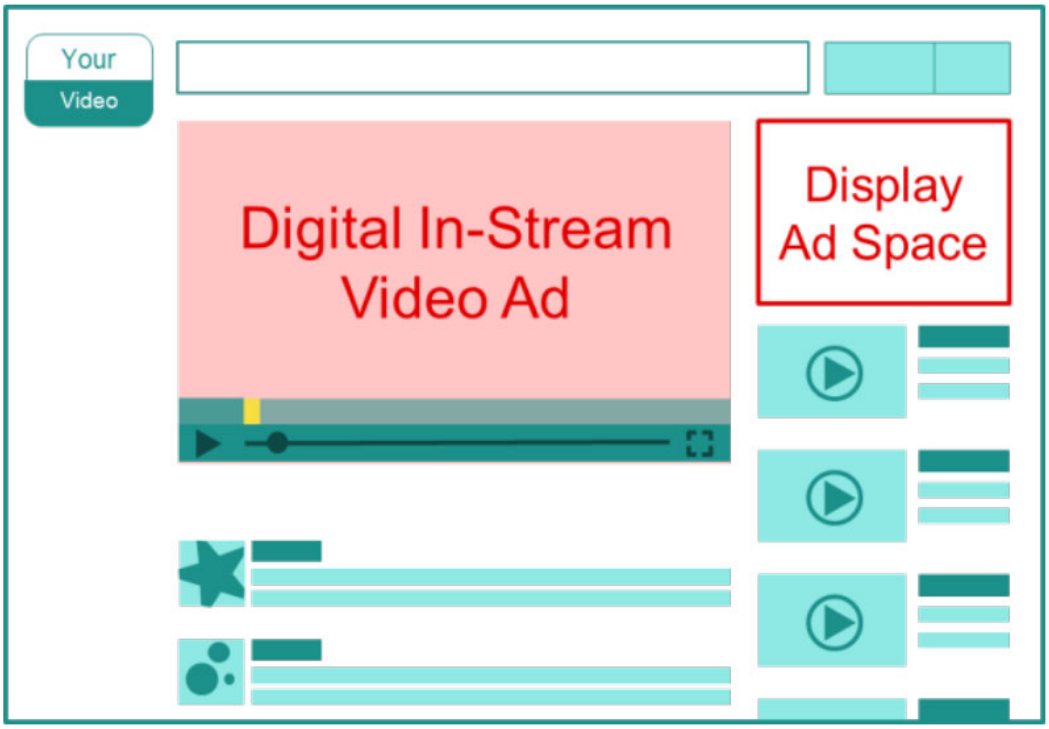
3. **Instream video**: Instream video ads are shown within a video player on a website, or in applications on mobile devices or connected TVs.[16] Instream video ads are viewed in a video player before, during, or after the original site's video content.[17] Instream video ads are distinct from "outstream" or "in-display" video ads, which are videos played in standard display ad

[16] IAB, "Definitions and Terminology," IAB, https://www.iabuk.com/ctv/glossary (defines connected TV as "[v]ideo content consumed on a TV screen, delivered via an internet connection. This includes TVs directly connected to the internet (Smart TV), as well as hardware that enables a TV to become connected, e.g. TV sticks, games consoles and set-top boxes that are connected to the internet.").

[17] IAB, "Digital Video In-Stream Ad Format Guidelines," Interactive Advertising Bureau (IAB), January 8, 2016, https://www.iab.com/wp-content/uploads/2016/01/DVAFG_2015-01-08.pdf, at 7 (defining digital video in-stream ads as "ad formats served into a video player: 'before, during, and after a variety of content including, but not limited to, streaming video, animation, gaming, and music video content in a player environment.'"); IAB UK, "A Guide to the Connected TV Supply Chain," IAB UK, March 2, 2021, https://www.iabuk.com/standard-content/guide-connected-tv-supply-chain ("The most prevalent format [of advertising on Connected TV] is instream video (pre-roll, mid-roll and post-roll)").

spaces and can be substituted in those spaces for "static" images.[18] Figure 8 below shows how instream video ad slots differ from display ad slots. In this report, I follow industry convention and distinguish between instream and outstream video ads, and use *display ads* to include outstream video but not instream video ads.

Figure 8. Example of digital instream video ad formats as specified by the Internet Advertising Bureau



Source: IAB, "Digital Video In-Stream Ad Format Guidelines,",IAB, January 2016, p. 7, https://www.iab.com/wp-content/uploads/2016/01/DVAFG_2015-01-08.pdf.

4. **Native**: Native ads are designed to blend in with the environment in which they are placed. While there are different types of native advertisements, the distinguishing feature of these ads is that

[18] The IAB defines the "Display (Banner / Rich Media)" advertising format as "a form of display advertising that can range from a static graphic to full motion video," and notes that "Video commercials that appear in video players are considered Digital Video Ads, not Rich Media." *See* Internet Advertising Bureau, "Internet Advertising Revenue Report: Full-year 2022 results," PwC & IAB Interactive Advertising Revenue Report, April 2023, https://www.iab.com/wp-content/uploads/2023/04/IAB_PwC_Internet_Advertising_Revenue_Report_2022.pdf. In Sections II and IV, I discuss differences between instream and outstream video ads further. *See also* IAB, "Digital Video In-Stream Ad Format Guidelines," IAB, January 8, 2016, https://www.iab.com/wp-content/uploads/2016/01/DVAFG_2015-01-08.pdf ("[A]ds in video format served to placements designated for display advertising are often confused with in-stream ads. Because video in-stream ads and in-display video are two ad forms that require different resources and technology, distinguishing the two are important to establishing digital video in-stream ad formats.").

they often mimic the style and structure of the surrounding content.[19] The following are prominent forms of native ads:

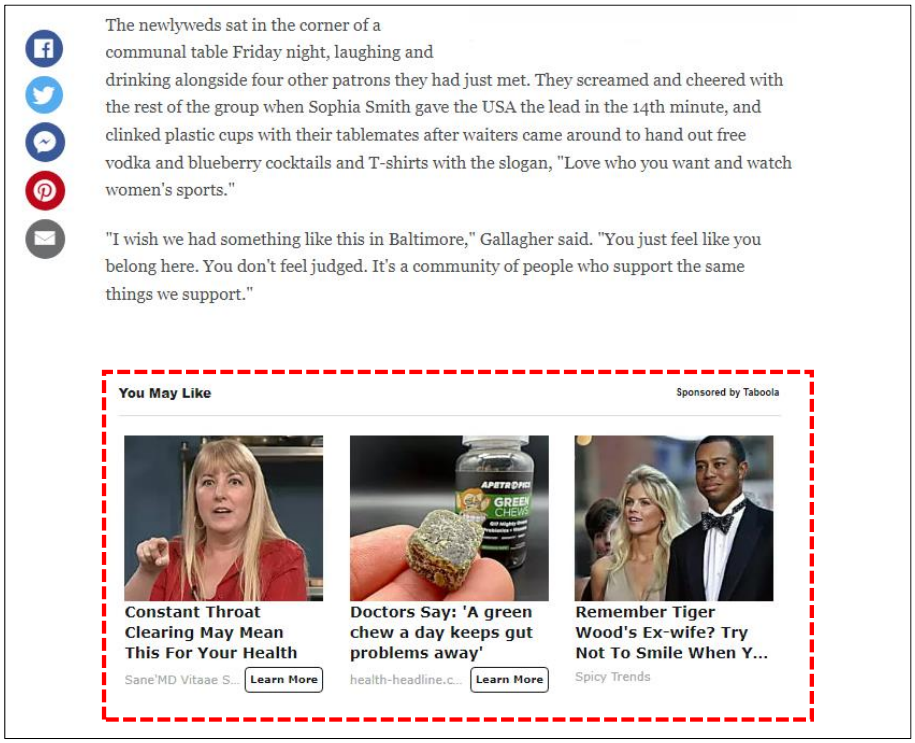
A. *Content recommendation* ads are collections of links that suggest additional external content for users. Advertisers may purchase these ad slots with the intention of driving traffic to the posted content.[20] Content recommendation ads are considered by many industry participants to contain lower quality content than display ads, with a significant amount of spend coming from "clickbait" ads; as a result, website operators tend to place these ad units at the bottom of their pages or prefer to not use them at all.[21] Figure 9 below shows an example of a content recommendation widget displayed on a webpage—in this case below a news article. Figure 10 shows how Google's Multiplex content recommendation product appears on a desktop computer.

[19] Although some sources may consider part of native advertising to be a part of display advertising, to be precise in my discussion, I do not use the term "display advertising" in this report to include native advertising unless explicitly stated otherwise. I discuss differences between display ads and native ads further in Section IV.B.1.a.ii.

[20] MMA Mobile Native Advertising Committee, "The Mobile Native Ad Formats," *Mobile Marketing Association*, accessed December 18, 2023, https://www.mmaglobal.com/files/documents/the_mobile_native_formats_final.pdf.

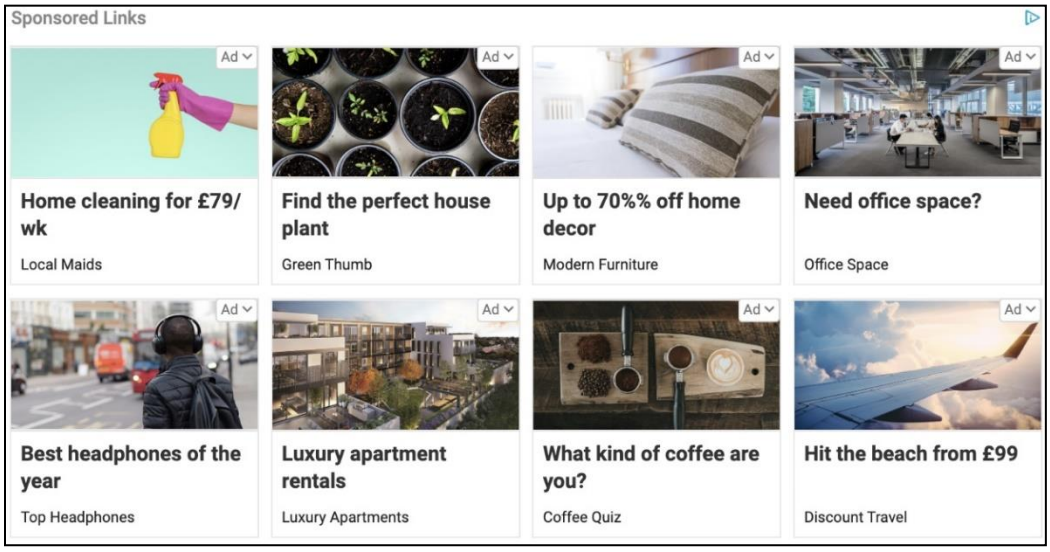
[21] GOOG-AT-MDL-003644990, at -995 (05/23/2017) ("Over the past several years the web has seen a proliferation of content recommendation ad units from three main companies: Taboola, Outbrain, and RevContent (TBOBRC)… These companies have grown enormously by peddling clickbait ads (sometimes scams and often NSFW) that generate high CTRs and CPMs for publishers… Because the minimum quality bar is set somewhere around "it makes me sick to my stomach" (real publisher quote), publishers typically relegate [content recommendation] ad units to the bottoms of articles. However the same publishers describe the revenue (often in the form of a guaranteed CPM) as 'like crack' which is why so few have chosen to abandon these ad units."); GOOG-DOJ-AT-00344037, at -068 (05/2017) (in reviewing the importance of content recommendation advertisements to publishers, Google noted testimony from a publisher who said "we were working with Taboola, but we ended our contract, because we were not pleased with the format and performance as far as to justify having additional ad code to slow things down".) *See also* Section IV.B.1.a.ii.

Figure 9. Example of content recommendation displayed below site content



Source: Jamie Goldberg, "First US all-women's-sports bar embraces the Women's World Cup", ESPN, captured on August 30, 2023, https://www.espn.com/soccer/story/_/id/38049431/uswnt-world-cup-game-sports-bra-portland-oregon.
Note: Red dashed lines highlight native ads shown through content recommendation.

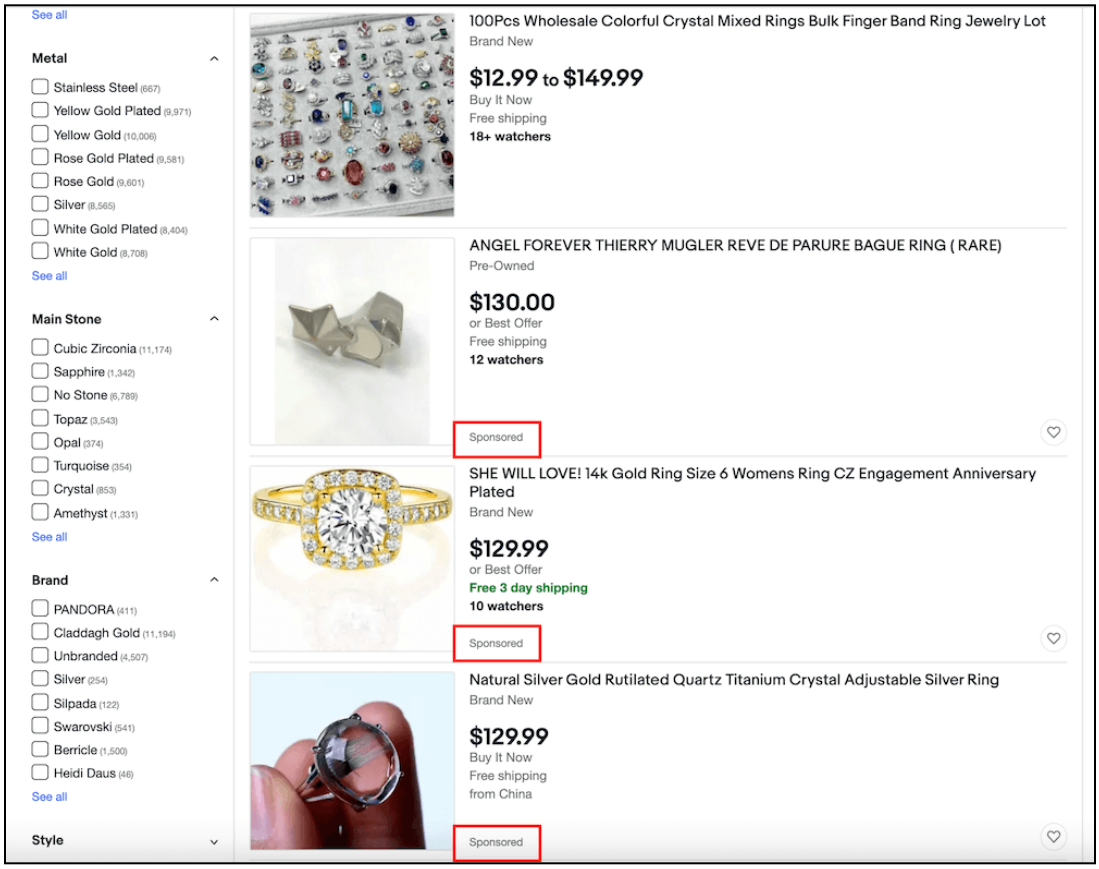
Figure 10. Example of Google's Multiplex content recommendation advertising on desktop



Source: Google,"About Multiplex ads," Google AdSense Help, accessed December 18, 2023, https://support.google.com/adsense/answer/9189566?hl=en.

B. *Sponsored Product* or *Sponsored Listing* ads promote specific products alongside "organic" product listings on e-commerce sites within search results or in suggested product pages.[22] These may appear similar to organic product listings with prices, reviews, and product details appearing in paid ad slots.[23]

Figure 11. Example of sponsored listing ads alongside organic listings on Ebay



Source: Kevel, "Sponsored Listings: The Definitive Guide for 2023," Kevel, last modified March 2, 2019, https://www.kevel.com/blog/sponsored-listings.

C. Social media (or "in-feed social") ads appear in social media feeds and closely resemble organic posts on those sites.[24] Users of the social media site can often engage with (e.g.,

22 GOOG-AT-MDL-000001750, at -750 (06/10/2021) ("Sponsored Product Ads (SPAs) are natively rendered, click on site ads on e-commerce publishers' sites/apps. These ads can appear in search results…, category browsing, or on product detail pages (e.g. 'you may also like..')").

23 MMA Mobile Native Advertising Committee, "The Mobile Native Ad Formats," *Mobile Marketing Association*, accessed December 18, 2023, https://www.mmaglobal.com/files/documents/the_mobile_native_formats_final.pdf

24 Some in-feed ads can also be shown on non-social media sites. These ads are distinct from display ads because the ad slot blends in with the publisher's content (as opposed to occupying space on top of or around it) and the ad creative matches the aesthetic of the publisher's content. *See* Interactive Advertising Bureau, Interactive Advertising Bureau, "Native Advertising Playbook 2.0" Internet Advertising Bureau, May 2019, https://www.iab.com/wp-content/uploads/2019/05/IAB-Native-Advertising-Playbook-2_0_Final.pdf; MMA Mobile Native Advertising

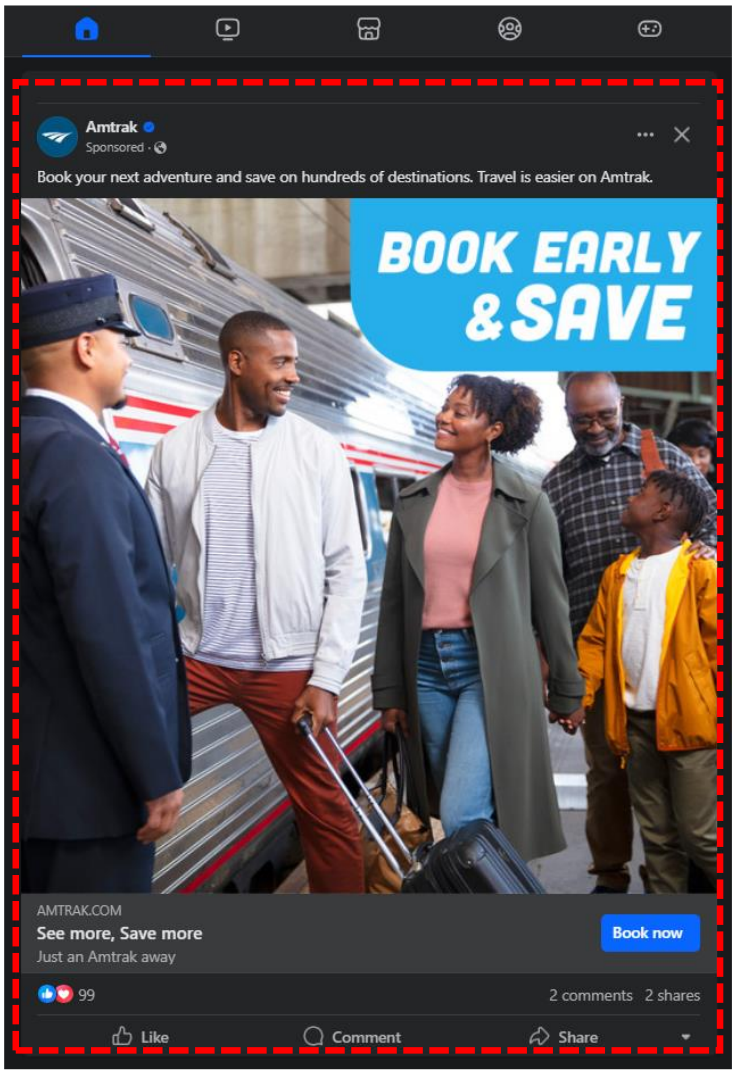
by reacting or commenting) the post. Advertisers may purchase these ad slots with the intention of building brand awareness, creating intent, or finding new customers.[25] While these ads are most often shown on the sites of social media pages such as Facebook, Instagram, or Twitter, Google has a similar in-feed ad product, known as "Discovery ads" that are shown on YouTube, Gmail, and on Google's Discover search feed.[26] Figure 12 below shows how an in-feed social media advertisement may appear on a social media site.

Committee, "The Mobile Native Ad Formats," MMA Mobile Native Advertising Committee, *Mobile Marketing Association*, accessed December 18, 2023, https://www.mmaglobal.com/files/documents/the_mobile_native_formats_final.pdf. In-feed ads can require substantial technical capability and be limited to more sophisticated publishers. *See* GOOG-AT-MDL-000994606, at -669 (07/19/2019) ("Creating a good looking, high performing native ad requires effort and skill. We strongly encourage publishers to use our templates as a starting point and to involve their design and engineering teams in the process… When a native ad is in a feed it should very closely match your site/apps layout. Plan on starting with a pre-made template but making significant edits to the CSS for layout, font, and styling.").

[25] MMA Mobile Native Advertising Committee, "The Mobile Native Ad Formats," Mobile Marketing Association, accessed December 18, 2023, https://www.mmaglobal.com/files/documents/the_mobile_native_formats_final.pdf, at 7–8. *See also* GOOG-AT-MDL-009638243, at -275 (06/05/202).

[26] GOOG-AT-MDL-009638243, at -246 (06/05/2020). As I explain further in Section IV, both Google and industry participants recognize social media advertising as distinct from display advertising.

Figure 12. Example of in-feed social native ads shown on Facebook



Source: Facebook, captured November 9, 2023,www.facebook.com.
Note: Red dashed lines highlight in-feed social ads (known as "Facebook Feed"). S*ee* Meta, "About Meda ads placements", Meta Business Help Center, accessed December 18, 2023, https://www.facebook.com/business/help/407108559393196?id=369787570424415.

(50) Ad types can also be distinguished based on where digital advertising is shown. Web advertising refers to digital ads shown on websites, viewed on both desktop and mobile devices. In-app advertising refers to digital ads delivered within mobile applications, including those that are accessible on smartphones, tablets, or wearable devices.[27]

[27] *See* Interactive Advertising Bureau Europe, "IAB Europe's Guide to In-App Advertising," February 2022, https://iabeurope.eu/wp-content/uploads/2022/02/IAB-Europe-Guide-to-In-app-advertising.pptx.pdf, 6 ("In-App advertising refers to ads and ad campaigns that are delivered within mobile applications, including smartphones, tablets, or wearable devices").

II.A.1. Ad tech products for display advertising and their customers

(51) "Ad tech," short for advertising technology, refers to software and other tools used to purchase, sell, and manage digital display advertising. I refer to companies offering ad tech products as ad tech intermediaries.

(52) Customers of ad tech products are advertisers and publishers of online content. Advertisers attempt to cost-effectively target their display ad campaigns at what they perceive to be high-value audiences, while publishers often seek to monetize their digital assets by selling online ad space on their websites, also referred to as their display ad "inventory."[28] Because advertisers are buyers and publishers are sellers of display ad inventory, advertisers are said to be on the "demand-side" (or "buy-side") while publishers are on the "supply-side" (or "sell-side").

(53) A variety of ad tech products work in conjunction with one another to facilitate display advertising transactions between publishers and advertisers. These products form what is known as the "ad tech stack." At a high level, the ad tech stack can be described as comprising three "layers" consisting of ad tech products that each serve different functions:

- publisher ad servers;
- ad exchanges; and
- advertiser bidding tools, comprising both demand-side platforms ("DSPs") and advertiser ad networks.[29]

(54) The purchase of a single online display ad "impression" (i.e., a single display ad shown to a single web visitor) by an advertiser from a publisher often involves participation by products in each of these layers. I describe these ad tech products in more detail in Section II.B.

(55) The focus of this report is ad tech products for display ads that are shown on websites, so unless otherwise specified, I will use the term *publishers* to refer to entities that operate online web pages and display content to web visitors. These publishers often monetize their web traffic by devoting some of the space on their web pages to display advertising. I will use the term *open-web publishers* to refer to those publishers that rely on third-party ad tech products (i.e., products that these publishers do not themselves own) to sell their display ad inventory.[30] Examples of large open-web publishers are USA Today, Weather.com, and Vox. In contrast, there are other publishers, including

[28] There are some forms of display ads that do not appear on websites, a notable example being in-app display ads. As I explain in Section IV, in-app ads are a distinct form of advertising from open-web display ads. Google also distinguishes between display, video, and in-app inventory. *See* GOOG-DOJ-AT-02199478, at -485 (06/2019).

[29] Certain ad networks can also be used to connect advertisers and publishers without relying on exchanges or publisher ad servers. *See* Section II.B.2.b.

[30] Unless otherwise specified, I use "publishers" in this report to mean "open-web publishers," as these are the publisher customers of the ad tech products that are the focus of this report.

Amazon and large social media publishers such as Facebook, that sell their owned and operated (O&O) display ad inventory to advertisers through their own integrated, internally supplied ad tech tools ("integrated advertising tools").[31]

(56) In my report, I use "open-web display advertising" to refer to display ads shown on the websites (which can be viewed on desktop or mobile devices) of open-web publishers. This excludes other forms of digital advertising (including search and instream video), and display ads that are shown in applications used on mobile devices or on TV media players.[32] Similarly, unless otherwise specified, I use the term *advertisers* in this report to refer to entities that purchase display advertising inventory.

(57) Even though website visitors and hence viewers of display ads ("users" or "consumers") are not direct customers of ad tech products, they too can be affected by changes in the quality or cost of display advertising. For example, users may benefit if display ads become more "relevant," which can mean that ads more frequently contain valuable information for consumers. They may also benefit if increased monetization from display advertising allows publishers to fund the creation of new content. On the other hand, users can be made worse off if display advertisements become less relevant, rely on more personal data, become more expensive and lead to higher final prices of goods or services, or if publishers earn less from the sale of online display inventory and therefore are less able to produce valuable content.

II.A.2. Uses of different forms of digital advertising

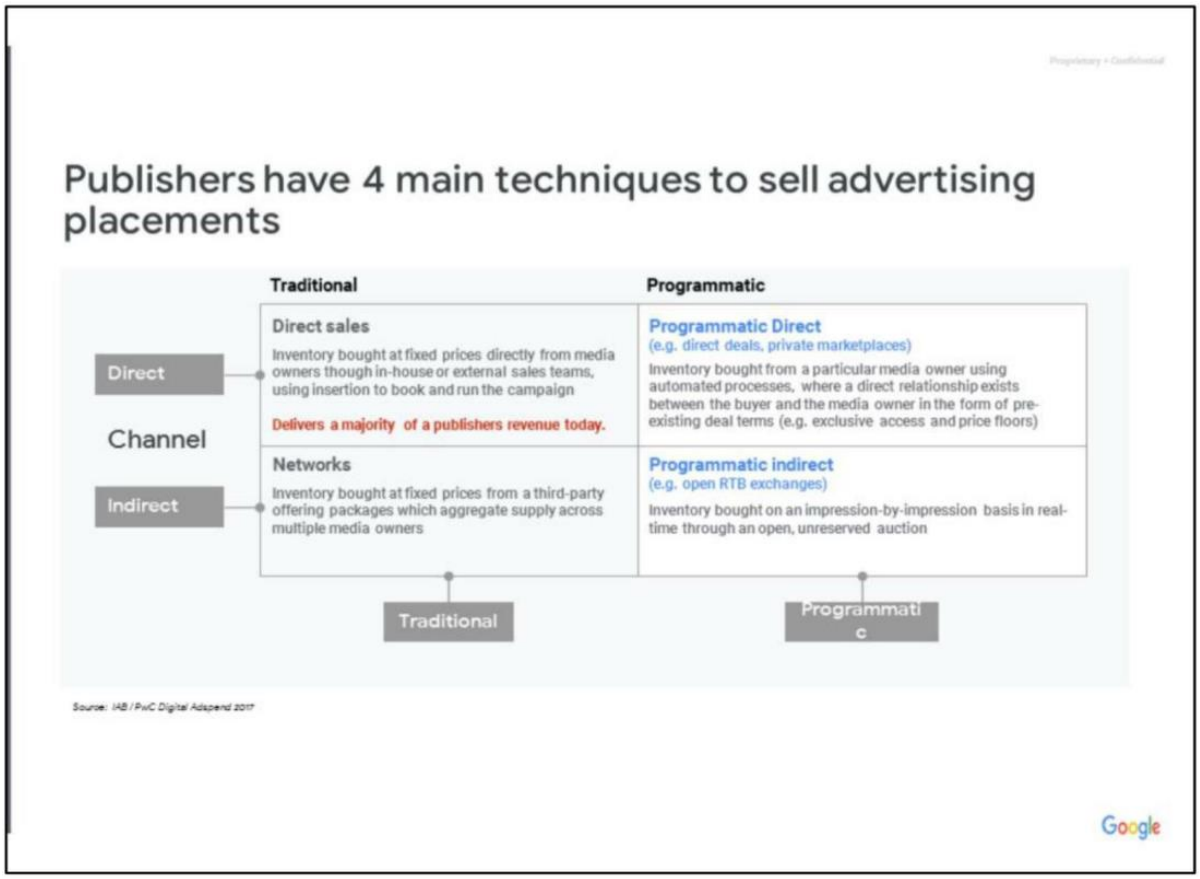
(58) Companies use advertising to achieve a variety of goals. Potential goals include building awareness for a company's products or brand, communicating a product's attractiveness compared to alternatives ("consideration"), or acquiring a new customer and inducing them to make a purchase ("conversion").[33] These and other roles played by advertising are often described by marketers as corresponding to different stages of a consumer's "journey" toward making a purchase. Marketing

[31] In a strategy document, Google described Facebook and Amazon as "typically requiring purchase through their buying door" in order to secure advertising inventory on their pages and referred to them as "[e]stablished walled gardens." *See* GOOG-AT-MDL-001970341, at -348 (08/2021). *See also* GOOG-TEX-00151409, at -409 (08/18/2017) (describing Amazon and Facebook's "walled garden inventory" and access to "open ecosystem inventory"); GOOG-DOJ-04442323, at -350 (2018), (describing Amazon and Facebook as part of "unaddressable" web inventory for Google's display business).

[32] Apple and Android smartphones and tablets are examples of mobile devices, and Roku, AppleTV, Amazon's Fire TV, and Google's Chromecast are examples of TV media players.

[33] Philip Kotler and Kevin Lane Keller, *A Framework for Marketing Management*, 6th ed. (Pearson Education, 2016): 122. ("Some people are unaware of the product, some are aware, some are informed, some are interested, some desire the product, and some intend to buy… [M]arketers can employ a marketing funnel to break the market into buyer-readiness stages."). *See also* Deposition of Kristy Kozlowski (Comcast), September 6, 2023, 186:8–186:13 ("Q. And what are the different parts of the [marketing] funnel? A. The top of the funnel would be more brand and awareness driving, the mid-funnel would be more consideration and the lower funnel would be more conversion."); *See also* Amazon Ads, "What is a marketing funnel? How they work, stages, and examples," Amazon Ads, accessed December 18, 2023, https://advertising.amazon.com/library/guides/marketing-funnel (describing a "four-stage marketing funnel" including the stages of "awareness, consideration, conversion, and loyalty.)

Figure 13. Google explanation of display advertising transaction types



Source: GOOG-DOJ-03242646, at -670 (09/26/2018).

(65) **Direct transactions** refer to those that are subject to terms individually and "directly" negotiated between publishers and advertisers.[41] Direct transactions that utilize sales teams and require manually recording deal terms are referred to as "traditional tag-based" or "non-programmatic direct" deals, while those that rely on automation or ad tech products are referred to as "programmatic direct."[42] *Programmatic* refers to "media or ad buying that uses technology to automate and optimize, in real time, the ad buying process."[43] Programmatic direct transactions can either reserve ad inventory that

[41] Google, "Delivery basics: Ways of transacting in Ad Manager," Google Ad Managers Help, accessed on December 18, 2023, https://support.google.com/admanager/answer/9248464.

[42] GOOG-DOJ-03242646, at -670 (09/26/2018) (defining Programmatic Direct as "[i]nventory bought from a particular media owner using automated processes, where a direct relationship exists between the buyer and the media owner in the form of pre-existing deal terms"); GOOG-DOJ-AT-02199478, at -525 (06/2019); Google, "Get started with Programmatic Direct," Google Ad Manager Help, accessed December 18, 2023, https://support.google.com/admanager/answer/6239618.

[43] *See* Interactive Advertising Bureau, "Glossary of Terminology," Interactive Advertising Bureau, accessed December 18, 2023, https://www.iab.com/insights/glossary-of-terminology/. *See also* GOOG-DOJ-03242646, at -669 (09/26/2018) ("Programmatic advertising is the automation of buying and selling of digital advertising").

is guaranteed for a buyer ("Programmatic Guaranteed"), or give the buyer a "preferred" option to buy the inventory ("Preferred Deals"), as described in more detail below.[44]

(66) **Indirect transactions** allow open-web publishers to sell remaining ("remnant") ad space on a page not allocated to direct deals to advertisers using ad tech products. Indirect transactions happen during the short period of time when a user loads a website. Indirect transactions can occur through auctions. These auctions can be conducted only among a publisher-approved set of advertisers (known as a "Private Auction", which are sometimes facilitated through a "Private Marketplace")[45] or a wider set of potential advertisers (known as an "Open Auction").[46] Indirect transactions sold through auctions are categorized as programmatic.[47]

(67) As I discuss further below in Section II.B.1, one of the primary features offered by a publisher ad server is its ability to assist a publisher managing the sale of display inventory using different transaction types.[48] Figure 14 below provides a depiction of how Google has categorized different transaction types for display advertising. I describe each of these in more detail below.

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[44] Google, "Programmatic Guaranteed vs. Preferred Deals," Google Ad Manager Help, accessed December 18, 2023, https://support.google.com/admanager/answer/7637485; Google, "Transaction types," Google Ad Manager Help, accessed December 18, 2023, https://support.google.com/admanager/answer/7637485; Google, "Transaction types," Google Ad Manager Help, accessed December 18, 2023, https://support.google.com/admanager/answer/2805834. *See also* GOOG-DOJ-AT-02199478, at -527 (05/18/2020) (defining preferred deal as "direct deal between publisher and buyer at a selected price, evaluated before the private and open auctions, if the buyer bids agreed price, it buys the impression even if auctions might have a higher bidder. Buyer does not need to buy the impression.").

[45] GOOG-AT-MDL-008544607, at -614 (05/18/2023).

[46] Google, "Transaction types," Google Ad Manager Help, accessed December 18, 2023, https://support.google.com/admanager/answer/2805834.

[47] Google, "Ways of transacting in Ad Manager," Google Ad Manager Help, accessed December 18, 2023, https://support.google.com/admanager/answer/9248464. (Some documents reference traditional networks, which sell previously unsold remnant inventory at pre-defined prices, as "indirect"). GOOG-DOJ-03242646, at -689 (09/26/2018) (In 2017 non-programmatic indirect transactions had an "Industry Average Ad Spend" of 2% as compared to 17% for programmatic indirect transactions).

[48] For example, when an online display impression becomes available for sale, a publisher's ad server decides how to prioritize different transaction methods. Programmatic Guaranteed deals typically share the highest priority with (non-programmatic) direct deals, and are tracked via Deal IDs, which uniquely identify an arrangement made between a publisher and an advertiser beforehand and allow the publisher to treat it according to the negotiated contract terms. *See, e.g.,* Google, "Line item types and priorities," Google Ad Manager Help, accessed December 18, 2023, https://support.google.com/admanager/answer/177279; Google, "Programmatic Guaranteed vs. Preferred Deals," Google Ad Manager Help, accessed December 18, 2023, https://support.google.com/admanager/answer/7637485. *See also* Interactive Advertising Bureau UK, "The Programmatic Handbook," Interactive Advertising Bureau UK, September 2014 https://www.iabuk.com/sites/default/files/The%20Programmatic%20Handbook.pdf, 35.

flexibility to purchase ad inventory that meets their campaign goals without an "upfront commitment."[58]

(72) Certain publishers may prefer to sell at least part of their inventory through direct deals. These reflect "[r]eserved [i]mpressions" with "[p]remium placements and formats" and high rates that "reflect the value of [the] most premium inventory."[59] As I show in Section IV.B.4, in 2022, publishers using Google's publisher ad server sold roughly 14% of their impressions through direct deals.[60]

II.A.4.b. Indirect transactions and real-time bidding ("RTB")

(73) Indirect transactions fulfilled through auctions emerged in the late 2000s as an alternative way for publishers to fill remnant or otherwise unsold inventory, allowing a larger pool of buyers to bid on available ad space in "real-time."[61] Auctions involved participants engaging in *real-time bidding* ("RTB"), whereby ad inventory could be sold at variable prices whenever a user visited a webpage and impressions became available for sale.[62] Prior to real-time bidding, publishers were able to sell indirect remnant inventory on a fixed-price basis.[63] As shown in a Google presentation in Figure 15 below, real-time bidding provided advantages over advertising that had previously been "[b]ought in advance, in bulk, and at a set price."[64]

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58 DoubleClick by Google, "The buyer's guide to Programmatic Direct," Double Click by Google, accessed on December 18, 2023, https://www.thinkwithgoogle.com/_qs/documents/717/canadian-buyers-guide-to-programmatic-direct.pdf, 12 (describing an example where an advertiser targeting a certain demographic group identifies websites that complement its campaign, but, only a small fraction of these websites' visitors meets the targeting criteria).

59 GOOG-AT-MDL-008544607, at -613–615, -634, -665 (05/18/2020).

60 DRX Internal Stats data (DOJ RFP 57). *See* Figure 31 in Section IV.B.4.

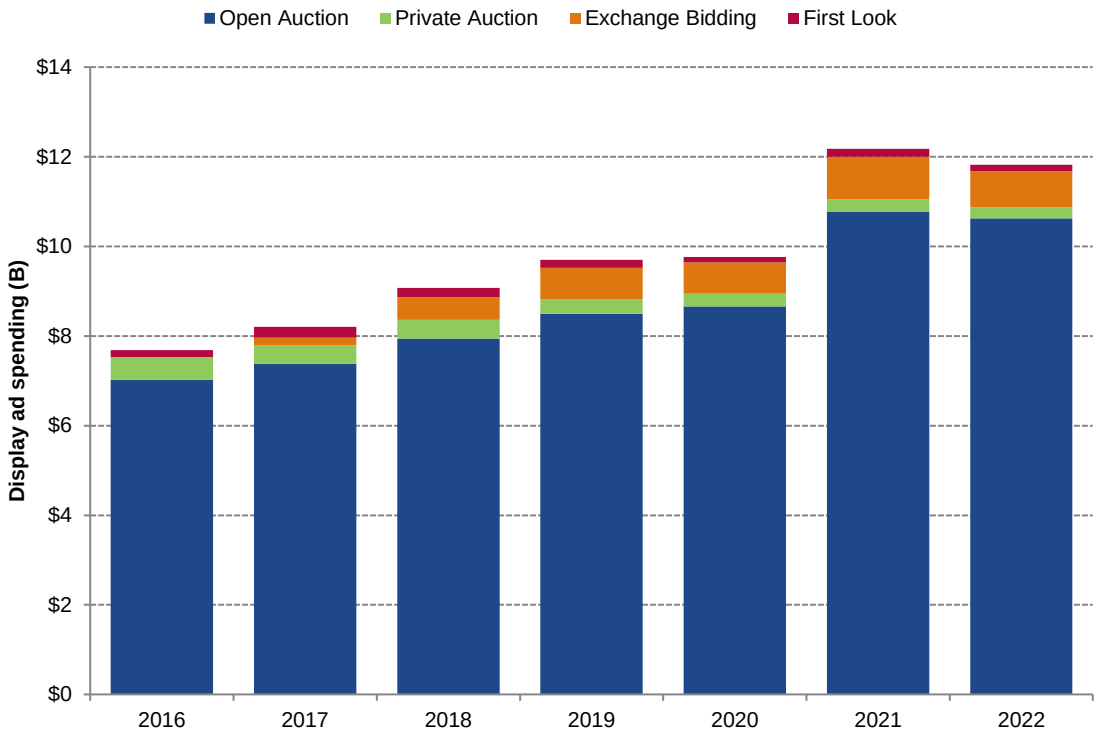
61 Maciej Zawadzinski and Mike Sweeney, "Understanding RTB, Programmatic Direct and Private Marketplace," Clearcode, April 13, 2018, https://clearcode.cc/blog/rtb-programmatic-direct-pmp/. *See also* GOOG-DOJ-03242646, at -664–667 (09/26/2018).

62 In my report, I use real-time bidding (RTB) to refer to the process by which a demand source is able to submit a bid for publishers' ad inventory at the impression (or "query") level and is not restricted to being able to purchase inventory at a predetermined price. For example, an open-web display transaction can involve RTB if real-time bids from various demand sources (e.g., from DSPs and advertiser ad networks within an ad exchange, or from ad exchanges within a publisher ad server) are sourced simultaneously. Although real-time bids can be sourced sequentially in a "waterfall" setup (see Section II.E.1), demand sources that are not called upon in a waterfall are not able to engage in RTB (and are instead, e.g., evaluated using a historical or static price). This is consistent with how Google uses the term (*see* GOOG-DOJ-03242646, at -664–65, describing real-time bidding as "the buying and selling of online media through real-time auctions" and "bought in real-time, at a variable price.").

63 GOOG-DOJ-03242646, at -670 (09/26/2018).

64 GOOG-DOJ-03242646, at -665 (09/26/2018).

Figure 17. Worldwide indirect programmatic spending on open-web display advertising by transaction type through Google's AdX and AdSense products (2016–2022)



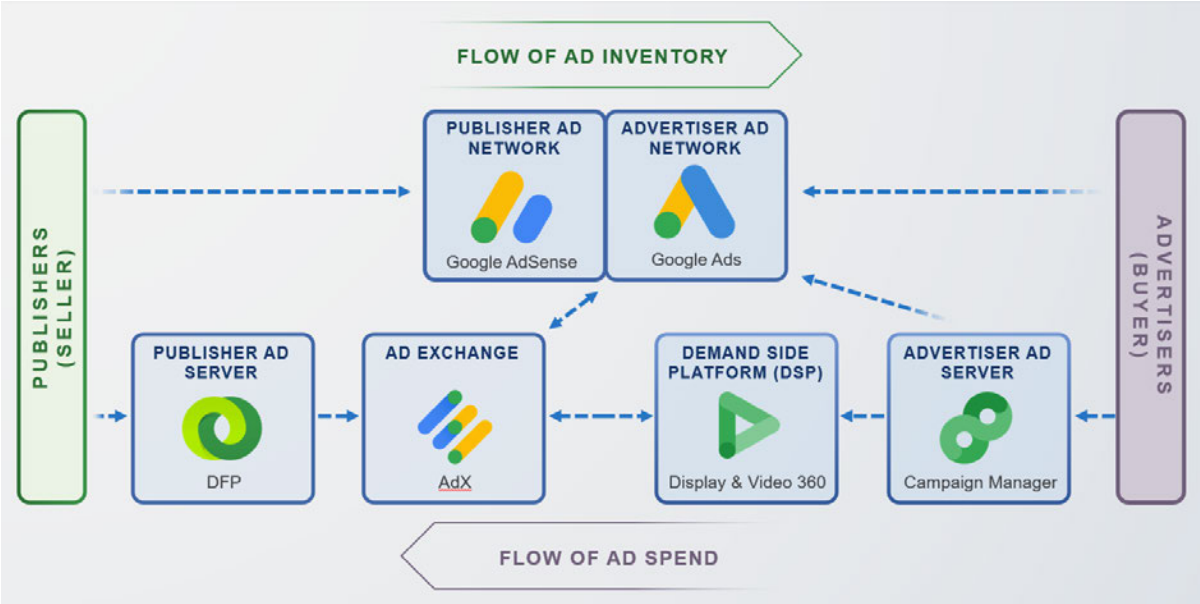
Source: Google XPP-M data (DOJ RFP 7).
Notes: Revenues are limited to web transactions through Google's AdX and AdSense and exclude transactions with "missing" or "unknown" transaction types. "Open Bidding" or "Exchange Bidding" is a program introduced by Google (described in more detail in Section II.E.4) and can include both Open Auctions as well as Private Auction transactions. First Look is a Google product that publishers can use to sell inventory ahead of its guaranteed inventory.

II.B. Ad tech products used for web display advertising

(79) Multiple ad tech products, or "components," are used by publishers and advertisers to serve, manage, and transact display advertising.

(80) Figure 18, based on a June 2020 Google presentation, provides a simplified depiction of the primary ad tech components. Publishers (i.e., sellers) are on the left-hand side, advertisers (i.e., buyers) are on the right-hand side, and ad tech products are in the middle. The diagram shows different sets of ad tech products, including publisher ad servers, ad exchanges, advertiser ad networks, and demand-side platforms. The diagram also highlights Google's products, which I discuss further in Section II.C.

Figure 18. Illustration of Google's ad tech products



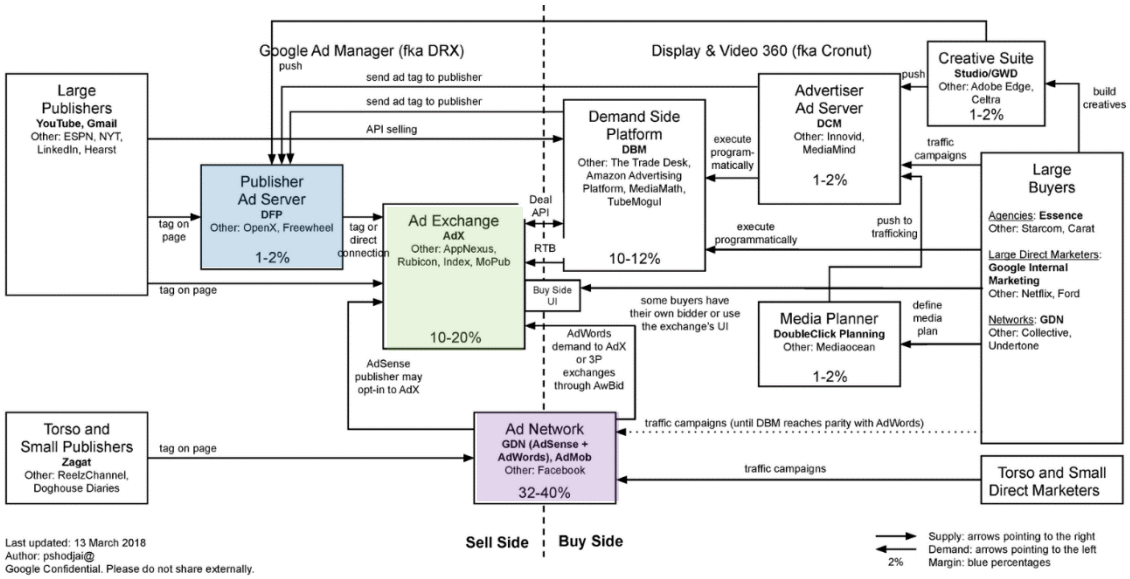
Source: Chart created using information from GOOG-DOJ-AT-01510462, at -469, -471; GOOG-DOJ-04601261.

(81) Figure 19, copied from an internal Google document, offers a more detailed visualization of the various ad tech components.[72] The figure groups together the ad tech products and shows how each connects with another. Each box within the figure lists the ad tech product at the top, followed by Google's offering in the space, and then by non-Google offerings.[73] The colored shading is added to highlight products I focus on in this report. For example, the green box represents the ad exchange: Google's ad exchange is AdX, whereas AppNexus (now Xandr) and Rubicon (now Magnite) operate third-party ad exchanges. As noted at the bottom of the figure, different ad tech products are categorized as "buy-side" (advertiser-facing) or "sell-side" (publisher-facing).

[72] The figure includes products which do not necessarily facilitate the sale of web display advertising (such as Google Campaign Manager) as well as products which sell in-app digital advertising (such as AdMob).

[73] I discuss the highlighted products in more detail below.

Figure 19. Google's visualization of the ad tech stack (not restricted to display) (2018)



Source: GOOG-DOJ-04601261 (03/18/2018).
Note: Highlighting added. While the overall structure of the ad tech stack has largely remained the same since this graphic was created in 2018, the names and ownership of certain product offerings may have changed (e.g., Google's "DBM" DSP is now known as "DV360").

(82) At a high level, an indirect transaction for display advertising typically utilizes many different ad tech products. For example, in an indirect transaction involving RTB, a publisher's ad server may send a request to an ad exchange, which in turn sends bid requests to multiple demand-side platforms (DSPs) and advertiser ad networks; advertisers then use DSPs or advertiser ad networks to bid on the request; the ad exchange runs an auction to determine which bids to pass along to the publisher ad server;[74] the publisher ad server uses that information to determine which ad to serve (taking into account direct agreements the publisher may have with individual advertisers as well as bids from other exchanges and sources of advertising demand ("demand sources")); and the winning advertiser's ad server may then deliver the ad for placement on the web page.

(83) As Figure 19 makes clear, each layer of the ad tech stack is composed of multiple products provided by a collection of companies. Hence, as long as those products allow such interconnections, advertisers and publishers can utilize different combinations of products (e.g., The Trade Desk's DSP with Google's AdX exchange) to transact with one another across the stack. When publishers and advertisers have more options to connect with one another, advertisers will be more likely to identify

[74] I describe this process in more detail in Section II.B.3. As shown in Figure 18 and Figure 19, ad networks are placed in the center of the ad tech stack and directly connect largely torso (medium) and small publishers to torso and small advertisers (with some exceptions). These ad networks, notably *Google Display Network* (GDN), can contain both advertiser- and publisher-facing components which can interoperate with other products. For example, as I discuss later in Section II.C.3.a, the advertiser-facing component of GDN, *Google Ads*, can participate in RTB auctions through AdX in addition to being able to purchase inventory through the publisher-facing component of GDN, *AdSense*.

additional valuable impressions to bid on, and publishers will more likely be able to sell the impressions generated by visitors on their webpages. Having more options available to advertisers and publishers will also tend to increase competition among ad tech products to provide higher quality services at lower prices.

(84) In this subsection I describe the functionality of the highlighted ad tech components in Figure 19 (publisher ad servers, DSPs, advertiser ad networks, and ad exchanges). I provide more detail about Google's specific offerings in Section II.C.[75]

II.B.1. Publisher ad servers

(85) Publisher ad servers are software products, often centrally hosted and accessed over the internet, used by publishers to facilitate the management and sale of display ads across different demand sources (e.g., ad networks and ad exchanges) and transaction types (e.g., direct and indirect deals).[76] While in

[75] Advertisers and publishers also use a number of peripheral products to assist in the development of advertising content and to manage their data. Two examples of these products are advertiser ad servers and data management platforms ("DMPs").

Advertiser ad servers are software products used by advertisers to serve, manage, and track their ad campaigns across websites and applications. They help share the chosen creative with publishers and monitor user clicks, conversions, and other relevant metrics across publishing platforms. IAB, Glossary of Terminology," IAB, accessed December 16, 2023, https://www.iab.com/insights/glossary-of-terminology/; Ankit Oberoi, "What is an ad server and how does it work?" https://www.adpushup.com/blog/the-ultimate-guide-to-ad-servers/. Companies such as Adform, Google and Sizmek operate advertiser ad servers. *See* Adform, "The Adform Ad Server," Adform, accessed December 18, 2023, https://site.adform.com/products/integrated-advertising-platform/ad-serving/; Google, "Overview of Campaign Manager 360," Campaign Manager 360 Help, accessed December 18, 2023, https://support.google.com/campaignmanager/answer/2709362; Delacon, "Sizmek MDX," Delacon, accessed December 18, 2023, https://www.delaconcorp.com/integrations/third-party-ad-server/sizmek-mdx/.

DMPs are software products that collect, store, and organize advertising-related data for advertisers, publishers, and other intermediaries for the purposes to improving ad targeting and conducting advanced analytics. *See* Maciej Zawadziński and Mike Sweeney, "What is a Data Management Platform (DMP) and How Does it Work?" Clearcode, May 21, 2015, https://clearcode.cc/blog/data-management-platforms/. DMPs combine data from their customers (publishers or advertisers, usually via their ad servers), with data from other significant players in the advertising industry, and broad data aggregators. *See* Lotame, "First-Party Data, Second-Party Data, Third-Party Data: What Does It All Mean?" Lotame, last modified November 16, 2023, https://www.lotame.com/1st-party-2nd-party-3rd-party-data-what-does-it-all-mean/. Other than Google, companies such as Adobe, Lotame, Nielsen, and Oracle operate DMPs. Adobe Experience Cloud, "Building an experience business starts with an experience-based DMP," Adobe Experience Cloud, accessed December 21, 2023, https://www.adobe.com/experience-cloud/topics/data-management-platform-dmp.html; Lotame, "What is a Data Management Platform (DMP)?" Lotame, last modified November 14, 2023, https://www.lotame.com/what-is-a-data-management-platform/; Nielsen, "Modernize for the future for smarter and more effective marketing," Nielsen, accessed December 21, 2023, https://www.nielsen.com/solutions/media-planning/marketing-cloud/; Oracle, "Oracle BlueKai Data Management Platform," Oracle, accessed December 21, 2023, https://www.oracle.com/cx/marketing/data-management-platform.
Other products used by advertisers include creative suites, which help advertisers build advertisements, and media planners, which help advertisers plan their advertising campaigns.

[76] Industry participants have referred to publisher ad servers as a "software-as-a-service" (SaaS) product, i.e., a product in which software is centrally hosted and licensed to users to access online. Alise Zaiceva, "What is an Ad Server? A Complete Guide for Publishers," SETUPAD Blog, January 9, 2023, https://setupad.com/blog/ad-server/. Publisher ad servers may also be able to handle the sale of non-display (e.g., instream video) or in-app display advertising. *See* Deposition of Jeremy Helfand (Disney), September 29, 2023, 132:3–132:8 ("Q. And just so I'm clear, does Disney still use Google's DFP ad server to sell video advertising outside of Hulu and Disney+? A. The Google Ad Manager, previously DFP, is used to deliver video advertising on some of our properties like ESPN.").

principle a publisher could sell ad inventory to a narrower set of buyers without a separate ad server, a publisher ad server allows a publisher to manage a wider range of demand sources and transaction types, as I discuss in Section IV.C.1.

(86) A publisher using a publisher ad server is able to divide its webpage into ad units, which are spaces in which an ad can be displayed.[77] One key feature of publisher ad servers is their ability to choose between indirect sources, such as ad exchanges, and other monetization sources, such as direct deals, to fulfill a particular advertising opportunity in real-time, according to priorities and requirements put in place by the publisher through its publisher ad server.[78] This functionality is particularly important for large publishers or those with more complex needs: for example, publishers who need to meet the pricing and scheduling requirements of direct deals while simultaneously seeking to allocate remaining inventory via indirect transactions in a manner that most effectively monetizes their display inventory.[79] Publisher ad servers also provide useful monitoring and reporting capabilities to help publishers track their monetization performance through metrics such as impressions, clicks, and expected payout rates.[80]

(87) Below, in Section II.C.1, I provide more details about how publisher ad servers work.

(88) Publishers rarely if at all use multiple publisher ad servers for selling web display inventory.[81] In addition, publishers rarely switch publisher ad servers due to significant switching costs.[82]

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[77] *See, e.g.,* Google, "Get Started with ads in Google Ad Manager," Google Ad Manager, accessed December 16, 2023, https://support.google.com/admanager/answer/6027116?hl=en&ref_topic=7506292.

[78] Publisher ad servers also provide ad serving technology and revenue optimization among other functions (e.g., billing and performance tracking) to publishers. *See* Deposition of Scott Sheffer (Google), July 20, 2021 80:15–81:22 ("What a [publisher] ad server enables a publisher to do is, subject to the publisher's decisions around pricing and scheduling and budgeting, the ad server enables them to run their monetization business according to the rules and the criteria and the setup that the publisher puts in place with that ad server."); *see also* Deposition of Max Loubser (Google), April 21, 2021, 167:3–167:20, ("Q. Focusing specifically on the reference to decision logic, how did header bidding present a challenge to DFP with respect to decision logic? A. … The decision logic typically refers to the process of the DFP ad server selecting which advertisement to deliver to the publisher's web page or other environment. And in order to make a good decision, where a good decision is one that would be optimal for the revenue of the publisher and then, again, as before, the advertiser's interests and the user's interests.").

[79] *See* Deposition of Scott Sheffer (Google), July 20, 2021, 79:19–84:3 ("[A] typical publisher has a chunk of advertising inventory that they would like to monetize… The challenge for a publisher is that they have typically a direct sales team, which may sell some of that inventory directly at negotiated rates that they do with an advertiser agency. And then they may have other inventory that a publisher may wish to monetize. What an ad server enables a publisher to do is, subject to the publisher's decisions around pricing and scheduling and budgeting, the ad server enables them to run their monetization business according to the rules and the criteria and the setup that the publisher puts in place with that ad server.").

[80] ATT-GCID-00000183, at -184 (03/06/2019).

[81] *See* Section III.C. *See also* Deposition of Andrew Casale (Index Exchange), September 26, 2023, 111:18–112:25 ("Q. How common is it for a publisher to utilize more than one publisher ad server? … It's not – it's very rare. That hardly every happens...A. Common across channel, so a publisher might opt to use an ad server for web display and a different ad server for video. I don't think publishers ever use two ad servers for one channel, so I don't think publishers would ever use two ad servers for web display.").

[82] *See* Section III.C. *See also* GOOG-DOJ-01657697, at -833 (03/14/2007);GOOG-TEX-00076049, at -049 ("Ad Servers

advertisers are typically referred to as demand side platforms ("DSPs"). Bidding tools geared to the needs of smaller advertisers or those with less "complex" needs are typically associated with, but not necessarily synonymous with, advertiser ad networks.

(92) Although both DSPs and advertiser ad networks are used by advertisers to place real-time bids on open-web display impressions, there are significant differences between the two sets of tools and the types of advertisers who use them. Advertiser ad networks often offer a more automated buying experience for advertisers who either lack the technical proficiency to utilize the complex features of DSPs or simply want a more "hands-off" solution.[91] Advertisers who use DSPs tend to be larger advertisers who use media agencies to bid on their behalf.[92]

(93) I describe DSPs and advertiser networks below and discuss differences between them further in Section IV.E.1.a.

II.B.2.a. Demand-side platforms (DSPs)

(94) DSPs are products that allow advertisers to manage and submit real-time bids for display inventory through ad exchanges.[93] DSPs facilitate audience targeting, in some cases allowing sophisticated advertisers to also use their own data to target customers and refine campaigns.[94] For example, using

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[91] In a 2011 email exchange, Brad Bender (Product Management Director at Google), notes that "GDN is a **network**, which means that Google sales and technology is managing the buy for you and delivering conversions. This is the 'hands-off solution' for large advertisers and the self-service offering for regular advertisers that you access through AdWords." GOOG-DOJ-05244847, at -847 (02/23/2011) (emphasis in original). A 2019 Google internal presentation titled "2019 DV360 Pricing" notes that with AdWords, "Google does all the optimization," whereas with DV360, "[b]uyers have decision control." *See* GOOG-DOJ-08138645, at -674 (08/21/2018). Eisar Lipkovitz stated in his deposition that "DSPs end up being these very complex super features that, in order to run a campaign, you need to have somebody super knowledgeable." *See* Deposition of Eisar Lipkovitz (Google), March 31, 2021, 88:13–90:28.

[92] Google's former lead engineer for the display and video team, Eisar Lipkovitz, stated in his deposition: "In my opinion, [small advertisers] have no reason to [use a DSP]. And, you know, like many of these other companies, and probably including Google, won't even return their phone call, right? It just doesn't make sense." *See* Deposition of Eisar Lipkovitz (Google), March 31, 2021, at 32:2–32:5 and 93:19–94:3. However, the sorting of advertiser types between the two types of buy-side products may not be based solely on size. On the types of advertisers that use networks, Lipkovitz stated: "It was a very long list, right. It could be an agency. It could be a very large advertiser. It could be a really tiny advertiser, because it was a simpler product used." *See* Deposition of Eisar Lipkovitz (Google), March 31, 2021, 93:7–93:13.

[93] *See, e.g.*, Deepak Sharma, "What is a Demand Side Platform and Its Importance for Publishers?," adpushup, March 10, 2023, https://www.adpushup.com/blog/what-is-demand-side-platform/. In limited cases, some DSPs such as Google's DV360 enable transactions directly to a publisher's ad server. I discuss these cases in additional detail in Appendix K.3.

[94] GOOG-AT-MDL-004522085, at -107 (02/23/2017) ("For larger or more sophisticated display buyers or agencies interested in more customization and additional controls that allow use of their own intelligence to drive successful campaign strategies DBM will generally prioritize the ability for customers to customize and control their campaigns at a granular level."). *See* Deposition of Eisar Lipkovitz (Google), March 31, 2021, 88:15–88:19 ("So if you wanted to make a distinction, right, and if you wanted to I sell that is worth it, right, is that DSPs generally were giving the advertiser a lot more control."). *See also* Aleesha Jacob, "What is a Demand Side Platform (DSP)? Benefits and Features Explained. Best in the Market Listed & More," MonetizeMore, last modified September 25, 2023, https://www.monetizemore.com/blog/demand-side-platform-dsp/ ("The added control of this bidding environment lets them make accurate buyer decisions and target the most relevant audience."); Anthony Loredo, "Programmatic Advertising 101: What is a DSP?," Basis Technologies, July 26, 2022, https://www.centro.net/blog/programmatic-101-dsps-explained.

a DSP, advertisers can construct campaigns to target particular groups or users (for example, parents in Virginia who are looking for daycares) and bid across multiple ad exchanges.[95] Advertisers, through their DSP, may have the option of choosing which exchanges to bid into for inventory.[96]

(95) As I discuss in Section III.C, there is evidence that advertisers using DSPs often use more than one.

(96) *DV360*, formerly DoubleClick Bid Manager ("DBM"), is Google's DSP. Other companies that offer or have offered DSP products are Adobe,[97] Amazon,[98] The Trade Desk,[99] Verizon Media,[100] and Xandr.[101]

II.B.2.b. Advertiser ad networks

(97) Similar to DSPs, advertiser ad networks are products that advertisers use to purchase display ad inventory from publishers.[102,103] In contrast to DSPs, advertiser ad networks provide a more managed and automated experience for advertisers and have a much simpler user interface.[104]

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[95] DAN000021 at -023 (04/18/2016) ("DBM provides access to extensive 3rd party data and allow advertisers to use their own data through their own DMP"). *See also* Deepak Sharma, "DSP vs. DMP: Differences, Similarities, and Their Hybrid Model," adpushup, March 3, 2023, https://www.adpushup.com/blog/dsp-vs-dmp-differences-similarities-and-their-hybrid-model/.

[96] Display and Video 360 Help, "Managing Exchanges," Google DV360, accessed December 16, 2023, https://support.google.com/displayvideo/answer/9230278. *See also* GOOG-AT-MDL-010636992 ("Response of 2 October to EC Questionnaire received on 12 July 2021"), at -006 (10/02/2021) ("In order to bid on an SSP, an advertiser needs to first 'enable' the SSP by going to 'Partner Settings > Basic Details > Exchanges'. In the Exchanges section, the advertiser will see a list of SSPs that are available on DV360. To enable an SSP, the advertiser needs to check the box next to the SSP. This applies to all SSPs, including AdX. That is, to bid on AdX, the advertiser needs to check the box next to Google Ad Manager in the Exchanges section. This is the 'managing exchanges' feature referred to in this question.").

[97] Adobe Experience Cloud, "One demand-side platform to rule them all," Adobe Experience Cloud, accessed December 14, 2023, https://www.adobe.com/advertising/demand-side-platform.

[98] Amazon Ads, "Amazon DSP," Amazon Ads, accessed December 16, 2023, https://advertising.amazon.com/solutions/products/amazon-dsp.

[99] The Trade Desk, "The Trade Desk repeats as top-ranked demand side platform based on Net Promoter Score," Tthe Trade Desk, October 31, 2017, https://www.thetradedesk.com/press-releases/the-trade-desk-repeats-as-top-ranked-demand-side-platform-based-on-net-promoter-score.

[100] Yahoo Advertising, "Ad Solutions Worth Yodeling About," Yahoo Advertising, accessed December 16, 2023, https://www.verizonmedia.com/insights/emerging-channels-reach-audiences-in-new-ways-with-our-dsp.

[101] Microsoft Advertising, "Xandr," Microsoft Advertising, accessed December 16, 2023, https://www.xandr.com/platform/invest/.

[102] Maciej Zawadzinski and Mike Sweeney, "What is an Ad Network and How Does it Work?," Clearcode, March 7, 2018, https://clearcode.cc/blog/what-is-an-ad-network-and-how-does-it-work/. *See also* GOOG-DOJ-14053654. at -659 (08/30/2017).

[103] Ad networks, as shown in Figure 19, are often depicted as connecting advertisers and publishers directly, and can have both an advertiser-facing component ("advertiser ad network") and a publisher-facing component. As noted above, Google Ads is the advertiser-facing component of Google's GDN network; AdSense is the publisher-facing component. I describe AdSense in further detail in Section II.C.3.b below.

[104] In his deposition, Eisar Lipkovitz states, "networks in general have a very simple UI…where you give us your objective…and the network does everything automatically for your and you get a good outcome". Deposition of Eisar Lipkovitz (Google), March 31, 2021, 88:13—90:2.

(101) Examples of advertiser ad networks for web display advertising include Google Ads and Criteo.[112] Meta Audience Network (formerly Facebook Audience Network) facilitated advertising transactions to open-web publishers until 2020, when it shifted focus to advertising on Meta O&O properties and select third-party mobile apps.[113]

(102) Ad networks, like Google's Display Network with *AdSense*, may also have a publisher-facing component used by open-web publishers to sell display inventory. I describe AdSense in further detail in Section II.C.3.b below.

II.B.3. Ad exchanges

(103) Ad exchanges (also previously referred to as supply side platforms, or "SSPs") are software products that run real-time auctions for publishers' display ad inventory.[114, 115] Publishers can sell display ads through ad exchanges via a publisher ad server, and advertisers can bid on those impressions using DSPs and advertiser ad networks.

(104) Ad exchanges can improve the matching of impressions between publishers and advertisers, and increase payouts for publishers relative to non-RTB indirect deals by allowing advertisers to bid in real-time.[116] They also provide additional control and targeting to both publishers and advertisers:

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[112] A 2018 Google document describes Criteo as a "[c]ompetitive performance ad network" and lists Facebook Ads (no longer active in open-web display) as the only other display ad network competitor. *See* GOOG-AT-MDL-003977297 ("Buyside Deep Dive") at -312 (03/13/2018). *See* Section V.D.

[113] Allison Schiff, "Facebook is Killing Off Its Web Supply In Audience Network – And Don't Be Surprised If It All Shuts Down," adexchanger, February 5, 2020, https://www.adexchanger.com/platforms/facebook-is-killing-off-its-web-supply-in-audience-network-and-dont-be-surprised-if-it-all-shuts-down/. *See also* Meta, "Changes to Web and In-stream Placements," https://www.facebook.com/business/help/645132129564436; Meta, "Meta Audience Network," https://www.facebook.com/audiencenetwork/ and discussion in Section V.B.2.b.

[114] While previously distinct, SSPs and ad exchanges today are often used to refer to the same set of products. GOOG-DOJ-04429792 ("Monetization Cheatsheet" presentation) at -795 (03/27/2017) ("Sell Side Platform (SSP)/Exchange – service for managing multiple programmatic monetization sources of online display inventory, DSP and ad networks are considered 'Buyers', and publishers and publisher networks are considered 'Sellers'. Google Exchange is called AdX"). *See also* GOOG-DOJ-AT-02199478 ("Ad Manager Ecosystem 101" presentation) at -481(06/2019) ("SSP is a publisher tool that lets them configure rules that (Ad) Exchanges must adhere to on the publisher inventory. For example: publishers can set advertisers they don't want on their sites (for example competitors) and they can set minimum prices for which ads can be bought (to protect direct ad sales)[.] Often SSP and Exchange are bundled as one product and both names are used interchangeably"); Ryan Joe, "Defining SSPs, Ad Exchanges and Rubicon Project," AdExchanger, Feb. 7, 2014, https://www.adexchanger.com/yield-management-tools/defining-ssps-ad-exchanges-and-rubicon-project/ ("The distinction between an ad exchange and a supply-side platform (SSP) has become muddled as the once disparate but complementary technologies have merged."). *See also* Michal Wlosik and Maciej Zawadzinski, "What is a Supply-Side Platform (SSP) and How Does It Work?," Clearcode, October 18, 2018, https://clearcode.cc/blog/what-is-supply-side-platform/.

[115] While certain exchanges such as Google's AdX have begun to facilitate programmatic direct transactions, ad exchanges have primarily fulfilled indirect deals via RTB auctions. In 2022, fewer than 4% of impressions and less than 14% of spend transacted by exchanges that produced data sufficient to identify transaction type in this matter were transacted through direct transactions.

[116] A 2018 Google presentation noted that RTB transactions offered publishers "[h]igher eCPMs" and allowed advertisers to "[t]arget and buy only the advertising they want, at an appropriate value". *See* GOOG-DOJ-03242646, at -666 (09/29/2018).

publishers can adjust minimum prices for their inventory and manage which advertisers are allowed to purchase their inventory, and advertisers can target particular publication and consumer characteristics at a specific per-impression price.[117]

(105) The process through which an impression is sold through an ad exchange can be summarized as follows:[118]

1. When an internet user browses the publisher's website, available impressions on that web page, as well as data about the user, are sent from a publisher's ad server to the ad exchange for auction.
2. The ad exchange sends bid requests to various demand sources, which include DSPs and advertiser ad networks.
3. Demand sources determine whether to bid on the impression and, if so, how much to bid.
4. The ad exchange then evaluates all bids received on the basis of whether the bid meets criteria set by the publisher. For example, a publisher could specify that they do not want to show ads from their competitors.[119]
5. After restricting to bids that meet the publisher's criteria, the ad exchange then selects the bidder with the highest bid (typically running either a first- or second-price auction)[120], and sends the winning bid to the publisher's ad server. In certain circumstances, bids from the ad exchange can compete with direct-sold ads and bids from other exchanges and networks within the publisher ad server.[121]

(106) Publishers that use exchanges often use multiple exchanges within their publisher ad servers.[122]

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[117] GOOG-DOJ-03242646, at -665, -666 (09/26/2018).

[118] GOOG-DOJ-AT-02199478, at -488, -500, -501 (05/26/2021). *See also* Irina Kovalenko, "What is an Ad Exchange?," Programmatic 101, January 30, 2017 https://smartyads.com/blog/what-is-an-ad-exchange/.

[119] Google, "Protections overview," Google Ad Manager Help, accessed December 18, 2023, https://support.google.com/admanager/answer/2913553.

[120] In both a first- and second-price auction, the winner is the highest bidder as long as the highest bidder clears the minimum price the seller is willing to accept, which is known as the reserve or "floor" price. If no one clears the reserve price, no one wins the auction. The difference between the two auction formats if there is a winner is that in a first-price auction, the winner pays her bid; in a second-price auction, the winner pays the higher of the second-highest bid or the reserve price. *See* Section III.E for additional detail.

[121] For example, as I explain in Section II.E.2, Google's Dynamic Allocation allows bids from its ad exchange to compete with direct-sold deals. In Section II.E, I provide further detail on how publisher ad servers select among competing ad sources.

[122] GOOG-DOJ-04329872, at -872 (11/10/2015) (In a November 2015 email exchange, Eisar Lipkovitz wrote that many publishers "wouldn't want to go exclusive with any SSP"). *See* Deposition of Scott Sheffer (Google), July 20, 2021, 149:20–151:24. *See also* Deposition of Tim Craycroft (Google), August 15, 2023, 143:10–143:17 ("most publishers using SSPs are using three, four, five of them at a time."). Mr. Craycroft is currently a Vice President and General Manager at Google who is "responsible for YouTube ads…Google Display ads, Google app ads, [and] publisher products, including Google Ad Manager, AdSense, [and] AdMob. Deposition of Tim Craycroft (Google), August 15, 2023, at 28:2–28:16.

(107) Examples of ad exchanges include Google's Ad Exchange ("AdX"), PubMatic, Magnite (formerly Rubicon), and Xandr (formerly AppNexus).[123]

II.C. Google's ad tech products

(108) In this Section, I describe Google's publisher ad server, ad exchange, ad network, and DSP products.

- In Section II.C.1, I describe DFP, Google's publisher ad server.
- In Section II.C.2, I describe AdX, Google's ad exchange.[124]
- In Section II.C.3, I describe Google Ads and AdSense, which are the advertiser- and publisher-facing components of the Google Display Network.
- In Section II.C.4, I describe DV360, Google's DSP.

(109) Last, in Section II.C.5, I briefly describe other products that Google owns that facilitates the sale of digital display advertising, including its advertiser ad server, Google Campaign Manager, and its data analytics product, Google Analytics.[125]

II.C.1. DoubleClick for Publishers (DFP)

(110) DFP is Google's publisher ad server, used by publishers to manage, sell, and serve display ads.[126]

[123] Deposition of Tim Craycroft (Google), August 15, 2023, at 90:25—92:6.

[124] In June 2018, Google introduced Google Ad Manager (GAM) which combined DFP and AdX. Jonathan Bellack, "Introducing Google Ad Manager," Google Ad Manager, Jun. 26, 2018, https://blog.google/products/admanager/introducing-google-ad-manager/. *See* Appendix K.1 for further detail on GAM. There is still a distinction between AdX and DFP. *See e.g.,* GOOG-AT-MDL-008842393, at -395 (08/04/2023) ("Up until at least December 2021, it was possible for a publisher using Google Ad Manager to exclude AdX from the sale process altogether."); *see also* GOOG-AT-MDL-000992438, at -438 (05/2022) (2022 Google Presentation, "We have now retired the DoubleClick brand, but internally, the products are still referred to as DFP and AdX."). In my report, I use DFP and AdX to refer to the publisher ad server and ad exchange products within GAM.

[125] I also describe its AdMob product which focuses on in-app advertising,

[126] Historically there have been two versions of DFP (DFP Premium and DFP Small Business) that differed in pricing and features. Currently, GAM 360 and GAM include these products. *See, e.g.,* GOOG-AT-MDL-B-003167073, at -074 (08/30/2018). ("Ad Manager is available in two flavors – Ad Manager (formerly DFP Small Business) (~30% of gross media revenue) offers self-serve signups and free ad serving at low volumes; Ad Manager 360 (~70% of gross media revenue) is for major media companies with negotiated contracts.") *See also* Google, "Repost: Publishers are succeeding on DFP," DoubleClick Publisher Blog, October 29, 2012, https://doubleclick-publishers.googleblog.com/2012/10/ ("We announced DFP two years ago with the goal of helping publishers open doors to new revenue. Since then, thousands of our smaller publishers have switched to DFP for Small Business and hundreds of our largest partners to DFP Premium."). *See also* GOOG-DOJ-13218256, at -256 (10/11/2018). ("Over the last 10 years, Google Ad Manager (AM) and Google Ad Manager 360 (AM 360) have converged into almost identical products with little feature differentiation. The few differentiators include data transfer, exchange bidding, teams support, audience features, special ad units, 5-level ad units, and advanced video functionality (full list, pitch deck)."); *See* Section II.D for a description of DFP pricing.

(111) DFP's transaction methods include, for example, Programmatic Guaranteed, Preferred Deals, Open and Private Auction, and non-programmatic direct deals in which the terms are negotiated and finalized outside of DFP.[127]

(112) Publishers can either sell individual ad units or create "placements," which are groupings of similar ad units that publishers bundle together to sell in bulk.[128]

(113) Each ad unit has an associated "tag," which is a line of code that the publisher inserts on one of its webpages. The tag allows a user's web browser to communicate with the publisher's ad server whenever the user visits the publisher's webpage and a display ad impression becomes available.[129] Whenever a user loads a webpage with a tag, the tag sends information to DFP, including,[130]

- The HTTP header, which contains information on the user's browser type, operating system, date and time;
- The user's IP address, which contains the user's geographic location;
- A user identifier, which provides additional information about the user, for example through DoubleClick cookies or a mobile device identifier;
- Custom targeting criteria set by the publisher, such as size and other characteristics of the ad unit, and information about what types of advertisements can appear;

(114) An important role of DFP (and publisher ad servers in general) is deciding which advertisements are displayed on the publisher's webpage. Using the data provided by the tag, DFP references a list of "line items" representing potential advertising sources available to the publisher that the publisher has placed into DFP, and selects those line items that match the targeting criteria set by the publisher which are then "eligible" to be served. Line items contain information about how certain advertisements are intended to serve on the publisher's website or app, and can represent both guaranteed and non-guaranteed deals.[131]

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[127] Google, "Ways of Transacting in Ad Manager," Google Ad Manager Help, accessed December 18, 2023, https://support.google.com/admanager/answer/9248464?hl=en&ref_topic=7506292.

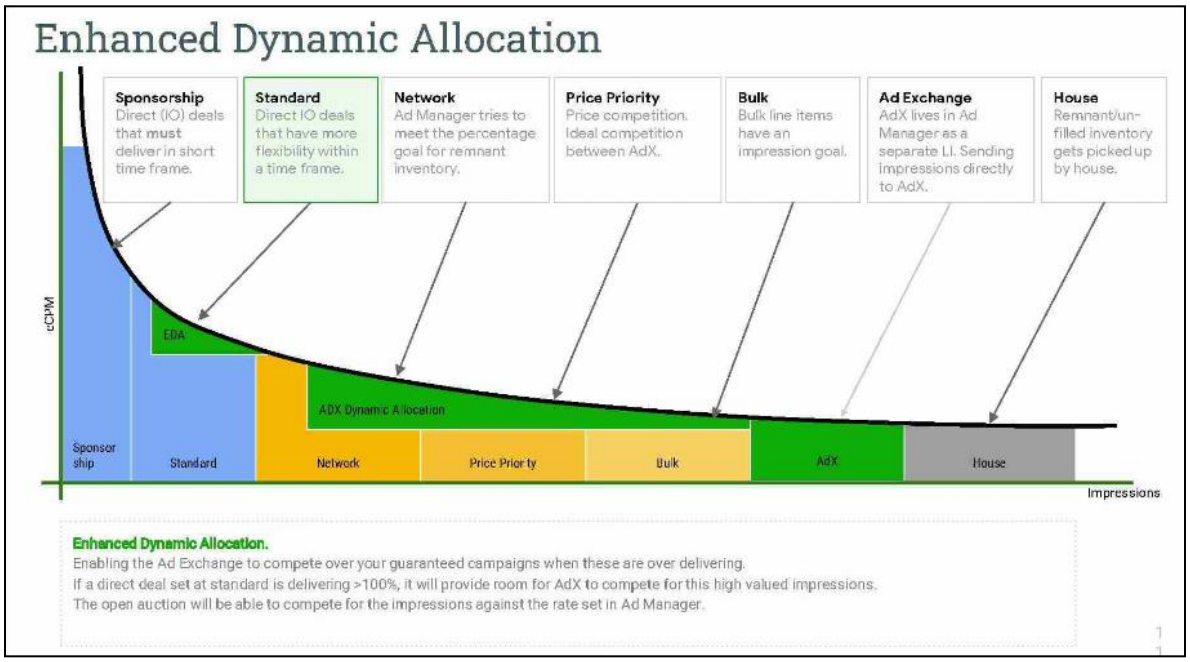
[128] Google, "About Placements," Google Ad Manager Help, accessed December 18, 2023, https://support.google.com/admanager/answer/177397?hl=en.

[129] Google, "Overview of Google Publisher Tag," Google Ad Manager Help, accessed https://support.google.com/admanager/answer/181073?hl=en&ref_topic=4390039&visit_id=637345059942282309-4157743706&rd=1.

[130] Google, "Overview of Google Publisher Tag," Google Ad Manager Help, accessed December 18, 2023, https://support.google.com/admanager/answer/1143651?hl=en&ref_topic=7506292.

[131] Google, "About line items," Google Ad Manager Help, accessed December 18, 2023, https://support.google.com/admanager/answer/9405477?hl=en&ref_topic=7506394. *See also* Google Ad Manager Help, "Ad selection white paper," Google Ads Manager Help, https://support.google.com/admanager/answer/1143651?hl=en&ref_topic=7506292.

Figure 22. Google's depiction of the "Yield Curve" and priority levels in DFP



Source: GOOG-DOJ-09498307, at -317 (12/10/2019).

II.C.2. AdX

(120) AdX is Google's ad exchange. AdX primarily facilitates auction-based indirect transactions via open and private auctions.[140]

(121) Currently, Google-owned bidding tools (DV360 and Google Ads) and third-party (non-Google) ad networks and DSPs are able to bid into AdX. A 2017 Google presentation notes that AdX connects publishers to "100% of the top ad networks, agency holding companies and DSPs" as well as "unique demand" through Google Ads (formerly AdWords).[141] Although third-party bidding tools can compete for publisher inventory that is auctioned through AdX, the vast majority impressions sold through AdX are purchased via DV360 and Google Ads: in 2022, approximately 78% of impressions sold on AdX were transacted using DV360 and Google Ads.[142]

line items. *See* Section II.E.2 for additional details.

[140] AdX also can be used for programmatic guaranteed deals. *See* GOOG-DOJ-04429792, at -809 (08/28/2017).

[141] GOOG-DOJ-04429792, at -804 (08/28/2017).

[142] Google AdX data (DOJ RFP 53).

II.C.3. Google Display Network (GDN)

(122) Google's display ad network, also referred to as the Google Display Network (GDN), consists of over 2 million websites, videos, and apps where targeted display ads can appear.[143] GDN consists of an advertiser-facing component, known as Google Ads, and a publisher-facing component, known as AdSense.

II.C.3.a. Google Ads

(123) Google Ads is Google's advertiser ad network.[144] With respect to display advertising, Google defines Google Ads as its "advertiser-facing component of Google's ad network, which advertisers can use to set up media campaigns to show digital ads on Google-owned inventory and third-party partner websites."[145] Using Google Ads, advertisers can control their ad settings and choose specific formats that they wish to run (e.g., text or image).[146] As they run ads, advertisers can also track campaign data related to conversions,[147] click-through rate ("CTR"),[148] keywords, search terms,[149] impressions, clicks, and average CPC.[150]

(124) One important feature of Google Ads as an advertiser ad network is the ability for bidders to bid for display ads on a CPC basis, even for impressions that are sold on a CPM basis. See Section II.B.2.b and Section IV.E.

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[143] Google, "Display Network: Definition," Google Ads Help, accessed December 18, 2023, https://support.google.com/google-ads/answer/117120. Note that "GDN" is used in internal documents and depositions to refer to both Google Ads and Google's sell-side inventory (e.g., AdSense publishers).

[144] Google, "Google Ads," accessed December 18, 2023, https://ads.google.com/home/. Originally launched in 2000 as Google AdWords, Google Ads originally allowed businesses to buy advertisements on Google search engine results pages. *See* GOOG-AT-MDL-010636992, at -994 (10/02/2021). Today, Google Ads allows businesses to execute Search, Shopping, Display, Video, App, and Local Campaigns, thus reaching audiences through Search, across websites, within Gmail, on YouTube, and more. *See* Dennis Buckley, "Types of Google Ads: Ad Formats, Campaign Types & Best Practices for 2022," Demand Curve, accessed December 18, 2023, https://www.demandcurve.com/blog/types-of-google-ads; Google, "Chose the right campaign type," Google Ads Help, accessed December 18, 2023, https://support.google.com/google-ads/answer/2567043. In this report, when I use Google Ads, I am referring to its display advertising component.

[145] GOOG-AT-MDL-006218257, at -260 (12/16/2022). Google also states that, "Google Ads is the advertising-facing component of Google's ad network, not a DSP." *See also* GOOG-AT-MDL-010636992, at -994 (10/02/2021).

[146] Google, "About Ad Formats available in different campaign types," Google Ads Help, accessed December 18, 2023, https://support.google.com/google-ads/answer/1722124?hl=en&ref_topic=3121941.

[147] Google, "About return on investment (ROI)," Google Ads Help, accessed December 18, 2023, https://support.google.com/google-ads/answer/1722066?hl=en&ref_topic=3121936.

[148] "CTR is the number of clicks that your ad receives divided by the number of times your ad is shown." Google Ads Help, accessed December 18, 2023, https://support.google.com/google-ads/search?q=ctr.

[149] Google, "Measure traffic to your website," Google Ads Help, accessed December 18, 2023, https://support.google.com/google-ads/answer/1722035?hl=en&ref_topic=3121936.

[150] Google, "Use data to optimize your search campaigns," Google Ads Help, accessed December 18, 2023, https://support.google.com/google-ads/answer/9451527?hl=en&ref_topic=3121936.

(129) Figure 24 summarizes additional differences between DFP and AdSense.

Figure 24. Differences between DFP and Google AdSense

	DFP	Google AdSense (ad network)
Inventory types available	Web + App	Web
Use other ad networks or negotiate directly-sold ads	Yes	No
Just tag pages to see ads	Yes, if you allow AdSense to show through Ad Manager	Yes
Make AdSense network compete with other ad networks to maximize revenue	Yes	No
Consistent reporting across all ad serving activities	Yes	N/A
Google manages payments to you and billing your advertisers or collecting payable amounts from ad networks	Yes, for Authorized Buyers, bidding, and transactions through Programmatic Direct. No, for traditionally negotiated line items, payments to you come directly from your advertisers or ad networks and you manage billing and collection	Yes

Source: Google, "Compare Ad Manager, AdSense, and AdMob," Google AdSense Help, accessed December 18, 2023, https://support.google.com/admanager/answer/9234653.

II.C.4. Display & Video 360 (DV360)

(130) Google's advertiser-facing DSP is called Display & Video 360 ("DV360"). Prior to 2018, this product was known as DoubleClick Bid Manager ("DBM").[160] Using DV360, advertisers can bid on advertising inventory available through AdX, third-party ad exchanges (such as those run by AppNexus and Rubicon), and on publishers using AdSense.[161] DV360 also allows access to certain types of YouTube inventory.[162]

[160] Google, "Introducing Google Marketing Platform," Display & Video 360 Help, accessed December 18, 2023, https://support.google.com/displayvideo/answer/9015629.

[161] *See also* Google, "Supported display exchanges," Google Display & Video 360 Help, accessed December 18, 2023, https://support.google.com/displayvideo/table/3267029.

[162] Google, "Display & Video 360," Google Marketing Platform, accessed December 18, 2023, https://marketingplatform.google.com/about/display-video-360/features/#integrations. In 2015, Google removed YouTube inventory from AdX. *See* Neal Mohan, "Focusing investments to improve buying on YouTube," DoubleClick Advertiser Blog, August 6, 2015, https://doubleclick-advertisers.googleblog.com/2015/08/focusing-investments-to-improve-youtube-buying.html. *See also* Foo Yun Chee, "EXCLUSIVE Google offers to let ad rivals place YouTube ads in EU antitrust probe – sources," *Reuters*, June 13, 2023, https://www.reuters.com/technology/exclusive-google-offers-let-ad-rivals-place-youtube-ads-eu-antitrust-probe-2022-06-13/ ("Google parent Alphabet (GOOGL.O) has offered to let rival ad intermediaries place ads on YouTube to address a crucial part of an EU antitrust investigation that could pave the way for it to settle the case without a fine, people familiar with the matter said ….The EU competition watchdog singled out Google's requirement that advertisers use its Ad Manager to display ads on YouTube and potential restrictions on the way in which rivals serve ads on YouTube. It is also looking into Google's requirement that advertisers use its services Display & Video 360 and Google Ads to buy YouTube ads. YouTube posted $6.9 billion in sales in the first quarter of this year.").

(131) Using DV360, advertisers can participate in open auctions, preferred deals, programmatic guaranteed deals, and private auctions.[163] Through these auctions, advertisers can use data from a variety of sources including DMPs and Google to target specific users.[164]

(132) Typically, DV360 is used by larger advertisers or ad agencies.[165] An internal Google document indicates that DV360 is "typically used by enterprise customers -- both direct advertisers/ marketers and agency partners, who expect and utilize granular controls and more customization."[166]

II.C.5. Other Google ad tech products

(133) Below I briefly describe other products that Google offers which assist advertiser and publishers in purchasing and selling display and digital advertising.

II.C.5.a. Google Campaign Manager (GCM)

(134) Google Campaign Manager ("GCM"), formerly known as DoubleClick Campaign Manager or DoubleClick for Advertisers, is Google's advertiser ad server.[167] GCM includes tools for trafficking, reporting, attribution, and verification, allowing advertisers to manage digital campaigns across both web and mobile platforms.[168] As one industry publication describes it, "Campaign Manager is an ad

[163] *See* Google, "Inventory source targeting," Display & Video 360 Help, accessed December 22, 2023, https://support.google.com/displayvideo/answer/2726009?hl=en.

[164] Google, "Audience list targeting," Display & Video 360 Help, accessed December 18, 2023, https://support.google.com/displayvideo/answer/2949947?hl=en&ref_topic=2726036.

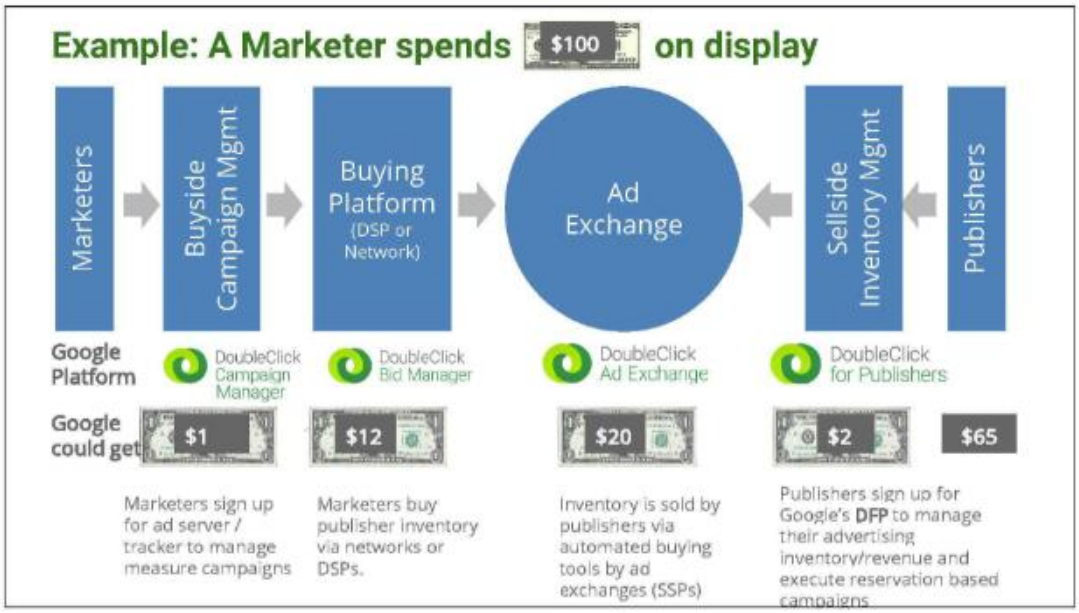
[165] In his deposition, Eisar Lipkovitz stated that "The vast majority of [DSP customers] were actually agencies acting as an agent on behalf of their large advertisers." *See* Deposition of Eisar Lipkovitz (Google), March 31, 2021, 88:6–90:2 ("But DSPs end up being these very complex super features that, in order to run a campaign, you need to have somebody super knowledgeable. And, yes, if you're independent, yes, you would say, this is it, right, this is the best thing for an advertiser. And agencies, which were the majority of the customers, were happy with that…"). *See also* 93:19-94:3 ("Q. Would a very small advertiser ever use a DSP?... A. In my opinion, they have no reason to. And, you know, like many of these other companies, and probably including Google, won't even return their phone call, right? It just doesn't make sense. It's a high maintenance, you know, salespeople, whatever."). *See also* Deposition of Tim Craycroft (Google), Aug. 15, 2023, at 169:15–170:25 ("Q: What's the difference between DV360 and Google Display ads?... A: Typically, different advertisers or different budgets within advertisers. As I said DV 3[60] is for more sophisticated advertisers where they're delegating to the agency. The agency is there to add their own value in terms of the art and science of optimizing for the advertiser's marketing objectives. With GDA, Google Display ads, increasingly, advertisers give more control to Google's systems to – through an automated process to achieve their marketing objectives. So it's machines versus humans. DV 3[60] is still a product for high-end advertisers that have practitioners that are specialists in programmatic advertising, figuring out what ads – what sites to run on, what to bid, how to measure success. GDA is a simpler product that scales to a much wider range of less sophisticated advertisers where -- you know, in oversimplified terms, you give it a bid and a budget and a marketing objective, and it does the rest… Q: Do large sophisticated advertisers use Google Display ads? A: Yes, they use both.").

[166] GOOG-DOJ-02858797, at -799 (09/2019).

[167] Samantha Barnes, "Integrating Google Analytics 360 With DoubleClick Campaign Manager," Bounteous, May 2, 2017, https://www.bounteous.com/insights/2017/05/02/integrating-google-analytics-360-doubleclick-campaign-manager/.

[168] Google, "Overview of Campaign Manager 360," Campaign Manager 360 Help, accessed December 15, 2023, https://support.google.com/campaignmanager/answer/2709362?hl=en#.

Figure 25. Payments made along the ad tech stack



Source: GOOG-DOJ-03641972, at -981 (12/10/2015).

II.E. Historical evolution of the sale of indirect display advertising

(144) In this Section I provide a brief overview of changes in how indirect display advertising has been sold over the past two decades.

II.E.1. The waterfall

(145) The "waterfall" refers to an early method of selling non-guaranteed or remnant display ad inventory in which a publisher ad server called demand sources in a sequential order.[193] The waterfall system has existed since at least 2006 within DoubleClick's publisher ad server.[194]

[193] *See, e.g.*, GOOG-AT-MDL-006217592, at -605 (12/12/2022) ("When Dynamic Allocation was introduced, publishers mostly sold their inventory through direct deals. Non-guaranteed ('remnant') inventories were sold through a 'waterfall process.' In that process, the ad server would first seek to fill an impression with an ad from an eligible guaranteed sales contract, to ensure the publisher fulfilled its contractual obligations. The publisher would set up 'guaranteed line items' for that purpose in its ad server. If there was no such eligible guaranteed line item, then the server would attempt to sell that remnant inventory by sequentially calling a series of ad networks in an order determined by the publisher. For this purpose, the publisher would set up 'remnant' or 'non-guaranteed' line items in the ad server. If the first ad network would not buy remnant inventory at or above the floor price set by the publisher for a particular ad unit or impression, the ad server would call the second network etc., until the impression was filled or could not be filled. In the waterfall process, a publisher typically would determine the order in which to call ad networks based on data about their historical average performance, based on negotiated fixed-price deals, or any other method the publisher saw fit.").

[194] Deposition of Brian O'Kelley (App Nexus), September, 29, 2023, 56:19–57:21 ("DoubleClick, at that time, and this is probably through 2006, was the primary ad server for most publishers … And the way it worked was that waterfall that I described. DoubleClick's ad server, DFP, would look at all the guaranteed, like, campaigns they'd sold to agencies. If

(146) The waterfall operated as follows. First, publishers prioritized ad networks (or other demand sources) in their publisher ad server often based on a measure of past performance and payment. When a remnant impression arrived (i.e., not one allocated to a guaranteed or direct deal), the publisher ad server would offer it to the ad network with the highest priority. If that ad network agreed to buy the impression at a price above a price floor, then the process would end. If not, the publisher would contact the next entity in the waterfall, repeating this process until the impression was filled or failed to find a buyer.

(147) A significant shortcoming of the waterfall was that a publisher could earn less for an impression than what another potential demand source would have been willing to pay. This is because a demand source in the waterfall could "win" the impression as long as it was willing to pay more than the publisher's price floor, which did not necessarily reflect what a lower-ranked demand source (which had not yet been called in the waterfall) would be willing to pay. In these cases, the publisher would lose out on revenue that it could have earned from selling this impression to the bidder with the highest willingness to pay.[195] The waterfall also had adverse impacts on advertisers who may not have been able to bid on impressions they would have valued, and disadvantaged smaller or entrant ad networks and demand sources that may have been ranked low (or not at all) within publishers' waterfall setups.[196]

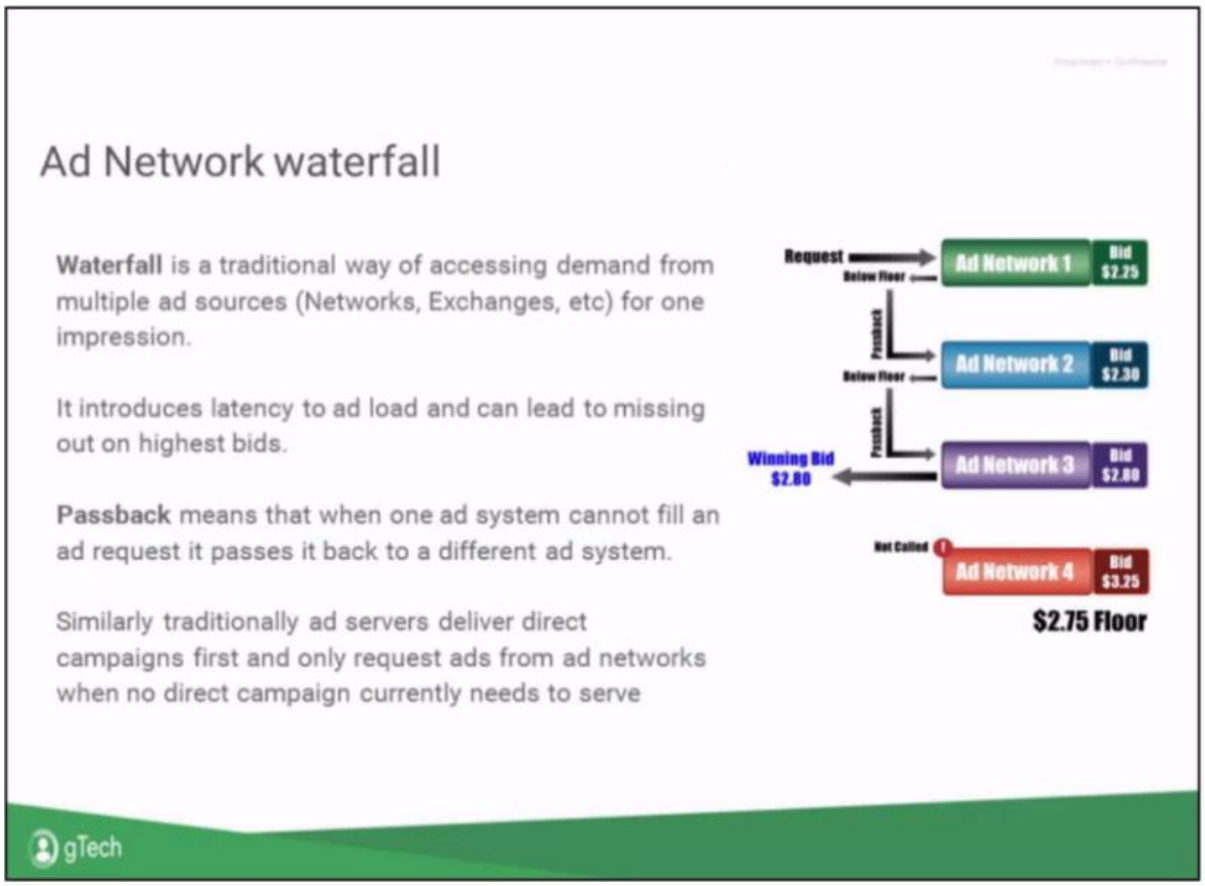
(148) Figure 26 from a 2019 Google presentation depicts a waterfall setup among different demand sources. In the example shown, the Ad Network 3 wins the impression request with a bid of $2.80, as it is the highest ranked demand source within the waterfall to submit a bid above its floor. However, Ad Network 4 would have had a higher bid ($3.25) but was not called and hence did not have an opportunity to compete for the request.

none of them monetized the ad, the last thing on the waterfall would be the ad exchange or other ad networks. So DoubleClick would get first look at everything, and then anything that didn't get sold would fall into this remnant space, where all the networks would compete for it. So DoubleClick, as a technology platform, sat in front of all this but didn't participate in it.").

[195] Kate Novatska, "Two Ways to Optimize Ad Serving: Waterfall vs. Header Bidding." https://epom.com/blog/ad-server/waterfall-vs-header-bidding ("Inventory is passing the route from top to bottom, similar to the water in the river flowing down the cliff to the basin. That's why it's called a waterfall auction, although it's not quite an auction in its nature. The inventory is often going to the one who is first in line, not the one who bids the highest.")

[196] *See e.g.,* Deposition of Andrew Casale (IndexExchange), September 26, 2023, 184:5-187:5; Deposition of Brian (AppNexus), 103:8-104:3 and 112:19-114:2.

Figure 26. Google's representation of the waterfall process



Source: GOOG-DOJ-AT-02199478, at -503 (06/2019) (2019 Google presentation, "Ad Manager Ecosystem 101").

II.E.2. Dynamic Allocation and Enhanced Dynamic Allocation

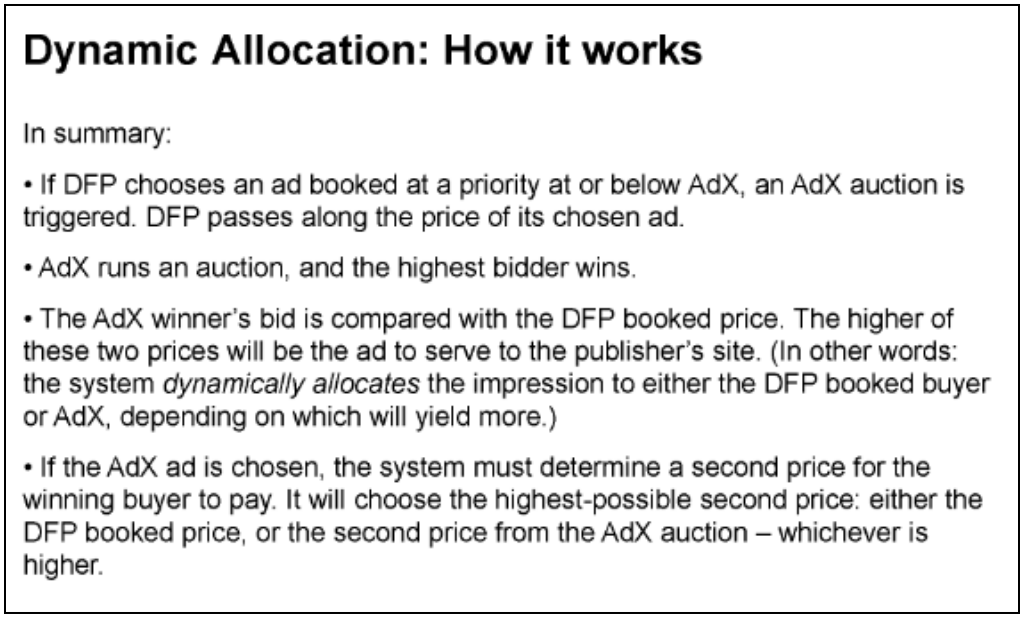
(149) When Google launched AdX in 2009,[197] Google introduced Dynamic Allocation ("DA"), which allowed AdX to compete with real-time bids against other non-guaranteed line items within DFP.[198] At a high level, DA allowed publishers to use the CPM from their directly booked, non-guaranteed

[197] Scott Spencer, "Announcing the New DoubleClick Ad Exchange," DoubleClick, September 18, 2009, https://web.archive.org/web/20091213142940/http://www.doubleclick.com/insight/blog/archives/doubleclick-advertising-exchange/announcing-the-new-doubleclick-ad-exchange.html.

[198] According to Google, "Dynamic Allocation was launched as a new feature in DoubleClick for Publishers ("DFP") in around July 2007, before Google's acquisition." GOOG-AT-MDL-006217592, at -605 (12/12/2022) (emphasis removed); Google, "Ad competition with dynamic allocation," Google Ad Manager Help, accessed December 18, 2023. https://support.google.com/admanager/answer/3721872 ("By allowing competition between guaranteed line items and remnant line items/Ad Exchange ads (when the latter have a sufficiently high bid), Ad Manager maximizes efficiency. This increases publisher yield and advertiser value compared to a static allocation ('waterfall') system.").

ads as the minimum price for the auction on AdX.[199] Figure 27 from a 2011 Google presentation summarized the DA process:

Figure 27. Google description of Dynamic Allocation



GOOG-DOJ-03601149, at -162 (12/15/2011).

(150) One Google publication describes DA with an example.

> Dynamic allocation is a unique technology that works by passing to the Ad Exchange the CPM value associated with any non-guaranteed ad that DFP is about to serve. Imagine that BigDFootball has sold an ad for $10 CPM to a Dallas pizza chain through an ad network, on a non-guaranteed basis. If the Ad Exchange can provide BigDFootball with a CPM higher than $10, the Ad Exchange will instead deliver the higher priced ad. If, however, $10 is higher than any ad in the Ad Exchange, the pizza chain's ad is served as planned.[200]

(151) Originally DA let AdX bid only against non-guaranteed line items. In 2014, Google introduced Enhanced Dynamic Allocation ("EDA") allowing AdX to bid against direct deals, including those with guaranteed commitments.[201]

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[199] GOOG-DOJ-03601149, at -162 (12/15/2011).

[200] Google, "Maximizing advertising revenues for online publishers," Google, accessed December 18, 2023, https://static.googleusercontent.com/media/www.google.com/en/us/googleblogs/pdfs/revenue_maximization_090210.pdf.

[201] GOOG-AT-MDL-006217592, at -606 (12/12/2022) ("EDA enabled publishers to allow [] indirect channels to compete

(152) Until 2016, only AdX among ad exchanges was provided access to DA and EDA in this manner within DFP, and other exchanges were not able to do so.[202] In Section VII.D.1, I discuss the advantages that AdX received from having exclusive access to DA and EDA within DFP.[203]

II.E.3. Header bidding

(153) The waterfall was increasingly being replaced by other methods involving real-time competition among multiple demand sources by the mid-2010s.[204]

(154) Partly to circumvent Google's restriction of Dynamic Allocation to AdX within DFP and to allow demand sources to submit bids for all impressions and not only through the inefficient waterfall, publishers increasingly adopted a technology called header bidding around 2014–2015.[205] Header bidding allowed ad exchanges and other indirect demand sources to compete against each other on the basis of their real-time demand, as opposed to being relegated to a waterfall where they would be ranked on the basis of historical performance.[206]

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simultaneously with the guaranteed reservation line items that they enabled for AdX demand. The indirect channel would win the impression if the revenue to be derived from that buyer was higher than the opportunity cost of not serving the guaranteed line item.") As described in GOOG-DOJ-05782415, at -433–434 (07/23/2019), under EDA, after a publisher makes an ad request to DFP, it finds "the best guaranteed line item eligible to serve for the ad request and calculates a temporary CPM based on the line item's current delivery" which is then compared against the highest bids among other eligible remnant line items and AdX. *See also* GOOG-DOJ-04429792, at -816 (04/2017) ("Enhanced Dynamic Allocation[:] ability … to see all impressions and compete in real time with guaranteed campaigns using the CPM of the direct sale as a floor price."); GOOG-DOJ-12799286, at -291 (11/2016) (A 2016 Google presentation noted, "what is unique about AdX and AdSense line items is, publishers do not book a CPM rate. Because of DFP's Dynamic Allocation feature, AdX and AdSense rates can be submitted in real time for every DFP query to include in its ad serving decision logic.").

[202] GOOG-TEX-00083092, at -092 (09/28/2016) (Google employee Aparna Pappu explaining that "dynamic allocation with DFP ONLY worked with AdX and not any other exchange"). Exchange Bidding, discussed in Section II.E.4, opened up Dynamic Allocation to third-party exchanges.

[203] Currently, Google in their support pages appears to refer to the features included in what has been referred to as DA and EDA both as "dynamic allocation." Google, "How we decide which ad is served," Accessed December 18, 2023, https://support.google.com/admanager/answer/11204312 ("Dynamic allocation helps the ad server pick the best ad… Ad Manager finds the best guaranteed line item eligible to serve for the ad request and calculates a temporary CPM based on the line item's current delivery. Programmatic Guaranteed (PG) deals that didn't get a bid are ruled out. Ad Manager calls Ad Exchange to find bids which can beat the temporary CPM of the best guaranteed line item."). For this reason, I use Dynamic Allocation to refer to both DA and EDA.

[204] Nitesh Korula stated in his declaration that "[t]he vast majority of web inventory has not been sold with the use of mediation chains, and it has not been possible to configure mediation chains on Google Ad Manager for web inventory since April 2017." Declaration of Nitish Korula (August 4, 2023) GOOG-AT-MDL-008842393, at 394.

[205] Declaration of Nitish Korula (August 4, 2023) GOOG-AT-MDL-008842393, at 397-398 ("Around 2014, web publishers began to adopt Header Bidding."). *See also* GOOG-AT-MDL-006217592, at -606 (12/12/2022) ("Header Bidding (2014/2015)"), Rashmita Behera, *Header Bidding: A Comprehensive Guide*, Adpushup, December 9, 2019, https://www.adpushup.com/blog/header-bidding-a-comprehensive-guide/ ("Header bidding made it to ad tech somewhere around 2014. And only after one year, in 2015, the technique went viral.").

[206] GOOG-AT-MDL-006217592, at -606 (12/12/2023) ("Header bidding is an additional auction that takes place outside of a publisher's ad server and allows that publisher to simultaneously offer ad space to numerous SSPs and ad exchanges before making a call to an ad server such as Ad Manager."). *See also* GOOG-DOJ-05782415, at -439 (07/23/2019) ("With the introduction of Header Bidding, third-party demand sources were able to compete dynamically in the Ad Manager (then DFP) auction).")

(155) There are two ways publishers can implement header bidding.

(156) The first, referred to as client-side header bidding, involves a publisher embedding a set of software code (referred to as a "header-bidding wrapper") on its websites that solicits bids from a selected set of exchanges in real-time when a user visits the publisher's page before the publisher's ad server is called.[207] The bids from these exchanges bidding into a heading-bidder wrapper ("header-bidding exchanges") are compared in an auction, with information from the winning bid transmitted into the publisher's ad server to be used in competition with the publisher's other demand sources.[208]

(157) The second type of header bidding, referred to as server-side header bidding, instead runs the header-bidding auction on a server and not within the user's browser.[209] Industry participants note that server-side header bidding reduces browser latency compared to client-side header bidding, but may reduce targeting capabilities.[210]

(158) Header bidding pricing varies by product. For example, Prebid.js, one of the most commonly used client-side header bidding solutions, is open-source and freely available to users.[211] Amazon's TAM (a server-side solution for enterprise publishers) charges a 2.5% fee, while Amazon's UAM (a server-side solution for small/medium publishers) charges a 10% take rate.[212]

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[207] Rashmita Behera, *Header Bidding: A Comprehensive Guide*, Adpushup, December 9, 2019, https://www.adpushup.com/blog/header-bidding-a-comprehensive-guide/.

[208] Declaration of Nitish Korula (August 4, 2023) GOOG-AT-MDL-008842393, at 397-398. *See also* Rashmita Behera, *Header Bidding: A Comprehensive Guide*, Adpushup, December 9, 2019, https://www.adpushup.com/blog/header-bidding-a-comprehensive-guide/. *See* Appendix L.2 for a more detailed description of this process.

[209] Happy, *Waterfall vs. Server-side or Client-side Header Bidding: What's The Difference?,* May 25, 2023, https://headerbidding.co/waterfall-vs-client-side-vs-server-side-header-bidding/; *see also* Deposition of Tim Craycoft (Google, formerly Amazon), August 15, 2023, 76:7–77:9 ("In server-side header bidding, all the bids are collected in the cloud over, you know, high-capacity internet, fast internet, not going through the user's browser. But then the results of jus the header bidding pre-auction, so to speak, have to be put into the browser and then back up to the ad server.")

[210] Rashmita Behera, *Header Bidding: A Comprehensive Guide*, Adpushup, December 9, 2019, https://www.adpushup.com/blog/header-bidding-a-comprehensive-guide/; Deposition of Tim Craycoft (Google, formerly Amazon), August 15, 2023, 76:7–77:9 ("Amazon's initial header bidding implementation was client-side, which is full of latency and other compatibility challenges. And then with TAM and UAM, we moved to server-side."); Deposition of Sam Cox (Google), October 26, 2020, 54:5–55:13 (When the header bidding process occurs on the client side, "it can have all sorts of negative impacts" including "malware, fraud, broadcast duplication, et cetera, and lots and lots of latency, and that's bad for a user experience [sic].")

[211] Prebid, "Introduction to Prebid," Prebid, accessed December 18, 2023, https://docs.prebid.org/overview/intro.html ("Prebid is the leading header bidding solution. It is free and fully open source, available to any publisher who wants to implement header bidding.") According to Kevel's Q4 2021 Header Bidding Tracker, 73% of all client-side wrappers were built on Prebid, while 27% used proprietary codebases (Kevel, "Header Bidding (HBIX) 2021 Tracker", Q4 2021, accessed December 18, 2023, https://web.archive.org/web/20211201060203/https://www.kevel.co/hbix/).

[212] Amazon's TAM product charges a 2.5% service fee. Amazon Publisher Services, "Transparent Ad Market Place," Amazon Publisher Services, accessed December 18, 2023, https://aps.amazon.com/aps/transparent-ad-marketplace/ ("A transparent 2.5% service fee charged to bidders."); Ronan Shields, "Amazon grants reprieve to ad tech partners in APS' ongoing pricing saga," *Digiday*, May 1, 2023, https://digiday.com/media/amazon-grants-reprieve-to-ad-tech-partners-in-aps-ongoing-pricing-saga/ ("Amazon Publisher Services will increase TAM buyer fees to 2.5% on May 1.") *Amazon Publisher Services*, "Unified Ad Marketplace," Amazon Publisher Services, accessed December 18, 2023, https://aps.amazon.com/aps/unified-ad-marketplace/ ("UAM charges a 10% transaction fee from SSP and Amazon bid prices prior to conducting a first price auction."); Neeraja Shanker, "UAM vs TAM: Your manual to Amazon Publisher

(159) By fostering real-time competition among multiple exchanges, header bidding resulted in higher payouts (also referred to as "yield") for publishers.[213] I discuss header bidding in greater detail in Appendix L.2.

II.E.4. Open Bidding

(160) In response to publishers' usage of header bidding, Google introduced Exchange Bidding, later renamed Open Bidding, in 2016, and made the product broadly available in 2018.[214] A 2017 Google document describes Exchange Bidding as "a DFP functionality," "allowing 3rd party-exchanges to bid in RTB alongside AdX in Dynamic Allocation."[215] In other words, third-party exchanges participating in Exchange Bidding had the ability to compete with real-time bids against AdX and deals that were subject to DA without being relegated to the waterfall. Google described Exchange Bidding as server-side header bidding alternative.[216] With Exchange Bidding, other exchanges were able to compete in real time with AdX within DFP's Dynamic Allocation.[217] (See discussion in Section VII.D.1.)

(161) For participating in Open Bidding, Google charges a 5% fee to GAM 360 publishers and a 10% fee to GAM publishers.[218] Google did not allow DSPs to participate in Exchange Bidding directly without exchanges, or allow exchanges to bid in with demand from their own DSPs.[219]

Services," Blockthrough, April 5, 2022, https://blockthrough.com/blog/uam-vs-tam-your-manual-to-amazon-publisher-services/ ("Fee structure: 10% transaction fee taken from SSP bid prices").

213 *See, e.g.*, a Google strategy document stating that "[h]eader bidding has given other Networks and SSPs per-query pricing access to Ad Manager inventory, increasing competition and delivering publishers 30-40% lift in programmatic revenues." GOOG-DOJ-04004392, at -394 (09/10/2018).

214 GOOG-AT-MDL-006217592, at -592 and -606 (12/12/2022) (noting Google "alpha" tested Exchange bidding in April 2016, entered it into beta testing in June 2017, and "rolled out to general availability" in April 2018). *See also* Google Responses to DOJ Ad-Tech Data Follow-Up Questions (July 10, 2020), noting that Open Bidding incorporates what was formerly known as Exchange Bidding and "was rebranded as 'Open Bidding' when Network Bidding was incorporated under the same umbrella in 2018. Open Bidding and Exchange Bidding are therefore not perfectly synonymous, but Network Bidding on Google Ad Manager is still in beta and represents a small portion of overall Open Bidding volume." In this report, I use Open Bidding to refer to the product that contains Exchange Bidding.

215 GOOG-DOJ-04429792, at -795, -808 (04/2017).

216 GOOG-TEX-00124296, at -325 (08/29/2016) ("Header bidding continues to grow. Exchange bidding is our server-side response, but it is still early days.").GOOG-AT-MDL-008842393, at -400 (08/04/2023) ("Open Bidding is a feature of Ad Manager and Google's server-side alternative to header bidding.").

217 GOOG-TEX-00000655, at -660 (01/04/2017) ("…exchanges that go through HB are subject to last look, and those that go through EB are not."); GOOG-TEX-00103579, at -580 (07/12/2016) ("…our exchange bidding product works just like HB. When a publisher is using HB, AdX still submits a real time bid to compete with all the HB bids that are input into DFP line items via key values.").

218 GOOG-AT-MDL-008842393, at -401 (08/04/2023) ("Up to at least December 2021, for publishers that utilized Open Bidding, when an auction was won by an Open Bidder, Google Ad Manager's standard charges for web display ads were 5% for GAM 360 customers and 10% for other GAM customers, and Google's standard charges for app and instream video ads were 10%."). .*See also* GOOG-TEX-00103579, at -579 (07/12/2016). (In a 2016 e-mail Jonathan Bellack wrote, "There's no actual fee to the exchange – we're taking a fee on the publisher side effectively, if a participating exchange says it'll pay $1 via exchange bidding and wins, we collect $1 from them and we pay out say 95c to the publisher.")

219 GOOG-TEX-00103579, at -579 (07/12/2016). (In a 2016 e-mail Jonathan Bellack wrote, "[W]e do not allow DSPs to

(162) Google also had a program called Network Bidding that allowed ad networks real-time bidding into DFP outside of the waterfall.[220] In September 2019, Google announced that Exchange Bidding and Network Bidding were combined and renamed as Open Bidding.[221]

(163) I discuss Open Bidding and Google's other responses to header biding in greater detail in Appendix L.3.[222]

II.E.5. Unified first price auction (UFPA)

(164) Prior to 2019, AdX auctions were run as second-price auctions, whereby the highest bidder wins and pays the higher of the second-highest bidder's bid or the reserve price. In March 2019, however, Google announced that AdX would move to a first-price auction.[223]

buy directly via exchange bidding. That includes DSPs owned by exchanges like AppNexus or Rubicon. DSPs can already buy on AdX via normal AdX buyer contracts. Exchange bidding is for publishers to connect with additional demand on other exchanges that they can't get through AdX buyers… it's not designed to be a way for a current DSP to circumvent AdX contract to get a cheaper revenue share."); Google, "Exchange Bidding Program Guidelines," accessed December 17, 2023, https://support.google.com/platformspolicy/answer/6348770 ("Your Buyers must be third-party DSPs, trading desks, or ad networks…if your business (or any of its affiliates) directly or indirectly owns or operates an entity that is eligible to buy through the Authorized Buyers product (such as a DSP, trading desk, or ad network), then that entity is not eligible to be your Buyer in transactions you make through the Exchange Bidding Program."). *See also* ATT-GCID-00000730, at -750 (2019). Confidential Response by Xandr, Inc. to the Request for Information Regarding the Online Advertising Industry of the French Competition Authority.) ("One of Xandr's greatest unique selling points is its direct access to its own demand (Xandr Invest, our DSP). However, if Xandr were to integrate with EBDA [Exchange Bidding in Dynamic Allocation], Google would not allow Xandr to push demand from our own DSP through our EBDA integration. This position is unacceptable from Xandr's point of view. Until recently Google never provided any reason for this position, however they have recently shared that it is intended to prevent DSPs such as TheTradeDesk or MediaMath from requested EBDA integrations as well."); MSFT-LIT-0000065289, at -90 (08/2021) Google Open Bidding Evaluation, August 2021 ("Question…We'd like to open the discussion to bringing Invest Demand…Google Answer…They are not changing their stance on bringing our own demand.").

[220] GOOG-DOJ-07967445, at -482 (07/2018) ("Exchange Bidding provides 3p exchanges with RTB access to DFP and AdMob publisher's inventory. Network Bidding does the same for networks (e.g. Facebook Audience Network").

[221] Google, "New trafficking experience, update your Tagless Request base URL, and Exchange Bidding is now Open Bidding," Google Ad Manager Help, September 23, 2019, https://support.google.com/admanager/answer/9197913#zippy=%2Cseptember-new-trafficking-experience-updateyour-tagless-request-base-url-and-exchange-bidding-is-now-open-bidding. ("Exchange Bidding has been renamed Open Bidding, which aligns Ad Manager with AdMob's Open Bidding. This name change will roll out gradually in the help center and in-product over the next few weeks. You can continue to work with the same exchanges and networks through the yield groups functionality while we improve the product and move to unified branding.")

[222] A 2019 Google presentation depicts how an impression is allocated within Google Ad Manager with header bidding and exchange bidding participants (GOOG-DOJ-AT-02199478, at -536-537 (06/2019).

[223] Google announced its planned move to a unified first price auction in March 2019, provided an "update" in May 2019, and announced they would fully implement the change in September 2019. *See* Sam Cox, "Simplifying programmatic: first price auctions for Google Ad Manager," Google Ad Manager , March 6, 2019, https://www.blog.google/products/admanager/simplifying-programmatic-first-price-auctions-google-ad-manager/; Jason Bigler, "An update on first price auctions for Google Ad Manager," Google Ad Manager , May 10, 2019, https://www.blog.google/products/admanager/update-first-price-auctions-google-ad-manager/; Jason Bigler, "Rolling out first price auctions to Google Ad Manager partners," Google Ad Manager, September 5, 2019, https://www.blog.google/products/admanager/rolling-out-first-price-auctions-google-ad-manager-partners/.

(165) In September 2019, Google launched its Unified First Price Auction ("UFPA"). Under the UFPA, AdX buyers competed against exchanges participating in Open Bidding and header bidding in a first-price auction; all participants also were able to compete against direct line items as in EDA.[224]

(166) There were additional changes that were introduced alongside the UFPA (see further discussion in Section VII.D.2). First, publishers were no longer allowed to set different price floors for different ad exchanges, DSPs, or advertiser ad networks, and instead had to set a uniform price floor for all UFPA participants.[225, 226] Second, Google introduced a Bid Data Transfer File to provide publishers with "bid landscape" data.[227] Third, Google began to provide the "minimum bid to win" to Authorized Buyers and Open Bidding participants.[228]

(167) By December 2019, all AdX traffic had transitioned to first price auctions.[229]

[224] GOOG-DOJ-AT-02204351, -at 354 (09/03/2019). *See also* GOOG-DOJ-07957145, at -148 (12/2018) ("AdManager, Admob and AdSense will move to a 1P auction in 2H'19. Migration will be leveraged to unify floor prices across AdX, Open Bidding and remnant demand (incl. Header Bidding) and improve inventory access on ADX"); GOOG-DOJ-11030354, at -354 (09/25/2019) ("Google's last look goes away with this change.").

[225] Jason Bigler, "An update on first price auctions for Google Ad Manager," Google Ad Manager, May 10, 2019, https://www.blog.google/products/admanager/update-first-price-auctions-google-ad-manager/.

[226] As I discuss in more detail in Section VII.D.2, publishers valued the ability to adjust price floors and set lower floors for rival exchanges than for AdX.

[227] Jason Bigler, "Rolling out first price auctions to Google Ad Manager partners," Google Ad Manager Blog, Sept. 5, 2019, *available at* https://blog.google/products/admanager/rolling-out-first-price-auctions-google-ad-manager-partners/ ("For publishers, we'll start a new beta that provides data from all the bids submitted to your auctions. With this Bid Data Transfer file, you'll be able to create a full bid landscape that shows the range and number of bids you received, across dimensions like ad unit and buyer. This information will help you evaluate the value of your inventory and better understand the bidding behavior of buyers.").

[228] Jason Bigler, "Rolling out first price auctions to Google Ad Manager partners," Google Ad Manager Blog, Sept. 5, 2019, *available at* https://blog.google/products/admanager/rolling-out-first-price-auctions-google-ad-manager-partners/, ("For Authorized Buyers and Open Bidders (formerly known as Exchange Bidding buyers), we'll provide additional information post-auction to help inform your bidding strategies. Buyers will receive the minimum bid price to win after the auction closes. This feedback will help you understand when to bid higher to win valuable inventory"). "Authorized Buyers" include ad networks and DSPs that are allowed to purchase display inventory on AdX (Google, "Authorized Buyers overview," Authorized Buyers Help, https://support.google.com/authorizedbuyers/answer/6138000?hl=en).

[229] Google, "Completed monitoring for transition to a first-price auction," Google Ad Manager Help, December 16, 2023, available at https://support.google.com/admanager/answer/9197913 ("When we transitioned to a first-price auction in October, a small percentage (3% or less) of Ad Exchange traffic continued to be governed by the second-price auction model to monitor performance. That monitoring is complete, and now all Ad Exchange traffic uses a first-price auction.").

III. Economic concepts for analyzing competition among ad tech products for open-web display advertising

(168) In this Section, I discuss important economic concepts for analyzing and understanding competition among different ad tech products involved in the purchase and sale of open-web display ads:

- In Section III.A, I define and highlight the role of *indirect network effects*;
- In Section III.B, I describe why *market power*[230] for an ad tech product depends on the responsiveness of both advertiser spending and publisher supply to both fees and product attractiveness, and why it is sufficient for that product to have market power over just "one side" of the market (i.e., only advertisers *or* publishers) to possess market power at all;
- In Section III.C, I describe how *multihoming* ad tech tools that make it easier or more valuable for customers to use multiple products (such as header bidding and yield managers with respect to exchanges) can intensify competition and reduce market power;
- In Section III.D, I discuss the importance of *scale*—as represented both by the number of advertisers and publishers using a product, and the volume of transactions served—for the competitiveness of an ad tech product. Greater usage and transaction volume enhances network effects, generates scale economies, and produces valuable data that an ad tech product relies upon to improve its quality and attractiveness for customers; and
- In Section III.E, I overview key economic concepts related to auctions, which are commonly used for the sale of open-web display advertising.

(169) The ad tech products that are the focus of my report are publisher ad servers, ad exchanges, and advertiser ad networks that serve and transact open-web display advertising.

III.A. Indirect network effects

(170) Ad tech products have features common to what have been referred to in the economics literature as "two-sided markets" and exhibit what are known as "indirect network effects."[231] The term "two-

[230] Economists define market power as the ability of a firm to profitably price above competitive levels, often measured by firms' marginal (or incremental) costs. *See* Section III.B.

[231] *See, e.g.*, Marc Rysman, "The Economics of Two-Sided Markets," *Journal of Economic Perspectives* 23, no. 3 (2009), 125 ("Broadly speaking, a two-sided market is one in which 1) two sets of agents interact through an intermediary or platform, and 2) the decisions of each set of agents affects the outcomes of the other set of agents"); Bruno Jullien, Alessandro Pavan, and Marc Rysman, "Two-sided Markets, Pricing, and Network Effects," in *Handbook of Industrial Organization, Volume 4*, eds. Kate Ho, Ali Hortaçsu, and Alessandro Lizzeri (2021), 488 ("indirect network effects lead the platform firm to take into account the various interdependencies between the two sides of the market, and the pertinent literature studying such interdependencies is often termed the study of *two-sided markets*."), and 490–491 ("We generally consider a two-sided market to be one in which at least two distinct sets of agents (or sides) interact through an intermediary—the platform—and in which the behavior of each set of agents directly impacts the utility, or

sided" refers to a product's need to attract two distinct sets of customers—e.g., publishers (sellers) and advertisers (buyers)—to generate value. Indirect network effects are present when the attractiveness of a product to one set of customers depends on the extent to which the other group also uses the product.[232] For example,

- Bidding into an advertiser ad network or ad exchange will generally not be attractive to advertisers if there is little publisher ad inventory available for purchase through them. Such products will also not be attractive options for publishers to sell ad inventory through if they do not have meaningful advertiser participation.
- A publisher ad server such as DFP also exhibits indirect network effects, as publishers that use DFP to serve display ads tend to derive greater value from DFP if more advertisers use ad exchanges that provide bids into DFP.

(171) The strength and importance of indirect network effects for adoption decisions will tend to vary across products and different sets of customers.[233] For example, indirect network effects are of central importance for customer adoptions decisions for ad exchanges as their primary role is to run auctions among advertisers for publishers' display inventory. Ad exchanges that have more advertisers participating in their auctions, by offering higher publisher payouts, will generally be able to win more transactions and attract more publisher inventory. Similarly, ad exchanges that have access to more publisher inventory will tend to attract more advertisers to their auctions.

(172) In contrast, indirect network effects (although present) are likely less salient for customer adoption decisions for publisher ad servers than for ad exchanges. This is for at least two reasons. First, publisher ad servers provide valuable stand-alone features to publishers, including managing and serving non-programmatic direct deals and house ads. Second, advertisers do not generally choose which publisher ad servers to bid into, but rather opt to use certain bidding tools and ad exchanges that, in turn, can bid for publisher inventory managed by different publisher ad servers. This means

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the profit, of the other set of agents. The impact of one set of agents on the other, and the resulting feedback to the first set of agents, is an indirect network effect.").

[232] *See, e.g.*, Hal R. Varian, "Use and Abuse of Network Effects," *Toward a Just Society: Joseph Stiglitz and Twenty-First Century Economics*, eds. Martin Guzman, (2018), 231–232 (when compared to direct network effects, indirect network effects "involve a somewhat more complex positive feedback loop. Think of an operating system where there are three relevant parties: the seller of the operating system, the developer of applications for the operating system, and the customers who buy both the operating system and the applications… Developers might find it attractive to develop applications for that system with the most users, and the users might find the operating system attractive that has the most applications. This leads to a positive feedback loop: more users leads to more developers leads to more applications leads to more users.") and Joseph Farrell and Paul Klemperer, "Coordination and Lock-in: Competition with Switching Costs and Network Effects," *Handbook of Industrial Organization*, Volume 3, eds. Mark Armstrong and Robert H. Porter (2007).

[233] *See, e.g.*, Bruno Jullien, Alessandro Pavan, and Marc Rysman, "Two-sided Markets, Pricing, and Network Effects," *Handbook of Industrial Organization*, Volume 4, eds. Kate Ho, Ali Hortaçsu, and Alessandro Lizzeri (2021), 485–592 and Mark Armstrong, "Competition in Two-sided Markets," *RAND Journal of Economics* 37, no. 3 (2006).

(231) Instead, each bidder has an economic incentive to bid strictly below their valuation, engaging in what is known as "bid shading." A bidder who shades their bid below their valuation still realizes zero surplus when they lose, but they earn positive surplus when they win.[318]

(232) The surplus-maximizing amount of bid shading in a first-price auction generally depends on the bidder's own valuation and the distribution of valuations for rival bidders.[319] In practice, determining the optimal bid in a single first-price auction may be challenging, but if similar items are repeatedly sold using first-price auctions, historical information on bids and auction prices as well as experimentation can be used to inform the optimal amount to bid shade.

(233) **Second-price auctions.** In a second price-auction, the bidder with the highest bid wins but pays the price that equals the bid submitted by the *second-highest* bidder (and none of the losing bidders pay any amount). In contrast to a first-price auction, a bidder's bid in a second-price auction affects the likelihood of winning (i.e., that the bidder has the highest bid), but not the price they pay if they win.

(234) A well-known economic principle is that, for a single second-price auction, bidders can do no better than submitting bids equal to their valuations, regardless of the way in which other auction participants choose to bid—in other words, bidders do not gain from bid shading.[320] From each bidder's perspective, their bid does not affect the price they pay because it is determined using a bid from another bidder over which they have no control. Hence, they would want to maximize the probability that they win the auction, while at the same time not bidding more than they would be willing to pay.[321]

(235) **Reserve prices.** A reserve price, sometimes also called a price floor, is a price below which the seller will not sell the item. Auctions are often conducted in environments where the number of potential bidders is variable. Without a reserve price, the item in question could, in principle, be sold for an

[318] When deciding how much to bid shade, each bidder faces a classic economic tradeoff. On the one hand, bidding close to the bidder's valuation (i.e., a small amount of bid shading) raises the likelihood that they win because it increases the chances that their bid will be the highest among all of the submitted bids. On the other hand, bidding close to the bidder's valuation reduces the surplus they earn if they win because the auction price, which equals their bid, will be closer to their own valuation.

[319] *See, e.g.*, Vijay Krishna, *Auction Theory*, 2nd ed. (Academic Press, 2009), 15–16; Paul Klemperer, *Auctions: Theory and Practice* (Princeton University Press, 2004), 43, 56–57.

[320] *See, e.g.*, Vijay Krishna, *Auction Theory*, 2nd ed. (Academic Press, 2009), 13; Paul Klemperer, *Auctions: Theory and Practice* (Princeton University Press, 2004), 14.

[321] No bid shading maximizes a bidder's surplus for a single auction. If multiple units of the same item are sold sequentially, one at a time, using second-price auctions, it is no longer necessarily true that each bidder with demand for one unit has a unilateral incentive to bid their valuation in each auction. For example, a bidder in the first auction would not necessarily want to maximize the probability that they win that specific auction, since if they lose, they will still have an opportunity to bid for another unit in subsequent auctions. The possibility of winning an item in one of the remaining auctions creates an incentive to bid shade. The incentive to bid shade grows weaker as the number of remaining auctions declines, so that in the last auction a bidder would bid their own valuation. *See, e.g.*, Vijay Krishna, *Auction Theory*, 2nd ed. (Academic Press, 2009), 221–24.

IV. Market definition

(241) Market definition is a tool for analyzing antitrust and monopolization claims. Defining relevant antitrust markets identifies a set of products over which an alleged or potential monopolist could possess and exercise market power. In doing so, it assists in the evaluation of whether the alleged or potential monopolist is able to engage in exclusionary conduct and whether such conduct likely harms competition and customers.

(242) Market definition is helpful for at least two reasons. First, market definition focuses attention on and delineate where potential competitive effects from particular conduct are most likely to occur. Second, market definition allows for the calculation of market shares and concentration measures which can be useful for examining the extent of market power. However, as I discuss further below, the market definition exercise properly applied does not necessarily lead to a single antitrust market. Appropriate relevant markets are those that help evaluate the competitive effects of the conduct at issue.

(243) In this section, I evaluate relevant antitrust markets for examining Google's market power and the competitive effects of its conduct on open-web display ad tech products.[330]

(244) A relevant market has both a product and geographic dimension.[331] In this matter, the complaint alleges three relevant product markets: *publisher ad servers*, *ad exchanges*, and *advertiser ad networks* that can be used to serve or transact open-web display advertising. The complaint also alleges a worldwide (with some countries and regions excluded) and United States geographic market for each of these product markets. In this section, I explain why each of these three product markets is a relevant product market, and why both the whole world (excluding certain countries and regions) and the United States are relevant geographic markets for each product market.[332]

(245) This section is organized as follows.

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[330] As I discussed in Section I.B, I was asked by counsel at the Department of Justice to "determine whether publisher ad servers, ad exchanges, and advertiser ad networks for open-web display advertising, both worldwide (excluding countries like the People's Republic of China that substantially restrict internet access) and in the United States, are relevant antitrust markets for the purpose of evaluating Google's market power and the alleged anticompetitive conduct."

[331] United States Department of Justice and Federal Trade Commission, *Horizontal Merger Guidelines*, August 19, 2010 (hereinafter, "HMG"), § 4 ("market definition helps specify the line of commerce and section of the country in which the competitive concern arises."). Additionally, using the label "relevant" serves to differentiate the analytic construct of a relevant market from other uses of the term "market": *see* HMG § 4 ("Relevant antitrust markets defined according to the hypothetical monopolist test are not always intuitive and may not align with how industry members use the term 'market.'"); Jonathan B. Baker, "Market Definition: An Analytical Overview," *Antitrust Law Journal* 74, no. 1 (2007): 130 (labeling markets as relevant or antitrust markets "distinguish[es] these markets from what business executives and consultants might define for other purposes.").

[332] My conclusions regarding Google's market power in the relevant product markets and the competitive effects of its conduct are not changed whether I consider a worldwide or US geographic market.

- In Section IV.A, I discuss economic issues regarding market definition for monopolization claims in ad tech products, and describe the economic framework that I use to define relevant antitrust markets.[333]
- In Section IV.B, I describe why open-web display advertising is an important and distinct form of advertising for open-web publishers and advertisers. Note that the relevant product markets do not contain the underlying display advertisements themselves, but rather the ad tech products used to serve and transact these ads. Nonetheless, focusing on the distinction between display and other forms of advertising clarifies why ad tech products that transact open-web display ads are particularly valued by publishers and advertisers, and why products that do not offer such functionalities are not close substitutes. In this Section, I also discuss why indirect deals for open-web display advertising provide distinct value to publishers and advertisers compared to other forms of transacting display advertising.
- In Sections IV.C–IV.E, I explain why *publisher ad servers*, *ad exchanges*, and *advertiser ad networks*—ad tech products that are used by publishers and advertisers to serve and transact open-web display advertising—are each relevant product markets.
- In Section IV.F, I explain why worldwide (excluding certain countries and regions) and the United States are both appropriate relevant geographic markets for all three relevant product markets.

IV.A. Market definition for monopolization claims in the ad tech stack

(246) For purposes of evaluating the monopolization claims in this matter, a relevant market contains products offered by the alleged monopolist (Google) and those alternative products that would impose significant competitive constraints on Google's products were Google's products priced at competitive levels. Focusing on alternatives that would constrain Google's exercise of market power were its products priced at competitive levels is important, as it identifies alternatives that, if not (potentially already) weakened or eliminated by Google's anticompetitive conduct, would prevent Google from exercising or continuing to exercise market power to the detriment of customers and consumers. Importantly, products that lie *outside* of the relevant market are relatively poor substitutes for competitively-priced products within the market, and customer substitution to these products would not be sufficient to constrain Google's ability to exercise market power in the relevant markets at issue.

(247) As made clear by this discussion, market definition focuses on the ability and willingness of customers to substitute among different products.[334] Relevant markets must contain enough

[333] In this report, when I say that I "define" relevant markets, I mean that I am evaluating whether the markets as described in my assignment are relevant antitrust markets.

[334] HMG, § 4 ("Market definition focuses solely on demand substitution factors, i.e., on customers' ability and willingness

reasonably close substitutes so that an exercise of significant market power by a monopolist of such products would not be rendered unprofitable by sufficient customer substitution to products outside of the market; but at the same time, a relevant market does not necessarily (or typically) include *all* potential substitutes for those products, since it is not necessary to control (or eliminate) all potential substitutes for a monopolist to exercise significant market power.

IV.A.1. The hypothetical monopolist test for monopolization claims

(248) To determine whether a set of products (within a geographic area) comprises a relevant market for the purposes of evaluating monopolization claims, I evaluate whether a "hypothetical monopolist" that owned these products would likely sell at least some of its products profitably to some set of customers at (quality-adjusted) prices[335] that significantly exceed levels that would be charged in a competitive market.

(249) Whether a set of products comprising a relevant market can profitably be monopolized depends on customer substitution patterns. To see why, consider a candidate set of products being evaluated as a possible relevant product market. If a hypothetical monopolist of this set of products would not maximize its profits by charging prices significantly above competitive levels, then there likely exists substantial customer substitution to alternative products *outside* of the candidate market if prices increased from competitive levels. In this case, the candidate market is too narrow and excludes products that are close substitutes to products within the market. If, in contrast, a hypothetical monopolist of a set of products would maximize its profits by charging prices significantly above competitive levels, then products outside of the market are not close substitutes for competitively-priced products within the market, and do not constrain the exercise of market power by the monopolist. In this case, the candidate set of products forms a relevant product market for the purposes of evaluating a monopolization claim.

(250) This economic framework for defining relevant markets is the "hypothetical monopolist test" (HMT) which is commonly used to define markets for the analysis of horizontal mergers.[336] However, there

to substitute away from one product to another in response to a price increase or a corresponding non-price change such as a reduction in product quality or service").

[335] The discussion in this Section uses a price increase as the focal means of exercising market power for a hypothetical monopolist. However, market power can also be exercised by reducing product quality, which can have the effect of reducing costs or increasing customer demand for the firm's other products on which the firm earns supracompetitive profits. The term "quality-adjusted" refers to the possibility that a firm (e.g., the alleged or hypothetical monopolist) would choose to exercise its market power not necessarily by increasing price, but potentially by reducing the quality of a product below that which would be offered in a competitive market. Lowering a product's quality while holding its price fixed is referred to in economics as increasing the quality-adjusted price for the product. In my report, a reference to a "price increase" includes this possibility of a quality-adjusted price increase. *See* HMG §1 ("Enhanced market power can also be manifested in non-price terms and conditions that adversely affect customers, including reduced product quality, reduced product variety, reduced service or diminished innovation.").

[336] HMG §§ 4, 4.1.1 ("The hypothetical monopolist test requires that a product market contain enough substitute products so that it could be subject to post-merger exercise of market power significantly exceeding that existing absent the

is an important difference in implementing the HMT for monopolization claims. In a horizontal merger case, the HMT examines whether a hypothetical monopolist can increase prices for a set of products significantly above *those that would likely be charged absent the merger*, which often are taken to be prevailing pre-merger prices.[337] By evaluating price increases starting from prevailing prices, the HMT in a horizontal merger setting aims to identify products that would likely constrain the merging parties from engaging in an exercise of increased market power following the merger.

(251) In contrast, for monopolization claims, the HMT considers customer substitution patterns at the benchmark of competitive prices.[338] This is because an important concern is that *prevailing prices may already reflect the exercise of substantial market power by the alleged monopolist*.[339] At such elevated prices, consumers would likely substitute away from the alleged monopolist's products to alternatives were the alleged monopolist to impose a further price increase—even if those alternatives are not close substitutes for the alleged monopolist's products *were the monopolist's products priced more competitively*. When there is a concern that prevailing prices (or product qualities) depart significantly from those that would otherwise obtain in a more competitive environment, relying on observed customer substitution patterns at existing price or quality levels risks overstating the competitive significance of more distant substitutes that customers only turn to after a set of products has already been monopolized.[340] Hence, quantitative estimates of demand elasticities and other

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merger. Specifically, the test requires that a hypothetical profit-maximizing firm, not subject to price regulation, that was the only present and future seller of those products ("hypothetical monopolist") likely would impose at least a small but significant and non-transitory increase in price ("SSNIP") on at least one product in the market, including at least one product sold by one of the merging firms.").

337 HMG §§ 4, 4.1.2 ("The Agencies apply the SSNIP [small but significant and non-transitory increase in price] starting from prices that would likely prevail absent the merger. If prices are not likely to change absent the merger, these benchmark prices can reasonably be taken to be the prices prevailing prior to the merger. If prices are likely to change absent the merger, e.g., because of innovation or entry, the Agencies may use anticipated future prices as the benchmark for the test.").

338 By competitive prices, I am referring to prices that likely would be offered if there were multiple efficient providers of similar and functionally substitutable products, limited not only to those currently available from existing market participants (e.g., products that could have been or could be offered by existing, past, or potential market participants). By using this benchmark level of prices in the hypothetical monopolist test (defined below), I seek to identify a set of products that could be, or *could already have been*, profitably monopolized.

339 Indeed, acknowledging issues with using consumer substitution at observed prevailing prices to define markets in monopolization cases, the *Horizontal Merger Guidelines* note that a monopolist's current prices may already reflect the exercise of its market power and that market definition in such cases will differ from evaluating horizontal mergers. HMG at fn. 5 ("Market definition for the evaluation of non-merger antitrust concerns such as monopolization or facilitating practices will differ [from mergers] in this respect [referring to the relevant benchmark for prices] if the effects resulting from the conduct of concern are already occurring at the time of evaluation.").

340 Phillip E. Areeda and Herbert Hovenkamp, *Antitrust Law: An Analysis of Antitrust Principles and Their Application*, 4th and 5th ed., cum sup. 2013–2020 (New York: CCH Incorporated, 2020), ¶ 539 ("A first approximation 'provisional market' is in fact a relevant antitrust market if its prices are already significantly supracompetitive. Such a market definition would be incorrectly broadened by adding a second product or region that would make a further price increase unprofitable to the first firm or set of firms. To put it another way, in seeking out a profit-maximizing price the monopolist or oligopolist finds a price so high that a still further price increase would be unprofitable because too many sales would be lost."). *See also* Massimo Motta, *Competition Policy: Theory and Practice*, (New York: Cambridge University Press, 2004), 105 ("Suppose for instance that the firm is the only seller in the correctly defined product market. Being a monopolist, it might have set its prices at such a high level that a further increase above the current prices would not be profitable. Therefore, the [HMT] test [using the monopolist's current prices as the competitive

measures of customer substitution computed at prevailing or historically observed prices will typically be less useful for defining markets for monopolization claims than for horizontal mergers.[341]

(252) Where it is possible that prevailing prices exceed competitive levels, it is useful to consider two categories of evidence that can inform whether competition from products outside the relevant product markets significantly constrains a hypothetical monopolist of products within a market from exercising market power.

(253) First, product characteristics and customer behavior can indicate products outside of each relevant market are not close enough substitutes for competitively-priced products within each relevant market to constrain a monopolist of all such products from exercising significant market power. I provide such evidence in this section. In particular,

- I discuss evidence that open-web display advertising is a distinct and important form of advertising and monetization for advertisers and publishers, and that publisher ad servers, ad

benchmark] might lead to a too-wide market definition, which in turn might lead to a calculation of small market shares, and to a finding of no dominance, for the firm under investigation.").

Relying on substitution patterns to identify substitutes at already "supracompetitive" prices has been referred to as the "Cellophane Fallacy" *See* Steven C. Salop, "The First Principles Approach to Antitrust, Kodak, and Antitrust at the Millennium," *Antitrust Law Journal*, vol. 68, (2000), 188 –189, 197 ("[M]arket power should be measured as the power profitably to raise or maintain price above the competitive benchmark price, which is the price that would prevail in the absence of the alleged anticompetitive restraint. The competitive benchmark may be the current price, the perfectly competitive price, or some other in-between price, depending on the particular allegations of anticompetitive effect being asserted. …Suppose, for example, that the antitrust allegation is that certain conduct has already permitted a firm to raise its price. In these circumstances, the proper competitive benchmark is not the current price. Instead, it is the lower price that would have prevailed absent the alleged restraint. If the current price is used as the competitive benchmark, the result will be an erroneous finding of no market power. This is the error that occurred in the Du Pont case, which now is explained under the rubric of the Cellophane Trap, or Cellophane Fallacy. There, Du Pont engaged in a variety of conduct that eliminated competition, permitting Du Pont to raise its price. The Court, however, evaluated market definition as a threshold filter that focused on the profitability of price increases above the already achieved monopolized price. That hypothetical price increase was found to be unprofitable, leading the Court to affirm the finding of a broad market and a lack of market power by Du Pont.") (emphases suppressed). *See also* Gene C. Schaerr, "The Cellophane Fallacy and the Justice Department's Guidelines for Horizontal Mergers," *Yale Law Journal* 94, no. 3 (1985), 670–93.

341 *See, e.g.*, Dennis W. Carlton and Jeffrey M. Perloff, *Modern Industrial Organization*, 4th ed. (Boston: Addison-Wesley, 2005), 646–647 ("Just because a monopolized product faces close demand substitutes at monopoly price, it does not follow that the firm producing the product has no market power (though it may not be able to raise price further). It is only if the substitution possibilities are so large as to generate a highly elastic residual demand that the monopoly has no significant market power. Because it is difficult to determine which products to include in the market definition, market shares may be only a crude indicator of market power. The *Cellophane* case illustrates these difficulties in defining a market. The Court investigated whether du Pont had market power in the pricing of cellophane. The Court reasoned that du Pont lacked market power because, at the current market prices, a user of cellophane had many substitutes, such as paper bags, and du Pont's share of the market including these substitutes was not large. There was also evidence, however, that price substantially exceeded marginal cost. Based on the foregoing discussion, it was an error to include other wrapping materials in the market definition because they did not prevent the exercise of market power and constrain the price of cellophane to competitive levels. If, however, instead of asking whether du Pont had market power, the Court had investigated whether a proposed merger would raise the cellophane price, its market definition might have been appropriate.").

exchanges and advertiser ad networks that facilitate the serving and sale of such advertising are each distinct sets of products without close substitutes for *either* advertisers or publishers.[342]

- I also discuss evidence that industry participants recognize products in each relevant market as offering features and capabilities to customers that are not offered by products outside of the market, which is also consistent with the conclusion that a hypothetical monopolist of products within the market would not be constrained from charging prices above competitive levels.
- I also provide quantitative evidence that supports the finding that products outside the market are not close substitutes from customers' perspectives.

(254) Second, I present direct evidence that Google possesses substantial and sustained market power with its publisher ad server (DFP), ad exchange (AdX), and advertiser ad network (Google Ads) products. Such evidence indicates that these are proper relevant markets: because Google was able to profitably exercise market power in these markets, a hypothetical monopolist that controlled Google's products as well as their close substitutes would also find it profitable to do so.[343] Direct evidence of Google's market power for these products includes Google's pricing behavior and ability to profitably implement certain policies contrary to the interests of publishers and/or advertisers without a sufficient competitive response to constrain Google's actions. This evidence shows that these relevant markets can be profitably monopolized.[344] Evidence of Google's market power over products contained within the relevant markets also demonstrates that potential constraints imposed by indirect network effects (or Google's sale of multiple complementary products) do not prevent it—nor a hypothetical monopolist within each market—from charging quality-adjusted prices above competitive levels.

IV.A.2. Relevant markets typically exclude some substitutes, and may exclude alternatives that are used alongside products within the relevant markets

(255) Despite its usefulness in productively focusing attention on areas where competitive concerns may arise, market definition is not "an end in itself" and is one of several tools that assist with the analysis

[342] Recall from Section III.B that an ad tech product will possess market power as long as *either* the advertisers or publishers that use it do not have close substitutes to turn to. Hence, as long as one set of customers (advertisers or publishers) lack close substitutes for a set of products, a monopolist of those products will be able to exercise market power and those products would comprise a relevant market.

[343] *See* Phillip E. Areeda and Herbert Hovenkamp, *Antitrust Law: An Analysis of Antitrust Principles and Their Application*, 4th and 5th ed., cum sup. 2013–2020 (New York: CCH Incorporated, 2020), ¶ 539b1 ("Where the provisional *A* grouping [of products] includes all reasonable substitutes made in the same region and by similar technology, substantial excess profits, prices significantly above marginal costs, or some instances of price discrimination reveal market power within that grouping. That conclusion overcomes the presumptive methodology for broadening the market. Indeed, there is seldom any reason to do more than conclude that the *A* grouping defines a market, once we know that the *A* firms possess substantial market power.").

[344] Notably, this direct evidence does not involve market shares computed for a given set of products (which would depend upon having defined a relevant market).

(280) As an example, Disney uses DFP for all of its display advertising,[371] but Disney also has developed its own in-house ad server, Disney Ad Server, with more "robust" large-scale video streaming capabilities than are available in DFP.[372]

(281) For many open-web publishers, however, developing and switching to integrated ad tech products would be costly and time consuming, require overcoming indirect network effects in order to attract advertiser spending, and would limit access to the large amount of advertiser demand that flows through third-party ad tech products.[373] I discuss the significant costs that publishers face in self-supply of their own ad tech products in more detail in Section V.B.2.b.

IV.B.2. Open-web display advertising is an important component of marketing for advertisers, and distinct from other forms of advertising

(282) As consumers have shifted spend and activity from traditional to digital media, advertisers have also shifted spend towards digital advertising and away from non-digital, or offline, forms of advertising such as print, television, and radio.[374]

(283) Digital advertising offers distinct benefits over offline advertising. Digital advertising can be used to engage immediately with consumers, for example by allowing consumers to immediately click on an ad and be directed to the advertiser's website.[375] Digital advertising also allows for more targeted ads than offline advertisements,[376] and can use data gathered from users' browsing history to improve

[371] Deposition of Jeremy Helfand (Disney), September 29, 2023 132:3–132:13 ("Q. And just so I'm clear, does Disney still use Google's DFP ad server to sell video advertising outside of Hulu and Disney+? A. The Google Ad Manager, previously DFP, is used to deliver video advertising on some of our properties like ESPN. Q. And Disney uses Google Ad Manager, previously known as DFP, to sell all of its display advertising; is that right? A. That is correct.").

[372] Deposition of Jeremy Helfand (Disney), September 29, 2023 132:14-133:4 ("Q. You talked a little bit about why Google, or sorry, Disney developed an in-ad server. How does Disney's ad server compare to Google's ad server? A. In comparison, what I would say is that the Disney Ad Server was built from the ground up for video. And some of the important capabilities associated with being able to deliver large scale video is inherent in the Disney Ad Server, especially for streaming. The Google ad server or Google Ad Manager started as a display ad server and has evolved to support video. And there are certain, I would say, video capabilities that are not as robust as what we developed for the Disney Ad Server.").

[373] *See* Deposition of James Glogovsky (New York Times), Aug. 25. 2023, 149:11–150:8 ("Q. What disadvantages, if any, are there to The New York Times using a publisher ad server for display that it has built and operated itself?… A. Maintaining ad technology that is homegrown, built internally, whether that be an ad server, has several disadvantages. One, the operational support and infrastructure in capital resources required to maintain that and to evolve with the industry changes would require us to invest a significant portion. And then also just staying up to date with the evolving landscape of the ad formats and being able to adapt to our clients' needs readily and availably, or quickly.").

[374] GOOG-DOJ-03242646, at -657 (09/26/2018) (Google "Programmatic Overview" deck).

[375] MSFT-LIT-0000046646, at -661 (10/10/2017) (AppNexus Response to FCA's RFI notes that unique characteristics of online advertising, which make offline advertising a weak substitute, include that "[o]nline advertising is uniquely well-suited to directing potential customers to advertisers' websites" and "[o]nline ads … offer the opportunity for immediate engagement with the advertisers' brand through links or other interactive experiences.").

[376] *See, e.g.*, MSFT-LIT-0000046646, at -660 (AppNexus Response to FCA's RFI notes that "Online advertising allows for much more specific audience targeting, in some cases enabling advertisers to reach specific potential customers. Targeting for offline ads, on the other hand, is far less exact."; *see also* Google, "What's online marketing?," https://support.google.com/google-ads/answer/6227161?sjid=780273546632133046 4-NA ("There's a lot that's different

such targeting.[377] Additionally, digital advertising enables advertisers to more accurately track and quickly respond to the effectiveness of their ads.[378] Even though many advertisers may still use both digital and offline advertising in their ad campaigns, they may also have complementary features from the perspective of advertisers.[379]

(284) Below, I discuss evidence that within digital advertising, display advertising on websites provides distinct value to advertisers as compared to other forms of digital advertising; and that for advertisers, open-web display advertising is distinct from display advertising on web sites of publishers that rely on their own integrated ad-tech products for the sale of display inventory.

IV.B.2.a. Display advertising on websites is distinct from other forms of digital advertising for advertisers

(285) Many advertisers use multiple forms of digital advertising. Marketing research and documents and testimony from industry participants acknowledge that different forms of advertising can target users at different stages of what is referred to as the "marketing funnel" (or, equivalently "sales funnel").[380] Moreover, because different forms of digital advertising may reach different sets of consumers, using multiple forms of digital advertising allows an advertiser to broaden the reach of a campaign.[381]

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about online advertising compared to traditional advertising like newspapers, TV ads, or billboards. … Online advertising lets you target your ads to the type of customers you want, and filter out those you don't."). *See also* Deposition of Kendall Oliphant (United States Census Bureau), Aug. 9, 2023, 214:17–217:15 ("A. Digital allowed you to be a little bit more precise in your targeting, and that precision was necessary as we got into the later stages of the campaign. Even if the cost had been higher, the ability to be so precise, so strategic, and to be able to adapt as quickly as we could, it would have made it worth it for this effort.").

377 MSFT-LIT-0000046646, at -663 (10/10/2017) (AppNexus Response to FCA's RFI). *See also* Google, "What's online marketing?," https://support.google.com/google-ads/answer/6227161?sjid=7802735466321330464-NA ("you can use different targeting methods to reach potential customers right when they're searching for your products or services. This can help make sure you're putting your advertising dollars towards reaching only the people most likely to become your customers.").

378 Google, "What's online marketing?," https://support.google.com/google-ads/answer/6227161?sjid=7802735466321330464-NA; Avi Goldfarb, "What is Different about Online Advertising?", *Review of Industrial Organization* 44, no. 2 (2014), 120.

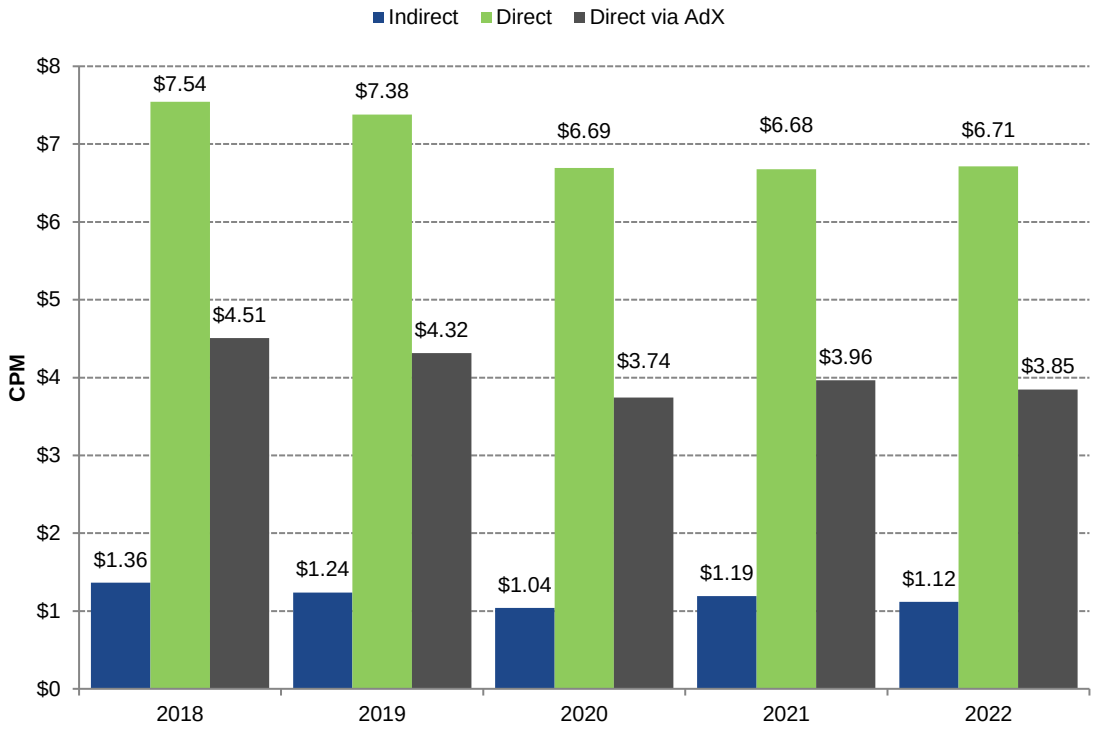
379 For example, AppNexus' response to FCA's request for information in 2017 states that "[o]nline and offline advertising, while complementary, are not substitutes," lists several features that differentiate online from offline advertising, and notes that "[f]rom an advertisers' perspective, offline advertising will not be substitutable for online advertising until offline ads can reasonably replicate these characteristics." MSFT-LIT-0000046646, at -660–662 (10/10/2017) (AppNexus Response to FCA's RFI); *see also* Deposition of Kristy Kozlowski (Comcast), Sep. 6, 2023, 54:12–55:9 ("Q. And I know you mentioned that Mr. Jenckes is on the sell side. But from your buy side perspective, how does the statement that the marketplace is highly competitive compare to Comcast's view on competition in the purchase of advertising?. . . I -- from my perspective as a buyer of media here for Comcast, I think that each media channel, whether it be broadcast, digital, out of home, radio, all plays a slightly different role in our media mix and our ability to deliver sales. They all sort of operate independently, yet synergistically help drive volume to our sales channels and work, you know, together in many ways but might be executed differently. But it really comes down to our ability to deliver our sales goals and what the right mix is and how efficiently we can do that.").

380 *See* Section II.A.2.

381 Advertisers say "diversification [across advertising types] is perceived as essential" and advertisers "won't completely turn a channel off as they want to diversity as much as possible" because they "perceive a diminishing returns if they focus on only a few channels." GOOG-DOJ-AT-0070932, at -947 (03/2020) (A Google "Discovery Campaigns Social

subset of direct transactions sold on AdX ("Direct via AdX"), CPMs are much higher than for indirect transactions.[451]

Figure 32. Average CPM of worldwide impressions on DFP by transaction type (2018–2022)



Source: DRX Internal Stats data (DOJ RFP 57)
Notes: Data contain 2018–2022 observations paid out in CPM. CPM is reported as gross revenue divided by impressions. Original data report reservation types. Impressions are limited to open-web display. Sponsorship and standard reservations as well as fixed CPM, preferred deals and programmatic guaranteed are considered direct sales. Price priority, network, bulk, and bumper reservations as well as open auction, private auction, and first look transactions through AdX are considered indirect sales. "Direct via AdX" are direct transactions sold on AdX. House ads and unknown reservation type are excluded. Transactions with greater than $100 CPM or with $0 revenue are excluded.

IV.C. Publisher ad servers is a relevant product market

(315) Publisher ad servers are software products used by publishers to manage and sell open-web display ad inventory through both direct and indirect sales methods (including RTB transactions).[452] A publisher

[451] *See* Figure 82 in Appendix C.3 for statistics restricted to transactions from US publishers. Using the same data, Figure 83 in Appendix C.3 reports results from regressions of publisher CPMs on indicator variables for indirect, direct via AdX, and direct non-AdX transactions, and publisher fixed effects (which controls for across-publisher variation in average CPMs). The results are consistent with publishers tending to earn significantly more revenue per transaction on direct transactions than indirect transactions.

[452] Publisher ad servers can also serve ads other than web display ads. *See, e.g.*, GOOG-DOJ-13218256, at -256 (10/11/2018) (A Google strategy paper that notes that Google Ad Manager and Ad Manager 360 offer a "full stack (display/video in web/app) solution.").

ad server assists a publisher in using various transaction types to maximize display ad revenue. These transaction types include non-programmatic direct reservations, programmatic direct deals (including programmatic guaranteed and preferred deals), and indirect transactions (including private auctions and open auctions).[453]

(316) To manage and select among these different transaction types in real-time, publisher ad servers allow a publisher to set rules and goals for ads being served, and are sometimes referred to as the "decision engine" for a publisher.[454] They typically also provide other features such as collecting and utilizing targeting information, and tracking ad performance and monetization.[455] Publisher multihoming across multiple publisher ad servers for display advertising is rare, and publishers typically use a single publisher ad server for display ads.[456]

(317) The services provided by a publisher ad server are particularly important for large publishers and those with more complex display advertising needs.[457] For example, this includes publishers who need to meet the pricing and scheduling requirements of direct deals while simultaneously seeking to allocate remaining inventory via RTB in a manner that most effectively monetizes their display inventory.[458] Further, publisher ad servers are useful for large publishers because they can provide the

[453] *See* Deposition of Scott Sheffer (Google), July 20, 2021, 79:23–81:22("a typical publisher has a chunk of advertising inventory that they would like to monetize… The challenge for a publisher is that they have typically a direct sales team, which may sell some of that inventory directly at negotiated rates that they do with an advertiser agency. And then they may have other inventory that a publisher may wish to monetize. What an ad server enables a publisher to do is, subject to the publisher's decisions around pricing and scheduling and budgeting, the ad server enables them to run their monetization business according to the rules and the criteria and the setup that the publisher puts in place with that ad server."). *See* Section II.B.1 for additional discussion of the functions of publisher ad servers and the different categories of advertising that it manages.

[454] *See* GOOG-DOJ-04429792, at -794 (04/2017). *See also* Deposition of Scott Sheffer (Google), July 20, 2021,79:23–81:22 ("What a [publisher] ad server enables a publisher to do is, subject to the publisher's decisions around pricing and scheduling and budgeting, the ad server enables them to run their monetization business according to the rules and the criteria and the setup that the publisher puts in place with that ad server"); Deposition of Max Loubser (Google), April 21, 2021 167:3–167:20, ("Focusing specifically on the reference to decision logic, how did header bidding present a challenge to DFP with respect to decision logic? A… The decision logic typically referes to the process of the DFP ad server selecting which advertisement to deliver to the publisher's web page or other environment. And in order to make a good decision, where a good decision is one that would be optimal for the revenue of the publisher and then, again, as before, the advertiser's interests and the user's interests.").

[455] *See* discussion in Section II.B.1.

[456] *See* discussion in Section III.C, fn. 246.

[457] Eisar Lipkovitz stated in his deposition that the "majority of [DFP customers] were sort of large publishers, large media companies, you know, big names…and, you know, it's a complicated product, right, so if you don't have a reason to use it, you don't have enough people to operate it, you wouldn't." He characterizes AdSense, a publisher-facing ad network, as a "self service, super simple to use" product for "long-tail" publishers that do not have a lot of impressions and are run by a very small number of people. Deposition of Eisar Lipkovitz (Google), March 31, 2021, 80:18–81:14 and 82:25–83:15.

See also GOOG-DOJ-13218256, at -256 (10/11/2018) ("Google currently offers 5 publisher products: 1. Google Ad Manager 360: Full stack (display / video in web / app) solution for large publishers with 3p demand and direct sales 2. Google Ad Manager: Full stack (display / video in web / app) solution for small- and medium sized publishers with 3p demand and direct sales 3. AdSense: Scalable, automated solution for small, web-based publishers without 3p demand or direct sales").

[458] Scott Sheffer, Google's Vice President of Global Partnerships, sell-side monetization stated in his deposition that, "a typical publisher has a chunk of advertising inventory that they would like to monetize… The challenge for a publisher

IV.C.3. A hypothetical monopolist of publisher ad servers would likely charge quality-adjusted prices above competitive levels

(332) A profit-maximizing hypothetical monopolist of publisher ad servers would likely charge (quality-adjusted) prices that significantly exceed competitive levels.[485] Such a hypothetical monopolist likely would do so due to the lack of close alternatives available to open-web publishers, as discussed above. These publishers can be targeted with price increases individually or by offering different versions of the product targeted to different consumer types.[486]

(333) Moreover, as I will detail further in Section V.B, there is direct evidence that Google's publisher ad server product, DFP, possesses significant market power. In that section, I describe Google documents indicating higher DFP fees would increase its profit. I also discuss DFP's deviations from competitive behavior, including actions it took to reduce its quality in order to meaningfully advantage AdX. All of this indicates evidence that Google faces limited constraints on its market power from customer substitution away from DFP.

(334) Hence, publisher ad servers is a relevant product market.

IV.D. Ad exchanges is a relevant product market

(335) Ad exchanges are software products that facilitate the indirect real-time programmatic sale of open-web display ad inventory by connecting publisher ad servers with multiple demand sources, including from DSPs and advertiser ad networks.[487] As I explained in Section II.B.3, ad exchanges allow publishers through their publisher ad servers to access advertiser demand through DSPs and networks via RTB.[488] In this role, ad exchanges also share data with and collect bids from demand partners that participate in the auction.[489]

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[485] A monopolist of publisher ad servers that also owned complementary products might also exercise market power in the publisher ad server market by reducing its quality to increase sales of complementary products (see Section V.B.3.b).

[486] As I discussed in Section II.D, Google offers two versions of DFP (Premium and Small Business) with different fees, and as I discuss in Section V.C.3, there is evidence that Google is able to charge varying prices for DFP Premium to different publishers.

[487] While ad exchanges have begun to facilitate some direct transactions, such as Programmatic Guaranteed and Preferred Deals, the vast majority of transactions on exchanges are indirect, most often filled through RTB (see discussion in fn. 115). As a result, I consider indirect open-web display transactions to be the relevant set of transactions for the ad exchange market. For the purposes of exchange market shares calculations in Section V, I include transactions facilitated through Open Auction, Private Auction, Open Bidding, Header Bidding, and Private Marketplace and exclude direct deals such as Programmatic Guaranteed and Preferred Deals.

[488] GOOG-DOJ-04429792, at -795 (04/2017) (Google presentation, "Sell Side Platform (SSP)/Exchange – service for managing multiple programmatic monetization sources of online display inventory, DSP and ad networks are considered 'Buyers', and publishers and publisher networks are considered 'Sellers'").

[489] As discussed in Section II.B.3, since SSPs and ad exchanges have largely been merged into the same products, I use the term "ad exchanges" to refer to services provided by both SSPs and exchanges.

(347) Though Google introduced Google Ad Manager (GAM) in June 2018 which contains both DFP and AdX,[505] it has subsequently in internal analyses still identified its publisher ad server and ad exchange as separate products.[506] In addition, it prices the publisher ad server (DFP) and ad exchange (AdX) components of GAM separately.[507]

IV.D.3. A hypothetical monopolist of ad exchanges would likely charge quality-adjusted prices above a competitive level

(348) A profit-maximizing hypothetical monopolist of ad exchanges providing real-time bids for open-web display ads would likely charge (quality-adjusted) prices that significantly exceed competitive levels. Within open-web display advertising, the market power of such a hypothetical monopolist primarily arises from the position of ad exchanges in the ad tech stack—as the intermediating layer between publishers and their publishers ad servers, and DSPs and advertiser ad networks used by advertisers and ad agencies—and the difficulties in circumventing this layer, as discussed above.

(349) As discussed earlier, because ad exchanges facilitate transactions between two distinct sets of agents, an exercise of market power requires only that *either* (a) publishers (or firms representing their supply from the perspective of ad exchanges) *or* (b) advertisers (or firms representing their demand from the perspective of ad exchanges) would not substantially substitute away from ad exchanges priced above competitive levels. The evidence provided above indicates that substitution by both advertisers and publishers to alternatives would not be sufficient to defeat an exercise of market power by a hypothetical monopolist, and that publishers and advertisers are willing to bear fees significantly above competitive levels to transact display ads through ad exchanges.

(350) Moreover, as I will discuss in detail in Section V.C.3, there is significant direct evidence that Google has been able to exercise substantial market power in the ad exchange market with its AdX product. For example, AdX's take rate of 20% is significantly higher than the average of its competitors and has been stable for the past decade. In addition, Google has been able to dynamically adjust its reserve prices (i.e., price floors) and use AdX to favor its own products in the ad tech stack even while degrading the quality of AdX by not providing real-time bids into rival publisher ad servers. During that time, a range of out-of-market advertisement options have grown in significance. These

[505] *See* discussion in Section II.C, fn.124.

[506] *See* GOOG-AT-MDL-000992438, at -438 (03/2022), ("We have now retired the DoubleClick brand, but internally, the products are still referred to as DFP and AdX.").

[507] *See* Section II.D. *See also* GOOG-AT-MDL-000992438, at -438 (03/2022) (The Korula Declaration states "Up until at least December 2021, it was possible for a publisher using Google Ad Manager to exclude AdX from the sale process altogether.").

options include "connected" and over-the-top TV services,[508] audio,[509] and social media sites such as TikTok, SnapChat and Facebook.[510] A lack of a price response from AdX, and its ability to degrade the quality of its product without losing substantial share, is consistent with out-of-market options imposing limited constraints on the market power for a hypothetical monopolist of ad exchanges for open-web display.

(351) Hence, ad exchanges is a relevant product market.

IV.E. Advertiser ad networks is a relevant product market

(352) Advertiser ad networks are bidding tools used by advertisers to purchase open-web display inventory.[511] Advertiser ad networks typically allow advertisers to bid on a cost-per-click (CPC) basis rather than a cost-per-impression (CPM) basis, which requires that the network estimate the likelihood of an impression becoming a click, since publishers are typically paid for display inventory

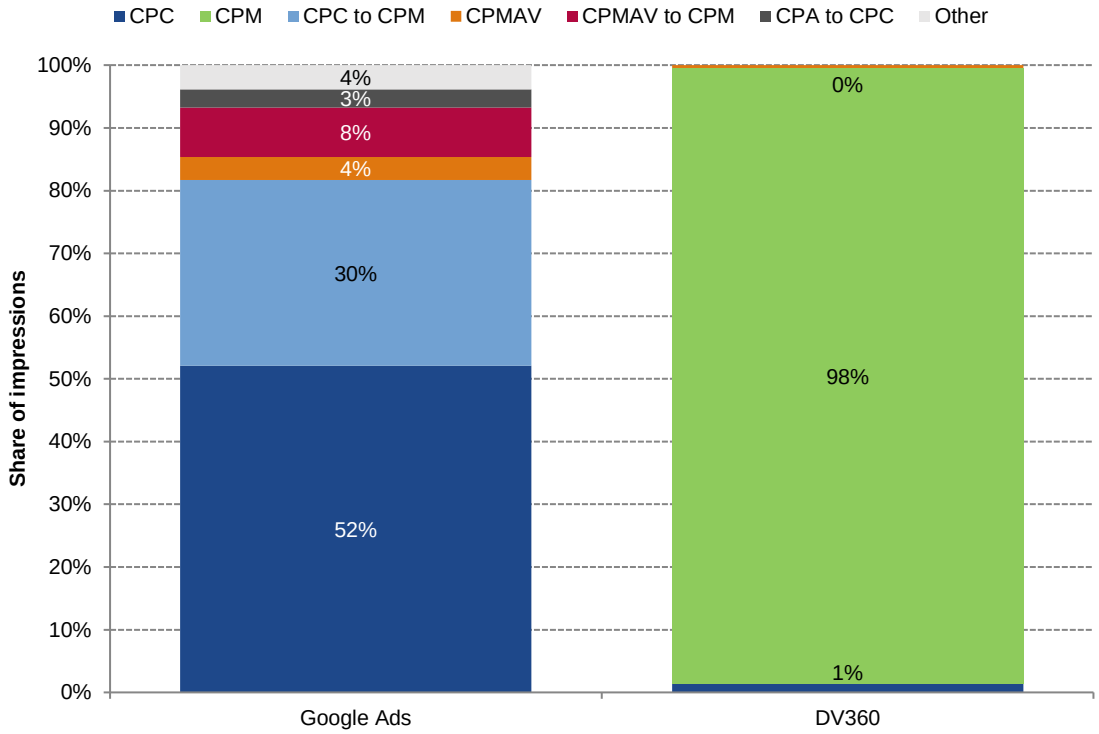
[508] IAB, "IAB internet advertising revenue report: 2018 full year results," PWC and IAB, last modified May 2019, https://www.iab.com/wp-content/uploads/2019/05/Full-Year-2018-IAB-Internet-Advertising-Revenue-Report.pdf. ("As consumers shift away from traditional media, digital leads the way in regaining their attention, first from desktop to mobile devices and more recently to connected TV, audio devices, and digital out of home…"). They echoed the rising significance of TV services for the first half of 2019 in the 2019 first six months results. *See* IAB, "IAB internet advertising revenue report: 2019 first six months results," IAB, October 2019, 5 https://www.iab.com/wp-content/uploads/2019/10/IAB-HY19-Internet-Advertising-Revenue-Report.pdf: "We are firmly in the third revolution of television content… publishers have indicated they are increasingly leveraging OTT to go direct to consumer…As viewers shift their behavior towards CTV, advertisers are following."

[509] IAB, "IAB internet advertising revenue report: 2019 first six months results," IAB, October 2019, 18 https://www.iab.com/wp-content/uploads/2019/10/IAB-HY19-Internet-Advertising-Revenue-Report.pdf: digital audio advertising revenue reached $1.2 billion in HY 2019, "a 30.1% increase over HY 2018 revenue."

[510] IAB, "IAB internet advertising revenue report: 2019 first six months results," IAB, October 2019, 17 https://www.iab.com/wp-content/uploads/2019/10/IAB-HY19-Internet-Advertising-Revenue-Report.pdf: social media advertising total revenue grew 30.6% between FY 2017 and 2018. In IAB, "IAB internet advertising revenue report: 2019 first six months results," IAB, October 2019, 21: "Social media advertising continues its ascent with revenues growing 25.7% in HY 2019 compared to HY 2018."

[511] *See* discussion of ad networks in Section II.B. An advertiser ad network may be bundled with a publisher-facing product, with the bundle being labeled as an "ad network" (for example, Google Ads and Google AdSense are advertiser-facing and publisher-facing components of Google's display ad network).

Figure 34. Google Ads and DV360 indirect open-web display impressions by cost type (2022)



Source: Google XP data (DOJ RFP 7), Google DV360 data (DOJ RFP 7).
Note: Worldwide share of billable impressions in 2022. Limited to indirect open-web display impressions. I supplement Google XP data with Google DV360 data as cost type information for DV360 is often missing in the Google XP data. Abbreviations: CPC (cost-per-click), CPM (cost-per-mille impressions), CPMAV (cost-per-mille active view), CPV (cost-per-view), CPA (cost-per-action), CPE (cost-per-engagement). *See* Google, "Glossary," Google Ads Help, https://support.google.com/google-ads/topic/3121777?hl=en. "Other" includes CPA-to-CPM, CPV, CPA, CPE, and CPE-to-CPM transaction types.

(366) Lastly, pricing levels between advertiser ad networks and DSPs can differ. For example, a Google document notes: "Why do Google Ads and Display and Video 360 charge different amounts? Google Ads is a broad offering used by a range of advertisers across a diverse base from small businesses to larger brands. DV360 is specifically used by large global advertisers and their agencies to execute complex marketing campaigns, and as such is priced as an enterprise-level solution."[531]

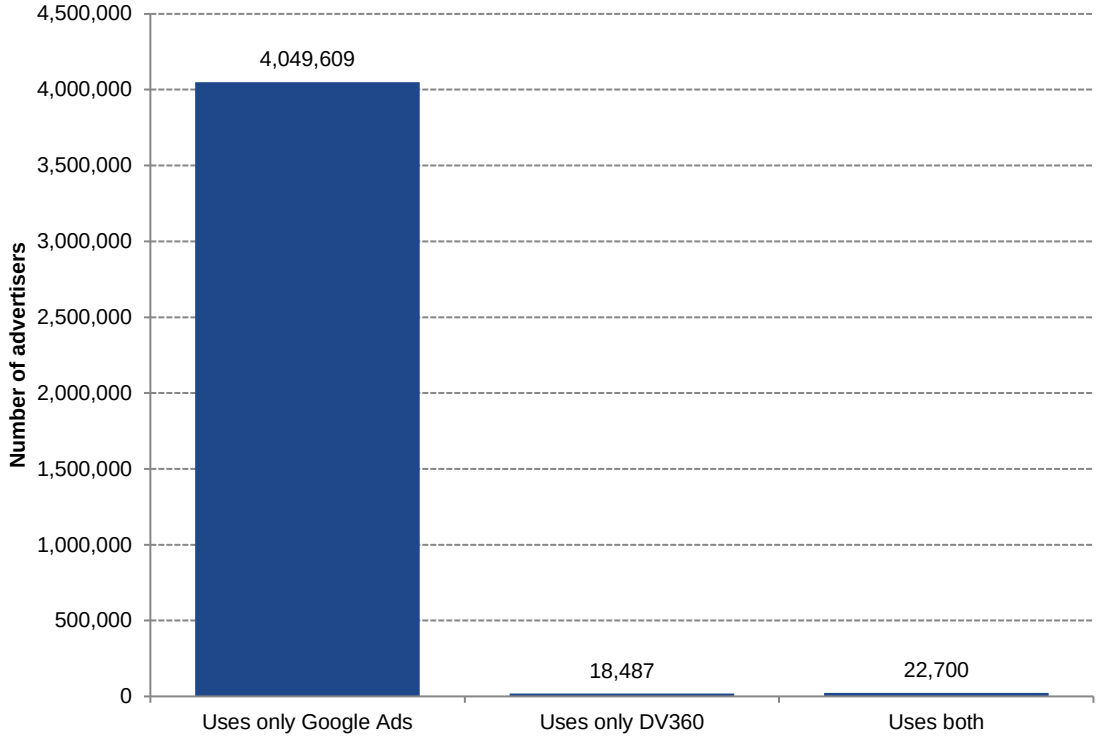
(367) Consistent with the above differences between advertiser ad networks from DSPs, the set of advertisers that use these distinct products differ.

(368) Using Google's data, I analyze the set of advertisers that use Google Ads and/or DV360.

(369) As shown in Figure 35 below, among the advertisers that use either product, the vast majority (nearly 99%) use only Google Ads.

[531] GOOG-DOJ-AT-00038180, at -190 (2020) (Google "Comms Doc"). *See also* Section II.C.4.

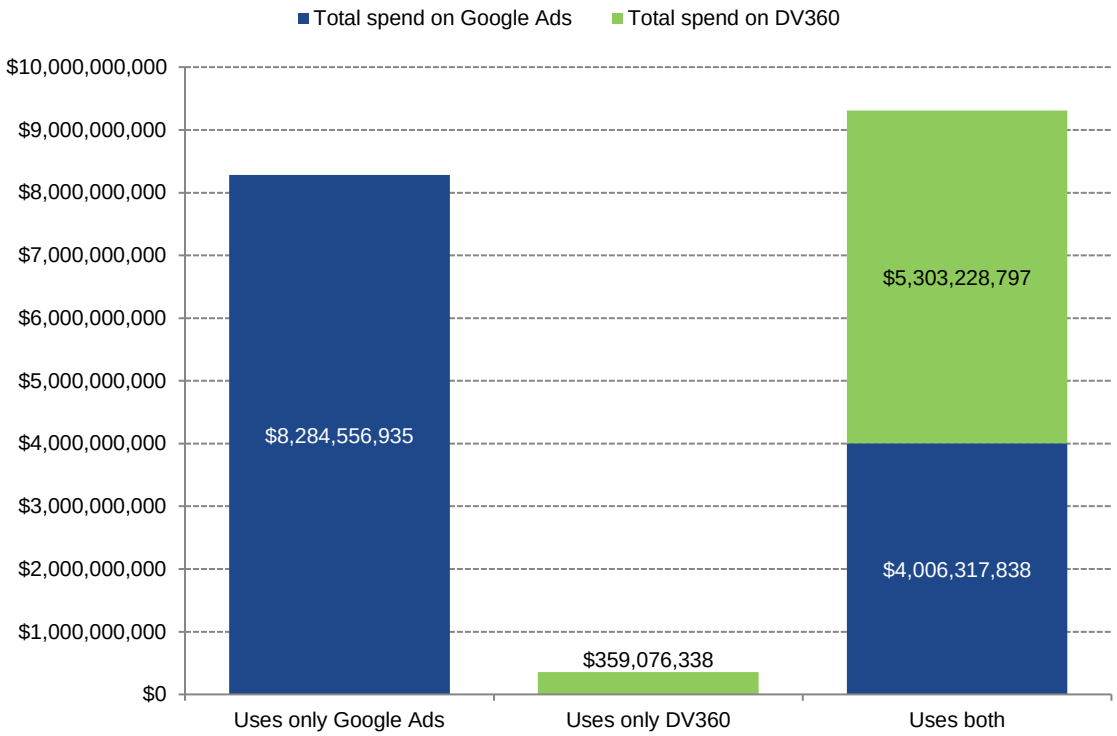
Figure 35. Number of advertisers who used only Google Ads, only DV360, or both (2022)



Source: Google XP data (DOJ RFP 7)
Notes: Figure displays the number of advertisers with positive spending on Google Ads, DV360, or both in 2022.YouTube and mobile app ads, and Programmatic Guarantee and Preferred Deal transactions are excluded. 0.4% of spending on Google Ads is attributed to observations with missing advertiser information, and are excluded.

(370) Despite the large differences in numbers within each group, the total spend represented by the advertisers that use Google Ads and DV360 compared to those that only use Google Ads is roughly comparable, as shown in Figure 36.

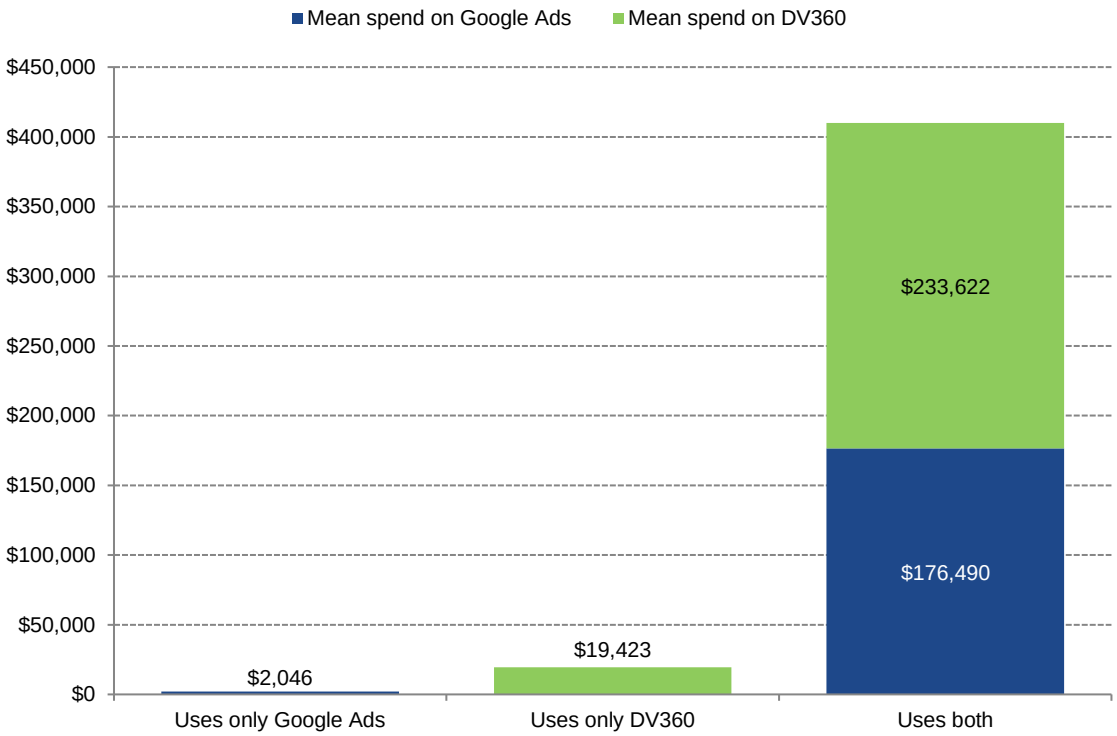
Figure 36. Total advertiser spend on indirect open-web display advertising within Google Ads and DV360 (2022)



Source: Google XP data (DOJ RFP 7)
Notes: Figure displays indirect open-web display spending from advertisers with positive spending on Google Ads, DV360, or both in 2022. YouTube and mobile app ads, and Programmatic Guarantee and Preferred Deal transactions are excluded. 0.4% of spending on Google Ads is attributed to observations with missing advertiser information, and are excluded.

(371) Hence, spending per advertiser by advertisers that use Google Ads is much lower than spending per advertiser by advertisers who use DV360, either instead of or in addition to Google Ads. Figure 37 below shows the average worldwide advertiser spend in 2022 on indirect open-web display advertisements. The figure shows that advertisers who use Google Ads have significantly lower spend than advertisers who use DV360 or a combination of Google Ads and DV360. Note that for those advertisers who use both Google Ads and DV360, a meaningful amount of their spend is through Google Ads.

Figure 37. Average worldwide advertiser spend on indirect open-web display advertising within Google Ads and DV360 (2022)



Source: Google XP data (DOJ RFP 7)
Notes: Figure displays average indirect open-web display spending among advertisers with positive spending on Google Ads, DV360, or both in 2022. YouTube and mobile app ads, and Programmatic Guarantee and Preferred Deal transactions are excluded. The median dollar amounts transacted by advertisers who use only Google Ads, use only DV360, and use both are: $33, $552, and $16,336, respectively. I limit the advertisers in each category to those with positive spend on Google Ads, DV360, or both in 2022, respectively. 0.4% of spending on Google Ads is attributed to observations with missing advertiser information, and are excluded.

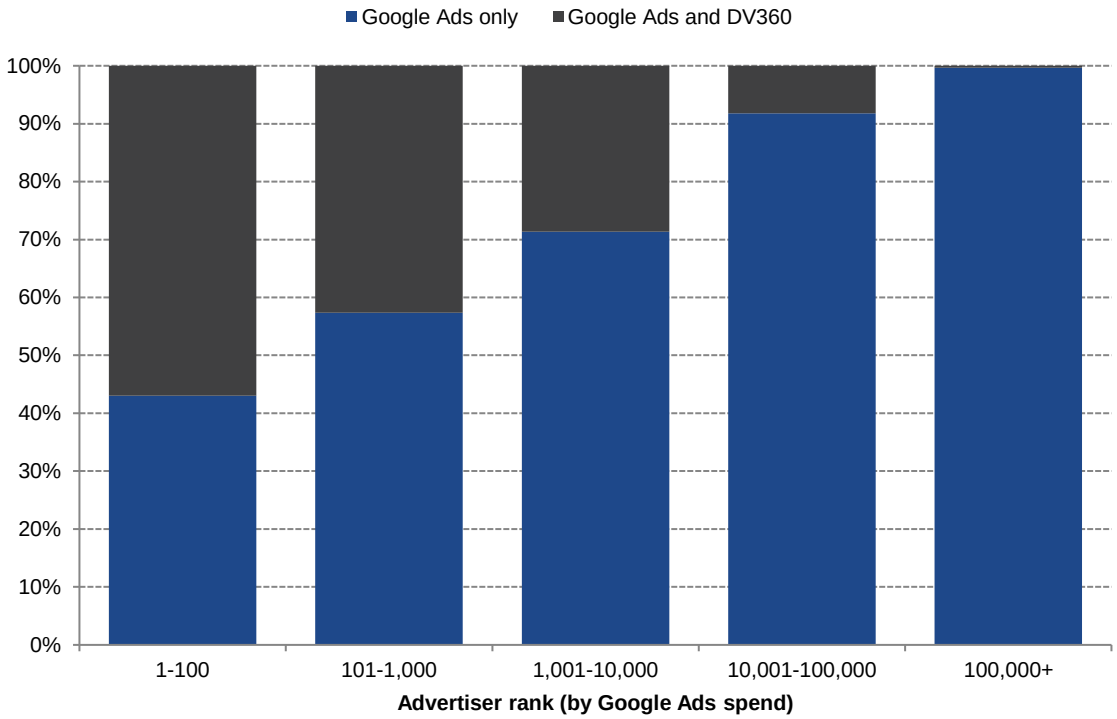
(372) Small advertisers tend to use advertiser ad networks exclusively, whereas advertising agencies and other large advertisers are more likely to (also) use DSPs.[532] Figure 38 shows that among Google Ads advertisers, the smallest advertisers tend to use Google Ads exclusively, whereas as the advertiser size increases, so does the tendency to use DV360 in addition to Google Ads.[533] The figure ranks advertisers based on their total spend on Google Ads in 2022 (i.e., advertisers ranked 1–100 are the 100 advertisers with the most spending on Google Ads in 2022). While more than half of the top 100

[532] A very small advertiser would "have no reason to" use a DSP and that this trend is "not specific to Google," but holds "through and across an entire set of DSPs." Deposition of Eisar Lipkovitz (Google), March 31, 2021, 93:19–94:3 Another Google document specifies that DV360's customers are the "Top 1500 Advertisers globally, Big 6, agencies, DCMPs" while AdWords serves the "Remaining 2M+ customers." GOOG-DOJ-14053654, at -660 (2017) (Google GDN and DBM performance deck).

[533] The top 100 advertisers accounted for 14% of total indirect open-web display spend on Google Ads. Advertisers ranked 101-1,000 accounted for 25% of spend, advertisers ranked 1,001-10,000 accounted for 33% of spend, advertisers ranked 10,001-100,000 accounted for 19% of spend. Over 3.9 million advertisers were not ranked among the top 100,000 Google Ads advertisers, and these advertisers made up only 9% of Google Ads indirect open-web display spend in 2022.

advertisers on Google Ads also used DV360, nearly all of the advertisers outside the top 100,000 had no spend on DV360 in 2022.

Figure 38. Use of Google Ads and DV360 across Google Ads advertisers, by spending rank (2022)



Source: Google XP data (DOJ RFP 7)
Notes: Figure depicts the (unweighted) share of advertisers using Google Ads only or Google Ads and DV360 in 2022, among groups of advertisers ranked by amount of indirect open-web display spending on Google Ads in 2022. Limited to advertisers with any indirect open-web display spend on Google Ads in 2022. A total of 4,072,309 advertisers are included in the analysis.

(373) A slide from a 2019 internal Google presentation, shown in Figure 39 below, provides further support for the tendency of larger advertisers ("Head" in the figure) to use both Google Ads and DV360, and smaller advertisers ("Tail") to single home on Google Ads.

access to demand from small advertisers that, in the words of a former Google executive, "have no reason" to use a DSP.[536]

(377) As discussed above, analysis of Google data indicates that in 2022, over 99% of advertisers who used Google Ads to purchase indirect open-web display ad inventory did not also use DV360. During that period, these advertisers comprised roughly 47% of all spend on Google Ads.[537] Forgoing advertiser demand coming from advertiser ad networks, such as Google Ads, publishers thus stand to lose access to a substantial unique set of advertising demand that is not accessible via DSPs. As I discuss further in Section VII.B, there is significant evidence that an important reason that publishers used Google's sell-side products DFP and AdX is to access Google Ads' demand.

(378) Last, as discussed in Section IV.B.4, direct deals are also not a substitute for indirect demand provided by advertiser ad networks for publishers.[538] For example, a 2011 Google document noted that small publishers "can't afford to maintain their own sales force and they don't have inventory to be of interest to large advertisers" and "large publishers have inventory that is of too low value to merit direct selling."[539]

IV.E.2. Industry participants recognize that ad networks are distinct products

(379) Industry participants have recognized the distinctiveness of advertiser ad networks, indicating that substitution to DSPs and other ad tech products would likely be limited in response to an exercise of market power by a hypothetical monopolist of competitively-priced advertiser ad networks. For instance,

- Google documents recognize that Google Ads and DV360 serve different sets of advertising customers[540] and that Google Ads customers have fundamentally different needs than DV360

[536] Deposition of Eisar Lipkovitz (Google), March 31, 2021, 93:19–94:17 ("Q. Would a very small advertiser ever use a DSP?. . . A. In my opinion, they have no reason to. And, you know, like many of these other companies, and probably including Google, won't even return their phone call, right?. . . If you don't have reason to use it, if you don't use enough volume, it doesn't make sense. I don't think that – that's not specific to Google."); A 2017 Google deck notes that DV360 customers include the "Top 1500 Advertisers globally, Big 6 agencies, DCMPs," the "Remaining 2M+ customers" use Google Ads. If publishers substituted selling inventory through Google Ads to selling inventory through DV360, they would forego access to demand from those 2M+ customers. GOOG-DOJ-14053654, at -660 (2017) (Google GDN + DBM Performance deck).

[537] Google XP data (DOJ RFP 7).

[538] John Dederick, Executive Vice President at The Trade Desk, testified that compared to publishers who sell inventory only through direct deals, publishers who sell inventory through ad networks get "more of an opportunity to optimize yield which really means … use all of the different supply you have access to to drive up costs and to sell through as much of your inventory as possible." Deposition of John Dederick (The Trade Desk), July 28, 2023, 156:15–157:6; GOOG-AT-MDL-004216796, at -802 (Google Display Advertising Ecosystem document).

[539] GOOG-AT-MDL-004216796, at -802 (Google Display Advertising Ecosystem document).

[540] A 2019 internal Google memo contains an FAQ section that says Google Ads and DV360 "serve distinctly different customer sets." GOOG-DOJ-02858797, at -807 (09/2019) ("Q: Are there any concerns about using Google Ads & DV360 at the same time? A: The goal for our two platforms is to serve distinctly different customer sets and, serve our individual customer sets with full funnel solutions that meet their needs.") The same memo describes DV360 as building

inventory. Indeed, a 2017 Google presentation described Google Ads as providing "[u]nique demand that adds auction pressure to drive greater CPMs, fill and overall yield."[548]

IV.E.3. A hypothetical monopolist of advertiser ad networks would likely charge quality-adjusted prices above competitive levels

(381) A profit-maximizing hypothetical monopolist of advertiser ad networks would likely charge (quality-adjusted) prices that significantly exceed competitive levels. The market power of such a hypothetical monopolist primarily arises from the uniqueness of advertiser ad networks as a buy-side solution for small advertisers, and the publisher demand for access to advertiser ad networks that arises out of the unique demand accessible through them.

(382) As discussed earlier, because advertiser ad networks facilitate transactions between two distinct sets of agents, an exercise of market power requires only that either (a) publishers (or firms representing their supply from the perspective of advertiser ad networks) or (b) advertisers (or firms representing their demand from the perspective of advertiser ad networks) would not substantially substitute away from advertiser ad networks priced above competitive levels. The evidence provided above indicates that substitution by both advertisers and publishers to alternatives would not be sufficient to defeat an exercise of market power by a hypothetical monopolist, and that publishers and advertisers are willing to bear fees significantly above competitive levels to transact display ads through advertiser ad networks.

(383) Moreover, as I will discuss in detail in Section V.D.3, there is direct evidence that Google has been able to exercise substantial market power in the advertiser ad network market with its Google Ads product. For over a decade, Google Ads has been able to charge fees above competitive levels and meaningfully affect publisher payouts by changing its bidding strategies into AdX. Moreover, Google has imposed constraints on Google Ads' ability to bid into third-party ad exchanges to favor AdX, degrading the quality of Google Ads in the process. Google Ads' ability to engage in such behavior strongly indicates that there are limited constraints on the market power a hypothetical monopolist of advertiser ad networks could exercise.

(384) Hence, advertiser ad networks is a relevant product market.

[548] GOOG-DOJ-04429792, at -804 (04/2017) ("Monetization Cheatsheet").

IV.F. Relevant geographic markets for publisher ad servers, ad exchanges, and advertiser ad networks

(385) Geographic market definition assists with evaluating monopolization claims by focusing attention on, and explicitly delineating, specific geographic areas where competitive and customer harm can occur.

(386) The focus of this matter is on third-party ad tech products that can be used to transact open-web display advertising. The customers of these third-party ad tech products are open-web publishers and advertisers, and the suppliers of these products include software companies such as Google and its competitors in the relevant product markets.

(387) A relevant geographic market can be based on the locations of customers (buyers or sellers of open-web display advertising). In this report, I focus on geographic market definition based on customer location—i.e., where open-web publishers and advertisers are located—and do not place restrictions on the location of suppliers.[549]

(388) Below, I describe why worldwide (excluding a limited number of regions) is a relevant geographic market for publisher ad servers, ad exchanges, and advertiser ad networks. Customers of ad tech products are located around the world, and transactions between open-web publishers and advertiers occur across country boundaries. Suppliers of ad tech products also have a global presence, and enjoy indirect network effects and scale benefits that are not limited to narrow geographic regions. Moreover, the effects of Google's conduct in the ad tech stack, and restrictions it has placed on the use of its products in the relevant product markets, have been imposed in countries around the world, and are not limited to customers within any single country.

(389) The ad tech industry and scope of Google's conduct is thus global. Although there may be some differences in competitive conditions within narrower geographic regions, there are compelling benefits to examining the whole world when examining the competitive significance and effects of Google's conduct within the relevant product markets.

(390) As a general matter, however, there may be multiple relevant geographic markets that are useful for the evaluation of competitive effects.[550] Below, I also describe why the United States is also a relevant geographic market for these product markets.

[549] HMG § 4.2 ("The arena of competition […] may be geographically bounded if geography limits some customers' willingness or ability to substitute to some products, or some suppliers' willingness or ability to serve some customers. Both supplier and customer locations can affect this."). The physical location of suppliers is often not relevant for market definition purposes for software products, such as the ones at issue in this case, where customers do not obtain the product at a supplier's location. *See* HMG § 4.2.1 ("Geographic markets based on the locations of suppliers encompass the region from which sales are made. Geographic markets of this type often apply when customers receive goods or services at suppliers' locations.").

[550] HMG § 4.1.1 ("the hypothetical monopolist test ensures that markets are not defined too narrowly, but it does not lead to

(391) In both cases, geographic restrictions are based on the location of customers (advertisers and open-web publishers) that use publisher ad servers, ad exchanges, and advertiser ad networks; and are not based on the location of suppliers (who may be located worldwide).

IV.F.1. A relevant geographic market for all product markets is worldwide (with certain exceptions)

(392) Worldwide, excluding certain countries and regions, is a relevant geographic market, and is appropriate for evaluating Google's market power in each of the relevant product markets and the competitive effects of its conduct. This is for three main reasons.

(393) First, advertisers and open-web publishers that are customers of ad tech products are located in countries located around the world and transact across country and region boundaries. Spending on open-web display is global, with publishers using ad tech products to sell open-web display inventory to advertisers around the world, and advertisers using ad tech products to purchase open-web display inventory from publishers around the world.[551]

(394) For example, Google often reports performance metrics surrounding its ad tech products across three regions—Americas, EMEA (Europe, Middle East, and Africa), and APAC (Asia-Pacific). Figure 40 from a 2018 Google presentation illustrates that although advertiser spending from a region often returns to the sell-side in that region (for example, this is the case for 72% of the spend originating in the Americas), there is a significant share of spending that is spent on the sell-side in other regions.

a single relevant market. The Agencies may evaluate a merger in any relevant market satisfying the test, guided by the overarching principle that the purpose of defining the market and measuring market shares is to illuminate the evaluation of competitive effects.").

[551] GOOG-DOJ-11890293, (01/2020) (Google "Display Highlights: GDA + DV360" deck); GOOG-DOJ-14436571, (06/2019) (Google "Business Forecast Meeting: Sellside" deck); GOOG-DOJ-AT-01592535, at -553 (2018) ("Welcome to the Sell-Side World!"). Criteo also has reported revenues separately by Americas, EMEA, and APAC regions. *See* CRI-00000003, at -011 (12/2018).

Figure 40. Google DVAA customer spending is global

Source: GOOG-DOJ-AT-01592535, at -553 (2018 presentation, "Welcome to the Sell-Side World!")

(395) Furthermore, as I show in the next Section, Google's market power in the relevant product markets is not limited to a single country or region.

(396) Second, aspects of "supply-side" competition among ad tech providers is global. The major competitors in each of the relevant product markets have a presence in multiple geographic regions.[552] Moreover, ad tech products benefit from scale effects—arising from both indirect network effects (as advertiser and publisher customers transact with one another across geographic regions) and data—that are not necessarily restricted to country-specific boundaries.[553]

(397) Third, Google's conduct that I evaluate in this report is not limited to the boundaries of any one country. Google has imposed restrictions on the use of its Google Ads, AdX, and DFP products by open-web publishers and advertisers located worldwide. Hence, the competitive effects of Google's

[552] Data produced by ad tech parties also indicate a significance share of open-web display impressions from publishers located outside of the US. For ad exchanges, over 45% of indirect open-web display impressions transacted by each of AdX, [redacted], [redacted], [redacted] and [redacted] in 2022 are from non-US publishers (*see* Figure 84 in Appendix C.4). For publisher ad servers, over 65% of open-web display impressions served by each of [redacted] and [redacted] in 2022 are from non-US publishers (*see* Figure 85 in Appendix C.4).

Moreover, for ad exchanges, over 55% of the impressions transacted by each of [redacted], [redacted], [redacted] and [redacted] were viewed by non-US users (*see* Figure 84 in Appendix C.4).

[553] For example, an ad tech product with a worldwide presence can collect data and track users who visit websites operated by publishers that are located in different countries.

conduct extend beyond any individual country's borders, and a worldwide geographic market accounts for this.

(398) To help productively focus attention on areas where Google possesses and exercises market power and where competitive effects of its conduct are most likely to occur, I exclude from the worldwide geographic market the following regions:[554]

- **People's Republic of China**: Chinese regulations that prevent Chinese users from accessing foreign websites and restrict the content that advertisers are able to show have limited the penetration of ad tech products from non-Chinese firms.[555] Google's open-web display presence is limited in China relative to its presence in other countries and regions.[556] Combined with Google's ability to engage in price discrimination, this indicates that a hypothetical monopolist would not likely be constrained in its ability to charge prices above competitive levels in regions outside of China by substitution patterns by advertiser and publisher customers within China.
- **Countries and regions where Google is restricted from operating due to US sanctions**: The US government places restrictions on working with customers in countries and regions that are subject to US sanctions.[557] These restricted areas include Iran, North Korea, Syria, Cuba, Crimea, Donetsk People's Republic (DNR), and Luhansk People's Republic (LNR).[558]

[554] As I discuss below with regard to a US geographic market, a hypothetical monopolist of any of the relevant product markets would likely be able to engage in discrimination based on customer locations. Hence, even if I were to include these regions within the worldwide geographic market, it would not change my conclusions regarding a hypothetical monopolist's likelihood of profitably charging quality-adjusted prices above competitive levels for customers located elsewhere. Even so, restricting attention to a narrower geographic market has the advantage of not overstating the competitive significance of potential alternatives located in these excluded regions.

[555] Specifically, the Chinese government restricts Chinese users from accessing non-Chinese web domains (i.e., those domains that do not end in ".cn"). As a result, many websites have to create Chinese-specific variants of their sites and advertising content on those sites must link to and use creatives from Chinese domains (GOOG-AT-MDL-011619755, at -755 (05/14/2021) "With upcoming Chinese regulation, all domains served from within Mainland China must be China-specific…If we want to continue to support Web Display in China, we will need to invest in migrating domains, and publishers will need to retag"). *See also* ADOBE-CID30473-0000070266, at -268 (11/22/2019) ("[The Trade Desk is] struggling with the same challenges every other non-Chinese advertising platform faces: approval of every ad by Chinese sensors…, difficulty sharing data, and that brands have a different site behind the Chinese Firewall").

[556] GOOG-DOJ-03597654, at -660 (2019) ("Global Ads Financials Fact Pack Q3 2019", indicating 1.8% of Google Ads revenue in 2018 from China and 46% from US). GOOG-DOJ-14436571, at -597 (06/24/2019) ("Business Forecast Meeting Sell-Side" presentation, indicating LPS within China revenue representing 0.2% of total revenue within display for "Google Network Web" and LPS within US representing 16%.).

[557] Google, "Understanding Google Ads country restrictions," Google Ads Help, https://support.google.com/google-ads/answer/6163740?hl=en.

[558] Google, "Understanding AdSense country restrictions," Google AdSense Help, https://support.google.com/adsense/answer/6167308?hl=en; Google, "Understanding Google Ads country restrictions," Google Ads Help, https://support.google.com/google-ads/answer/6163740?hl=en; Google, "Google Publisher Policies," Google Ad Manager Help, https://support.google.com/admanager/answer/10502938?hl=en.

(399) The exclusion of customers within these excluded regions reflects a very small number of total open-web display transactions and, as a result, their inclusion or exclusion does not affect my opinions.[559]

(400) For the rest of this report, when I use "worldwide," I am referring to all countries and regions excluding those described above.

IV.F.2. A relevant geographic market for all product markets is the United States

(401) The United States is also a relevant geographic market for each of the relevant product markets for examining Google's market power and the competitive effects of its conduct. This is for two main reasons.

(402) First, a hypothetical monopolist of all publisher ad servers, ad exchanges, or advertiser ad networks available to customers (advertisers or open-web publishers) located in the United States would likely profitably exercise market power over those customers, and would not likely be constrained by the prices charged by ad tech products available only to open-web publishers and advertisers that are both located outside of the United States. This is because there is significant evidence that a hypothetical monopolist of each of the relevant product markets would be able to engage in price discrimination based on the location of its customers.[560] Indeed, Google has demonstrated its ability to do so in the relevant product markets:

- For publisher ad servers, Google cites different prices to publishers located in different countries, including the US.[561]
- For ad exchanges and advertiser ad networks, Google is able to dynamically adjust the fee on its AdX and Google Ads products across publishers, and even in some cases within publisher across impressions.[562]

[559] Among all exchanges for which I have data, only AdX and AdSense Backfill provide country- or region-level granularity for publisher or advertiser locations that allows for these restrictions. In 2022, less than 0.1% of AdX open-web display impressions were from publishers reported to be within these excluded regions (Google AdX data (DOJ RFP 53)). For AdSense Backfill, roughly 0.1% of 2022 open-web display impressions were from publishers within these excluded regions (Google AdSense Backfill (DOJ RFP 7)). For DFP, in 2022 less than 0.1% of open-web display transactions were from publishers reported to be located within these excluded regions (Google DRX Internal Stats data). For Google Ads, in 2022, there were no open-web display impressions from advertisers reported to be located within these restricted regions (Google Ads aggregate data (DOJ RFP 54)).

[560] HMG § 4.2.2 ("When the hypothetical monopolist could discriminate based on customer location, the Agencies may define geographic markets based on the locations of targeted customers.").

[561] *See, e.g.*, "Google Responses to DOJ Ad-Tech Data Follow-Up Questions (July 10, 2020)"; "Appendix A – Corrected sell-side rate card – HIGHLY CONFIDENTIAL.xlsx." *See* Section II.D for a discussion of fees in the ad tech stack.

[562] For AdX, *see* GOOG-AT-MDL-006217592, at -593, (Google's response to the European Commission's RFI 10,"Dynamic Revenue Share provided the flexibility for publishers to accept a lower revenue share in some auctions, if other auctions transact at a correspondingly higher revenue share.") and GOOG-AT-MDL-009045058, at -063 (08/04/2021) (A document by AdX's Rita Ren which records that: "DRS under first-price was implemented and experimented with during 2020Q3-Q4. The experiment result showed ~$100M ARR"). For Google Ads, *see*: GOOG-

(403) Google's ability to engage in price discrimination and charge different prices to customers without being constrained by customer substitution implies that a hypothetical monopolist could also engage in a targeted exercise of market power over customers within a particular geographic region.

(404) Hence, a hypothetical monopolist of all products within a relevant product market would likely be able to exercise market power over US customers—and in particular, US open-web publishers—without being constrained by the prices charged for ad tech products only available to customers located outside of the United States.

(405) Second, the competitive effects of Google's conduct are likely to be particularly meaningful within the United States. Although (as noted above) Google often reports display advertising metrics across three broad geographic regions (Americas, EMEA, APAC), Google also often reports metrics at the US level as well.[563] There is evidence that the United States represents a meaningful share of Google's revenues from web display advertising.[564] For example, in 2022, 31% of impressions and 45% of spend from open-web display indirect transactions on AdX originated from publishers located in the United States.[565] Similarly, in 2022, advertisers located in the United States accounted for 35% of impressions and 58% of spend from open-web display indirect transactions on DV360.[566] The US also represents a large share of open-web display impressions for many of the major competitors in the relevant product markets.[567]

AT-MDL-006218271, at -284–285 describing Project Bernanke, which varied the take rate targeted by Google Ads across impressions and publishers ("Under the initial version of Bernanke, Google Ads targeted an average take rate on a per publisher basis. Under Global Bernanke, launched in 2015, Google Ads targeted an average take rate across all publishers, but allowed the target take rate to vary to an extent for individual publishers."; "Google Ads DRS [a predecessor of Project Bernanke] was launched in January 2013 to allow Google Ads to dynamically adjust the take rate it targetd, depending on the competitiveness of the AdX auction."). *See also* GOOG-DOJ-AT-02471194, (07/26/2015) ("Global Bernanke is an extension of project Bernanke in which GDN retains a 15% margin on AdX as a whole, while deviating from 15% on individual publishers."). *See also* discussion of dynamic reserve price optimization (RPO) for AdX in Section V.C.3.

563 *See, e.g.*, GOOG-DOJ-03597654, at -664 (2019) (Global Ads Financial Fact Pack, Q3 2019), GOOG-DOJ-AT-00288371, at -373 (2020) (Global Ads Financials Fact Pack, Q2 2020), GOOG-DOJ-14436571, at -597 (06/2019) (Business Forecast Meeting, Sell-Side); *see also* GOOG-DOJ-04407255, at tab ">>>Desktop Display Ads" (Industry Metrics – Advertising Fact Pack, September 2012, at tab ">>>Desktop Display Ads," which breaks out "Desktop Display Ad spend" for the United States).

564 *See also* GOOG-DOJ-04407244, at -664 (2019) ("Industry Metrics - Advertising Fact Pack, Global Business Strategy, September 2012," From 2008-2012, the US comprised the largest ad spend on Google's desktop display advertising of any country listed); GOOG-DOJ-03597654, at -664 (2019) ("Global Ads Financials Fact Pack Q3 2019," US representing 41.8% of Google Ads global display revenue and the largest of any country or region listed); GOOG-AT-MDL-008574604, at -612 and -620 (01/2021) (Google GDA Overview deck, January 2021,"Regionally we see the majority of revenue in the Americas, with US contributing 44% of revenue." US and Canada contributes more to revenue from display campaigns than any other region.); GOOG-DOJ-14436571, at -597 (06/24/2019) (Google Business Forecast Meeting deck) (In 2019, over half of all sell-side revenue from Google's LPS publishers was from US inventory).

565 Google AdX data (DOJ RFP 53).

566 Google DV360 data (DOJ RFP 7).

567 For ad exchanges, over 15% of 2022 indirect open-web display impressions transacted by each of [redacted], and [redacted] are from US publishers (*see* Figure 84 in Appendix C.4). For publisher ad servers, over 20% of 2022 open-web display impressions served by each of [redacted], and [redacted] are from US publishers (see

(406) For these reasons, the US is also a relevant geographic market for the purposes of analyzing Google's market power and the competitive effects of its conduct.

Figure 85 in Appendix C.4).

aggregation, however, includes transactions of non-open-web display ads, such as in-app ads sold through AdX and display and instream video ads sold through connected TV.[590]

(418) Dr. Respess calculates that Google's operating profit in the DVAA product area (excluding AdMob) increased from $312 million in 2020 to $1.185 billion in 2022.[591] Dr. Respess's calculations also show negative accounting profits from 2015–2017. As a general matter, negative accounting profit (which are not based on economic opportunity costs) does not rule out the possession of substantial market power. For example, firms with substantial market power may invest profits today in order to entrench their market power and recover greater returns in the future.[592]

(419) Given the general difficulties in comparing economic profits and accounting profits discussed above, and the challenges with mapping Google's profits to the products contained in the relevant markets at issue in this matter, I do not rely on measures of accounting profit and instead rely on other indirect and direct evidence to evaluate Google's market power in the relevant markets.

V.A. Sources of Google's market power over its ad tech products

(420) Because each of the relevant markets that I evaluate in this report are intertwined, and Google's market power in the relevant markets in part flows from Google's assets that lie both within and outside these markets, I begin by discussing key sources of Google's market power across the ad tech stack. I then discuss common economic factors that increase barriers to entry in each of the relevant product markets.

V.A.1. Google's key strategic assets

(421) Google's substantial market power for its ad tech products derives from several key strategic assets that Google has leveraged within the ad tech stack. The presence of indirect network effects has amplified the importance of these assets.

AwBid, the other three sellside P&Ls, all sell some open-web display ads, in addition to other ad formats like app, instream video, and display ads on platforms like connected TV and video game consoles.)".

590 *See* Respess Report, Section IX.B. As I note in Section II.A, connected TV refers to "[v]ideo content consumed on a TV screen, delivered via an internet connection," such as TV viewed via a streaming service.

591 *See* Respess Report, Figure 30. I understand that Dr. Respess has noted in his report that Google instituted an accounting change for its DVAA segment in 2021, implying that DVAA profitability calculated before and after 2020 may not be directly comparable. *See* Respess Report, Section IX.A and IX.B ("Starting in 2021 (but recast back to 2020), Google began presenting individual ad tech stack product P&Ls in a 'mutually exclusive, collectively exhaustive' view ("MECE")…Figure 27 shows that because Google allocates costs differently in each of the three types of P&Ls, the three types are not comparable on a side-by-side basis over time…The buyside, sellside, and MECE P&Ls are three different ways of looking at the profits and profitability of products in Google's ad stack.").

592 *See* Section VII.A.

(422) First, Google offers unique access to O&O ad inventory including Google search and YouTube through its bidding tools. Google's search ads, accessible through Google Ads, were already valuable digital ad inventory when it completed its acquisition of DoubleClick in 2008 and continue to be valuable today.[593] YouTube video ads, available through Google Ads and DV360, comprise a meaningful share of online video advertising spending.[594] Industry participants have recognized the value of access to Google's O&O inventory for driving usage of Google's ad tech products over those offered by rivals.[595] These O&O properties are an important source of Google's market power in ad tech because they serve to draw advertisers into using Google's ad tech products.[596]

(423) Second, Google benefits from its Google Ads advertisers, which Google initially gained and likely continues to maintain because of its large presence in search advertising and its control over unique small publisher inventory with AdSense.[597] Google has ensured that, since AdX's launch, AdX has

[593] As of 2008, Search generated substantially more revenue than Google's display business. GOOG-AT-MDL-007402944, at -955 (2009). As of 2020, Search continues to generate substantially more revenue than Google's display business.GOOG-AT-MDL-000969513, at -514–515 (11/2020).

[594] YouTube video ads used to be accessible through third-party DSPs. MSFT-LIT-0000065309, at -322 (02/01/2021). "Google announced its decision to withdraw YouTube inventory from its ad exchange on 6 August 2015, and did so via its public blog… YouTube is important ad inventory, because it accounts for approximately 50% of video ad inventory worldwide, and video ads are now a core element of nearly every ad campaign. Therefore, to access such inventory, advertisers are forced either to switch to Google's DSP (DV360) or multi-home…"). In August 2015, Google announced that beginning in 2016, it would withdraw YouTube inventory from all DSPs besides Google's products, Google Ads and DV360. MSFT-LIT-0000065309, at -322 (02/01/2021) ("Google announced its decision to withdraw YouTube inventory from its ad exchange on 6 August 2015, and did so via its public blog. Google implemented its decision from the start of 2016"). A June 2020 Google "Global Internal Sales Positioning" document stated that a key feature of Google Ads was access to Google O&O inventory including "Discovery, Gmail, YouTube, and more coming soon" and also that "[u]nique access to inventory across devices on Google O&O properties, including YouTube, Gmail, Maps, and more" is a reason for advertisers to buy display and video inventory on Google. GOOG-AT-MDL-000888797, at -797–798 (06/2020).

[595] Deposition of John Dederick (The Trade Desk), Jul. 28, 2023, 170:13–172:7, (on advantages of Google's products, "[A]dvantages are exclusive access to huge pools of inventory that every buyer has to have, any massive and authenticated audience that has signed up for Google properties, Gmail, Maps, Google Chrome. There are billions of registered users whose data are being monetized to drive more revenue to Google properties. And so, it's that, it's the exclusive access to huge pools of inventory and the data asset that's come from all of the logged in users across Google and associated metadata. And then, you know the other things that are happening are pricing incentives for using more of the overall Google stack. So, you know, there are frequently deals where if a buyer will agree to buy X amount of YouTube or AdWords, they get benefits across more of the ecosystem. So, consolidation plays leaning on the dominant position in publisher ad serving, leaning on the dominant position in Search, leaning on dominant position in YouTube that say advertiser you should use our DSP too. That's why we struggle to compete with DV360.").

[596] *See, e.g.,* GOOG-DOJ-11728951, -975 (11/15/2019) ("Of new advertisers spending on GDN, about 1/3 of revenue in the first month comes from existing Search advertisers"); Deposition of John Dederick (The Trade Desk), Jul. 28, 2023, 277:8–279:14, ("Q. What is the "forcing agencies to commit part" mean? . . . A. … how is Google forcing agencies to commit to the entire tech stack, is the same reason that Google would operate an inferior DSP product, but be significantly more successful than The Trade Desk in 2015 and remains larger today. And it's because of offering benefits to buyers from all of their access points into advertising. . . we talked about dominance in the advertising ad serving and in the DSP, not to mention exclusive access to YouTube and to Google Search in preferential access for AdWords. And so, all of those benefits mean that Google could structure a commercial agreement with an agency or an advertiser that says, only if you buy through my DSP will you get preferential rates on my inventory. . . if you commit to buying this much YouTube inventory via DV360, your DV360 rate and your ad serving rates are lower and your inventive fund is as such.").

[597] GOOG-DOJ-AT-01592535, at -542 (2018) ("Welcome to the Sell-Side World!") ("Google Search ads started, and were so successful that we started putting them elsewhere i.e. on 3rd party websites, and called this 'AdSense' (2003)."); GOOG-DOJ-AT-00221276, at -311 (03/19/2019) (In 2003, a presentation on Google Display Network noted in,

been the only ad exchange with unrestricted access to Google Ads demand for display ads, which accounted for 38% of open-web display ad impressions transacted through exchanges in 2022.[598] Having exclusive access to unrestricted Google Ads' demand is one of the key sources of Google's market power.[599] (I discuss the importance of Google Ads' demand further below in Section V.D and in VII.B.)

(424) Third, DFP's publisher customers are "sticky" because it is very disruptive for them to change ad servers. The stickiness of publisher ad servers was recognized at the time of Google's DoubleClick acquisition.[600] Through the DoubleClick acquisition, Google obtained a publisher ad server that already had a significant share of publisher customers, and these sticky single-homing publishers helped Google gain and continue to maintain market power in the publisher ad server market and elsewhere in the ad tech stack. (I discuss the importance of DFP for Google's market power in Section VII.A.)

(425) Fourth, Google offers unique access to the large number of AdSense customers.[601] Open-web publishers that use AdSense have few comparable alternatives to Google for the kind of all-in-one solution it offers.[602]

"Google AdSense Publisher network launched to tap into Google search demand"); GOOG-DOJ-11728951, at -975 (11/15/2019) ("Of new advertisers spending on GDN, about 1/3 of revenue in the first month comes from existing Search advertisers").

598 Google Ads data (DOJ RFP 54) and exchange panel (see Appendix H). Shares reflect Google Ads impressions compared to all indirect open-web display impressions transacted through exchanges. *See* Figure 117 in Appendix F.

599 *See, e.g.*, GOOG-DOJ-AT-02118579, at -580 (07/11/2018) (A Google presentation titled "Sell-Side Pricing Strategy Review," notes "The value Google delivers as a sell-side product, and thus our ability to charge publishers, is therefore heavily determined by how differentiated the incoming demand is, compared to the demand available through other sell-side products (networks or platforms). GDN demand via our sell-side products has the highest value to publishers, because they treat networks like GDN as new revenue that they could not get on their own.").

600 *See* Sections V.B.1, II.E.2, and Appendix L.1.

601 AdSense publishers only have access to Google Ads advertisers and select Google-certified Ad Exchange buyers. https://support.google.com/admanager/answer/4599464?hl=en. According to a 2018 presentation, Google's AdSense publisher network has "3M websites and apps", with "204M visitors/month" and "317B impressions/month" and access to "92% of US internet users." GOOG-DOJ-AT-00221276, at -278-79 (03/19/2019).

602 GOOG-DOJ-AT-00198548, at -551–552 (10/12/2020) (In a chat between Nitish Korula and Chetna Bindra, Korula says "Nobody else is interested in competing for AdSense publishers" and "Competing SSPs very explicitly don[']t work with small publishers. So there[']s no magical competitor out there who[']s going to come in and invest in the tail of the web"). *See also* Deposition of Nitish Korula (Google), October 28, 2021, at 126:7–127:2, discussing uncertainties on products that compete with AdSense. *See also* GOOG-DOJ-04004392, at -399 (09/10/2018) ("Adsense was first to market and a strong leader in the simple website market on the strength of contextual targeting technology and strong demand from AdWords."). *See* Section II.C.3 for a discussion of AdSense as an open-web display solution for small publishers.

(432) **Access to Google Ads and AdX.** First, Google's publisher ad server product, DFP, is the only publisher ad server that provides unrestricted access to and use of real-time bids in Google's AdX exchange.[609] AdX is in turn essentially the only way for a publisher ad server to obtain access to all of Google Ads' demand.[610] This access gives DFP a significant advantage over competing publisher ad servers.[611] For instance, News Corp's ad tech executive Stephanie Layser has said that "the tie of Google Ads demand to AdX and AdX to DoubleClick for Publishers (DFP) on the sell side is a huge reason publishers stay on Google Ad Manager."[612] Google Principal for Corporate Strategy Bryan Rowley testified that AdWords demand was a selling point for AdX because "[w]hen demand can only be found through certain sources, it compels publishers to work with that product."[613]

(433) I explain how access to Google Ads and AdX advantages DFP over rival publisher ad servers in more detail in Sections VII.C, and how this conduct harmed the competitiveness of rival publisher ad servers and hence served to enhance DFP's market power in Section VII.F.2.

(434) **High switching costs and access to publisher inventory.** Second, Google's dominance over the publisher ad server market is protected by the high costs of switching publisher ad servers, resulting in "sticky" publisher demand for DFP. Google documents recognized this stickiness as early as the DoubleClick acquisition.[614] Publishers testifying in this matter have noted that switching ad servers is difficult due to, among other things, the costs of setting up a new ad server, migrating ongoing campaigns and switching of ad calls on the website.[615] Switching publisher ad servers has been called

[609] *See* Section VII.C.

[610] *See* Section VII.B.

[611] *See* Section VII.F.

[612] Stephanie Layser, "Are Unified Pricing Changes Good For Publishers Or Good For Google?," AdExchanger, July 12, 2019, https://www.adexchanger.com/the-sell-sider/are-unified-pricing-changes-good-for-publishers-or-good-for-google/. *See also* GOOG-DOJ-AT-00045716, at -719 (04/26/2019) (Google Internal Briefing "News Corp Unified Pricing Floors Discussion," quoting Stephanie Layser of News Corp. ("90% of all pubs are on DFP, and it feels like you can make changes to your products because we can't get all of AdSense demand anywhere else… [K]eeping your AdX demand from working optimally with other adserver tech feels like flexing monopolistic power here." and "One of my biggest issues with the current functionality and proposed functionality of GAM is that AdX is currently tied to DFP functionality leaving me to be forced into using the ad server should I want full access to AdWords, GDN, and DV360 demand in a real-time pricing basis.").

[613] Deposition of Bryan Rowley (Google), Jul. 22, 2021, 108:18–109:3 ("Q. When you joined Google, was AdWords demand only available on Google products? A Yes. Q. And did that fact benefit AdX? A. Yeah. I think that was a selling point. When demand can only be found through certain sources, it compels publishers to work with that product.").

[614] Google documents recognized the stickiness of publishers with respect to publisher ad servers when it was in a weeks-long bidding battle with Microsoft for the acquisition of DoubleClick. In a March 2007 email exchange, right before Google closed the acquisition deal, a Google employee notes, "[W]e may end up paying a lot for Liberty [code name for the DoubleClick acquisition] because the [Yahoo/Microsoft] inventory combo + advertiser tag switching costs will make it very very hard for us to gain market traction." *See* GOOG-DOJ-01657697, at -833 (03/14/2007). *See* discussion in Section VII.A and Appendix L.1. More recent Google documents also discuss the stickiness of publisher ad servers. *See, e.g.,* GOOG-TEX-00076049, at -049 (09/10/2012), an internal email that notes that "Ad Servers are sticky, and hard to replace." *See also* GOOG-TEX-00109645, at -647 ("Web-2020 Product and Business Strategy") at -647 ("We have long held the belief that ad servers are sticky.").

[615] Deposition of Ryan Pauley (Vox), Aug. 23, 2023, 95:16–96:6 ("Q. For a publisher, how easy or difficult is it to switch publisher ad servers. A. It's generally pretty difficult. It requires a lot of time and people. Q. And why is that? A. It's a

(443) My analysis of data provided in this matter also corroborates DFP's large share of open-web display impressions served.

(444) Because open-web publishers usually choose at most one publisher ad server for their direct and indirect display advertising needs,[633] publishers will typically value a publisher ad server's ability to serve both of these types of transactions. Hence, I compute market shares based on all impressions served.

(445) Figure 45 below shows the monthly total number of worldwide open-web display impressions served by a set of publisher ad servers for which I have data.[634] I conservatively include a broader set of impressions from certain third-party publisher ad servers that do not provide sufficient data to isolate open-web display transactions (which understates DFP market share among this set of products).[635] In 2022, DFP served approximately 91% of total worldwide open-web display impressions among this

[633] *See* discussion in Section III.C, fn. 246.

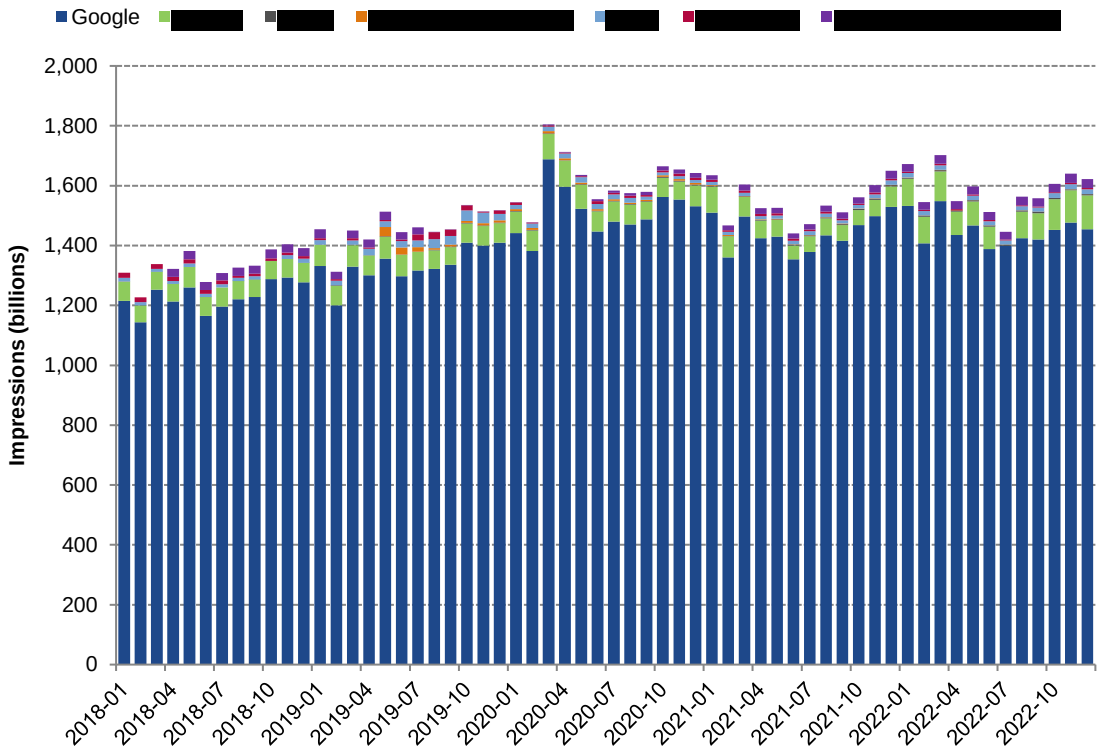
[634] I obtained publisher ad server data from Google, [redacted] and [redacted] I do not have data from other publisher ad servers, but have not seen information that indicates that inclusion of impressions from other third-party publisher ad servers would significantly reduce DFP's market share of open-web display impressions among worldwide or US publishers. A set of non-DFP publisher ad servers including [redacted] and [redacted] are "miniscule" in size compared to GAM, according to an executive from a third-party publisher server. Deposition of [redacted] 89:14–89:19. I am aware of a product named SAS ad server; the information I have reviewed does not suggest it has a meaningful US or worldwide presence as a publisher ad server for open-web display advertising. According to [redacted] has a publisher ad server called [redacted] that "focused on retail publishers" that "are looking to participate in retail media and commerce media" with "sponsored product listings" and advertisements served on the retailer websites. Deposition of [redacted] 203:22-206:16. ("Q How does the number of customers that [redacted] has for its publisher ad server compare to the number of customers that Google has for its publisher ad server? A Much smaller. Much, much smaller. Q Do you have a sense of the order of magnitude how much smaller the number of customers for [redacted] publisher … ad server are? A I don't. [] I'm speaking about what I believe to be much smaller because, in our world, the ad server that I'm [] talking about is specific to retail media. So we don't maintain a competitor to Google Ad Manager.") Consistent with this description of [redacted] focusing on retail publishers, a 2020 Google "Product and Business Strategy" document lists "[redacted] Sponsored Products [redacted] as competition under "Commerce (Sponsored Products)" (GOOG-DOJ-09183023, at -30).

[635] Due to limitations in certain third-party publisher ad server data, in some instances I am unable to restrict the data to open-web display impressions. When this occurs, I conservatively include a broader set of impressions from third-party publisher ad servers (see figure notes for Figure 45). I describe my data processing in more detail in Appendix H. While [redacted], and [redacted] can facilitate the serving of open-web display ads, they each have a focus on non-display advertising. [redacted] builds ad servers for publishers with a focus on native advertising [redacted] at 15:02–15:05), while both [redacted] and [redacted] focus on instream video advertising [redacted] "[redacted] is] [s]trong on Video and CTV but not a generalist;" DOJ_Google Templates - Confidential (v2).xlsx [redacted] took over programmatic ad serving from the [redacted] ad server)). Due to data limitations, I make the following assumptions when incorporating the relevant set of transactions from these products. For [redacted] I am unable to distinguish within [redacted] data which transactions are non-native display. As noted above, to be conservative, I include all of [redacted] transactions in my market share calculations, even though this understates DFP's market share. While [redacted] data does not allow me to distinguish between instream and outstream advertisements, I include all of [redacted] transactions to be conservative, but exclude impressions that are served on TVs (as I note in Section II.A, instream video advertisements are shown on TVs). Note that the remaining [redacted] impressions likely include a large number of instream video ads served on web.

My market share calculations exclude impressions that DFP serves from Google-owned properties.

set of publisher ad servers; DFP's 2022 share of open-web display impressions from US publishers is approximately 87% among this set.[636]

Figure 45. Worldwide open-web display impressions served by publisher ad servers (2018–2022)



Source: Publisher ad server panel (*see* Appendix H).
Notes: 1. Limited to open-web display impressions on mobile and desktop devices (includes house ads). 2. [redacted] and [redacted] data do not contain information on device type, transaction type, ad type, instream/outstream or mobile channel. Since the data do not allow me to identify open-web display impressions, I conservatively include all [redacted] and [redacted] impressions. 3. [redacted] data do not distinguish between ad types; hence, I conservatively include all [redacted] ad types. 3[redacted] and [redacted] data do not distinguish between instream and outstream video ads; I conservatively include all [redacted] and [redacted] video impressions, excluding impressions served on TVs for [redacted]. 4. Due to issues with the reported data, [redacted] data is missing in July 2022; [redacted] data is missing in May, July, and November of 2018; [redacted] data is unavailable prior to May 2019[redacted] data is unavailable prior to April 2018; [redacted] l data is missing in October 2018 and April 2022.

V.B.2.b. Barriers to entry and expansion

(446) Competitive entry into the publisher ad server market to an extent that would challenge the dominance of Google's DFP would be extremely difficult.

[636] *See* Figure 108 in Appendix D.4. These open-web display impression market share calculations include house ads. Excluding house ads, from 2018 through 2022, DFP maintained a greater than 69% share of *direct* open-web display impressions and 88% share of *indirect* open-web display impressions worldwide among this set of publisher ad servers. (Transaction type information is unavailable in all periods of the Equativ and Kevel data, and for certain transactions in the BRX-D and Xandr data. When these data are missing transaction type information, I conservatively include all of the impressions when calculating market shares without house ads among direct or indirect transactions for DFP.).

relies on our unwillingness to open our systems to the types of transactions, policies and innovations that buyers and sellers wish to transact."[676]

(465) Moreover, as I described above, when Google made Open Bidding broadly available in 2018, it charged 5-10% for use of this functionality, more than the cost of alternative header bidding tools (as discussed above). In a more competitive market, a rival publisher ad server alternative that enabled publishers to access multiple ad exchanges in real-time would likely have restricted Google's ability to profitably levy such a fee.

V.C. Google possesses substantial and sustained market power in the ad exchange market

(466) Google's ad exchange, AdX, is the largest ad exchange for open-web display transactions, and possesses substantial market power. In this section,

- I first describe how AdX's market power derives in large part from its advantaged treatment by Google Ads and DFP (Section V.C.1).
- I then provide measures of AdX's market shares and discuss barriers to entry and expansion in the ad exchange market (Section V.C.2). AdX is by far the largest exchange in the ad exchange market across a variety of measures. Among worldwide indirect open-web display transactions, I calculate that AdX has maintained a share of over 50-60% of impressions and over 40% of fees since 2018. Barriers to entry and expansion include significant fixed costs of building, maintaining, and starting an ad exchange; and overcoming network effect and data disadvantages relative to incumbents.
- Last, I provide direct evidence of AdX's market power (Section V.C.3). AdX has maintained a supracompetitive take rate of 20% since 2012 while maintaining high market shares. Google's own analyses also indicate that Google could profitably raise AdX's take rate above competitive levels. Moreover, Google's conduct, including its ability to dynamically adjust reserve prices (starting in 2015) and use AdX to favor its own products in the ad tech stack even while degrading the quality of AdX by not submitting real-time bids into rival publisher ad servers, also demonstrate AdX's substantial market power. Such conduct would not be sustainable in a competitive market, as customers would substitute away to comparable alternatives to an extent to make this conduct unprofitable.

(467) Substantial barriers to entry and expansion in the ad exchange market have protected Google's dominant position, and allowed it to maintain a high take rate and take actions that degrade AdX's

[676] GOOG-TEX-00097138, at -138 (09/26/2016) ("Integrating All Demand DRX Strat Paper").

quality without generating a competitive response sufficient to unseat its position as the dominant ad exchange.

(468) For these reasons, I conclude that AdX has substantial market power in the ad exchange market, and has likely had such market power since at least 2015.

V.C.1. Sources of Google's market power in the ad exchange market

(469) Google's market power in the ad exchange market derives in large part from Google's conduct providing it with unique access to valuable sources of advertiser demand and publisher supply (inventory).

(470) **Access to Google Ads and DV360.** AdX's market power arises in part from being the sole ad exchange with unrestricted access to Google Ads demand: publishers have no exchange alternative to AdX in order to access all of Google Ads' demand.[677] In 2022, Google Ads transactions conducted through AdX represented approximately 34% of worldwide indirect open-web display impressions transacted through exchanges.[678] This exclusive access to all of Google Ads' demand (which I show in Section V.D is particularly valuable) provides AdX with a substantial advantage over rival exchanges, and incentivizes publishers to use AdX to transact impressions despite AdX charging fees that exceed rivals' and competitive levels. Publishers value the additional revenue generated by additional demand.[679]

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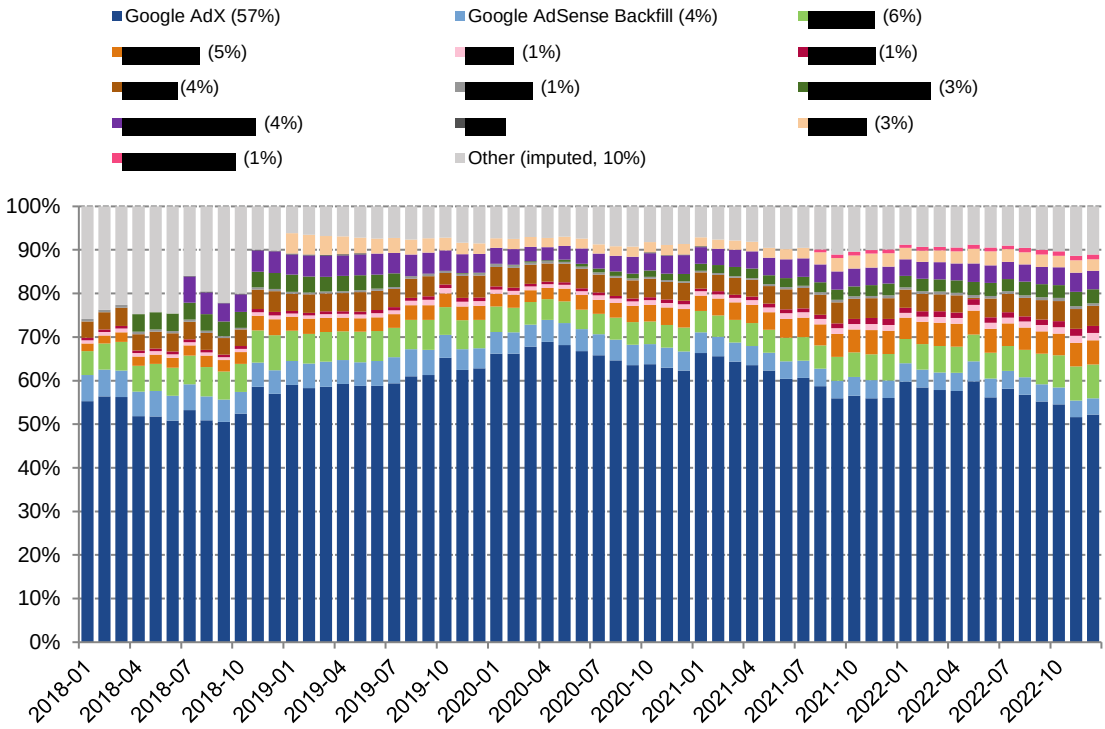
[677] *See* Section VII.B. Further evidence of the importance of Google Ads demand for AdX can be found in Google employees' discussions regarding Google's AWBid launch. AWBid was a Google program that allowed AdWords buyers to access retargeting impressions from non-Google publishers and exchanges such as AdMeld, PubMatic, and Rubicon (*See* Section II.D). AdWords' third-party SSP bidding through AWBid accounts for a small fraction of AdWords' bidding. Nevertheless, in a February 2011 email thread, one Google employee expressed the concern that this move would competitively disadvantage Google's sell-side business, inquiring: "Do we plan on additional differentiation points for the AdX sell side facing solution that will help us compete when our leverage of 'Largest Demand Source' is not relevant given our allowing AdWords to compete on any other supply source?" *See* GOOG-DOJ-05244839, at -839 (02/14/2011).

Moreover, as I discuss further in Appendix L.4, Google engaged in a series of programs that adjusted Google Ads margin in a manner to win additional impressions through AdX or otherwise preference AdX over rival exchanges. *See e.g.*, Deposition of Brian O'Kelley (AppNexus), September 29, 2023, 163:9–164:23 ("Q. And how, if at all, did Google's use of dynamic revenue share impact your ability to compete?... Q. -- with Google?... THE WITNESS: Because they were changing the price. The net price of the publisher is the bid minus the rev share. The advantage that Google had against us was that, because they could see all the bids, they could adjust the rev share at the end. So we could have taken a lower rev share, but we were just guessing at what the clearing price would be. But since they sat at the end of the auction, they would know -- let's say their highest bid was a dollar, that our highest bid was $0.90. If they took their full 20 percent rev share, they would lose. But if they took a 9 percent rev share, they would win. And so because they were at the end of the process, because they owned the ad server, they could win that impression. It might make more sense for them, commercially, to get 9 percent versus nothing. And from our perspective, you know, getting nothing versus 10 percent was a huge impact.").

[678] *See* Section VII.F.1.a; Figure 73. Google Ads represents 24% of indirect open-web display impressions transacted through exchanges from US users. See Figure 119 in Appendix F.

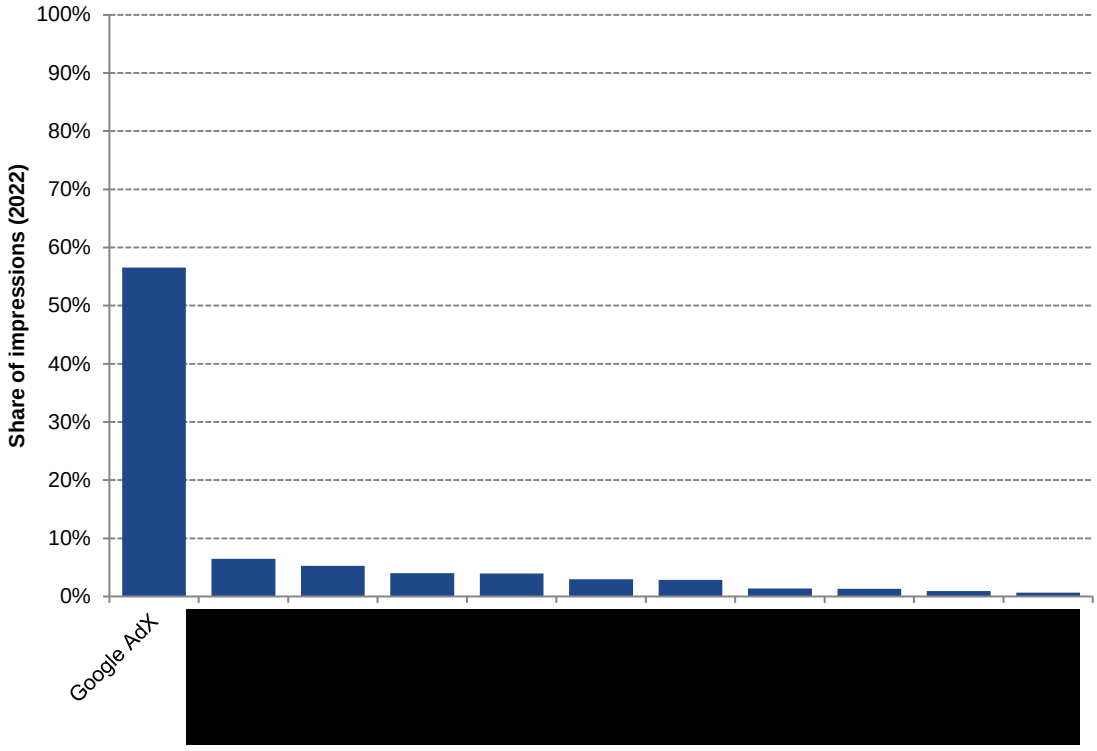
[679] *See, e.g.*, Deposition of Neal Mohan (Google), October 30, 2023, 238:21 –239:9 ("Q. Do you have any recollection of any feature of Google's display strategy post Google-Doubleclick merger? [A.] I mean, there were hundreds of features.

Figure 47. AdX maintains a substantial share of worldwide indirect open-web display impressions transacted through ad exchanges (2018–2022)



Source: Google AdX data (DOJ RFP 53); Exchange panel (*See* Appendix H.1.c).
Notes: Denominator includes impressions from Google and ad exchanges that produced data in this matter, and impressions estimated from exchanges that did not produce data on this matter ("Other (imputed)"). The set of exchanges within "Other (imputed)" varies during the time period shown due to incomplete data from certain third-party exchanges. Appendix H provides a description of how I perform this estimation. The legend contains the share of indirect open-web display impressions in 2022 in parenthesis for those exchanges that produced data on indirect open-web display impressions in 2022.

Figure 48. AdX and third-party ad exchanges' shares of worldwide indirect open-web display impressions among ad exchange (2022)



Source: Google AdX data (DOJ RFP 53); Exchange panel (*See* Appendix H.1.c).
Notes: 2022 worldwide indirect open-web display impression market shares for ad exchanges shown in Figure 47 (see table notes). In 2022, exchanges that did not produce data are estimated to represent 10% of worldwide indirect open-web display impressions. The largest of those exchanges, [redacted], represented less than 5% of impressions through bidding tools that produced by-exchange data.

(486) Due to data limitations, I am unable to compute reliable ad exchange market shares based on transactions restricted to ad exchange customer locations—i.e., based on transactions involving US open-web publishers or US advertisers.[697] However, I am able to present market shares based on *user locations*—i.e., based on the location of the visitor to a publisher's website. Such share calculations based on user locations can still be informative for at least two reasons.

(487) First, publishers and advertisers in the US may particularly value ad tech products used to buy and sell display advertisements served to *users located in the US*. Consistent with this, a large fraction of open-web display transactions served by US publishers and purchased by US advertisers involve US users. For US publishers engaged in indirect open-web advertising on AdX and AdSense, a large proportion of their display advertising transactions involve US users (57% of impressions and 81% of spending for US AdX publishers, and 57% of impressions and 81% of spending for US AdSense

[697] Information on publisher and advertiser geographic locations are missing from data provided by many third-party ad exchanges, advertiser ad networks, and DSPs that produced data in this matter.

Backfill publishers).[698] For US advertisers engaged in indirect open-web advertising on DV360, a large proportion of their display advertising transactions involve impressions from US users (72% of impressions and 90% of spending).[699]

(488) Since advertisers and open-web publishers located in the US are thus likely to particularly value ad tech products that are able to effectively serve display ads to US users, an ad tech product's high market share over US users can inform the extent to which that product is attractive to US customers (i.e., US open-web publishers and US advertisers).

(489) Second, I am able to compare market shares based on user locations to those based on customer locations for a subset of exchanges whose data provide information on both publisher and user locations for indirect open-web transactions between 2020 – 2022. These exchanges include AdX, Magnite, Index Exchange, OpenX, and Equativ. I find that impression and net revenue shares among this subset of exchanges are very similar across transactions involving US publishers *or* US users.[700] Hence, even though market shares computed using transactions involving US users are not the same as those computed using transactions involving US publishers, this analysis suggests that they may be close.

(490) Having acknowledged these considerations, I calculate AdX's market share over transactions involving US users across a broader set of ad exchanges, and note that it is also high.[701] Limiting to indirect open-web display impressions for US users, AdX's share is between 45–55% from 2018 through 2022.[702] For 2022, this is 5 times as large as the next largest ad exchange competitor that produced data.[703]

(491) Summarizing the above results, I calculate that AdX has maintained approximately an annual 55–65% share of worldwide indirect open-web display impressions among ad exchanges since 2018.

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698 Google AdX data (DOJ RFP 53); Google AdSense Backfill data (DOJ RFP 7).

699 Google DV360 data (DOJ RFP 7).

700 For example, I find that there is less than a 1.5% share difference for AdX among this subset of exchanges, for both impressions and net revenues and across all years 2020 – 2022, between US market shares computed based on user versus publisher location. *See* Figure 86 and Figure 87 in Appendix C.4. ([redacted] data does not contain net revenue information and is excluded from the calculation of net revenue shares).

701 To estimate the size of US-user impressions transacted by ad exchanges that did not produce data, I perform the following exercise: I first compute the the average ratio of impressions for US users relative to impressions for all users among ad exchanges who produced data with sufficient user-geography information. I then apply that average ratio to the estimate of total worldwide impressions for the exchanges who did not produce data at all or who did not produce data with US-user breakdowns. *See* Appendix H.

702 Figures depicting shares based on impressions from US users are contained in Appendix D.1.b.

703 In 2022, AdX transacted roughly 1.4T indirect open-web display impressions served to US users (Google AdX data (DOJ RFP 53)). [redacted] transacted just 275 billion indirect open-web display impressions served to US users during this period ([redacted] exchange data).

Limited to impressions from US users, AdX has maintained approximately an annual 45–55% share since 2018.[704]

(492) Note that Verizon (Yahoo) shut down its exchange product to open-web publisher inventory in 2023.[705] Excluding Verizon's impressions from the ad exchange market size would provide AdX a 58% share of worldwide impressions and a 48% share of impressions from US users in 2022.[706]

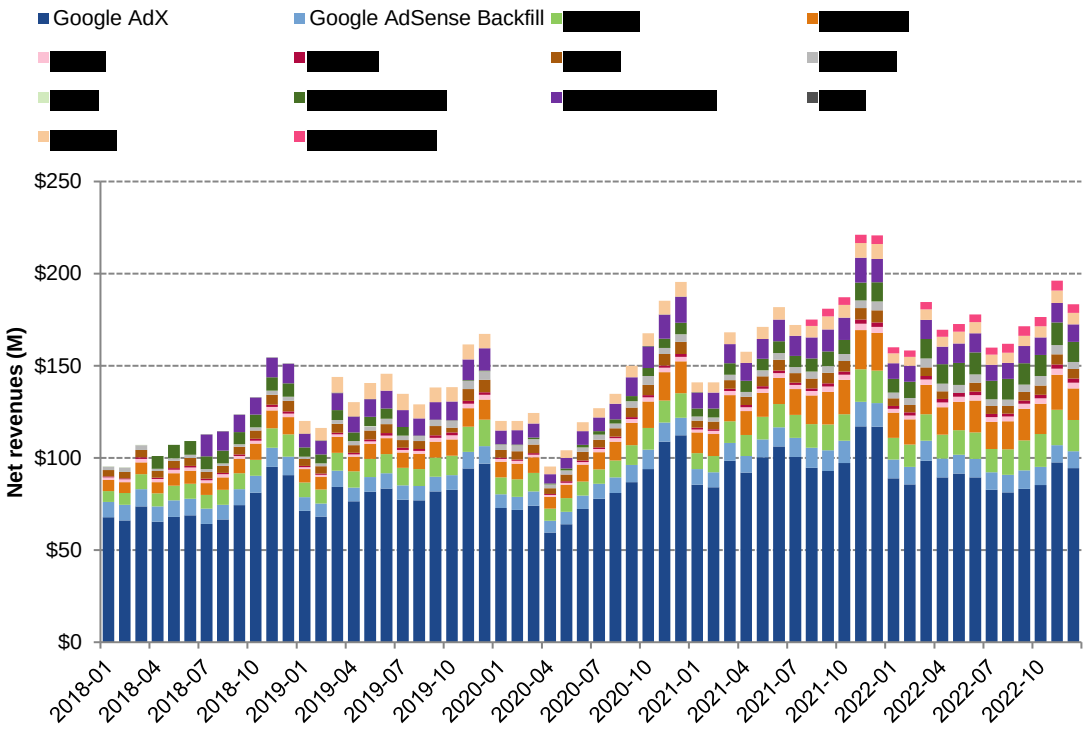
(493) **Net Revenues (Fees).** Figure 49 below shows net revenues on worldwide indirect open-web transactions collected by ad exchanges for which I have data. AdX collects significantly more fees for transacting indirect open-web display impressions than other exchanges depicted. Since 2018, the first year that data is available for most exchanges, AdX has accounted for over 55% of total fees collected by this set of exchanges.

[704] For robustness, I have analyzed AdX's market shares across several alternative specifications and find that these results are consistent. *See* Figure 89 in Appendix D.1.

[705] Sara Fischer, "Exclusive: Yahoo to lay off more than 20% of staff as it shrinks ad biz," Axios, February 9, 2023, https://www.axios.com/2023/02/09/yahoo-layoffs-2023-tech-media-companies. *See also* YAH_GG_LIT_004590 (06/26/2023).

[706] *See* Figure 88 and Figure 89 in Appendix D.1.a.

Figure 49. AdX earns consistently high net revenues from the sale of worldwide indirect open-web display impressions (2018–2022)

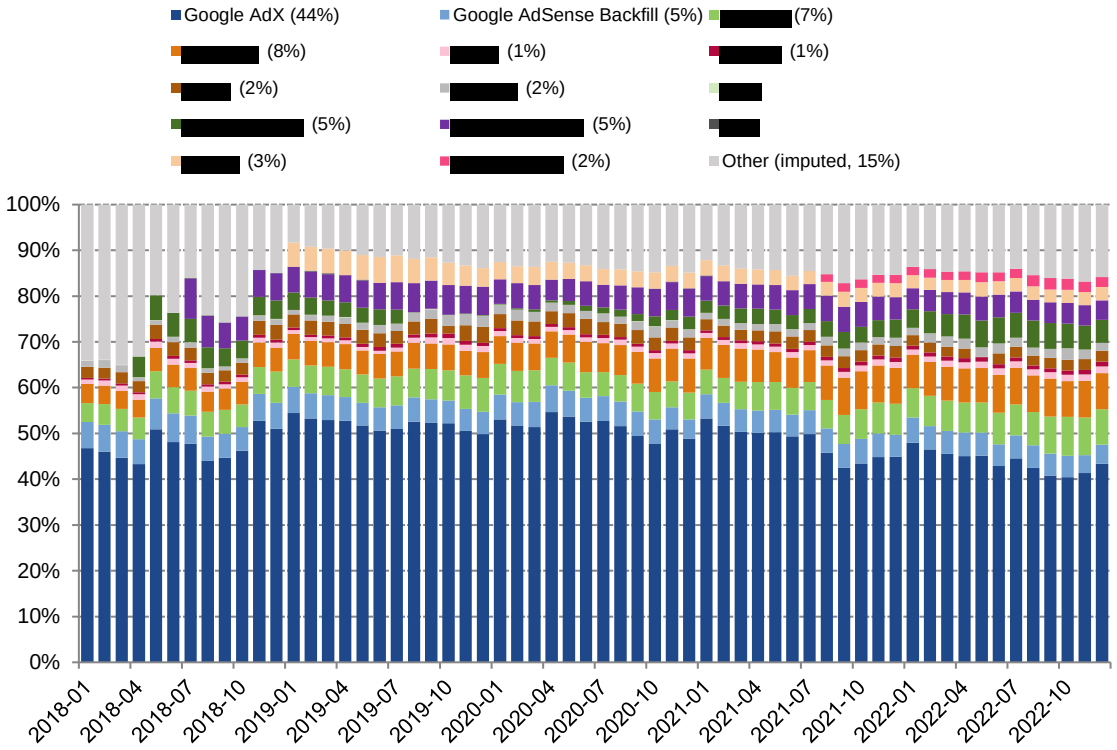


Source: Google AdX data (DOJ RFP 53); Exchange panel (*See* Appendix H.1.c).
Notes: 1. Includes net revenues from Google and exchanges that produced data in this matter. 2. AdSense Backfill refers to the set of transactions that are served from AdSense through DFP. Google charges a single 32% take rate for transactions through AdSense (including those through AdSense Backfill) and does not separate the take rate into buy-side and sell-side components. For the purposes of these share calculations, I apply the full 32% take rate to transactions through AdSense Backfill. 3. For exchanges from which I have data on gross revenue but not net revenue, I apply the weighted average take rate among third-party exchanges that produced both gross and net revenue data to those exchanges' spend.

(494) However, for the same reasons as I discussed above, these overstate AdX's shares among all ad exchanges as they do not include ad exchanges for which I do not have data. Hence, I obtain an estimate of AdX's share of fees among all ad exchanges as follows. First, using a similar approach that I described above for computing impression shares in the ad exchange market, I estimate the share of total ad exchange *spending* from ad exchanges for which I do not have data. Second, I apply the average take rate charged by the third-party exchanges that I do have data from in order to obtain an estimate of the share of *fees* from these ad exchanges that did not produce data. As Figure 50 below shows, under this calculation method, AdX's share of ad exchange fees is approximately 40–45% in 2022.[707] As shown in Figure 51 below, in 2022, AdX's net revenue shares were over 5 times higher than net revenues for the next largest ad exchange for which I have data [redacted]

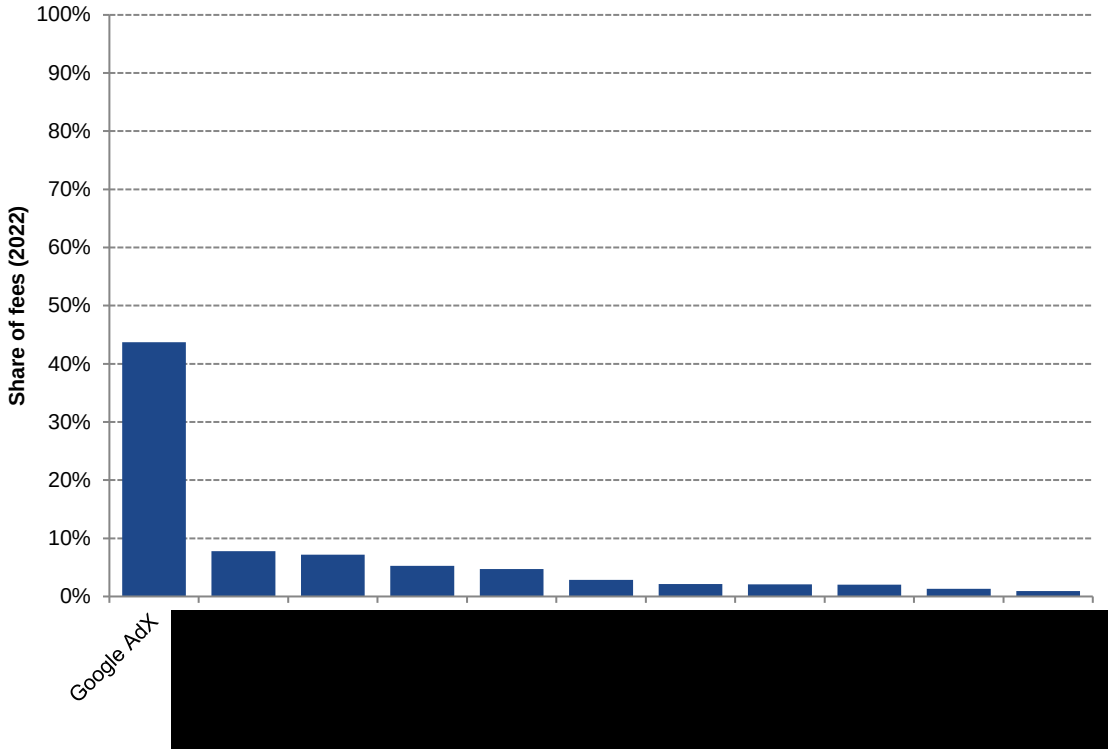
[707] Limited to fees collected from impressions served to US users, AdX's share of ad exchange fees is 36% in 2022. *See* Figure 92 in Appendix D.1.a.

Figure 50. AdX maintains a significant share of ad exchange fees from worldwide indirect open-web display transactions (2018–2022)



Source: Google AdX data (DOJ RFP 53); Exchange panel (*See* Appendix H.1.c).
Notes: 1. Includes net revenues from Google and exchanges that produced data in this matter as well as net revenues that I estimate coming from exchanges that did not produce data on this matter. Appendix H contains a description of how I perform this estimation. For exchanges that produced fees data in 2022, the legend lists the exchange's share of fees in 2022 in parentheses. 2. AdSense Backfill refers to the set of transactions that are served from AdSense through DFP. Google charges a single 32% take rate for transactions through AdSense (including those through AdSense Backfill) and does not separate the take rate into buy-side and sell-side components. For the purposes of these share calculations, I apply the full 32% take rate to transactions through AdSense Backfill. 3. For imputed "other" exchanges as well as exchanges from which I have data on gross revenue but not net revenue apply the weighted average take rate among third-party exchanges that produced both gross and net revenue data to those exchanges' spend.

Figure 51. AdX and third-party ad exchanges' shares of ad exchange fees from worldwide indirect open-web display transactions (2022)



Source: Google AdX data (DOJ RFP 53); Exchange panel (*See* Appendix H.1.c).Notes: 2022 worldwide indirect open-web display net revenue market shares for ad exchanges shown in Figure 50 (see table notes). In 2022, exchanges that did not produce data are estimated to represent 17% of worldwide indirect open-web display spend. The largest of those exchanges, [redacted], represented less than 7% of spend through bidding tools that produced by-exchange data.

(495) Hence, worldwide, AdX has maintained an annual fee share greater than 40% since 2018. Limited to transactions originating from users located in the United States, AdX has maintained an annual fee share greater than 35% since 2018.[708]

V.C.2.b. Barriers to entry and expansion

(496) There are substantial barriers to entry and expansion in the ad exchange market. These include:

- **Costs of building/maintaining/starting an ad exchange.** Ad exchanges are complex products to engineer that require both fixed and recurring investments in infrastructure to offer exchange

[708] *See* Figure 89 in Appendix D.1.a.

services.[709] Rival exchanges have also emphasized the costs of establishing integrations with publishers and DSPs as a significant barrier to entry in the exchange market.[710]

- **Network effects.** Ad exchanges generate value by connecting publisher supply with advertiser demand. Ad exchanges are more highly valued by publishers to the extent they can connect publishers to more advertiser demand and are more highly valued by advertisers to the extent they can connect advertisers to more publisher supply. A new entrant into the ad exchange market lacking access to substantial publisher supply or advertiser demand thus faces a chicken-and-egg problem in building an attractive exchange: publishers will not be willing to incur the costs of establishing a relationship with an exchange without access to substantial demand, and advertisers or their representatives will not be willing to incur the costs developing such a relationship without access to substantial supply.

- **Access to data**. Access to user data gives existing ad exchanges a substantial advantage over new exchanges without access to such data. As I described in Section III.D.3, an ad exchange can provide additional targeting information for a given impression to potential bidders, which can increase an advertiser's value for given impressions, and by extension its willingness to pay, thereby improving publishers' expected monetization from an exchange.[711] Exchanges such as AdX also rely on large-scale data to determine how to dynamically adjust their take rates and improve profitability.[712] Rival exchanges have recognized the lack of data as a barrier to competing successfully in the exchange market.[713]

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[709] *See* Section III.D.2. *See also* PUBMATIC_DOJ-00000041, at -057–058 (09/03/2019) (PubMatic submission to CMA, "[t]here is significant cost and scale required to maintain an SSP…the infrastructure costs are high to support the scale that PubMatic does…the costs do not scale well. Each ad impression and Ad Exchange has a certain amount of fixed cost tied to server processing, connectivity, storage, and bandwidth.").

[710] *See, e.g.*, Deposition of [redacted], 135:8–137:13 ("Q. Have you ever heard of the concept of barriers to entry to a market? A. Yes. Q. How would you characterize the barriers to entry to the exchange market for open web display transactions?... THE WITNESS: I think they're rising all the time and have never been higher for a variety of reasons, and the cost to build the platform is not trivial, the time to build it is not trivial. A platform is meaningless without integrations. To establish integrations with major publishers and major DSPs takes a significant amount of time. There's a significant cost burden to process the scale of transactions in this marketplace. And more recently there is a growing regulatory burden to be in compliance with regulations from a privacy perspective. So yeah, I'd say the barriers continue to rise and have never been higher. Q. How many DSP integrations does [redacted] have today? A. I don't know the specific stats particular, but I would estimate in approximately seventy-five. Q. And how long did it take [redacted] to onboard that many DSP integrations? A. DSP one was onboarded in [redacted] and we're still integrating DSPs today. Q. And is that a time-intensive process to onboard DSPs?... THE WITNESS: It's the longest sales cycle we have in [redacted] Some integrations we have literally waited five years to win. And then there is an integration process and a ramp up process before we have a competitive allocation of their demand. Q. And from first outreach to competitive allocation of demand, what is the average amount of time it could take? A. Six to twelve months. Q. And potentially longer? A. As I mentioned, we have DSPs that it's taken five years to integrate.").

[711] *See* Section III.D.3.

[712] *See* Section III.D.3 for further details; Section VII.D.1.b also contains a more detailed discussion of AdX Dynamic Revenue Sharing ("DRS"), which dynamically adjusted take rates.

[713] Deposition of Andrew Casale (Index Exchange), September 26, 2023, 234:13–236:7 ("Q. How would you characterize the level of difficulty for a new business to enter the exchange market today?... THE WITNESS: I would say when we pivoted the company in 2010, it was near impossible, and it's thirteen years later. So near impossibly impossible. Q. And can you give me some of the reasons why it's near impossibly impossible?... Or would be. A. It's very expensive

- **Google's conduct.** Google's conduct has increased barriers to entry and expansion in the ad exchange market by foreclosing rival ad exchanges from Google Ads demand (see Section VII.B) and previously restricting access to dynamic allocation within DFP (see Section VII.D.1).

V.C.3. Direct evidence of Google's market power in the ad exchange market

(497) Direct evidence of Google's substantial and sustained market power in the ad exchange market includes its ability to charge supracompetitive prices (while maintaining a high market share), degrade AdX's quality by limiting unrestricted access and use of its real-time bids to DFP, and vary its revenue share and reserve prices significantly across impressions.

V.C.3.a. Google AdX is able to maintain quality-adjusted prices above competitive levels

(498) Three types of evidence indicate AdX profitably levies supracompetitive fees, and hence that AdX possesses substantial market power. First, Google documents and internal analyses point to its ability to control prices and profitably charge fees above competitive levels without losing a significant amount of its transaction volume. Second, Google and third-party documents indicate that AdX maintains a higher take rate than other exchanges, and has maintained a substantial take rate for years despite reductions in the fees charged by competing ad exchanges. Third, my own analysis of Google and third-party data corroborate AdX's stable and high fees.

(499) **Google documents and internal analyses.** Since approximately 2012, Google has charged a roughly 20% take rate or fee for Open Auction impressions bought through its ad exchange.[714] AdX's take rate for Open Auction transactions was 19.8% in 2012 and 19.3% in 2015;[715] it returned to 19.8% by the first quarter of 2018.[716]

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to operate an exchange. If you built an exchange from scratch in today's environment where ML is everywhere, by having like a small volume of transactions scale, all of your optimization decisions would likely be wrong, which would not make you very competitive. So even if you were able to raise the capital to build the exchange, that exchange would likely not be performing for years, and that would imply that you have every DSP integrated which also takes years. And then you're running into a marketplace that's attempting to commoditize itself, which means the value of that business over time will shrink. So mathematically I'd say the odds are very much stacked against a new exchange coming into the market, but anything is certainly possible. Q. And you referenced ML everywhere. What is ML? A. Machine learning. It's a more advanced form of optimization. Many of the tech next at ad tech historically were done very manually and are now far more automated.").

[714] GOOG-DOJ-12700111, at -112(12/19/2018) (An email from LaSala to Bellack and others).

[715] GOOG-DOJ-03640993, at -009 (02/23/2016).

[716] GOOG-AT-MDL-019097789, at -807 (01/06/2023) (Google's response to the European Commission's RFI states, "Google's standard revenue share rate for Open Auction and Private Auction transactions is 20%, and Google's standard rate for Preferred Deal and Programmatic Guaranteed is 10%. To the best of the knowledge of current Google employees, prior to the introduction of new transaction types with different rates (Private Auction, Preferred Deal and Programmatic Guaranteed), Google's standard contractual rate was 20%."). *See also* GOOG-DOJ-03733834, at -870 ("AdX rev shares: OA holding steady", showing Open Auction transactions as the majority of AdX revenue).

(500) Google documents indicate that AdX tranasaction volume from its customers are not highly responsive to fees, and that lower fees would do little to increase market share, but would instead merely reduce AdX revenues, a fact that is, consistent with AdX possessing substantial market power.

(501) For example, a slide from a 2014 "Ad Platforms Pricing Review" (Figure 52 below) reports the "expected elasticity" of AdX for a reduction "in price today" from its 20% take rate to 15%.[717] The elasticity of demand for a product represents the percent change in quantity for a one-percent change in price.[718] The slide shows that the "total blended" average expected elasticity across customer groups is less than 1. This is known in economics as inelastic demand.[719] When demand is inelastic, a one percent change in price leads to a less than one percent change in quantity, implying that a one percent decrease in price reduces total revenues.[720] Consistent with this, the slide states, "[r]educing AdX rev share likely value destroying" for the majority of AdX's publishers with inelastic demand. As a matter of economics, inelastic demand refers to low customer responsiveness to price, and a firm facing inelastic demand at prices above its marginal cost will generally possess significant market power as it can increase prices from competitive levels without losing a large amount of demand.

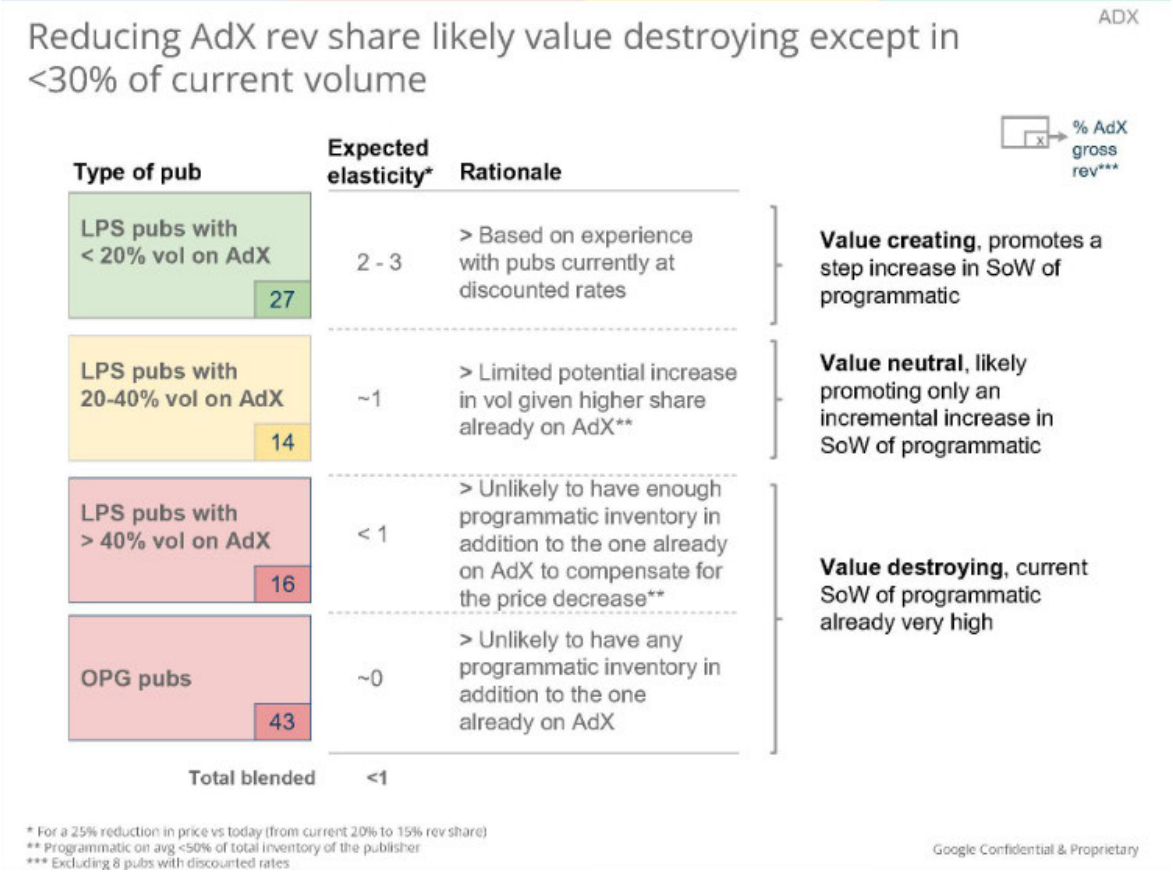
[717] GOOG-AT-MDL-003839960, at -979 (07/08/2014) (July 8th, 2014, "Ads Platforms Pricing Review").

[718] *See* Hal R. Varian, *Intermediate Microeconomics*, 9th ed. (New York: WW Norton, 2014), 274 ("The price elasticity of demand, ϵ, is defined to be the percent change in quantity divided by the percent change in price.").

[719] *See* Hal R. Varian, *Intermediate Microeconomics*, 9th ed. (New York: WW Norton, 2014), 276 ("If the elasticity is less than 1 in absolute value we say it has an inelastic demand.").

[720] *See* Hal R. Varian, *Intermediate Microeconomics*, 9th ed. (New York: WW Norton, 2014), 279 ("Thus revenue increases when price increases if the elasticity of demand is less than 1 in absolute value."). Analogously, a revenue *decreases* when price *decreases* if the elasticity of demand is less than 1 in absolute value.

Figure 52. Google analysis of AdX price elasticity (2014)



Source: GOOG-AT-MDL-003839960, at -979

(502) Moreover, a 2016 Google email chain discussed a simulation in which Google varied the take rates on AdX and GDN, indicating that reducing the AdX take rate from 15% to 10% to 5% while holding the GDN margin at 20% would reduce Google's gross and net revenues earned from AdX publishers on AdX, Google Ads, and DV360.[721] Figure 53 below presents a summary of the results, focusing on net revenues. The percentage changes in net revenue in the table are expressed relative to a baseline scenario with a 20% AdX take rate and 15% Google Ads margin. This simulation is again consistent with AdX possessing significant market power, as it indicates that—even accounting for Google's buy-side margins—a reduction in AdX take rates would reduce net revenue earned on AdX publishers.

[721] GOOG-DOJ-04615040, at -040 (11/14/2016) ("For gross revenue on AdX pubs, Adw, DBM, and other RTB buyers on AdX pubs make up 46%, 32%, and 22% of the total respectively. For net revenue, adw (including buy-side margin), dbm (including markup), and other rtb buyers make up around 50%, 35% and 15% respectively"), -043.

Figure 53. Results from a 2016 simulation varying Google Ads margin and AdX take rate on change in net revenues earned from AdX publishers

AdX take rate	Google Ads margin				
	15%	20%	25%	28%	32%
0%		-52.43%			-28.96%
5%		-37.83%		-22.05%	
10%		-22.92%	-15.04%		
15%		-7.69%			
20%	0.00%				

Source: GOOG-DOJ-04615040, at -043. The table represents the change in net revenues earned from AdX publishers on AdX, Google Ads, and DV360 relative to the baseline scenario of 15% Google Ads margin and 20% AdX take rate.

(503) **AdX charges supracompetitive fees and sustains higher fees than other ad exchanges**. Numerous Google documents indicate that AdX charged higher take rates than rival ad exchanges and was able to sustain those prices even after other exchanges lowered their take rates.[722] For example, a July 2018 "Sell-side Pricing Strategy Review" document noted that, "our revshare (20%) is much higher than other exchanges (generally 10%)," and that "DRX's 20% rate is problematic for DBM and AdX buyers as well, because as discussed, it is significantly higher than the competition."[723]

(504) Additionally,

- When discussing the 2016 simulation described above regarding AdX's margins, Tobias Maurer, Product Manager at Google, characterized a *lower* AdX take rate as one that is at a "more competitive level," implying that 20% is not a competitive take rate.[724]

[722] *See* GOOG-TEX-00106259, at -259–260 (11/04/2017) (An email chain among senior Google ad tech executives which contains a discussion of an article published by *AdExchanger* about Rubicon eliminating buy-side fees; in the email chain, the executives also describe how AdX's take rate is substantially higher than that of rivals like Rubicon and AppNexus. Payam Shodjai states, "Rubicon's take home will be around 10% to 12% next quarter according to the article. If you look at what Amazon is doing . . . and header bidding, there will be even more pressure on the 10%. I think SSP margins will stabilize at around 5%." Eisar Lipkovitz later replies, "While true that 20% for just sellside platform/exchange isn't likely justified by value, I equally don't think Rubicon or AN [AppNexus] can run an actual business with 5% or even 10%." Jim Giles concludes, "I think the other important thing to keep in mind versus most SSPs is that we also have the ad server. I think pure SSP is definitely commoditizing… I think the combination of ad server / exchange plus data gives us cover for total costs that are higher than other exchanges."), GOOG-DOJ-03640993, at -010 (02/23/2016) (A Google presentation which reports take rates for AdX and some third-party exchanges, indicating that Google ("DoubleClick AdExchange") charges 20% for open auction, 20% for private auction, and 10% for programmatic direct and programmatic guaranteed transactions; that Rubicon charges 10-20% for open auction and 5-12% for private auction and programmatic guaranteed transactions; that AppNexus charges approximately 8% across all deal types; that Facebook (Liverail) charges 10-20% for open auction and 4-10% for programmatic direct; and that MoPub (Twitter) charges 20% for open auction, private auction, and programmatic direct transactions.).

[723] GOOG-DOJ-AT-02118579, at -581–582 (07/11/2018) (Google "Sell-Side Pricing Strategy Review," July 11, 2018).

[724] GOOG-DOJ-07817544, at -545 (11/09/2016) ("I think there is a case to be made for moving some margin to buy-side and communicating that our sell-side margin dropped to more competitive level (15% [AdX], 20% [GDN] option on the slide)"). *See also* GOOG-DOJ-11772703, at tab "Notes" (10/2016) (An internal Google document studying potential AdX take rates characterized a hypothetical 10% take rate as matching [redacted] rate, which we are told is comfortably profitable.").

- In a January 2017 email chain, Director of Publisher Ad Platforms at Google Jonathan Bellack noted, "If everyone else is at 20 we can justify 20. We never originally intended to have AdX as a premium over other exchanges, that was the market price. Now that [redacted] is at 10% and AppNexus is offering 5% at least as a promotion, the question is whether we can defend a 50% or 100% premium (15-20% vs 10%). . . I do not think it is feasible to try to defend a 3-4x (15-20% vs 5%) on third party AdX buyers."[725]
- In email correspondence from November 2016, Google employees discussed Rubicon's offer to publishers to move from 15% revenue share to a flat $0.05 CPM fee for sell-side margins. One Google employee noted that the move would mean "their margins will get closer to Index and other SSPs compared to AdX," and another provided reasons "why is Rubicon doing this and therefore why should we not do it," including "they [Rubicon] don't own an Adserver, so their primary deal-making engine is to convince a publisher to put their SSP in a better/exclusive position within someone else's stack."[726] That is, without its own publisher ad server, Rubicon would have to convince a publisher to prioritize its exchange within another server (e.g., DFP) to gain transaction volume. In contrast, AdX already possessed privileged access to inventory through DFP (see Section VII.D.1), and hence could support a higher take rate.

(505) Third party documents and depositions also indicate that rival exchanges charged lower take rates than AdX.[727] Moreover, competitors and publishers described an inability to affect or negotiate AdX fees. For example,

- Rubicon's quarterly financial reports indicate that its take rates were lower than Google's in 2018.[728] In 2023 (after Rubicon merged with Telaria and was renamed Magnite), Magnite's Chief

[725] GOOG-DOJ-09470144, at -145 (01/30/2017).

[726] *See* GOOG-DOJ-05314741, at -741–744 (11/22/2016).

[727] *See also* [redacted] ("To compete, [redacted] competitors have lowered take rates. This strategy disadvantages [redacted] which, sources say, often charges fee close to 20%, on par with Google. But [redacted] charges 12, and [redacted] averaged 8.5% a year ago."

[728] In particular, [redacted] indicated that its take rate was 11.8% in 2018Q1 [redacted] 12.1% in 2018Q2 [redacted] 12.3% in 2018Q3 [redacted] 13.8% in 2018Q4 [redacted] and 14% in the full year of 2019 [redacted]). Several of these financial reports indicate that [redacted] cut take rates between 2017 and 2018 (For example, the report for 2018Q1 indicates that [redacted] take rate in 2017Q1 was 23.7%, [redacted] In February 2021 (after [redacted] merged with [redacted] and was renamed [redacted] – *see* [redacted] CFO stated on the 2020 end-of-year earnings call that "[G]iven the significant and growing competitive

Product Officer testified that AdX can charge higher take rates than Magnite because Google "can command whataver take rate they so chose [sic]."[729]

- Similarly, Trade Desk Executive Vice President John Dederick has said that while his negotiations with Google over AdX rates are "sort of a take it or leave it relationship," his negotiations with other exchanges are "much more reasonable" because there's a "fairer balance of power."[730]
- Ryan Pauley, President of Revenue and Growth at Vox (an open-web publisher), has said that Vox has "limited leverage" when negotiating AdX take rates because Vox does not "currently have any reasonable alternatives' to AdX's Open Auction demand.[731] In contrast, he says that his team has "been able to negotiate more favorable rev shares for Vox Media from other partners, typically."[732]
- OpenX CEO John Gentry identifies Magnite and PubMatic as the exchanges most impacting how OpenX sets its open auction display take rates because they "have been aggressive about lowering fees for advertisers as a means of differentiation."[733] In contrast, he says, "to the best of my knowledge, my memory, I have never heard any advertiser, buyer, or holding co tell us that Google AdX was providing a lower rate than us in the marketplace."[734] OpenX would not attempt to take market share from AdX because, according to Gentry, "we're not ever going to convince a publisher to drop AdX and keep us in and we're never going to convince a buyer to not buy on Google and buy only on us."[735]

(506) AdX's take rate has remained largely constant over time even though other ad exchanges have reduced their take rates. A March 2018 Google internal presentation highlighted this trend in other

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sensitivity related to our take rates, we will not be providing specific ad spend and take rate figures going forward. From a qualitative perspective, however, [our] take rates remain stable"[redacted]

729 Deposition of [redacted] 60:17–61:20 ("Q. And how does [redacted] open auction display take rate compare to that? A. Our take rate is lower. Q. Approximately how much lower? A. Our take rate for open auction is approximately 18 percent. Q. And do you have a view on why Google's take rate for its AdX product is higher than yours, how are they able to kind of bear that in the market?. . . A. My view of that would be that they get -- they can command whatever take rate they so chose. Q. And can you elaborate on that? Why do you think that? A. They are not held to the same transparency standards that we are on the buy side of the business. And they have the ability to win inventory or they had the ability to win inventory at whatever take rate they put out there. Q. Could you elaborate on why transparency has something to do with take rate?. . . A. So buyers, particularly the largest agencies and the largest marketers, went through a wave of demands from companies like [redacted] to declare and report against our take rate. Q. And is that not the same for AdX?. . . A. AdX -- my understanding is that AdX would not engage in those conversations and didn't have to negotiate those rates.").

730 Deposition of John Dederick (The Trade Desk), Jul. 28, 2023, 164:2–165:17.

731 Deposition of Ryan Pauley (Vox), Aug. 23, 2023, 12:8–13:24.

732 Deposition of Ryan Pauley (Vox), Aug. 23, 2023, 13:25–14:25.

733 *See* Deposition of John Gentry (OpenX), Oct 26, 2023, 94:4–16.

734 Deposition of John Gentry (OpenX), Oct 26, 2023, 94:17–25.

735 *See* Deposition of John Gentry (OpenX), Oct 26, 2023, 99:11–18.

exchange's fees, noting "margin compression" as a result of header bidding and smarter buyers.[736] The same presentation observed that in 2017, [redacted] slashed its take rate in half and that[redacted] reduced its take rate "even further" to 8.5%.[737]

(507) Payam Shodjai, at the time Google's Director of Product Management for Display and Video Ads, in a 2017 internal email chain wrote that "the technology, demand and supply that SSPs offer have been commoditized to a large extent," and that, "I think SSP margins will stabilize at around 5%. Maybe it will happen by this time next year or in early 2019."[738] However, as I show next, AdX's take rates have remained well above this level.

(508) **Analysis of data.** The aforementioned take rate patterns described in documentary evidence and testimony are also present in the data. Figure 54 plots take rates for AdX and a set of third-party exchanges from which I obtained data on gross and net revenues between January 2018 and December 2022 (shown in the colored lines, with the take rate scale on the left); the figure also plots AdX's market share of worldwide indirect open-web display impressions among exchanges (in the grey shaded area, with the market share scale on the right). During this period, AdX's take rate remained stable at 20%, and AdX maintained a high (approximately 50–60%) market share of worldwide open-web indirect impressions among ad exchanges.[739] As noted in the figure legend, none of the exchanges depicted had a greater than 6% share of these impressions in 2022.

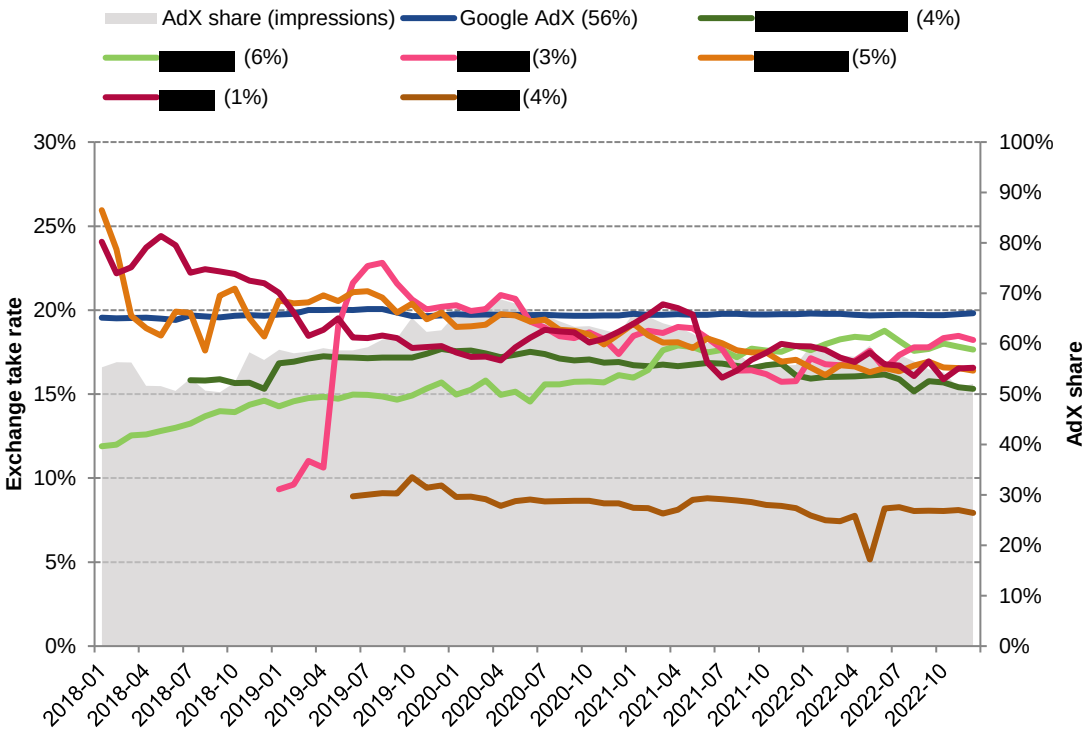
[736] *See* GOOG-DOJ-05285023, at -044 (03/2018).

[737] *See* GOOG-DOJ-05285023, at -044 (03/2018).

[738] *See* GOOG-TEX-00106259, at -260 (11/04/2017) (Mr. Shodjai also wrote, "I also don't think we should try to milk our margins for as long as we can (whether it's through AdX or Demand Product), because we would be prioritizing short-term profits over long-term profits," also consistent with AdX's 20% fee being above competitive levels); Payam Shodjai, "Payam Shodjai," LinkedIn, https://www.linkedin.com/in/pshodjai/.

[739] When limited to impressions served to US users, AdX maintains a high market share and a stable 20% take rate throughout this period, higher than the weighted average take rate among third-party exchanges. See Figure 109 in Appendix E.1.

Figure 54. Worldwide open-web indirect display take rates for ad exchanges, and AdX's worldwide indirect open-web display market share (2018–2022)

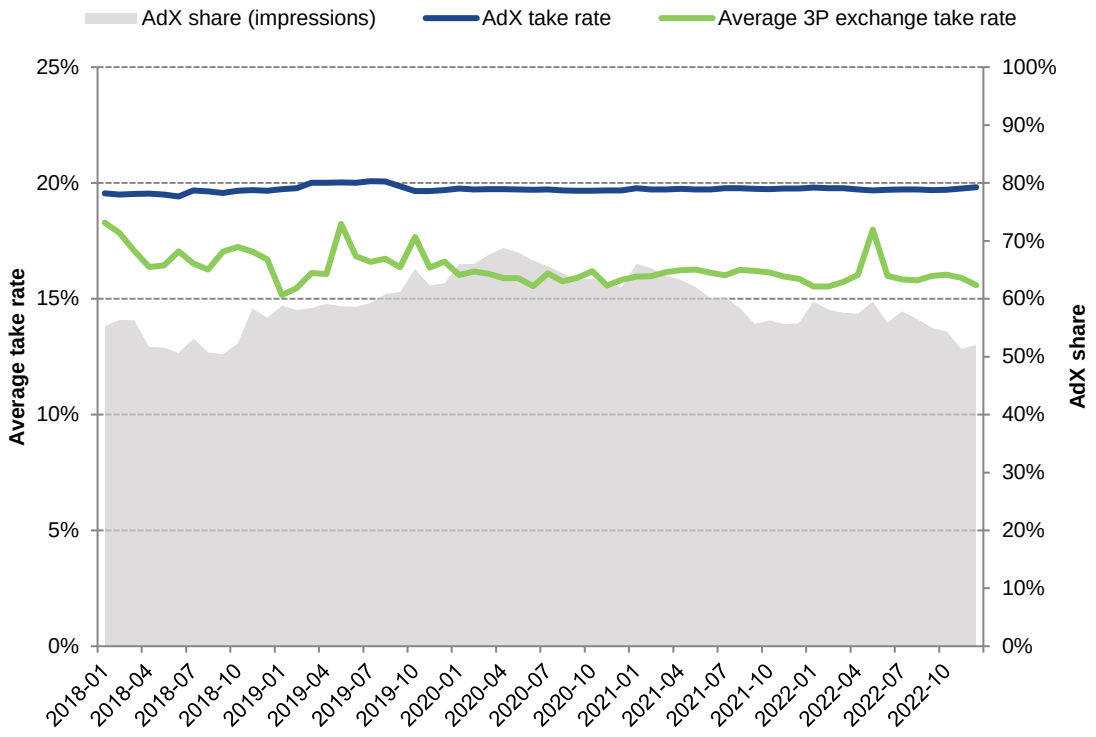


Source: Exchange data panel (*See* Appendix H.1.c for details).
Notes: Limited to open-web display advertisements transacted through indirect transactions (including open auction, private auction, or header bidding). For take rates, I exclude observations where ad type, transaction type, or channel is unknown. The chart above includes all exchanges that produced both gross and net revenue data, excluding exchanges that never exceed 1% of impressions in the exchange market in any given year during the data period, limited to indirect open-web display transactions excluding unknown values (these exchanges are [redacted], and [redacted]). Monthly average take rates are computed as reported net revenue divided by gross revenue.
The legend in the chart above lists each exchange with its share of worldwide indirect open-web display impressions in 2022 in parentheses. "AdX share (impressions)" (shaded grey area in chart) is AdX's share of worldwide indirect open-web display impressions. *See* Figure 47 and Appendix H for details.

(509) Figure 55 below plots AdX's take rate against the weighted-average take rate among third-party exchanges for 2018 – 2022, alongside AdX's share of worldwide indirect open-web impressions.[740] During this time period, AdX maintained consistently high market share of impressions and net revenues, while maintaining a consistently higher take rate than the average of its rivals.

[740] Note that while Figure 54 excludes exchanges that never exceed 1% of impressions in a given year, the weighted average take rate presented in Figure 55.is calculated across all third-party exchanges that produced both gross and net revenue data. The third-party exchanges that are included are OpenX, Index Exchange, Magnite, Xandr, Sovrn, Sharethrough, Yieldmo, DCN, Zedo, and PubMatic.

Figure 55. Worldwide open-web indirect display take rates for AdX and third-party exchanges (average), and AdX's worldwide indirect open-web display market share (2018–2022)



Source: Google AdX data (DOJ RFP 53); Exchange data panel (*See* Appendix H.1.c for details).
Notes Limited to open-web display advertisements transacted through indirect transactions (including open auction, private auction, or header bidding). "Average 3P exchange take rate" is the monthly weighted average take rate by exchange spend among all third-party exchanges that produced both gross and net revenue data. "AdX share (impressions)" (shaded grey area in chart) is AdX's share of worldwide indirect open-web display impressions. *See* Figure 47 and Appendix H for details.

(510) The ability of Google to maintain a constant 20% take rate and maintain a high market share in the ad exchange market despite lower fees charged by rivals, and in an industry that observers have described as an increasingly commoditized market,[741] is consistent with AdX's substantial and sustained market power.

[741] *See, e.g.,* Ronan Shields, 'Fundamentally, the SSP business is not very attractive': The fall out of ad tech's latest round of closures," Digiday, February 13, 2023, https://digiday.com/media/fundamentally-the-ssp-business-is-not-very-attractive-the-fall-out-of-ad-techs-latest-round-of-closures/ ("Ari Paparo, founder of Marketecture, told Digiday that Yahoo's cutbacks were to be expected given the ongoing challenges the sellside of the market faces as the buy-side of the industry seeks to downsize the number of players they work with." 'I think that, fundamentally, the SSP business is not very attractive … It's not growing, and it's very competitive as publishers really treat you like a commodity, they have like 10 or 20 of them implemented on every page,' he added. 'And it's becoming less attractive because it's under pressure from the buy-side who's using SPO [supply-path optimization] to reduce the number of paths that they're buying from. And also, you have, advertisers and agencies running bake-offs on the supply side to have preferred relationships, this all favors the biggest SSPs in a consolidating business.'").

able to "reclaim" lost revenue "through more aggressive RPO tactics."[753] In July 2018, Google launched "Truthful DRS," which adjusted reserve prices for some transactions such that AdX would pay the publisher less than the dynamic reserve price that it would set in the auction; in those cases, Google could recollect its lost profit via the difference between the RPO price and the next highest price in the auction.[754]

(518) When discussing RPO Ali Nasiri Amini (then a senior staff scientist and current Google Vice President of Engineering) noted that, "[i]n an opaque market place [the] auctioneer tries different tricks to squeeze more money from buyers and their agents."[755] In a competitive market, AdX would not have been able to "squeeze more money" from advertisers without losing significant business to alternative ad exchanges. It is precisely because AdX possesses substantial market power that it is able to control prices for certain transactions and collect higher fees.

V.D. Google possesses substantial and sustained market power in the advertiser ad network market

(519) Google's advertiser ad network, Google Ads, is the largest advertiser ad network for open-web display advertising, and possesses substantial market power. In this section,

- I first describe key sources of Google's market power in the advertiser ad network market (Section V.D.1), which include its unique access to advertiser demand and publisher inventory (including Google's O&O properties and open-web AdSense publishers) and significant scale advantages over competitors.
- I then provide measures of Google Ads' market shares and discuss barriers to entry and expansion in the advertiser ad network market (Section V.D.2). Google Ads' market share among advertiser ad networks that I have data for has been over 65% or higher since 2018 for both impressions and fees among worldwide open-web indirect display transactions.
- Last, I provide direct evidence of Google Ads' market power (Section V.D.3). This includes:

publisher yield" and "will never set a price below an existing floor [set by the publisher]." *See* GOOG-AT-MDL-009013430, at -432–433 (5/9/2016).

753 GOOG-TEX-00000655, at -660 (12/15/2016) (An email from Google Jim Giles noting that "we aren't actually losing much money by giving [Last Look] up" with Exchange Bidding, stating: "reclaiming what money we lose is completely under our control through more aggressive RPO tactics".).

754 GOOG-AT-MDL-009644404 ("By adjusting reserve prices down dynamically we effectively adjust AdX's profit margin from full margin to low margin to match more queries. The lost profit on these transactions will be recollected from the price gap between RPO price (and optionally buyer's self min_payment) and the next highest price (we charge buyer RPO price+revshare and pay publisher less than RPO price).").

755 GOOG-AT-MDL-B-002097533, at -534 (04/26/2015) (An email from Google employee Ali Amini).

- Describing Google Ads' ability to target supracompetitive margins and vary its bidding behavior to increase profits and affect publishers' behavior. Google's own analyses indicates that it could profitably do so as far back as 2014.
- Discussing how Google has used its market power in the advertiser ad network market to favor its own products in the ad tech stack, thereby degrading the quality of Google Ads in the process. In a competive market, this would lead to significant substitution to competing products. In this market, protected by significant barriers to entry, Google Ads was able to maintain its market share over time despite degradations to its quality.
- Presenting two analyses—one using 2023 data produced in the matter, and another described in a 2014 Google document—demonstrating that Google Ads has the ability to meaningfully affect publisher payouts through its participation in ad exchange auctions. This impact on payouts indicates that Google Ads provides significant value to publishers over alternative demand sources, enabling it to levy supracompetitive fees.

(520) For these reasons, I conclude that Google Ads has substantial market power in the advertiser ad network market, and has likely had such market power since at least 2015.

V.D.1. Sources of Google's market power in the advertiser ad network market

(521) Google Ads' dominant position in the advertiser ad network market derives in part from its access to unique advertising demand and publisher inventory, and its much larger scale than other competitors and potential competitors.

(522) **Unique advertising demand and publisher inventory.** Google Ads had a key advantage from its creation because of its exclusive access to valuable Google Search advertising inventory.[756] Google later added the ability to access open-web display advertising through Google Ads.[757] Given the costs of using multiple bidding tools and the tendency for smaller advertisers to use a single bidding tool for digital advertising needs,[758] Google Ads started with a large source of advertising demand through search as it developed its web display advertising business. This was described in a 2017 presentation

[756] In addition, a deal with AOL enabled AdWords advertisers to purchase search ads on AOL search listings and thereby granted AdWords and its customers access to AOL's then-34 million users. Christine Frey, "Overture Loses AOL Contract to Google," Los Angeles Times, May 2, 2002, https://www.latimes.com/archives/la-xpm-2002-may-02-fi-overture2-story.html. The deal propelled Google's search advertising business and by early 2003, Google touted the "largest and fastest growing" online advertising base in the industry, with over 100,000 advertisers. Google, Google News, "Google Builds World's Largest Advertising and Search Monitization Program," Google, March 4, 2003, https://googlepress.blogspot.com/2003/03/google-builds-worlds-largest.html.

[757] *See* GOOG-DOJ-AT-01592535, at -542 (09/27/2018) (A presentation titled, "Welcome to the Sell-Side World!" states, "Google Search ads started, and were so successful that we started putting them elsewhere i.e. on 3rd party websites, and called this 'AdSense' (2003)".).

[758] *See* Section IV.E.1.

by Google as providing Google Ads with "[u]nique demand that adds auction pressure to drive greater CPMs, fill and overall yield".[759]

(523) Today, Google Ads customers gain access to additional Google O&O inventory including YouTube that cannot be accessed through non-Google bidding tools,[760] as well as access to open-web publishers using AdSense. Large advertisers and those with more complex advertising needs often use both Google's DSP product, DV360, and Google Ads.[761] Small advertisers and those with less complex advertising needs, who tend to single home on bidding tools and use advertiser ad networks rather than demand side platforms, have no realistic alternative to Google Ads to access unique Google inventory.[762]

(524) **Scale and data.** Related to its access to unique demand and supply sources, Google Ads also benefits from its significant scale. For example, a 2018 Google presentation on Google's Display Network, highlights the advantage that Google Ads is able to provide advertisers by having access to "3M+ website and app partners" and being able to target users across its entire network.[763] Having by far the largest transaction volume of any competitor in the advertiser ad network market provides Google Ads with scale and data advantages in developing better targeting algorithms that lead to better ad campaign performance for its advertiser customers.[764]

V.D.2. Indirect evidence of Google's market power in the advertiser ad network market

(525) Google's high market shares across a variety of measures, as well as evidence of significant barriers to entry, provide indirect evidence of Google's substantial and sustained market power in the advertiser ad network market.

[759] *See* GOOG-DOJ-04429792, at -804 (04/2017) ("Monetization Cheatsheet").

[760] Advertisers can access YouTube and Google O&O inventory like Search via Google Ads. Google, "Grow your business with Google Ads," *Google Ads Help*, https://ads.google.com/intl/en_us/home/campaigns/video-ads/. *See also* Sections II.C.3 and V.A.1.

[761] *See* Figure 33 and Figure 38 in Section IV.E.1.a.

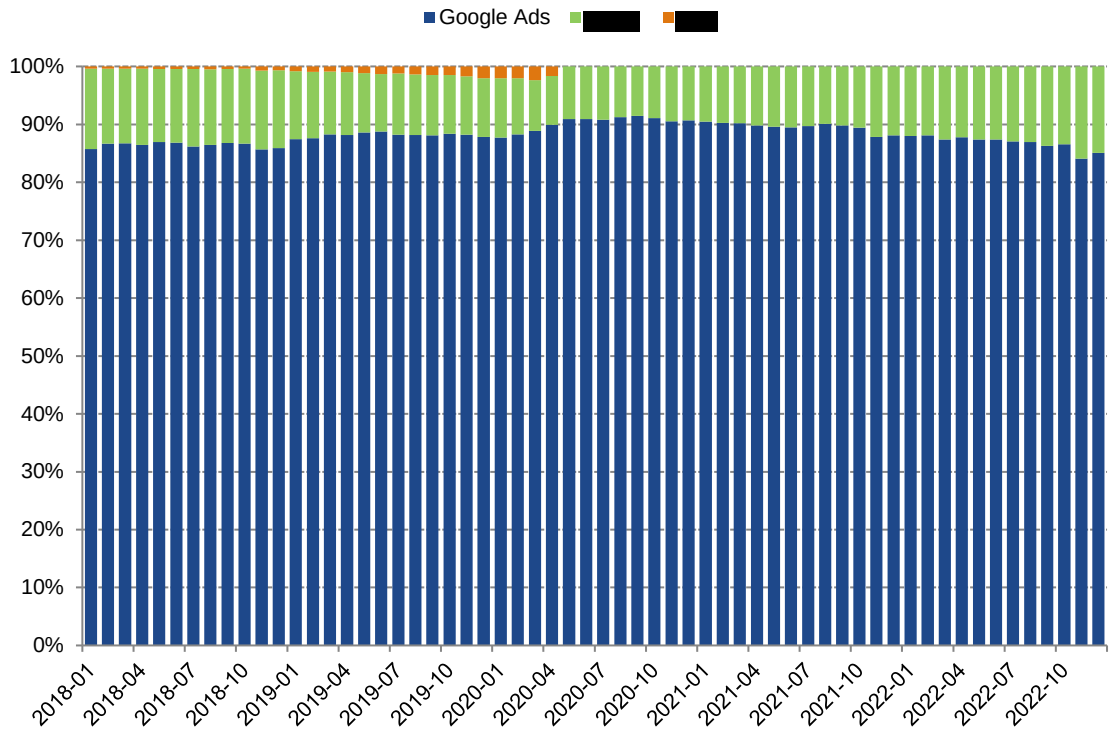
[762] *See* Figure 35 in Section IV.E.1.a. *See also* Deposition of Eisar Lipkovitz, March 31, 2021, 315:20–316:14 ("Q. I guess the thing that I'm trying to understand is, is it [GDN demand] differentiated because of the targeting and targeting technology? Is it differentiated because it's using different data signals? Is it differentiated because it's using -- it has small advertisers that are able to buy programatically through it?... A. I mean, Tim, literally it's all of the above, right. Really, the key point there is the advertiser is not in full control of each impression, because the advertiser chose to outsource that work to GDN, right. And if it's a small advertiser, frankly, that's the only thing they can do. Like they have no idea how to do anything better, right.").

[763] GOOG-DOJ-AT-00221276, at -312 (n.d.). *See also* GOOG-AT-MDL-004522085, at -092 (02/2017) ("GDN reaches over 95% of global internet users and is the world's largest ad network.").

[764] *See* Section III.D.

(531) When restricting attention to indirect open-web display impressions from US advertisers or users among these three advertiser ad networks, Google Ads share is similarly high at approximately 90% throughout the sample period (88% in 2022).[772]

Figure 56. Google Ads has maintained a substantial share of worldwide indirect open-web display impressions among advertiser ad networks (2018–2022)



Source: Google Ads data (DOJ RFP 54); Bidding tools panel (*See* Appendix H.1.b).
Notes: Denominator includes open-web display impressions from Google Ads, [redacted] and [redacted]. Impressions include all indirect open-web display transactions from these parties. [redacted] exited the open-web display market in April 2020.

(532) **Net revenues (fees)**. Google Ads also maintains a significant share of fees collected in the advertiser ad network market. In 2022, Google Ads accounted for 81% of worldwide net revenues from indirect open-web display transactions among Google Ads, Criteo, and FAN.[773] Limiting to fees collected

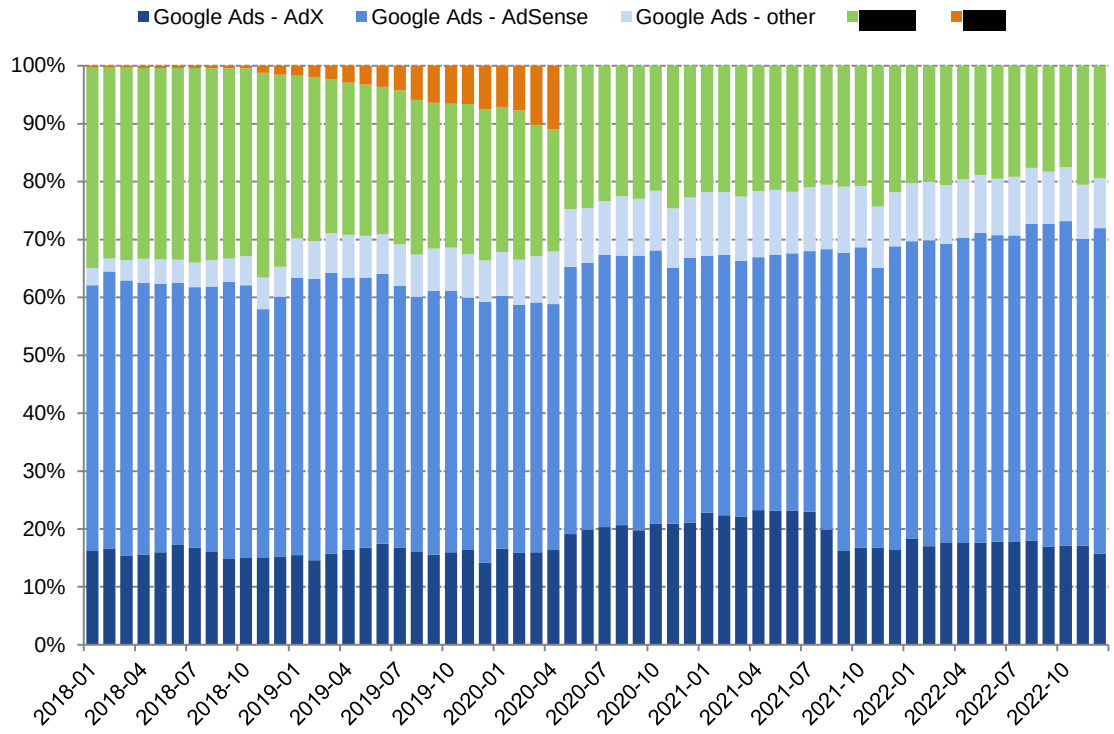
(including Google's AdSense). Even if I exclude impressions from Google Ads transacted through AdSense, Google Ads still comprises a significant share of worldwide indirect open-web impressions among advertiser ad networks, with a share exceeding 75% between 2018 and 2022. *See* Figure 97 in Appendix D.2.a.

[772] *See* Figure 98 in Appendix D.2.a. Google Ads data (DOJ RFP 7 and DOJ RFP 54) only provide information on advertiser geography, while data from Criteo and FAN only provide information on user geography. Given this, I calculate shares among US advertisers or users. *See also* discussion in Section V.C.2.a regarding market share measures based on US users.

[773] *See* Figure 97 in Appendix D.2.a. Impressions that are transacted from Google Ads to AdSense are subject to a 32% total take rate. *See* GOOG-DOJ-04004392, at -393–394 (2018) (Google "Sellside Guiding Principles" document).They are not disaggregated into separate rates for Google Ads and AdSense. In contrast, while Google Ads transactions through AdX also target roughly a 32% total take rate, this rate is split into a 15% margin for Google Ads and a 20% take for

from impressions served to US advertisers or users, Google Ads' share of net revenues among these three ad networks was 83% in 2022.[774]

Figure 57. Google Ads has maintained a substantial share of fees from worldwide indirect open-web display transactions among advertiser ad networks (2018–2022)



Source: Google Ads data (DOJ RFP 7, 54); [redacted]);[redacted]
Notes: 1. Includes net revenues from open-web display impressions from Google Ads (separated into transactions through AdX, AdSense, and other third-party exchanges)[redacted], and[redacted]. 2. Google aggregates buy-side and sell-side fees for transactions through AdSense ("Google Ads - AdSense" net revenues reflect a reported 32% take rate). 3.[redacted]exited the open-web display market in April 2020.

V.D.2.b. Barriers to entry and expansion

(533) There are substantial barriers to entry and expansion in the ad network market. These include:

- **Access to publisher inventory.** Due to indirect network effects, unless an entrant has access to publisher inventory, it will have difficulty attracting advertisers and compelling them to incur the costs of connecting to its services. As discussed in Section V.D.1 above, Google Ads has access to unique Google O&O inventory both within and outside of web display advertising. I also

AdX. The "GOOGLE ADS TO ADX" series in Figure 57 below reflects the 15% take rate for Google Ads transactions through AdX. However, because there is not a clear way to disaggregate Google Ads and AdSense take rates, the "GOOGLE ADS TO ADSENSE" series reflects the full 32% take rate. Appendix 0 includes a version of this figure where I assume that Google Ads collects a 15% take rate for impressions sold through AdSense.

774 *See* Figure 98 in Appendix D.2.a.

discussed in Section V.B.2.b Facebook's acknowledged difficulties in accessing open-web publisher inventory for its advertiser ad network product.

- **Scale and data.** In addition, new entrants are disadvantaged by initially lacking scale. As I discussed in Section III.D.3, data is important for developing targeting algorithms and making predictions for offering CPC-to-CPM conversions, as well as running experiments used to evaluate new features and products. Advertiser ad networks also use large volumes of historical data to predict the probability that users will click on an ad.[775] As Google Ads executives explained in a 2017 presentation to the communications firm RingCentral, "All of these signals means we have a lot of data to work with … We're thus able to optimize with the same level of rigor that you would, but with exponentially more data, scale and precision."[776] Absent sufficient data, entrant ad networks would be competitively disadvantaged relative to existing ad networks.
- **Google's conduct.** As I discuss in Section VII.F.3, Google's conduct that impaired the competitiveness of non-Google ad exchanges and publisher ad servers impeded rival advertiser ad networks from accessing publisher inventory through non-Google products.

V.D.3. Direct evidence of Google's market power in the advertiser ad network market

(534) Direct evidence of Google's substantial and sustained market power in the advertiser ad network market includes:

- Google Ads' ability to charge supracompetitive fees and vary its targeted margins significantly across impressions, and Google's own analyses indicating that increasing fees would increase profits.
- Google's ability to restrict Google Ads' bidding on non-Google exchanges, thereby degrading the availability of publisher inventory for Google Ads' advertiser customers to benefit AdX.
- Google Ads, by either bidding into or withholding its demand from an ad exchange, meaningfully affects payouts through the exchange.

V.D.3.a. Google Ads is able to maintain supracompetitive fees, and vary its targeted margins to win more auctions, increase profits, and influence publisher behavior

(535) Google Ads targets a 15% margin with Google Ads on Open Auction transactions through AdX, and a 31-32% margin on transactions it facilitates through AdSense.[777] A July 2018 "Sell-side Pricing

[775] *See* Section III.D.3 for further details.

[776] GOOG-AT-MDL-004522085, at -088.

[777] *See* GOOG-AT-MDL-006218257, (12/16/2022) (Google response to the EC's RFI of October 31, 2022) at -264. GOOG-AT-MDL-000969513, at -525 (11/2020).

Strategy Review" document noted that, "AFC [Adsense for Content] and AdMob have not historically faced price pressure on their 32% revenue share."[778]

(536) Google has performed multiple analyses that show that Google can significantly increase Google Ads' margins while increasing Google's profit and net revenue earned on its ad tech products. These analyses, which are indicators of Google Ads' market power, include:[779]

- A March 2014 experiment found that an increase in Google Ads' margin from 14% to 15% (a 1 percentage point, or 7 percent increase) resulted in an increase in Google Ads' net revenues earned on AdX transactions.[780]
- The 2016 simulation described in Section V.C.3.a and depicted in Figure 52 and Figure 53 showed that for fixed AdX take rates, increases in Google Ads' margin would increase Google's net revenues earned on AdX publishers.[781]
- A simulation conducted by Google in May 2018 indicates that an increase in Google Ads' margin on AdX from 15% to 20% would increase Google's profit on "AdX web publishers" by 6.4%.[782] Figure 58 below from a Google document describing these simulations plots buy- and sell-side profit as increasing in Ads' margin (see plot on right, where profit increases as Google Ads' margin increases from 10%).

[778] GOOG-DOJ-AT-02118579, at -580 (07/11/2018) (Google "Sell-Side Pricing Strategy Review,").

[779] *See* Section V.B.3.a for economic reasons why a firm with substantial market power may choose to price below its short-run or static profit maximizing level.

[780] *See* GOOG-DOJ-AT-02096186, at -186 (03/2014) (Google proposal "Increase GDN margin on AdX from 14% to 15%," states, "Recently the GDN margin on AdSense has come closer to 32%, therefore we propose to increase the GDN buy-side margin on AdX to 15%...."; The "Measured Impact" "For AdWords on AdX slice" reads, "GDN profit +5.3%" and "Google profit +2.2%", with "publisher payout -0.8%". The document indicates that GDN profit is computed only on AdX publishers. The document also indicates GDN profit represents "GDN's net revenues on AdX transactions", and "Google profit is the amount of money collected from advertisers minus the amount paid to the publisher.").

[781] *See* GOOG-DOJ-04615040, at -040, -043 (11/14/2016) (An email chain regarding simulation). For example, holding AdX's margin at 10%, an increase in GDN's fee from 20% to 25% would increase Google's net revenue by approximately 8% relative to its current levels (-22.92% to -15.04%).

[782] GOOG-DOJ-04736246, at -246 (05/09/2018) ("At 20% buy side margin, revenue goes down -0.9% (-$53M) but the overall (buy+sell side) profit increases 6.5% ($70M)"). An increase from 15% to 20% represents approximately a 33 percent increase in Ads' fee and a 16–17 percent increase in Google's total fee, from 30–32% to 35–37%. *See also* GOOG-DOJ-05277697, at -698 (05/10/2018) (A May 2018 email chain discussing this simulation which notes also "[w]e have been running an experiment [on AWBid] where we have been targeting roughly 5% more margin. It's showing ~$2M revenue and +$15M profit (on about $450M revenue)") and GOOG-DOJ-AT-02118579, at -581, (07/2018) (A July 2018 "Sell-side Pricing Strategy Review" document noting that, "simply increasing the GDN margin could generate meaningful net revenue improvements, based on an experiment with Web inventory.").

Figure 58. Results of Google's 2018 simulations that varied Google Ads margin relative to 15% on gross and net revenues earned on AdX web publishers

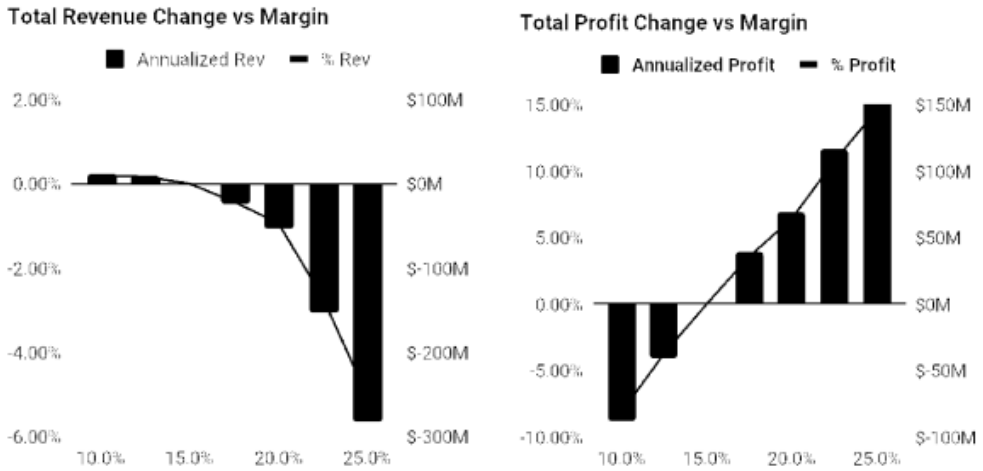


Figure 1: Total impact on revenue and profit relative to production. X-axis is the buy side margin, left Y-axis is the % change and right Y-axis is the annualized change.

Source: GOOG-DOJ-04736246, at -247. Change in gross revenue and net revenue on buy- and sell-side products earned on AdX web publishers.

(537) Google Ads' market power is also demonstrated by its bidding behavior into AdX auctions.

(538) Prior to the Uniform First Price Auction introduced in 2019, Google Ads (AdWords at the time) submitted two bids into the AdX auction.[783] Google documents indicated that this was "to prop up publisher payout" in AdX's second-price auction,[784] but would tend to increase the auction price paid by the winning Google Ads advertiser. According to a 2013 Google document, Google Ads' margin would be significantly higher (57% as opposed to 14%) if it did not submit two bids into AdX, and its "2nd bid accounts for ~50% of pub revenue, >$500M/yr!"[785] This indicates Google Ads' significant value to publishers as early as a decade ago, consistent with its substantial market power even at that time.

(539) Moreover, beginning in 2013, Google began dynamically varying Google Ads' margin by adjusting the two bids that Google Ads submitted into AdX through programs referred to as Google Ads Dynamic Revenue Share ("Google Ads DRS") and Project Bernanke.[786] Google Ads' ability to

[783] *See* GOOG-AT-MDL-006218271, at -284–286 (01/06/2023).

[784] GOOG-DOJ-10733927, at -933 (n.d.). Before 2019, AdX ran a second-price auction where the winning bidder pays the maximum of the second-highest bid or the reserve (or floor) price. By submitting a second bid from Google Ads, Google would increase the payment to the publisher in the event AdX served the ad, and both the highest and second-highest bids into AdX were from Google Ads. This would also tend to increase the auction price paid by the winning Google Ads advertiser.

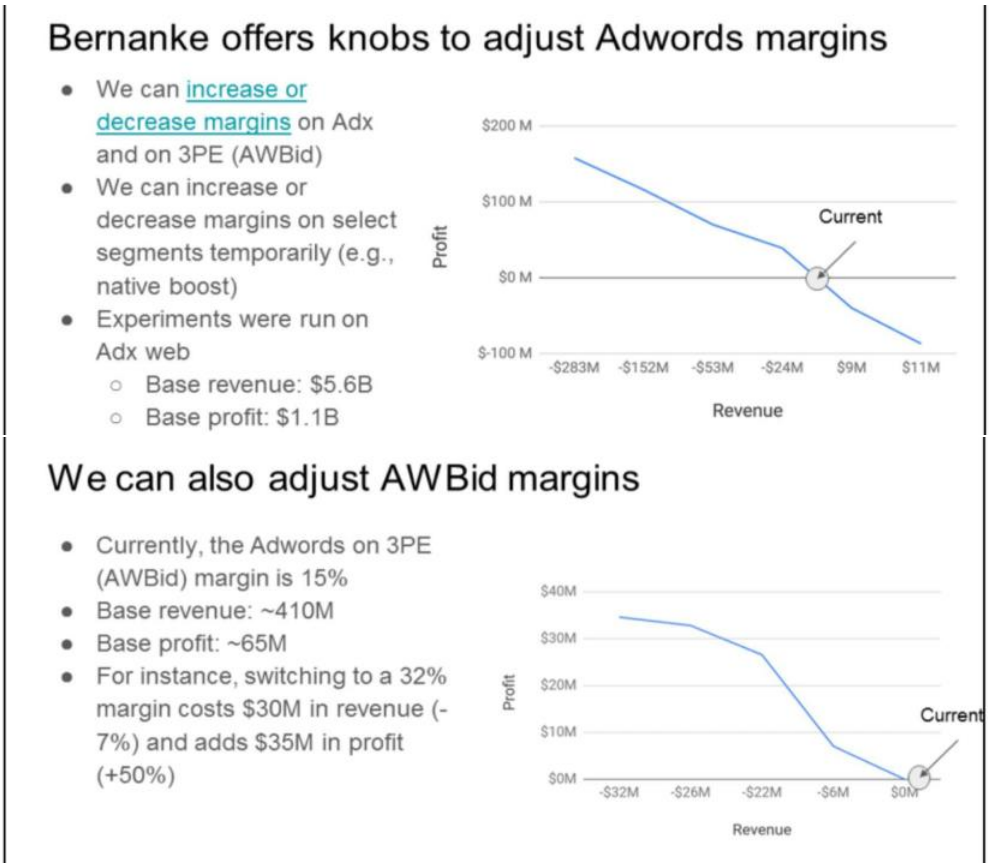
[785] GOOG-DOJ-28386151, at -154 (12/10/2013).

[786] Project Bernanke allowed Google Ads to bid such that it earned a a lower margin in certain auctions and a higher margin

control prices is evident in documents describing Project Bernanke. For example, Figure 59 from a 2018 presentation shows that Google characterized Bernanke as "offer[ing] knobs to adjust Adwords margins"—i.e., control price for Ads—to increase profits.

(540) In another slide from the same presentation, also shown in Figure 59, Google noted that it could adjust margins for its AWBid product which allowed Ads to bid on third-party exchanges for a limited set of impressions (see Section VII.B): the figure shows that increasing Ads' margin from 15% to 32% on AWBid transactions would significantly increase its profits (see last bullet point in Figure 59).

Figure 59. Google Ads' ability to control margins and increase profits



Source: GOOG-DOJ-10733927, at –942, –943

(541) Additionally, Google introduced an update to Project Bernanke in 2016 that altered Google Ads' bids for certain publishers that Google detected as engaging in "calling" AdX multiple times for the same

in others. In the majority of wins (85% of the time according to a 2013 document) Google Ads second priced itself, and thus it could lower the second bid that it submitted and increase its take rate on what it deemed to be less competitive auctions. *See* GOOG-DOJ-06842351, at -356 (10/2013), Google continues to engage in variable pricing with Ads via Project Alchemist. *See* Appendix L.4 for further discussion on Google Ads' dynamic revenue sharing programs.

bidding opportunity.[787] A Senior Director of Engineering at Google noted that "Google communicated with multi-call publishers that Google Ads would be making some changes to how it submitted bids in response to multi-calling" in order "to encourage them to reduce usage of multi-calls."[788] Google's acknowledged use of Google Ads' bidding behavior to affect how publishers engaged in yield management is a recognition of Google Ads' substantial market power—in a competitive market, Google Ads' ability to reduce publisher payouts below competitive levels would be constrained by other demand sources that publishers could substitute to (as those demand sources would then win the auction instead of Google Ads). I discuss this program further in Appendix L.4.

(542) The ability of Google Ads to engage in significant price discrimination across publishers and charge widely varying margins is also indicated by analysis of the data produced in this matter. In Appendix E.4, Figure 114 and Figure, I show that there exists significant dispersion in Google Ads' margin among large publishers. For example, in 2022, weighting by impressions: 42% of the top 100 publishers were charged an average margin of less than 10%, 29% were charged an average margin between 10% and 12.5%, and 29% were charged an average margin greater than 12.5%.[789]

(543) These are clear indicators that Google Ads possesses substantial market power, as that it has the ability to profitably charge fees (i.e., target margins) above competitive levels.

V.D.3.b. Google Ads is able to significantly deviate from competitive behavior in the advertiser ad network market and meaningfully impact publisher payouts

(544) Google's substantial market power in the advertiser ad network market is also strongly evident in its restriction on Google Ads' ability to bid into rival exchanges without losing significant transaction volume.[790] One Google document noted that this "exclusivity" between Google Ads and AdX "makes AdX more attractive to sellers."[791] However, Google also acknowledged that restricting Google Ads from purchasing inventory on third party exchanges strongly disadvantages Google Ads relative to other ad networks.[792]

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[787] GOOG-AT-MDL-008842383, at -386 (08/05/2023) (Declaration of Nirmal Jayaram, "Global Bernanke was subsequently updated in October 2016. This update, relating to the detection and management of multiple calls, was sometimes referred to internally as 'Bell v.2.' Under Bell v.2, Google Ads would modify its bidding behavior (to decrease bid variance) when receiving multiple calls for the same ad request to protect advertisers from the risk of price inflation. A 'call' refers to a publisher's request that an ad exchange supply an ad to show in response to a specific ad opportunity when a user has navigated to the publisher's property. Some publishers would call an ad exchange, such as AdX, multiple times for the same potential ad opportunity.").

[788] GOOG-AT-MDL-008842383, at -386 (08/05/2023) (Declaration of Nirmal Jayaram).

[789] DRX Internal Stats data (DOJ RFP 57).

[790] *See* Section VII.C.1. for more details on Google Ads' bidding relationship with AdX.

[791] GOOG-DOJ-05247075, at -083 (09/14/2012).

[792] GOOG-DOJ-05247075, at -083 (09/14/2012) ("GDN is competitively disadvantaged against buy-side competition … In the auction ecosystem, we appear to be running a buyside-subsidizes-sellside model; we are artificially handicapping our buyside (GDN) to boost the attractiveness of our sellside (AdX)."). *See* Section VII.C.1 for further discussion.

(545) Despite restricting Google Ads' ability to bid through rival ad exchanges, Google Ads has maintained a dominant market share in the advertiser ad network market across a variety of measures. The dominance of Google Ads despite being disadvantaged to strengthen AdX is consistent with Google Ads' possession of substantial market power. This is because, again, in a competitive market, an ad tech product (all else equal) would not likely be able to profitably restrict access to inventory available to its advertiser customers, as doing so would risk losing a large amount of its transaction volume to rivals that did not impose such restrictions.

(546) Next, I present an analysis of the data produced in this matter that demonstrates the importance of Google Ads for monetizing publishers' display ad inventory. This represents evidence of Google Ads' substantial market power and ability to profitably charge supracompetitive fees. (In Section VII.B and VII.F.1, I provide additional evidence that access to Google Ads' demand contributed meaningfully to AdX's market power and attractiveness to customers.[793])

(547) I performed a simulation exercise in which I removed all Google Ads' bids from a random sample of GAM auctions run in June 2023,[794] and for impressions within GAM that Google Ads had previously won (comprising 27.8% of transactions in the sample), assigned the publisher payout for the impression to the value of the next-highest bid. I found that the impact of removing Google Ads demand from GAM auctions would have substantial effects on publisher monetization. First, of the auctions Google Ads won, 51.7% had no competing[795] non-zero bidder, meaning that without demand from Google Ads, publishers would likely not have monetized this inventory at all. Second, for the remaining transactions previously won by Google Ads that are assigned to the next-highest non-zero bid, I found that the payout would fall by 38.5%. The simulation also indicates that the number of transactions won by AdX in GAM would fall by 40.2%.

(548) Across all GAM auctions in the sample, total publisher payout would decrease by 14.4% if Google Ads were removed and its impressions were reassigned in this manner. I repeated this exercise by removing instead different demand sources identified in the data. No other single demand source identified in the data had a larger impact on publisher payouts than Google Ads. The demand sources identified in the data with the next largest reductions in publisher payouts were DV360 (6.2%),

[793] For example, GOOG-DOJ-04004392, at -397 (2018) (An internal Google memo which states, "Recent market dynamics (header bidding, Amazon TAM offering, free mediation in apps) are putting pressure on the 20% [AdX] fee and it is becoming more clear that the market bears the fee primarily because of exclusive access to our AdWords demand.").

[794] This exercise was performed using the GAM log-level data, which contains impressions sold during the 35th-through 39th seconds of every minute of June 2023, excluding June 28, which is captured in full. The analysis sample for this chart is a 1-in-60 sub-sample (minute 9 of each hour) of the June 1st GAM sample. Out of the 31,865,691 auctions thus drawn, I exclude approximately 4.1% due to errors in the data production. *See* 2023.11.20 Letter from D. Pearl to M. Freeman, November 20, 2023. Additionally, I exclude 0.8% with winning bid CPMs of $100 or greater, and 0.8% because the auction included Programmatic Guaranteed, Private Auction, or Preferred Deal bids.

[795] I consider only non-winning bids for which the variable "win_loss" is equal to "Lost," meaning that the bid competed directly against the winning bid, was above the price floor, and was not blocked by the publisher due to attributes of the ad or the advertiser.

"Header Bidding Yield Group" (2%), [redacted] (0.5%), and Rubicon (0.5%); all other ad exchanges and DSPs had an impact below 0.5%.[796]

(549) Note that this analysis likely understates the impact that the removal of Google Ads' bids would have had on publisher payouts, as it does not account for the change in the bids of other auction participants. As I discussed in Section III.E, additional competition tends to generate *higher* bids into a first-price auction (which is the auction format used by AdX and GAM during this time period). By introducing additional competition, Google Ads' participation in AdX auctions likely led to higher bids and higher publisher payouts *even for transactions that Google Ads did not win.*[797]

(550) The results of my analysis indicating the importance of Google Ads' participation on publisher payouts are also consistent with a 2014 Google auction simulation studying the "Impact of GDN not participating in AdX auctions":[798] among a sample of 7.5B daily queries on AdX (of which 5.3 billion or over 70% were won by Google Ads), the simulation found that without Google Ads demand, the number of queries won by AdX would fall by 51%, Google revenue would fall by 70%, and publisher payout would fall by 65%.[799] The simulation found that much of the reduction in publisher payout was from those queries where Ads had previous won, both because "a large number (70%) go unmatched" and "the RPM on queries won now by AdX buyers is only a third of the RPM on queries

[796] Third-party ad exchanges are identified in the data only when participating through Exchange Bidding. Some exchanges may also participate in the auction through remnant line items captured by the "Reservation" category. The "targeted_custom_criteria" field from the GAM log-level data contains publisher-entered tags which include, among other information, the names of exchanges that the publisher wishes to solicit bids from. These fields often contain multiple exchanges. I understand that Google uses this information in identifying both the presence of header bidding within DFP as well as the underlying exchanges. *See* GOOG-AT-MDL-008928566, at -575, -579, and -586 (08/23/2017. To obtain a more conservative estimate of the impact of removing each exchange, I performed the following exercise, in turn, for each of the top 5 Open Bidders on GAM [redacted] and [redacted] I assigned to it all instances of "Reservation" bids for which the exchange's name or header bidding code (e.g., [redacted] or [redacted] for [redacted]) appear in the "targeted_custom_criteria" field (ignoring other exchanges or "!" signs), then simulated removing those bids as well at that exchange's bids from the dataset. I find that the respective impact, in terms of foregone publisher revenue, is: 2.1% for [redacted] 2.2% for [redacted] 1.5% for [redacted] 0.8% for [redacted] and 0.4% for [redacted]

Header Bidding in Yield Groups ("HBYG") are defined by Google to be header bidders "with whom Google has a contractual relationship" and are provided minimum-bid-to-win information; these were launched in 2022 in response to commitments with the French Competition Authority. *See* GOOG-AT-MDL-006217592, at -603 (12/12/2022).

[797] To see this another way, consider the same exercise of removing Google Ads' bids from a set of *second-price* auctions. Again, for those transactions that Google Ads would have won, if Google Ads' bids were removed then those transactions would go to a different winner at a lower transaction price (or be unmatched), thereby reducing publisher payouts. However, there is an additional effect for transactions that Google Ads did not win. For these transactions, if Google Ads' bids were removed, publisher payouts would also fall whenever Google Ads had placed second, since those transactions would now clear at lower auction prices (recall that under a second-price auction, the winner pays the second-highest bid). This additional effect—i.e., of Google Ads "second pricing" other bidders—is an example of how Google Ads' participation in an auction can affect payouts even for transactions that it does not win, and is recognized in the Google simulation described next. *See generally* GOOG-DOJ-15140608 (01/2014) (A Google analysis by Nirmal Jayaram titled "Impact of GDN not participating in AdX auctions").

[798] Google Senior Director of Engineering Nirmal Jayaram testified that, "Auction simulation is the process of trying to do an offline analysis, so not in real auctions, but in a simulated setting, trying to understand the outcome of certain scenarios." Deposition of Nirmal Jayaram (Google) September 17, 2021, 135:24-136:4. Mr. Jayaram described the simulation as "referring to AdWords not participating on AdX auctions." 138:23-25.

[799] GOOG-DOJ-15140608, at -608–609 (01/2014).

won by [Google Ads] earlier."[800] In addition, the simulation found that some reduction in publisher payout would result from "GDN no longer second pric[ing]" queries on which an AdX buyer had previously won.

(551) Combined, these simulation results indicate that Google Ads was and continues to be a uniquely large and important buyer of publisher inventory, meaningfully impacting publisher payouts through its bidding behavior, and supports the conclusion that Google Ads' possesses substantial and sustained market power.

[800] GOOG-DOJ-15140608, at -608–609 (01/2014). ("Q. Can you help me understand what this is saying? A. I think what it is saying is if GDN did not participate on those queries that were being won by GDN, 70 percent of them go unmatched in the AdX auction. Q. So does that mean that there's no winner for those auctions? A. There is no winner in the AdX auction.") Deposition of Nirmal Jayaram (Google) September 17, 2021, 142:15–142:24.

VII. Google has historically engaged in, and continues to engage in, conduct within and across the relevant markets that excluded and harmed the competitiveness of rivals and potential entrants

(570) Over the last 15 years, Google has pursued a campaign to obtain, strengthen, and protect substantial market power throughout the open-web display ad tech stack. Although some of its market power may have been obtained through improvements to its existing products, Google has nonetheless engaged in other actions that have preserved its market power by acquiring or excluding rivals, and by frustrating and impeding their efforts to compete for customers.

(571) In particular, Google has engaged in efforts to leverage its market power in one relevant market to strengthen its position in other markets. By using its position in one market to benefit its products in another, Google reduces demand (i.e., advertiser spending) or supply (i.e., publisher inventory) for rivals in the targeted market, both reducing the competitiveness of these rivals and the likelihood of entry of new ones. Moreover, because of indirect network effects and the need for different ad tech products to interoperate, reducing rivals' competitiveness in the targeted market also reduces the attractiveness of non-Google alternatives in other ad tech product markets.

(572) In this Section, I examine the competitive effects of five actions that Google has undertaken with its ad tech products. I provide the basis for my opinion that these actions have harmed the competitiveness of rivals and their ability to attract advertiser spending and publisher inventory within the publisher ad server, ad exchange, and advertiser ad network markets. (Later, in Section VIII, I discuss how these actions have preserved and enhanced Google's market power and harmed customers and consumers.)

(573) Before I examine the competitive effects of Google's five actions, I first provide background context for Google's conduct in Section VII.A.

- I provide an overview of Google's strategy in the ad tech stack since its acquisition of DoubleClick in 2008. This acquisition, which provided Google with its publisher ad sever (DFP) and ad exchange (AdX) products, laid the groundwork for Google's practice of using market power in one relevant market to foreclose rivals and distort competition in favor of its own products in another market. I describe as well the importance that Google placed on controlling the publisher ad server, allowing it to then further protect and enhance its market power across the ad tech stack.
- I also describe how Google viewed yield managers and header bidding tools—which helped publishers access rival non-Google ad exchanges—as "disintermediation" threats to DFP's substantial market power. This discussion, as well as Google's varied responses, shows that

Google's efforts to impede and harm the competitiveness of rival ad exchanges not only had effects on competition within the ad exchange market, but also impacted competition within the advertiser ad network and publisher ad server markets and protected DFP's substantial market power. Moreover, the limited impact of these threats to Google highlights the durability of Google's entrenched position and market power, maintained and enhanced by the conduct described in the remainder of the Section.

(574) Next, I evaluate five actions taken by Google. In Sections VII.B and VII.C, I describe how following the acquisition of DoubleClick, Google established a Google-only pipeline through the heart of the ad tech stack, denying non-Google rivals the same access to real-time demand that it provided its own products, by providing:

- (1) Unrestricted access to Google Ads' advertiser demand exclusively to AdX;
- (2) Access to and use of real-time bids from AdX exclusively to DFP.

(575) In these instances, Google's actions denied or otherwise degraded rivals' access to a valuable asset that it controlled, and conditioned access to this asset on the use of its other products.[815] The bidding relationship between Google Ads and AdX foreclosed publishers who used a rival exchange from Google Ads' advertiser demand; this had the effect of diverting publisher inventory away from rival exchanges and towards AdX. Similarly, foreclosing rival publisher ad servers from access to real-time bids from AdX (whose own market power was enhanced by its preferred access to Google Ads) steered publishers towards DFP instead.

(576) Hence, Google used the market power it had in the advertiser ad network market with Google Ads to enhance AdX's market power in the ad exchange market, which in turn Google used to further strengthen and preserve DFP's market power in the publisher ad server market. Given Google Ads' and AdX's market power, Google possessed both the ability and evident incentive to engage in these actions. Such actions harmed the competitiveness of rivals in the relevant markets, ultimately to the detriment of advertisers and publishers.

(577) In Section VII.D, I describe how Google used DFP's market power, strengthened and preserved by the above conduct, to further advantage AdX over rival exchanges. It did so in at least two ways.

- (3) DFP granted AdX exclusive access among ad exchanges to its Dynamic Allocation and Enhanced Dynamic Allocation features (until the introduction of Exchange Bidding), thereby providing AdX with advantageous access to inventory over rival exchanges. AdX was thus

[815] In Sections VII.B.3 and VII.C.3, I discuss Google's AWBid feature, which allowed Google Ads to bid on rival exchanges for a subset of display impressions (albeit at a significantly higher targeted margin than it targeted on AdX), and Google's AdX Direct tag, which provided limited access to AdX to rival publisher ad servers. In both cases, I show that these features have meaningful restrictions, and that usage of these features is relatively small as a fraction of overall Ads or AdX transaction volume.

provided with exclusive access to what industry participants referred to as both a "first look" and "last look" advantage over rival exchanges. The effects of these advantages have likely persisted beyond Google's ending of this practice due to the durability of network effects and scale effects, and due to the presence of switching costs.

- (4) Google removed publishers' ability to set variable floors across exchanges within its "Unified Pricing Rules" (UPR) in 2019. This act impaired publishers' ability to work with rival exchanges that would otherwise exert competitive pressures on AdX.

(578) In Section VII.E, I then discuss how Google responded to potential competitive threats posed by "yield managers" by:

- (5) Acquiring AdMeld in 2011. This acquisition had the effect of removing an emergent competitor to Google's sell-side products and eliminating an option for accessing and managing multiple exchanges and demand sources.

(579) In Figure 60Figure 60, I depict the conduct discussed in Sections VII.B–VII.E. In the diagram, I show three of Google's ad tech products—from left to right, its advertiser ad network (Google Ads), its ad exchange (AdX), and publisher ad server (DFP)—and show how Google's actions leveraged market power in one relevant market to impose restraints that strengthen its own products and foreclose rivals in an "adjacent" relevant market within the ad tech stack. For example, Google's decision to make unrestricted access to Google Ads' demand exclusive to AdX had the effect of foreclosing rival exchanges; and Google's decision to make unrestricted access to and use of real-time bids from AdX to DFP had the effect of foreclosing rival publisher ad servers. Moreover, by granting the first- and last-look advantages associated with Dynamic Allocation exclusively to AdX, Google foreclosed rival ad exchanges from real-time competition within DFP.

- Second, the potential threat that header bidding adoption posed to DFP likely incentivized Google to innovate and introduce Exchange Bidding (later renamed Open Bidding).[846] I return to this point, and the role that competition plays in encouraging innovation, in Section VIII below.

(602) Having provided this context, I turn in the rest of this Section to discussing the conduct that is the focus of my report.

VII.B. Google provided unrestricted access to Google Ads exclusively to AdX, thereby foreclosing rival exchanges from access to Google Ads' advertiser demand

(603) Following the DoubleClick acquisition, Google launched "AdX 2.0" (hereafter, AdX) on September 17, 2009.[847] A 2009 Google document titled "AdExchange primer" explained that AdX would be "linked to both AdSense and AdWords, leveraging [Google's Content Network]" and that AdX would differentiate from other exchanges via "access to AdWords advertisers."[848] (In this Section, as I have previously, I use Google Ads to refer to the advertiser ad network component of the product formerly known as AdWords.)

(604) Since the launch of AdX, Google has restricted the demand provided by Google Ads into rival exchanges, and continues to provide unrestricted access to all of Google Ads' advertiser demand ("Google Ads demand") for display advertising only to publishers using AdX and AdSense; Google documents have referred to this relationship as "exclusivity" between Google Ads and AdX.[849] This exclusivity provides a competitive advantage to AdX and encourages publishers to use or prioritize AdX over rival exchanges.

[846] GOOG-TEX-00117939, at -939 (01/06/2016) (At the same time, in 2016 Google described its goal for "allow[ing] non-AdX exchanges to compete with realtime pricing from within DFP" within Exchange Bidding is "to provide slightly better value for publishers than header bidding but not so much that it completely cannibalizes AdX." GOOG-TEX-00117939, at -939. Google also charged a fee for participants in Exchange Bidding. See discussion in Section II.E.4 and Appendix L.3.a.

[847] Neal Mohan, "The DoubleClick Ad Exchange: growing the display advertising pie for everyone," Google Official Blog, September 17, 2009, https://googleblog.blogspot.com/2009/09/doubleclick-ad-exchange-growing-display.html; GOOG-DOJ-11899169, at -196–198 (10/10/2011).

[848] GOOG-DOJ-12119445, at -445–447, (10/06/2009).

[849] GOOG-DOJ-05247075, at -083, (09/14/2012) ("Google "chosen to limit GDN to buying only on AdX, an exclusivity that makes AdX more attractive to sellers."); GOOG-DOJ-03525434, at -434 (10/18/2013) ("AdWords advertiser demand is currently limited to buying inventory that is available on GDN and inventory managed through AdX."); GOOG-DOJ-07275375, at -517 (01/14/2016) ("the key differentiator of AdX: GDN exclusivity and dynamic exclusivity."); GOOG-DOJ-AT-00045716, at -719 (04/26/2019) ("not all Google Ads demand is currently available on 3rd party exchanges.").

(605) In this Section, I describe how, through this "exclusivity," Google foreclosed rival exchanges and strengthened AdX's market power, enabling AdX to sustain fees significantly above competitive levels.

(606) This Section is organized as follows.

- In Section VII.B.1, I explain that Google Ads demand meaningfully affects the competitiveness of an ad exchange.
- In Section VII.B.2, I show that keeping unrestricted access to Google Ads demand exclusive to AdX would advantage AdX over rival exchanges competing for publisher inventory and advertiser spending. Moreover, statements from Google documents indicate that the restrictions placed on Google Ads bidding into rival exchanges diminished the attractiveness of Google Ads to its advertiser customers, but nevertheless Google continued to do so to the benefit of AdX and thus strengthened Google's market power in the exchange market, supporting higher AdX fees and increasing Google's overall profits.
- In Section VII.B.3, I describe Google's AWBid program which allowed Google Ads to bid on rival exchanges for a subset of impressions. I provide evidence that Google Ads targeted significantly higher margins on rival exchanges than on AdX when it did bid, reducing the likelihood that those exchanges would win an impression using Google Ads' demand, and that AWBid has represented a small share of Google Ads' overall spend. Hence, this program did not prevent rival exchanges from being foreclosed from Google Ads' demand.

(607) Later, in Section VII.F.1.a, I discuss how Google's exclusive bidding relationship between Google Ads and AdX, by foreclosing rival exchanges from a substantial amount of advertiser demand, harmed rival exchanges' competitiveness.

VII.B.1. Access to Google Ads' advertiser demand affects the competitiveness of an ad exchange

(608) Google Ads' bidding behavior into an exchange meaningfully impacts an exchange's ability to monetize impressions and attract publisher inventory, thereby affecting an ad exchange's competitiveness. This is supported by the following evidence, documents, and testimony.

(609) First, direct support for Google Ads' substantial and sustained market power presented in Section V.D.3 demonstrates the importance of Google Ads demand for the competitiveness of an ad exchange. For example, I described an analysis of 2023 data indicating that Google Ads' participation on an ad exchange has a meaningful impact on publishers' payouts, larger than any other ad exchange or demand source. This is consistent with a 2014 simulation exercise from Google that indicated removing bids submitted by Google Ads would significantly reduce publisher payouts from an

exchange, thereby adversely impacting that exchange's attractiveness to publishers. I also discussed Google's update to Project Bernanke which it described as adjusting Google Ads' bids into certain publishers in order to influence how they called upon ad exchanges.[850]

(610) Second, numerous Google documents have referred to and explained why exclusive access to Google Ads' advertiser demand provides AdX with competitive benefits not available on rival exchanges. For example, Google's Director of Product Management, Scott Spencer, wrote in a 2013 email: "[o]ur goal should be all or nothing – use AdX as your SSP or don't get access to our demand. It's a key feature and we need to use it while its still proprietary to AdX."[851]

(611) Third, deposition testimony from executives of third parties discusses the importance of access to Google Ads demand for publishers,[852] and that full access to Google Ads through an ad exchange is available only via AdX.[853]

VII.B.2. Google's bidding relationship between Google Ads and AdX foreclosed rival exchanges, enhancing AdX's market power and ability to maintain high fees

(612) By limiting rival ad exchanges' access to bids from Google Ads, Google reduced publisher payouts on other exchanges, making them less competitive alternatives to AdX even if they could otherwise offer the same or better exchange services or charge a lower fee. This had the effect of leading publishers to monetize fewer impressions through third-party exchanges than they would have had Google not restricted their access to Google Ads–both because publishers would be less likely to send

850 *See also* Appendix L.4 for further discussion of Project Bernanke, and evidence that it had an impact on publisher behavior.

851 GOOG-DOJ-15600216, at -216 (12/06/2012). The email also lists five reasons why AdX will explicitly not be allowed to be operated via another yield manager. *See also* GOOG-DOJ-03863839, at -839 (03/09/2011) ("Having AdWords as a buyer is a major advantage for AdX."); GOOG-DOJ-03707195, at -205, (09/2013) ("[e]xclusive access to Google demand is a key competitive advantage for AdX."); GOOG-DOJ-03548575, at -575 (08/27/2015) ("[m]y understanding is that one of the strongest draws of AdX for sellers was exclusive access to AdWords."); GOOG-DOJ-14432746, at -748 (12/2015) ("AdX/AFC value proposition is diluted/compromised if 3rd party exchanges have access to GDN's 2m+ advertisers and targeting capabilities.")

852 *See, e.g.*, Deposition of Michael Shaughnessy (Kargo), August 9, 2023, 60:3–60:17. ("Q. What is the importance of Google's GDN demand to publishers? A. It's massive. Q. What do you mean by saying "it's massive"? A. It is significant to a publisher's bottom line. Q. Why is GDN demand significant to a publisher's bottom line? A. It contributes significantly to their top-line revenues. Q. And what's your basis for saying that GDN demand is significant to a publisher's bottom line? A. My experience being a publisher."). *See* Section VII.F.1 for additional testimony.

853 *E.g.*, Deposition of Arnaud Creput (Equativ), September 5, 2023, 33:11–34:4. ("Q. Okay. You also said Google's -- AdX's position is determined by its self-preferencing. Can you explain what you meant by that? A. In the first stage, the self-preferencing behavior of the ad server does not give access to data to other SSP -- it does not give access to data that the other SSPs don't have access to. An example is that the Google SSP has access to all the auction data from the SSPs, the other SSPs, but the SSPs don't have access to this data. The second point is that AdX has access to all Google Ads exclusively while other SSPs do not have access to Google Ads -- or AdX, I apologize"). *See* Section VII.F.1.a for additional testimony.

impressions to third-party exchanges, and because third-party exchanges would win less often when competing against AdX.

(613) This point is evident in a 2011 Google presentation noting that, "enablement of AdWords on 3rd party inventory sources will incentivize clients to move from AdX and AdSense to Rubicon, Pubmatic and Admeld."[854] The presentation also acknowledged that the long-term impact of providing Google Ads inventory elsewhere could impact DFP as well: "[p]ublishers move away from AdSense / AdX to 3rd party exchanges," and that there would be "DFP differentiation at risk with RTB based spend on Ruby/Pub/Meld."[855]

(614) Additional Google documents and deposition testimony indicate that exclusive access to unique Google Ads demand weakened the attractiveness of rival exchanges relative to AdX for publishers. For example, a 2011 Google memo describes Google Ads demand as a "unique sales proposition" for AdX to use with publishers, and that the loss of exclusive access to that demand would cause publishers to switch to a different exchange.[856] In his deposition, then-Google Principal of Corporate Strategy Bryan Rowley explained that exclusive access to Google Ads demand benefited AdX, noting that "When demand can only be found through certain sources, it compels publishers to work with that product."[857] Third-party documents and testimony corroborate the importance of Google Ads demand, as I describe in Section VII.F.

(615) Google documents and testimony indicate that while Google Ads' exclusivity benefited AdX, it weakened the value of Google Ads to advertisers.[858]

(616) For example, according to a 2012 Google display ad strategy document, "GDN is competitively disadvantaged against buy-side competition … In the auction ecosystem, we appear to be running a buyside-subsidizes-sellside model: we are artificially handicapping our buyside (GDN) to boost the attractiveness of our sellside (AdX)."[859] The same Google document noted that "we have chosen to

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[854] GOOG-DOJ-14826585, at -586 (02/2011). In addition, a February 2011 email described an analysis indicating that the expected impact of allowing AdWords to bid into third-party yield managers would increase GDN revenue by 5%, but increase the eCPM on the yield managers by 16% while decreasing existing AdX and AdSense publisher's eCPM by 10%. Scott Spencer, Google's Director of Product Management, acknowledged that this "could cause some publishers to shift where they offer their inventory." GOOG-DOJ-04293455, at -455 (02/14/2011).

[855] GOOG-DOJ-14826585, at -592 (02/2011).

[856] GOOG-DOJ-03863784, at -784 (03/02/2011) ("AdWords Cross Exchange Bidding Commz kick-off" document goes on to state that "AdSense and AdX use AdWords demand as a unique sales proposition (USP)[.] Given the current market position of AdX versus other Yield Managers, if publishers can get the same AdWords RTB demand from any yield management/exchange partner, there is a risk that many publishers would terminate their AdX relationship in favor of their preferred alternate vendor."). *See also* GOOG-DOJ-14826825, (03/03/2011); GOOG-DOJ-03872448, (03/02/2011).

[857] Deposition of Bryan Rowley (Google), July 22, 2021, 108:22–109:3.

[858] For example, in 2014, a Google employee described Google Ads as sending Google's publisher platforms a "$3bn yearly check by overcharging our advertisers to ensure we're strong on the pub[lisher] side." GOOG-DOJ-07809181, at -181 (06/24/2014).

[859] GOOG-DOJ-05247075-0001, at -083-0009 (08/2012).

into AdX. One contributing factor are differences in targeted margins across exchanges: based on Google Ads' aggregate data from December 2022 across worldwide open-web display impressions purchased through open auction, Google Ads' average margin was 12.1% on AdX and was 32.5% on third-party exchanges.[890]

VII.C. Google provided access to and use of real-time bids from AdX exclusively to DFP, thereby foreclosing rival publisher ad servers' access to real-time bids from AdX

(631) Google has historically placed restrictions on the access to and use of AdX real-time bids for rival publisher servers and yield managers—in particular, preventing those third parties from receiving and comparing real-time bids from AdX with other exchanges and demand sources.[891] Google has instead made access to AdX's real-time bids exclusive to DFP.[892]

(632) This characterization is consistent with Google's own descriptions. For example, in a 2015 email Google's Product Management Director Jonathan Bellack explained that "[w]e agreed some time ago

[890] *See* Figure 112 in Appendix E.3.

[891] Greg Sterling, "Google Formally Announces New DoubleClick Ad Exchange," Search Engine Land, September 18, 2009, https://searchengineland.com/googles-doubleclick-formally-announces-new-ad-exchange-26042 ("As a basic matter, to gain access, publishers need to be on a Google ad server, especially DART (the system's not compatible with OpenX or Altas [*sic*] for example)."); GOOG-TEX-00149044, at -044, (03/22/2013) (Scott Spencer wrote "The current policy restricts calling AdX from another yield manager or exchange when there is AdX sub-syndication (i.e., network partners) in place. We define a yield manager as a system that automatically determines the CPM from multiple indirect channels. We define a exchange as something with RTB callouts… We are planning to remove the AdX sub-syndication dependency in January once we have a good track record with the full AdMeld functionality integrated into AdX."); GOOG-TEX-00149056, at -057, (03/25/2013) (In a 2013 email chain, in response to a publisher wishing to use "Ad Ex tags into the Rubicon Platform," Scott Spencer confirming that "by the end of the year, we will completely block publishers from running AdX inside of SSPs from a policy perspective," to be "legally enforce[d]" in "Q1 2014."). *See also* Google, "Google Ad Manager Partner Guidelines," Google Ad Manager Help, accessed December 18, 2023, https://support.google.com/admanager/answer/9059370?hl=en ("Once Partner [publisher] has made an ad call for Google Monetization [i.e. to AdX] of a given impression, Partner is not permitted to pass that impression through any other system (including Partner's own system) that dynamically or programmatically allocates ad calls based on actual or estimated real-time pricing information."); GOOG-TEX-00149044, at -045 (03/22/2013) ("We allow redirection from 3rd party ad servers, but not from other exchanges or yield managers. Why? Because if we did then those systems would immediately have a super set of demand – anything the SSP had + all of AdX (including AdWords). No one would sign up for AdX directly."). *See also* GOOG-DOJ-09451567, at -570 (04/01/2014) ("Initial new product design principles would have the effect that implementing AdX backfill via a third party ad server would be unfeasible."); GOOG-DOJ-15182420, at -420 (03/18/2015) (Describing "Rubicon's launching Yield Management that competes with both DFP & AdX," noting "If AdX had a bid (we are not participating) that passed the min we may still not win the actual impression and that is not allowed by our policies".).

[892] GOOG-DOJ-AT-02199478, at -500 (05/26/2018) ("Google Ad Manager is the only way to access Google Ad Exchange as a publisher*." The deck also notes that "* - as of July 2019 there is still a legacy way to access AdX standalone, but it will go away in a near future."). *See also* ATT-GCID-00000001, at -033–034 (12/14/2016) (In a 2016 submission to the FCA, AppNexus characterized Google's restrictions between AdX and DFP as "impos[ing] contractual restrictions on publishers that prohibit the use of mediation or other analytic tools to help publishers maximize revenue by pitting AdX prices and ROI against those offered by competing exchanges" and "prohibit[ing] publishers from using tools to compare Google's prices against the competition.").

that we are not going to be doing real-time bidding integrations with other ad servers."[893] Google's 2019 submission to the French Competition Authority ("FCA") states that "AdX is an ad exchange, and does not directly bid into auctions run by third party ad servers. A publisher using a third-party ad server would have to assign a static CPM price or serving priority to the AdX demand."[894] Consequently, rival publisher ad servers could not place real-time bids from AdX in real-time competition with other demand sources.

(633) In this Section, I describe how Google's foreclosure of rival publisher ad servers from accessing and using real-time bids from AdX leveraged AdX's market power in the exchange market (enhanced by its preferential access to Google Ads demand) to harm the competitiveness of rivals in the publisher ad server market.

(634) This Section is organized as follows.

- In Section VII.C.1, I describe why being able to receive and compare real-time bids from exchanges is highly valuable for publishers, improving their yield and monetization from display advertising.
- Next, in Section VII.C.2, I explain that because real-time bids from AdX have been and are only available via DFP, Google's restrictions discourage publishers from using rival publisher ad servers. By foreclosing rival publisher ad servers from access to real-time AdX bids, Google harms the competitiveness of those rivals. It does so by decreasing a publisher's expected revenues from using those rivals, thereby reducing their attractiveness for publishers compared to DFP.
- Last, in Section VII.C.3, I discuss why alternative forms of accessing AdX outside of DFP have meaningful limitations and are not widely used. For example, Google's AdX Direct Tag does not provide real-time bid price information to third-party publisher ad servers, and has limited usage.

(635) Later, in Section VII.F.2, I explain how Google, by foreclosing rival publisher ad servers from access to real-time bids from AdX, harmed the competitiveness of rival publisher ad servers and enhanced DFP's market power.

[893] GOOG-DOJ-14507818, at -818 (10/23/2015).

[894] GOOG-DOJ-05782415, at -439 (11/22/2019) (Google submission to FCA, "Any third party ad server can be used in combination with AdX, but Dynamic Allocation is a technical feature of Ad Manager's ad serving function… AdX operates in a combination with third party ad servers through Google Publisher Tag (**GPT**) passbacks and AdX direct tags. The third party ad server can make a call to AdX, using a GPT passback or AdX direct tag, to serve an ad matching specified targeting criteria. The Ad Manager ad server will then return an ad that matches the specified targeting criteria."). (emphasis in original).

VII.C.1. Real-time bids from exchanges are highly valuable for publishers

(636) In Section II.A.4 I discussed the emergence of real-time bidding (RTB) within auctions for the sale of open-web display ads. RTB in auctions improves publishers' monetization (relative to traditional advertising) by allowing them to sell inventory at variable prices as individual impressions become available, and enables greater precision in advertising campaigns by allowing advertisers to target consumers and condition real-time bids on impression characteristics, user interests and/or demographics.[895]

(637) Consistent with the economic value generated by the ability to sell indirect impressions via RTB within auctions, a 2012 email from Google's Director of Product Management Scott Spencer stated that "RTB is one of the most important innovations in digital advertising in the past decade. Not only has it brought a new level of efficiency to how inventory is bought and sold, but it's helping to drive more demand [for publishers] [sic] into the marketplace. We support all deal models, but RTB is a large and growing part of what we do – more than 70% of the spend on the DoubleClick Ad Exchange is conducted via RTB."[896]

(638) Publishers using DFP benefitted from AdX's provision of real-time bids in numerous ways. For example, when AdX won under Dynamic Allocation within DFP, the publisher would be paid the higher of the floor price or the second price from the AdX auction.[897] The value of this real-time bidding from AdX increased further with the introduction of Enhanced Dynamic Allocation in 2015, where real-time AdX bids could compete against guaranteed deals. Later, within Open Bidding and within the Unified First Price Auction, publishers could use DFP to compare AdX's real-time bids against real-time bids from other exchanges, with publishers benefiting from increased competition.

(639) Google documents also acknowledged the benefits of receiving and comparing real-time bids—also referred to as "per query pricing"—received from multiple exchanges.[898] Indeed, one of the primary reasons why header bidding was adopted by publishers was that it allowed for the real-time access and comparison to real-time bids from multiple exchanges, significantly increasing publishers' yields.[899] As Google Vice President and General Manager of Google Advertising Tim Craycroft

[895] GOOG-DOJ-03242646, at -665–666 (09/26/2018).

[896] GOOG-DOJ-14235498, at -498 (01/27/2012).

[897] GOOG-DOJ-03601149, at -162 (12/15/2011). *See also* GOOG-DOJ-10877988, at -012 (12/17/2019) ("for publishers, RTB provides the opportunity to get fair market value for each impression with the idea that this should help publishers better monetize their ad inventory."); MSFT-LIT-0000016534 (slide 14, AppNexus presentation stating that RTB matters because it allows publishers to "[g]et more than their page value" and "capture value of users visiting their site.").

[898] GOOG-AT-MDL-016927030, at -033 (10/27/2015) ("Multiple exchanges compete on per query pricing to help increase publisher yield."). *See also* GOOG-AT-MDL-007365297, at -002 (08/24/2015) ("Pubs can earn 20-30% more with others competing").

[899] *See* Sections II.E.3, VII.A.2, and Appendix L.2. *See also* GOOG-DOJ-04004392, at -394 ("[h]eader bidding has given other Networks and SSPs per-query pricing access to Ad Manager inventory, increasing competition and delivering publishers 30-40% lift in programmatic revenues."); GOOG-TEX-00119553, at -556 ("anecdotal evidence from 40 pubs

testified: "Header bidding enables all those ad exchanges to compete at the same time, which enables better price discovery, which drives improved revenue for the publisher."[900]

VII.C.2. Providing real-time bids from AdX exclusively to DFP discouraged the use of rival publisher ad servers

(640) Despite the benefits provided to publishers from being able to access and compare real-time bids from multiple exchanges, Google has historically restricted third-party publisher ad servers from receiving real-time bids from AdX.[901] Instead, if used within a rival publisher ad server, AdX would return only an ad, but not the bid price, if it was called and able to beat the floor price sent to it (see discussion of AdX Direct below).[902] As a result, other publisher ad servers were unable to incorporate AdX's real-time bids in their ad-serving decision making, adversely impacting their ability to monetize publishers' inventory.

(641) Statements from Google's documents indicate this relationship between AdX and DFP discouraged publishers from using rival publisher ad servers, and "lock[ed] in" impressions into DFP.

- In a September 2012 email Google's then-Head of Mobile Platform Sales Marc Theermann wrote: "it is too early to give AdX to non-XFP [DFP] partners.... This is an amazing time to 'lock in' impressions by offering XFP [DFP] to publishers with full AdX dynamic allocation. AdX can serve as a tool to pull publishers onto XFP [DFP]. By allowing third parties to integrate with AdX mobile/web we are giving away this advantage."[903]
- In a 2015 email, Google's then-Group Product Manager Drew Bradstock acknowledged the importance of Dynamic Allocation and its impact on Google's rate card: "We do not want to fully embrace header bidding as we are giving away a cheap form of dynamic allocation for free to all our competitors. This would have a large distorting effect on our rate card as one of the largest advantages to AdX is real time competition. In many regions, especially EMEA, we have given away dfp at huge discounts to get access to inventory via DA."[904]

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using header tags… [the publishers] are seeing 20-30% higher yield than just using AdX for indirect demand.").

900 Deposition of Tim Craycroft (Google), August 15, 2023, 59:15–59:24.

901 GOOG-AT-MDL-001937115, at -115 (09/29/2017) ("AdX does not pass through real-time bids to [] other ad servers (instead it passes through a "dumb" flat CPM based on historical averages."); ATT-GCID-00000680, at -696 (10/29/2019) (third-party "publisher ad server[s] ha[ve] no indication of the price of AdX's demand in real-time").

902 KVL00000945, at -945 (04/25/2019) (email from James Avery explaining limitations of an AdX tag used in another publisher ad server: "The problem with tags is that they are opaque, you don't get the bid of the ad. You can set a floor price, but you can't have it compete with other tags," and the tag "either [] wins or doesn't and you never actually find out the price it won at.") Rival publisher ad servers were not provided with "per-query pricing" from AdX (GOOG-AT-MDL-013293586, at -588 (n.d.)), and a Google presentation characterized not using per-query pricing as "[i]nefficient" with "[p]ublishers making less money" (GOOG-TEX-01267302, at -339 (05/08/2017)).

903 GOOG-TEX-00034461, at -462 (09/10/2012).

904 GOOG-TEX-00116236, at -236 (07/21/2015). *See also* GOOG-DOJ-03634896, at -904 (09/25/2018) (2018 Google presentation, "AdX Direct Overview," discussing third-party ad servers having access to AdX, and "[c]oncern we are

(642) The following testimony from third parties is consistent with the Google documents cited above, indicating that the lack of access to AdX's real-time bids within rival publisher ad servers significantly limited their adoption by publishers:

- When asked what role AdX's demand plays in publisher's decisions of which publisher ad server to use, Kargo's Michael Shaughnessy answered "[i]t is a significant consideration for publishers."[905] He also testified based on his publishing experience that "Publishers believe that they need to use DFP in order to leverage the demand of AdX."[906]
- When asked why Kevel's publisher ad server stopped focusing on traditional programmatic display advertising, Kevel founder and CEO James Avery answered "[b]ecause we could not compete with GAM … based on the fact that AdX was tightly integrated with GAM and we could not access AdX."[907]
- When asked why Xandr's publisher ad server has been unable to penetrate the US market for several years, Microsoft's Benneaser John answered "Number one is the AdX demand. Number two is migration is very hard. Publishers had to put an effort to migrate. And the primary reason is the demand. They are worried about losing the Google AdX demand."[908]
- When asked why Equativ's publisher ad server lost [redacted] to Google's DFP, Equativ's Amaud Creput answered "the reason why most of the publishers working with us left for Google is a hard kind of all – all in the records. They didn't have access to Google AdX. So Google AdX is the SSP of Google, which owns a very significant market shares and this AdExchange or Google AdX wasn't at that time and still not available with ad server. So when you work with a rival ad server, such as Equativ, you accept to -- not to have access to a significant part of the market and of the ad spend."[909]
- When asked how AdX's role impacted publishers' willingness to walk away from DFP, AppNexus's Brian O'Kelley testified that "it was pretty clear that, you know, it was DFP and AdX together. And publishers would see that AdX was producing 60 percent of their programmatic revenue. And their perspective was that switching ad servers would put that 60

making Web & Video competitors stronger by making Google demand available.").

905 Deposition of Michael Shaughnessy (Kargo), August 9, 2023, 43:24–44:5.

906 Deposition of Michael Shaughnessy (Kargo), August 9, 2023, 21:19–22:13 ("Q. And do you believe it's true that publishers need to use DFP to leverage the demand of AdX? A. When I was a-- MS. MORGAN: Objection. A. When I was a publisher, that was my belief and how I operated. Q. And what was your basis for reaching that conclusion? A. Based on how AdX and pricing rules and, at one point, I believe AdX removed some of the tag functionality of how you would traffic within the ad server.").

907 Deposition of James Avery (Kevel), August 16, 2023, 21:22–22:3.

908 Deposition of Benneaser John (Microsoft), September 8, 2023, 159:14–159:23. Mr. John also explained that "Let's say if you're migrating to Xandr, are there any third-party ad server out of GAM, the option of getting the demand is only through like a third-party external exchange. And that demand is very, very small compared to the local native demand that Google brings to AdX." Deposition of Benneaser John (Microsoft), September 8, 2023, 159:24–161:9.

909 Deposition of Arnaud Creput (Equativ), September 5, 2023, 15:11–16:17.

percent of revenue at risk."[910] Mr. O'Kelley gave an example of a publisher customer who they were "pitching…to switch from DFP" to AppNexus's publisher ad server[911] AppNexus "convinced [this publisher that] all the features were, you know, the same or better" and offered "three or six months free" and "to put a bunch of resources around it" to "make it economically viable" to switch.[912] Ultimately, the publisher was "really nervous about turning off AdX" and cited "fear of losing Google revenue as the reason [it] couldn't switch."[913]James Avery, founder and CEO of Kevel, a publisher ad server, testified that Google refused at least two requests in the 2012–2014 period to integrate Kevel's publisher ad server with AdX in the same way that Google integrated Google's publisher ad server with AdX.[914] Referring to a more recent request, Mr. Avery explained that "they [Google] weren't aware of any integrations done to another ad server and that they would have to check internally to see if it was possible. And we have not heard back."[915]

VII.C.3. Accessing AdX through rival publisher ad servers is meaningfully limited

(643) Below, I describe two ways in which publishers using rival publisher ad servers can access AdX demand—via AdX Direct or through what is referred to as a "hybrid" setup. In both cases, there are meaningful limitations, and publishers' usage of these approaches is limited. Hence, the existence of these options does not alter the conclusion that Google foreclosed rival publisher ad servers and

[910] Deposition of Brian O'Kelley (AppNexus), September 29, 2023, 116:10–118:18.

[911] Deposition of Brian O'Kelley (AppNexus), September 29, 2023, 190:11–192:21.

[912] Deposition of Brian O'Kelley (AppNexus), September 29, 2023, 190:11–192:21.

[913] Deposition of Brian O'Kelley (AppNexus), September 29, 2023, 190:11–192:21. ("Q. So why do you think it was that, despite the thesis you had going into it, you didn't have more adoption of AppNexus's publisher ad server? […] A. I remember a specific example where we were talking to the leadership team of a large news publisher here in the U.S., and they basically went through the process of us pitching them to switch from DFP. Now, it's a significant switching cost. There's, like, work they have to do. They have to retraffic all their campaigns. And we were willing to make it economically viable for them, you know, to give them three or six months free to make the transition. And we're going to put a bunch of resources around it. And we'd convinced them that all the features were, you know, the same or better. They actually used a product called YieldX, which was a forecasting tool that we bought along the way. So they were already a customer. They're already an ad exchange customer. They're already a YieldX customer. And we came down to the sort of final part of the process. They said, listen, we're just -- we're really, really nervous about turning off AdX. And, you know, this is obviously me hearing this from them. They said we've talked to Google, and Google has said that they will definitely not bid as much or contribute as much revenue if we switch. And we're really, really nervous, as a news publisher, that we can't afford revenue head. Can you guarantee us that we won't lose revenue from Google? They're 60 percent of our programatic revenue. And, you know, that was a very typical conversation of, you know, fear of losing Google revenue as the reason we couldn't switch, without writing a check and saying we'll cover all the costs, which, as a startup, is harder to do.").

[914] Deposition of James Avery (Kevel), August 16, 2023, 39:5–40:5. Referring to the request in 2012, Mr. Avery testified that "integration with AdX was essential to be able to compete for traditional publishers."

[915] Deposition of James Avery (Kevel), August 16, 2023, 40:14–40:20. *See also* KVL00000945, at -946 (04/24/2019), (email from Avery, "We asked Google multiple times to let us integrate with AdX the same way Ad Manager does and they always claimed it wasn't possible. (despite us doing the same with Index, PubMatic, etc).")

harmed their competitiveness by exclusively providing access to AdX's real-time bids to DFP (see Section VII.F).

VII.C.3.a. AdX Direct has meaningful limitations and limited usage

(644) Since the introduction of AdX in 2009, Google allowed customers to generate "AdX Direct" tags, which provide a limited way for third-party publisher ad servers to obtain access to AdX demand.[916] Google does not "specifically market AdX Direct to publishers," and I explain below that AdX Direct had several limitations and comprised only a small fraction of overall AdX revenues.[917]

(645) Notably, in 2012, Google experimented with a limited "third-party dynamic allocation" feature that would have allowed AdX to be used within a non-DFP publisher ad server by passing a "minCPM to beat over to AdX without any advanced functionality."[918] A 2012 Google "Display Strategy Working Document" noted that this feature "is available today but in beta. Minimal effort is required to roll it out more broadly."[919] However, this document also noted that a risk was that it "takes away a key differentiator for DFP."[920] A 2012 email thread among Google employees noted that, "[t]o allow dynamic allocation to [a non-DFP publisher ad server] means to delete one of the major arguments to use DoubleClick or Admeld. This weakens the market position for some of our products."[921] The beta was officially shut down in 2012.[922]

VII.C.3.a.i. AdX Direct does not return real-time AdX bids to publishers using third-party publisher ad servers

(646) AdX does not integrate with rival ad servers in the same manner as it does with DFP. In particular, internal Google documents discuss an important reason why an AdX Direct tag does not provide publishers using rival publisher ad servers with the same features they would have on DFP: AdX

[916] GOOG-DOJ-27799214, at -215 ("AdX Direct allows publishers to use AdX as a standalone product. This is done by generating AdX ad tags (different from GPT tags) which allows pubs with non-Google ad servers to access AdX (OA & PA only).", "AdX Direct predates the Google acquisition and AdX-DFP merger"); Neal Mohan, "The DoubleClick Ad Exchange: Growing the Display Advertising Pie for Everyone," last modified September 17, 2009, https://googleblog.blogspot.com/2009/09/doubleclick-ad-exchange-growing-display.html; GOOG-DOJ-11899169. GOOG-DOJ-13233139, at -139 (2019) ("When AdX was first launched as a standalone product, it possessed the ability to generate an ad tag that could be used to request ads from AdX.").

[917] Letter from David R. Pearl to Kelly Garcia, "Re: *United States, et al. v. Google LLC*, No. 1:23-cv-00108-LMB-JFA," October 6, 2023, ("AdX Direct is a name given to publisher configurations that integrate with Google Ad Managers' ad exchange using its 'Ad Exchange' tag.' … Google does not specifically market AdX Direct to publishers.").

[918] GOOG-DOJ-15583409, at -410 (02/10/2012). *See also* GOOG-AT-MDL-006218257, at -259 (12/16/2022) (Google's Dec 16, 2023 response to European Commission's RFI 10 states, "Third-party dynamic allocation was an experimental feature that would have allowed an ad tag to specify a minimum CPM that the exchange (AdX) must beat in order for an ad from the exchange to be shown. Improve Digital was invited to participate in the beta for this feature but the beta was ended in February 2012.") *See also* GOOG-DOJ-15583409, at -410 (02/09/2012) (2012 email chain, "[w]e are offering Improve Digital 3rd party dynamic allocation between the DoubleClick Ad Exchange and their proprietary ad server")

[919] GOOG-DOJ-05247075-0001, at -061 (08/2012).

[920] GOOG-DOJ-05247075-0001, at -061 (08/2012).

[921] GOOG-DOJ-15583409, at -410 (02/09/2012).

[922] GOOG-AT-MDL-006218257, at -259 (12/16/2022).

document further states that a hybrid setup is "suboptimal", "adds unnecessary complexity & latency to the partner's ad stack", has "known technical limitations", and concludes that "[w]e [Google] should not be pitching hybrid set-ups."[943]

VII.D. Google used DFP's substantial market power to deny rival exchanges advantages provided to AdX and interfere with publishers' ability to work with rivals

(657) In this Section, I discuss how Google used DFP's substantial market power to deny rival exchanges advantages provided to AdX and inhibit publishers' ability to work with rivals:

- In Section VII.D.1, I discuss how Google, until the introduction of Exchange Bidding, provided only AdX with the ability to participate in Dynamic and Enhanced Dynamic Allocation within DFP. Google exclusively provided AdX with this advantage—and the associated benefits of "first look" and "last look"—and left rival exchanges with fewer and less valuable impressions to bid upon within DFP.
- In Section VII.D.2, I discuss how Google introduced variable floor restrictions within DFP, which eliminated the ability of publishers to set lower reserve prices (i.e., price floors) for third-party exchanges than for AdX, thereby impeding publishers' ability to steer more of their impressions to AdX's rivals.

(658) Later, in Sections VII.F.1.b and VII.F.1.c, I discuss how these actions harmed the competitiveness of rival exchanges.

(659) These actions also increased the effectiveness of exclusive access to and use of real-time bids from AdX to DFP (discussed in Section VII.C above) because rival publisher ad servers had worsened non-AdX ad exchanges to work with. Hence, the actions taken by DFP to weaken rival exchanges described here, and the exclusive access to AdX's real-time bids provided to DFP described earlier, served to reinforce one another.

VII.D.1. Google exclusively provided AdX with Dynamic and Enhanced Dynamic Allocation, denying "first look" and "last look" advantages to rival exchanges

(660) In Section II.E.2 I described Dynamic Allocation (DA), a feature Google provided within DFP since the launch of AdX. DA allowed publishers to use real-time bids from AdX to compete with directly booked, non-guaranteed ads within DFP. In Section II.E.2 I also discussed Enhanced Dynamic

[943] GOOG-DOJ-32280764, at -765-766 (07/2019).

(663) An internal Google document described the benefits of DA as "allow[ing] publishers to maximize their earnings by getting the highest paying ad available for any given ad impression."[950] It noted two benefits: introducing real-time competition from AdX, and filling remnant inventory "when no other campaigns are available to run in that ad unit (backfill)."[951] Another Google document noted that publishers benefited from DA.[952]

(664) However, critically, only AdX was initially allowed to compete in real time against guaranteed- and non-guaranteed line items within DFP's DA and EDA features.[953] Other exchanges were not provided with this opportunity by DFP before Google's Exchange Bidding, which was fully launched in 2018.[954]

(665) The rest of this Section is organized as follows.

- In Section VII.D.1.a, I describe the Dynamic and Enhanced Dynamic Allocation programs, and how DFP's exclusive provision of them to AdX provided AdX with first- and last-look advantages over rival exchanges;
- In Section VII.D.1.b, I describe how AdX was able to further benefit from these advantages with a program known as "AdX Dynamic Revenue Share";

AdX was also the exclusive provider of real-time EDA bids until the release Exchange Bidding. *See* GOOG-DOJ-14156104, at -105 (09/20/2016) (email chain between Google employees describing how "third-party exchanges cannot compete with AdX through EDA on the similar footing"); GOOG-DOJ-AT-00589814, at -823 (01/28/2019) ("Unified auction in Google Ad Manager" presentation, "With exchange bidding, 3rd party exchanges are now able to bid in real time for your inventory through dynamic allocation"); GOOG-AT-MDL-001793318, at -366 (2021) (Google "RTB Insights" deck, "Open Bidding also allows other third-party exchanges to participate in EDA"). Google charged third party exchanges a 5% revenue share when buying ads through DFP's Dynamic Allocation. *See* GOOG-DOJ-15277215, at -222 (05/05/2016).

950 GOOG-DOJ-03601149, at -151 (12/15/2011).

951 GOOG-DOJ-03601149, at -151 (12/15/2011) ("Dynamic allocation with DFP* and AdX/AFC maximizes publishers' yield in two ways: 1. By serving AdX/AFC whenever they offer more than the competing booked ad networks (real-time competition) 2. By serving AdX/AFC when no other campaigns are available to run in that ad unit (backfill).").

952 GOOG-DOJ-03610481, at -499 (04/2014) ("When AdX partners use Dynamic Allocation, there is an uplift of eCPMs by over 20%").

953 GOOG-TEX-00083092, at -092 (09/28/2016) (Google's Senior Engineering Director of Publisher Ads Aparna Pappu explaining that "dynamic allocation with DFP ONLY worked with AdX and not any other exchange"). *See also* GOOG-DOJ-05782415, at -438 (11/22/2019) (Google submission to FCA, "When first launched, Dynamic Allocation did not facilitate competition between multiple exchanges in real time. Third party exchanges could compete only at a fixed price… To facilitate competition between multiple intermediation platforms, AdX would have had to make calls to third party ad exchanges to bid for ad inventory purchased in the auction… With the introduction of Header Bidding, third-party demand sources were able to compete dynamically in the Ad Manager (then DFP) auction.")

954 GOOG-DOJ-05782415, at -432 (11/22/2019) (Google submission to FCA, "Exchange Bidding is a server-to-server feature of Ad Manager that builds upon the existing capabilities of Enhanced Dynamic allocation… It allows third party ad exchanges to compete with line items booked in Ad Manager and with AdX in a unified real time auction.") As I discussed in Section II.E.3, header bidding emerged as a way for publishers to circumvent Google's restrictions and bring in real-time competition from rival exchanges by running an auction outside of DFP. GOOG-DOJ-05782415, at -439 (11/22/2019) ("With the introduction of Header Bidding, third-party demand sources were able to compete dynamically in the Ad Manager (then DFP) auction.").

- In Section VII.D.1.c, I explain that AdX meaningfully benefitted, and rivals were meaningfully adversely impacted, from these exclusive advantages provided by DFP.

VII.D.1.a. Dynamic and Enhanced Dynamic Allocation provided AdX with "first look" and "last look" advantages over rival exchanges

(666) DA and EDA provided AdX with what has been referred to as a "first look" at inventory coming from DFP.[955] Since DA allowed AdX to compete against the highest remnant line item, AdX could view and purchase an impression before any network or exchange in the waterfall had an opportunity to provide a real-time bid.

(667) Statements from Google documents acknowledged the benefits of AdX's privileged access to DFP inventory.[956] For example, a 2015 Google "DFP Mediation" presentation outlines two ways in which "first look [is] crucial": "1. First look allows access to the most valuable cookies, hence the highest paying impressions. 2. Without first look, we are left with inventory that other buyers have had a look into and didn't want to pay for."[957]

(668) Since AdX historically competed against static or historical prices of line items in the waterfall, AdX was able to bid on impressions before the other demand sources in the waterfall had an opportunity to produce a "live" price (even though the live price could have been higher than the winning AdX bid), thereby allowing AdX to win an impression even if some other demand source was willing to pay more.[958] This reduced publisher revenues and the efficiency of the auction relative to having these demand sources compete in real time with each other.

(669) In a 2016 email, then-Google Managing Director of Global Publisher Solutions and Innovation Jerome Grateau noted explicitly that AdX's exclusive access to EDA allowed it to win without necessarily providing the best price to publishers: "[T]he 'internal' objective of our Sell-Side platform

[955] This is distinct from what has been referred to as "DoubleClick First Look," introduced in 2016 (*see* GOOG-DOJ-AT-02199478, at -516-521 (10/26/2018) ("First Look AdManager features allows publishers to offer certain buyers an ability to buy selected inventory ahead of any reservation campaigns as long as they bid above a first look floor"); DoubleClick Publisher Blog, "Delivering yield, speed, and control with DoubleClick for Publishers First Look," December 1, 2015, DoubleClick Publisher Blog, https://doubleclick-publishers.googleblog.com/2015/12/delivering-yield-speed-and-control-with.html

[956] *See* GOOG-DOJ-01439665, at -668 (02/11/2009) (Transcript of David Rosenblatt's (former DoubleClick CEO) overview of Google's display strategy) ("If you don't have access to that inventory, nothing else matters. It turns out that the most efficient way to access that inventory is by owning the primary ad server that premium and non-premium publishers use to manage their inventory. It allows you as a network the so called 'first look' at each impression"). *See also* GOOG-DOJ-01657697, at -729 (03/15/2007) (A 2007 Google document regarding DoubleClick which acknowledges that DoubleClick would allow Google "to 'cherry-pick' inventory without implications of pass-back").

[957] GOOG-DOJ-10547033, at -064 (05/2015).

[958] GOOG-DOJ-AT-00292252, at -256 (10/10/2019) (In a Google slide describing the problems with the waterfall setup, the slide acknowledges that "line items were compared on their average CPMs not their 'live CPMs'." The slide also shows an example where the second line item has a historical CPM of $1.5, but a "Live" CPM of $3. Since the first line item has a historical CPM of $2, Dynamic Allocation would allow AdX to compete in real-time against the $2 price, potentially allowing AdX to win at just over $2 before the second line item could produce a live price of $3).

is to maximize our access to inventory. We managed historically to have an advantage through EDA vs other sources of demand…so our demand could win even if we did not provide the best CPM on a specific impression."[959]

(670) Also, in 2017, Google's Director of Global Revenue Intelligence Michelle Dauwalter acknowledged another potential implication of its first look advantage when discussing the hypothetical disadvantages of "spinning off DoubleClick":[960]

> Our buyers enjoy a competitive advantage from dynamic allocation because they receive first look on inventory, which inherently provides higher CPMs (from which Google benefits on the rev share). Launching AdX into a non-DFP server destroys this competitive first look advantage and would most likely lead to AdX (1) losing access to overall queries, and (2) losing access to the *highest-value* queries. **From there, it becomes a self-fulfilling prophecy in that less-valuable inventory begets lower CPMs, publishers react by decreasing inventory access, which begets even lower CPMs.**

(671) By preventing other exchanges from being called upon in Dynamic Allocation, Google subjected its *rivals* to precisely the dynamic Dauwalter described. Because AdX could purchase queries before remnant line items could provide a bid, AdX could "cherry pick" higher value queries (i.e., those queries that advertisers were willing to bid more for) before its rivals. In turn, this would reduce the CPMs that rivals—whenever called—would be able to deliver, reducing their historical performance. If this occurred, as the statement indicates, publishers would likely react by "decreasing inventory access" to these rivals by ranking rival exchanges lower in the waterfall (e.g., if rankings are based on historical outcomes) or no longer calling them, leading to even lower CPMs for those rival exchanges.

(672) This "self-fulfilling prophecy" whereby "less-valuable inventory begets lower CPMs… which begets even lower CPMs" is related to an economic feature of selection markets:[961] here, the impressions left for rival exchanges after AdX had its first look (and passed them over) tend to be less valuable, thereby lowering the expected CPM performance of those rivals on the impressions they are able to compete for and win. Indeed, despite imposing disadvantages on its rivals by keeping DA and EDA

[959] GOOG-TEX-00104315, at -315 (09/15/2016).

[960] GOOG-DOJ-04830048, at -048 (09/05/2017) (emphasis added).

[961] In selection markets where transactions differ in value, firms have an incentive to engage in "cherry-picking" or "cream-skimming" more valuable transactions, leaving behind the less valuable ones. *See* Liran Einav, Amy Finkelstein, and Neale Mahoney, "The IO of Selection Markets," *Handbook of Industrial Organization, Volume 5*, eds. Kate Ho, Ali Hortaçsu, and Alessandro Lizzeri (2021), 390–426. With AdX's first-look advantage, impressions that AdX did not purchase and other ad exchanges could then bid on were likely to be lower value than those impressions that AdX did purchase.

exclusive to AdX, a 2016 Google document acknowledged the negative effects that rivals bidding first could have on AdX.[962]

(673) When header bidding emerged, AdX's exclusive access to Dynamic Allocation became referred to as a "last look" advantage against header-bidding exchanges. The reason is that, previously, other remnant line items in DFP reflected historical or static prices. However, under header bidding, rival exchanges could submit real-time bids for consideration *before* DFP was called, and the winning bid from the header bidding auction could be then used to compete against AdX within DFP.[963] Under Dynamic Allocation, AdX was able to use the winning header-bidding price as a floor: if the price produced in the AdX auction surpassed the reserve price generated through header bidding, AdX would win the impression.[964] This advantage was referred to as a "last look," since AdX was given an opportunity to win impressions *after* other header-bidding exchanges already submitted bids.[965]

(674) Figure 68 from a 2019 Google presentation illustrates this "Last Look" dynamic, whereby the bid from the winning header bidder ("HB winner") is used as a floor within the AdX auction. In the Figure, as long as one of the buyers within the AdX auction had a bid greater than the floor, AdX would win.

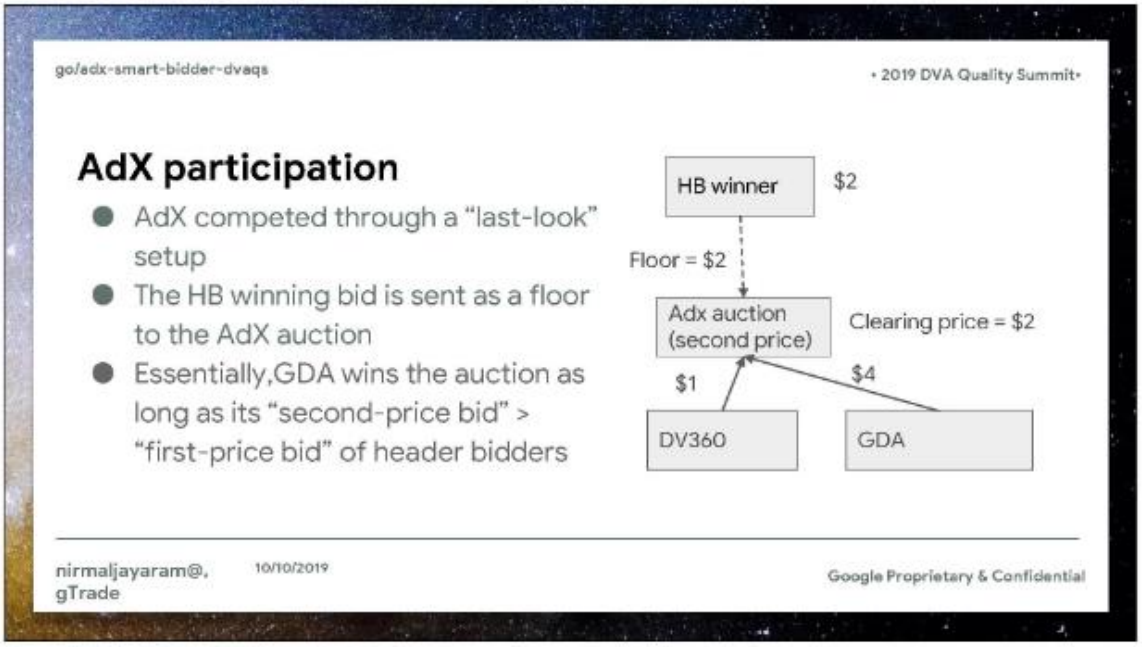
[962] *See* GOOG-DOJ-13205878, (08/08/2016) ("Our competitors are cherry picking higher value impressions at a low fill rate (<20%) and then passing the leftovers to be filled by Google. This tactic is leading them to appear as being a high performing partner and Google increasingly being a long tail network with lower CPMs.")

[963] *See* Figure 151 in Appendix L.2.a. *See also* GOOG-DOJ-15277215, at -221 (05/05/2016).

[964] GOOG-DOJ-15277215, at -221 (05/05/2016).

[965] GOOG-AT-MDL-008106705, at -709 (03/04/2019) ("Unified 1st Price Auction" deck states "This is what the industry refers as 'last look', where AdX is called last to see if any bid can beat the remnant price").

Figure 68. AdX's last look advantage



Source: GOOG-DOJ-AT-00292252, at -258, Oct. 10, 2019 (slide deck: "AdX first-price bidding").

(675) A 2019 Google document defined last look as follows:[966]

> "Last Look" is a term used by some in the industry to refer to the way Dynamic Allocation works. Dynamic Allocation gives AdX the opportunity to compete against all* line items in DFP to help publishers get the most value from every impression. Before Dynamic Allocation calls AdX to run its auction, DFP determines its winning line item and passes a floor price (minimum price) into the AdX auction. This means line items from directly sold campaigns, Ad networks, other SSPs booked directly in DFP, and line items activated by Header Bidding can set the floor price of the AdX auction.

(676) Consistent with Google benefiting from this advantage, in a 2016 email, Google Director of Engineering for AdSense and GAM Jim Giles stated that last look "only benefits us."[967]

(677) Google adjusted its policies in response to header bidding. As I discussed in Appendix L, Google viewed the rise of header bidding as a threat to AdX, because it allowed publishers to receive real-

[966] GOOG-DOJ-11030354, at -354 (09/25/2019).

[967] GOOG-TEX-00122345, at -349 (07/20/2017) (Discussing a proposal that, "on a per query basis, if any bid from an exchange is lower than the ADX floor, then we would ignore the ADX floor and let ADX compete. Unlike last look that only benefits us, this makes the publisher strictly more money and can be viewed as an optimization feature for them.").

time bids from multiple exchanges. Yet initial header bidding implementations did not completely close the gap between AdX and third-party ad exchanges. Critically, due to the way that header bidding was implemented, AdX maintained this Last Look advantage over third-party ad exchanges whereby AdX could effectively observe the real-time bids of header-bidding exchanges and use it as a floor price in its own auction. This allowed AdX bidders to outbid those exchanges by a minimal amount for any impression if they chose to do so.

(678) Google documents acknowledged that publishers and exchanges complained about Last Look.[968] Google removed its Last Look advantage over participants in its Exchange Bidding (EB, later Open Bidding) product, which was launched broadly in April 2018.[969] An announcement in the industry press cites statements from Google's Director of Product Management Jonathan Bellack that feedback from publishers and exchanges influenced the decision to remove Last Look and that "[t]he exchanges and publishers we've been working with like this [change], because they think this is a fair way to make competition."[970] That statement is consistent with testimony from Facebook's Henry Crum, who explained that last look was not "fair and transparent" conduct in auctions.[971] According to Nitish Korula, who led engineering teams on GAM, the Last Look advantage over Exchange Bidding participants was removed in response to customer feedback.[972]

(679) However, Google maintained the Last Look advantage over header bidding until 2019. In one 2016 email chain explaining why last look would be removed against EB bidders but not for HB, Jim Giles noted that "[Last look] creates a clear differentiation between EB and HB – exchanges that go through HB are subject to last look, and those that go *through* EB are not. This gives a pretty big incentive to switch."[973] A 2019 Google presentation noted that maintaining Last Look over header-

[968] GOOG-TEX-00000655, at -660 (12/15/2016) (An email from Jim Giles states, "both publisher and exchanges have very strongly complained about the fairness of [last look]. This was one of the biggest objections raised in the recent EB steering committee meeting with exchanges. If we want exchanges to give up HB and move to EB, we need to give up some concessions.") *See also* GOOG-DOJ-AT-00589814, at -821 (01/28/2019) (A Google presentation titled "Unified auction in Google Ad Manager" reads "3P partners (the market) have often complained about last look on line items unfairly disadvantaging headers. Since the uniformity of auction model and floor model fixes the negative implications for buyers and sellers, we can eliminate this hated (but currently necessary and fair) feature.").

[969] GOOG-AT-MDL-006217592, at -592 and -606 (12/12/2022).

[970] Sarah Sluis, "Google Removes Its 'Last-Look' Auction Advantage," AdExchanger.com. March 31, 2017. https://www.adexchanger.com/platforms/google-removes-last-look-auction-advantage/.

[971] Deposition of Henry Crum (Meta), April 22, 2022, 119:5–121:5 ("[W]e wanted the auction to be fair and transparent. So that meant things like no last look.") and ("Q. So sticking with DFP and AdX's last look, did you consider last look to be consistent with the principle of fair and transparent auctions in the code of conduct? A. No, because we thought the competition should happen all at the same time.").

[972] GOOG-AT-MDL-008842393, at -401 (08/04/2023) (The Declaration of Nitish Korula states "Open Bidding was initially launched in alpha in 2016. Following the initial alpha launch of Open Bidding, Google removed AdX's "last look" over Open Bidding, by ensuring that the clearing price from the AdX auction was compared to the highest bid from an Open Bidding buyer. Google removed this in response to customer feedback, before Open Bidding became generally available in April 2018."). Dr. Korula is currently "Senior Technical Advisor to Prabhakar Raghavan" whose "current responsibility include managing an engineering team on Google Assistant," but "[f]rom July 2016 through December 2021, [he] was a member of and led engineering teams developing Google products that allow publishers to sell display advertising inventory, including Google Ad Manager." GOOG-AT-MDL-008842393, at -393 (08/04/2023).

[973] GOOG-TEX-00000655, at -660 (12/15/2016).

bidding exchanges was "[u]nfair for HB."[974] It was not until the introduction of the Unified First Price Auction in 2019 that Google removed the last-look advantage over header bidding exchanges.[975]

(680) Nonetheless, Google still imposed a 5% or 10% fee (depending on whether the publisher used GAM 360 or GAM, respectively) on EB transactions within DFP.[976] According to a Google document, that fee level discouraged buyers from switching away from AdX, as fees of 3% or lower would pose "[h]uge risks to AdX revenue."[977]

(681) To analyze the impact of the Open Bidding fee on auction outcomes, I considered a sample of auctions from June 1, 2023 reported in Google's log-level data.[978] Within that sample, Open Bidding exchanges participate in 19.6% of AdX auctions, and win 29.4% of these auctions, for an overall share of 5.8%. Holding all bids the same, I remove the 5% or 10% fee on Open Bidding transactions, and determine the number of auctions for which Open Bidding exchanges would have the highest bid absent the Open Bidding fee.[979] If Open Bidding exchanges with the highest bid are now assigned the impression, I find that the win rate for these exchanges would have increased from 29.4% to 32.1%, for an overall share of 6.3% impressions won in GAM.[980] These results indicate that the fees Google charged on EB transactions reduced the transactions won by rival ad exchanges.

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974 GOOG-DOJ-AT-00589814, at -823 (01/28/2019) (A Google presentation titled "Unified auction in Google Ad Manager" states, "HB payout sent as reserve price to AdX; AdX / EB knows what HB is **willing to pay** before submitting bids → (-) Unfair for HB (compare a bid vs payout)").

975 GOOG-DOJ-AT-01813120, (07/25/2018) (A presentation titled, "PRD: Unified 1P auction and Pricing rules" states, "AdX will no longer have last look against remnant line items (price priority, bulk and network) – Remnant line items will no longer provide price support to AdX 2P bids"); GOOG-DOJ-11030354, at -354 (01/28/2019) ("Google's last look goes away with this change.").

976 GOOG-AT-MDL-008842393, at -401 (08/04/2023) (The Declaration of Nitish Korula states "Up to at least December 2021, for publishers that utilized Open Bidding, when an auction was won by an Open Bidder, Google Ad Manager's standard charges for web display ads were 5% for GAM 360 customers and 10% for other GAM customers, and Google's standard charges for app and instream video ads were 10%,"). I also examined Open Bidding fees using auctions from June 1, 2023 within the Google Ad Manager log-level data. More than 98% of GAM 360 exchange bidding transactions involved an Open Bidding fee of 5% and more than 98% of GAM exchange bidding transactions involved an Open Bidding fee of 10%. For this and the following exercise, I use the following two variables from the GAM log-level data: "dsp_paid_usd", which is the payment of the advertiser's DSP into AdX; and "pub_payout_usd", which is the bid considered in the AdX auction. The difference between the two reflects the open bidding fee charged by AdX (i.e., "pub_payout_usd" equals either 90 or 95 percent of "dsp_paid_usd" in almost all cases).

977 GOOG-TEX-00082594, at -611 (07/30/2015).

978 The analysis sample for this chart is a 1-in-60 sub-sample (minute 9 of each hour) of the June 1st GAM sample, representing on average 1 out of every 720 auctions run on GAM that day. The analysis uses the same GAM log-level sample as the simulation described in Section V.D.3.b. Exchange bidders are identified as including the strings "(EB)" or "(OB)" at the end of the name.

979 I estimate the Open Bidder's bid excluding the OB fee using the "dsp_paid_usd" field instead of "pub_payout_usd". As noted above, the "dsp_paid_usd" field reflects the payment made by the OB exchanges into GAM, excluding the OB fee.

980 Of these additional impressions with a highest bid from Open Bidders when the Open Bidding fee is removed, a little over half (51.5%) would come from AdX (14.6% from Google Ads, 17.2% from AdX buyers, and 19.8% from DV360). This is consistent with a positive Open Bidding fee generating more transactions through AdX.

VII.D.2. Google prevented publishers from setting variable pricing floors, weakening competitive pressures on AdX and impeding publisher's ability to sell impressions through rival exchanges

(694) Google's Unified Pricing Rules ("UPR"), launched with Google's introduction of the Unified First Price Auction ("UFPA") in 2019, included a restriction that publisher pricing rules "will be applied to all partners equally, and cannot be set for individual buying platforms."[999] This restriction eliminated the ability of publishers using DFP to set lower reserve prices for rival exchanges than they set for AdX, thereby restricting publishers' ability to work with non-AdX exchanges. In doing so, Google used DFP's substantial market power to directly weaken the competitive pressures faced by AdX in at least two ways.

(695) First, as I describe, publishers valued the ability to adjust price floors and often set lower floors for rival exchanges than for AdX. This implies that publishers were willing to serve impressions through non-Google ad exchanges even if, for a given impression, AdX would pay more for that impression. This is consistent with publishers deriving non-monetary or quality/service benefits from selling impressions through rival exchanges. Moreover, if rival exchanges obtained more transaction volume, they would likely have improved both in adoption, usage, and hence monetization over time, thereby yielding additional benefits to publishers through increased competition among exchanges.

(696) Second, publishers' higher floors on AdX imposed more competition on the bids received from AdX. Additionally, because AdX (prior to the change to UFPA) dynamically adjusted its take rates under DRS, higher floors also would tend to put pressure on the fees that AdX could charge.

(697) Google's variable floor restriction eliminated this ability of publishers to work with rival exchanges via setting variable floors, increasing Google's AdX revenues and impressions, and reducing those of rivals. Similar to how most-favored nation or anti-steering clauses can yield anticompetitive effects in other platform settings,[1000] Google's variable floor restriction softened the competitive pressures on AdX to reduce fees, improve quality, or otherwise increase its attractiveness to publishers that floored its exchange higher in order win business that was being captured by rival exchanges.

(698) Google thus used its dominant position in the publisher ad server market to impede competition in the exchange market, and capture business for AdX not through product innovation or fee reductions, but rather by frustrating the efforts of publishers and rival exchanges to transact with one another.

(699) In June 2021, Google agreed to relax restrictions on publishers' abilities to set variable pricing floors within DFP with the French Competition Authority.[1001] This exception is limited to publishers in the

[999] Jason Bigler, "An update on first price auctions for Google Ad Manager," Google Ad Manager Blog, May 10, 2019, https://www.blog.google/products/admanager/update-first-price-auctions-google-ad-manager/.

[1000] *See* Section VI.

[1001] DOJ-ADS-0000046935, at -935 (06/07/2021); GOOG-AT-MDL-010525710, at -717 (06/21/2022).

(707) Prior to the move to UFPA, Google's internal documents indicated that publishers used variable floors across exchanges, and in some cases set higher floor prices on AdX than on rival ad exchanges.[1011] One reason publishers set higher floor prices on AdX is that AdX had different demand than other exchanges. According to economic theory, the reserve price that maximizes expected seller revenues would likely vary across exchanges, as it depends on each exchange's bidders and their valuations.[1012] This principle applies even in a first-price auction format, because floors affect the bids that buyers would submit into the auction, exerting additional competitive pressure. Consistent with this principle, in a 2017 email chain Google's Jonathan Bellack wrote that another employee: [1013]

> raises an interesting point that some pubs are raising AdX floors on purpose to make us work harder. That means pubs do think of us differently, after all we do have differentiated demand with GDN. They must have a belief (or evidence) that they get GDN to pay higher when they push up the floors… Or, since Index Exchange is generally 10% revshare not 20%, they only want to call AdX when we are paying so much more to be worth the bigger cut. Or, just generally thinking Google is rich and so should be forced to pay more.

VII.D.2.c. UPR eliminated this ability of publishers to work with rival exchanges via setting variable floors

(708) In May 2019, Google launched UPR, a program that modified publisher price controls within DFP. UPR included a restriction that publisher pricing rules "will be applied to all partners equally, and cannot be set for individual buying platforms."[1014] That restriction required publishers to set a single floor price for inventory that applied to all ad exchanges and advertiser buying tools, thus preventing publishers from setting differential price floors on Google's ad exchange or advertiser buying tools versus rival ad exchanges or advertiser buying tools.[1015] Google implemented the switch to the UFPA with UPR in September 2019.[1016]

[1011] GOOG-DOJ-10664165, at -165 (05/10/2019) ("AdX has typically been subject to higher floors set by pubs on other exchanges."; GOOG-TEX-00122345, at -348 (07/20/2017) ("We suspected higher ADX floors is what was happening both for HB and for Jedi, but without the Jedi data we didn't have a way to conclusively prove it. Now that we know for sure, there are several things we can do about it."); GOOG-TEX-00124787, at -792 (07/009/2018) ("42% of HB won queries have a higher AdX floor than the HB [line item] price.").

[1012] Roger Myerson, "Optimal Auction Design," *Mathematics of Operations Research* 6, no. 1 (1981); 58–73; Vijay Krishna, *Auction Theory*, 2nd ed. (Burlington, MA: Academic Press, 2009), Ch. 2.

[1013] GOOG-TEX-00122345, at -346 (07/21/2017).

[1014] Jason Bigler, "An update on first price auctions for Google Ad Manager," Google Ad Manager Blog, May 10, 2019, https://www.blog.google/products/admanager/update-first-price-auctions-google-ad-manager/.

[1015] Jason Bigler, "An update on first price auctions for Google Ad Manager," Google Ad Manager Blog, May 10, 2019, https://www.blog.google/products/admanager/update-first-price-auctions-google-ad-manager/.

[1016] Jason Bigler, "Rolling out first price auctions to Google Ad Manager partners," Google Ad Manager Blog, September 5, 2019, https://www.blog.google/products/admanager/rolling-out-first-price-auctions-google-ad-manager-partners/. One internal document refers to these "rules" as "unified pricing controls." *See* GOOG-DOJ-AT-01139367, at -367

limited a publisher's ability to use buyer-specific floors to protect against "low quality (bad) ads," while also increasing revenues but reducing per-transaction payouts from Google Ads.[1044]

VII.E. Google's acquisition of AdMeld

(717) In this Section, I describe Google's 2011 acquisition of AdMeld. I show how Google sought to counter a threat it perceived from yield managers, and how as the result of the acquisition, Google eliminated an option previously available to open-web publishers for accessing and working with multiple demand sources. In doing so, Google eliminated competitive pressures on its AdX and DFP products.

VII.E.1. Google acquired AdMeld in response to a perceived threat from yield managers

(718) By 2010, yield managers (also initially called supply-side platforms, or SSPs) emerged as a threat to Google's ad exchange and publisher ad server businesses. Yield managers assisted publishers with connecting to and selecting among a variety of indirect demand sources, including ad networks and ad exchanges, for monetizing display ad inventory.[1045] Some yield managers were able to access real-time bids from multiple demand sources at once.[1046]

(719) As a 2011 Google email noted, "[p]ublishers fundamentally believe they get maximum yield through a broad mix of deal types"—including sponsorships, direct network relationships, "cherry-picking

[1044] GOOG-AT-MDL-014303955, at -955–956 (08/16/2019) (A Google email chain discussing feedback from Dutch publisher on UPR states, "[s]ince we are meeting with DPG Media on Monday, I wanted to give you a heads up. We (Katya & myself) just received the mail below from Jeroen Swiers (their head of digital) demanding the ability to set buyer specific floors (to control adwords). His claims: -Adwords revenue has increased … and this is adding a lot of bad ads (fake news) on their domains. -They used to set higher floor prices for Adwords due to these low quality (bad) ads. Adwords eCPM is declining, while win rate is increasing due to UPR --> huge concern for them [] I ran a quick report, mostly confirming his revenue related claims… Offering the ability to set advertiser specific floors for Adwords small land medium business would probably resolve their issue (related to ad quality)").

[1045] Neal Mohan, "Helping publishers get the most from display advertising with AdMeld," Google Official Blog, June 13, 2011, https://googleblog.blogspot.com/2011/06/helping-publishers-get-most-from.html ("Some publishers also work with a 'yield optimization' provider… that supplies technology to select ads from across these many indirect options", including ad networks and advertising exchanges). Yield managers were also at the time referred to as "supply side platforms," which was a term that later came to include products that also combined functionalities of ad exchanges. *See* GOOG-AT-MDL-008569724, at -724 (08/08/2023) ("Supply-Side Platforms (SSPs) More commonly known as yield managers"); *see also* GOOG-AT-MDL-008569591, at -605 (01/2011) ("Supply-side platforms… [p]reviously more commonly known as publisher yield managers/optimizers").

[1046] GOOG-DOJ-03599592, at -593–596 (02/25/2011) (Admeld Proposal, AdMeld (the leading yield manager) "connects to every ad server, buyer, and data source in a transparent, real-time environment." And, AdMeld was founded in 2007, and "[i]n its first eighteen months, Admeld worked primarily as an ad network optimization platform for publishers… The platform processed impressions through traditional ad tags, and leveraged predictive algorithms to create network 'daisy chains' that generate the highest expected revenue values for each impression;" and "Admeld's first RTB bid was conducted in July 2009 – making Admeld one of the first companies to embrace this new ecosystem… In Admeld's unified auction each impression is awarded to the highest-paying qualified buyer – whether they are bidding via RTB or via traditional ad network tags.").

control over the inventory supply."[1051] In 2010, Google declared that "Yield Managers are a threat we need to take *very* seriously."[1052]

(723) A 2010 Google presentation identified three main yield managers (Rubicon, AdMeld, Pubmatic), and noted that "[y]ield [m]anagers and other technology exchanges are considered direct competitors to AdX."[1053] Figure 70 depicts a slide from this presentation, indicating that these yield managers—labeled also as exchanges—"pose[d] a significant threat to both AdSense and AdX growth" by "owning the remnant tag" and influencing the allocation of inventory across networks.[1054]

[1051] GOOG-TEX-00101777, at -780 (01/2011) ("Yield Managers through a scrappy service and tech offering have side-stepped our platform strategy and are 'owning the remnant tag' for a growing number of premium publishers, putting at risk our current and future control over the inventory supply."); GOOG-TEX-00101777, at -788 (01/2011) ("The value proposition offered by YMs has been compelling to premium publishers as an estimated 60% of DFP publishers have integrated with YMs … Since the YMs now manage the decision as to which ad network should monetize remnant inventory for a publisher, they are increasingly in a position to generate their own buy-side demand and monetize inventory themselves, thus taking a higher rev share … As a result, Google's platform strategy to 'own the tag' in order to ensure optimal control over inventory for monetization (Adx and AdSense) is at risk.").

[1052] GOOG-DOJ-02139596, at -597 (09/09/2010) (emphasis in original).

[1053] GOOG-TEX-00101777, at -782 and -788 (01/2011).

[1054] GOOG-TEX-00101777, at -783 (01/2011).

(727) Google documents highlighted AdMeld's RTB strengths among yield managers.[1061] A Google slide deck that summarized "Competitive Intel" indicated that Rubicon had "no support for RTB," that for AdMeld real time bidding is a "Key Strength," and that Pubmatic allowed real time bidding on an "optional" basis.[1062] A 2011 slide deck, when comparing the options of buying AdMeld and buying PubMatic, stated that AdMeld has a "Stronger product offering" and PubMatic "has less RTB." The presentation also stated that Rubicon "was inferior to AM and PM."[1063]

(728) Consistent with the above, a 2011 AdMeld document described itself as "the world's largest, independent practitioner of Real Time Bidding (RTB)," noting that it connected to more than 200 ad networks and 35 DSPs while providing "ad decisioning on over 1.7 billion advertisements per day."[1064] AdMeld described their "core functionality" as Real-Time Bidding and proposed to become the "central ad decision hub."[1065]

(729) In June 2011, Google announced the acquisition of AdMeld.[1066]

VII.E.2. Google's acquisition of AdMeld eliminated a competitor and option for publishers to manage multiple demand sources

(730) Following the closing of its acquisition of AdMeld in December, 2011, Google began replicating some of AdMeld's features and migrating customers into AdX and DFP.[1067] Documents indicate that Google halted the development of AdMeld as a separate product and merged the two products together under the AdX umbrella by 2013.[1068]

[1061] GOOG-DOJ-13252093, at -112 (09/24/2020).

[1062] GOOG-TEX-00101777, at -802–804 (01/2011).

[1063] GOOG-DOJ-10590974, at -981 and -986 (03/15/2011).

[1064] GOOG-DOJ-03599592, at -593 and -603 (02/25/2011).

[1065] GOOG-DOJ-03599592, at -603 (02/25/2011).

[1066] Neal Mohan, "Helping publishers get the most from display advertising with Admeld," Google Official Blog, June 13, 2011, *Helping publishers get the most from display advertising with Admeld* (June 13, 2011), https://googleblog.blogspot.com/2011/06/helping-publishers-get-most-from.html; Amir Efrati, "Google in Deal to buy Admeld," *The Wall Street Journal*, June 14, 2011; GOOG-DOJ-11026951, at -951 (02/12/2019).

[1067] GOOG-TEX-00054421, at -421 (09/14/2021) (Google's AdMeld design document resads, "Admeld Migration Design Document (Early Draft)", "Google acquired Admeld for roughy [sic] $400M in December 2011. The Admeld platform combines Real Time Bidding with numerous features that Google Ad Exchange did not previously support, including Traditional Yield Management, Private Exchanges, and Bid Landscapes. In the nine months since the acquisition, AdX has made substantial progress towards replicating these features. In the first half of 2013 The Admeld migration team will migrate all or substantially all of the Admeld customers to AdX"); GOOG-DOJ-04302630, at -643 (02/28/2012) (Google's "Display Strategy Review" presentation states, "Yield Mgmt(AdX + Admeld). Combine most competitive SSP with the most competitive Exchange. Extend network yield mgmt. into Google stack. DFP integration."); Deposition of Scott Spencer (Google), 166:22–167:1 ("Q. But AdMeld got integrated into Google's exchange product? A. Well, AdMeld got more integrated – got partially integrated into DFP and partially integrated into the exchange.").

[1068] GOOG-DOJ-03603298, at -299 (08/01/2019) ("Admeld Migration (for Sales and Services)" document states, "[r]ealize that innovation will come to a halt on Admeld in late 2012, but will continue on AdX. Additionally, the AdX engineering team has spent the bulk of 2012 building out those features unique to Admeld, in order to achieve feature parity across the two platforms by early 2013."); GOOG-DOJ-03606441, at -442 (09/01/2012) (A Google document

(731) Following the acquisition, Google indicated in internal documents that it did not plan to integrate AdMeld features that would provide real-time bids into rival publisher ad servers. For example, a 2012 client migration document following the acquisition noted that Google did not plan to integrate AdMeld's API features that, if allowed, would "pass real-time AdX pricing into a non-DFP ad server."[1069] Further, when Google consolidated AdX and AdMeld into "a single offering," a Google document indicated that the combined product would adopt AdX's terms.[1070] These terms restricted the use of AdX within SSPs, other exchanges, or yield managers.[1071]

(732) A 2013 email from Google executive Scott Spencer (Director of Product Management for AdX) noted that the policy to "completely block publishers from running AdX inside of SSPs" would be enforced in "Q1 2014."[1072] In an earlier email, he explained the rationale behind limiting AdX's usage with yield managers: "This was a strategic decision. We allow redirection from 3rd party ad servers, but not from other exchanges or yield managers. Why? Because if we did then those systems would immediately have a super set of demand – anything the SSP had + all of AdX (including AdWords). No one would sign up for AdX directly."[1073]

states, "As we enter the latter part of 2012, it is becoming clearer that Admeld will, indeed, be sunset, and the features most relevant to Admeld customers will become part of the AdX platform."); GOOG-DOJ-03540728, at -728 (01/24/2012).

[1069] GOOG-DOJ-03606441, at -448 (09/01/2012) ("Admeld can be called via API to serve an ad. There are small handful of Admeld sellers that currently have API integrations in place at the ad server level. While these integrations are being considered, they are not currently planned. There are policy implications for supporting these types of integrations on AdX; most notably, they pass real-time AdX pricing into a non-DFP ad server." For a description of "RTB API", *see* GOOG-AT-MDL-B-004270584, at -589–590 (04/24/2011); *see also* GOOG-DOJ-09448411, at -412–414 (06/11/2012) (An email exchange between Google employees discussing a request from a client states, "Metanetworks is looking to implement the integration they used to have with AdMeld. Admeld got to see the querie [sic] from Meta in an RTB integration and decide wether [sic] to take it or not, putting a bid to their system. They want to see if that is feasible with AdExchange." A Google employee responded, stating that "even a bid-based server side integration like the Admeld api would be against adx sellside policy.").

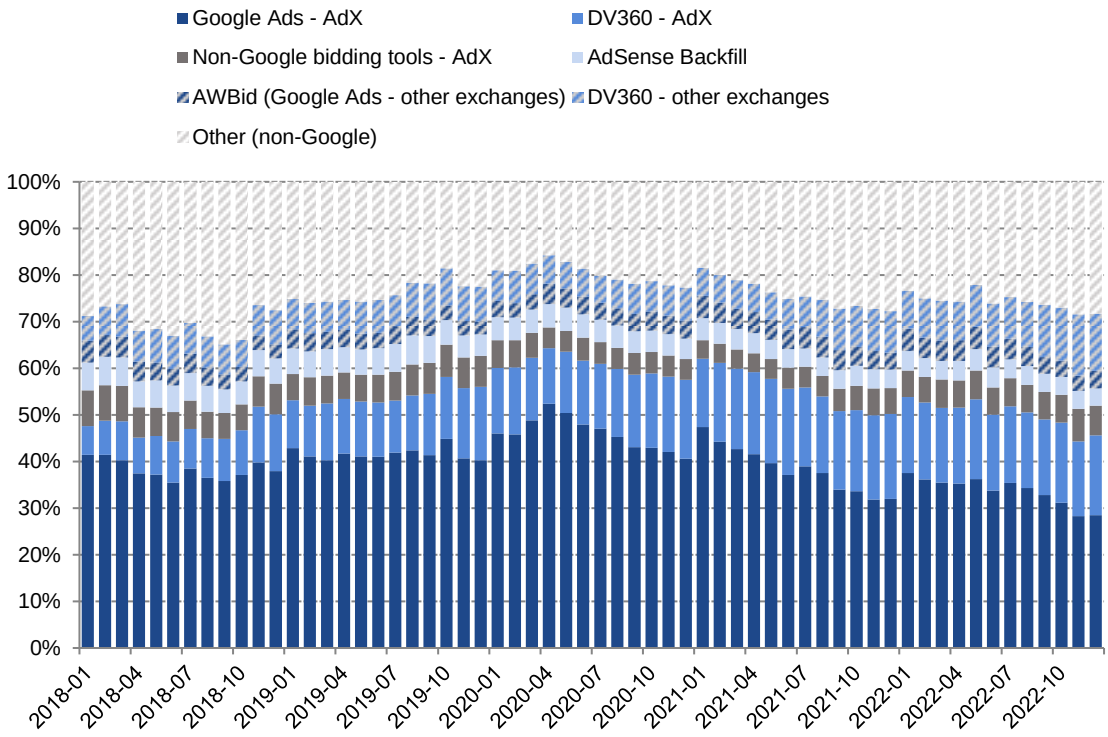
[1070] GOOG-DOJ-03540728, at -728-729 (01/23/2012) (An email on "Admeld Integration," noting "[w]e are consolidating the products to a single offering, based on the AdX product" and "DFP Yield Management effort and coordination[.] Establish a path forward for DFP YM report given the proposal that the functionality be under the ADX contract terms.").

[1071] GOOG-TEX-00149044, at -044 (03/22/2013) ("The current policy restricts calling AdX from another yield manager or exchange when there is AdX sub-syndication (i.e., network partners) in place. We define a yield manager as a system that automatically determines the CPM from multiple indirect channels. We define a exchange as something with RTB callouts. This definition has worked well since, even in systems with multiple functions, these can typically be turned off. We are planning to remove the AdX sub-syndication dependency in January once we have a good track record with the full Admeld functionality integrated into AdX.").

[1072] GOOG-TEX-00149056, at -057 (03/26/2013). SSPs, or supply-side platforms, include yield managers.

[1073] GOOG-TEX-00149044, at -044–045 (03/22/2013). Later in the same email chain, a Google employee wrote, "I am wondering what a good working definition of an ad server, because in my mind the line between an ad server and a yield manager is fairly blurry, as these things venture into each other's territory. The reason I ask is that presumably integration with 'ad servers' is presumably a good thing that should be encouraged while integration with the rest is undesirable." Spencer responded, "We define a yield manager as a system that automatically determines the CPM from multiple indirect channels. We define a exchange as something with RTB callouts." Even though AdX could be called from third-party ad servers, it did not provide real-time bids. *See* Section VII.C for more details.

Figure 73. Google Ads-AdX share of worldwide indirect open-web display impressions transacted through exchanges (2018–2022)



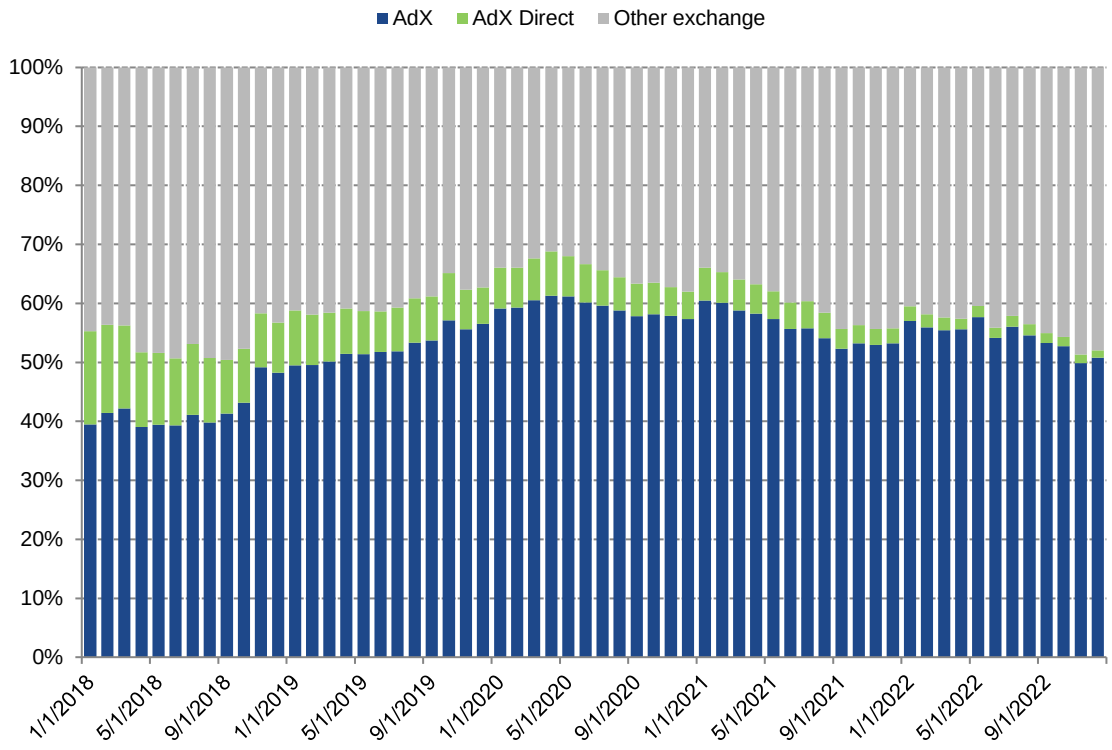
Source: Google Ads data (DOJ RFP 54); Exchange data panel (*See* Appendix H.1.b for details)
Note: Google Ads-AdX impressions include all open-web display impressions purchased by Google Ads from AdX, excluding AWBid and any inventory that originates from Google's O&O properties. AWBid impressions include all open-web display impressions purchased by Google Ads from third-party exchanges. The figure also identifies impressions transacted by DV360, AdX, and AdSense Backfill. Blue shading indicates impressions purchased by a Google bidding tool (i.e., Google Ads, DV360) or AdSense, and hashed bars indicate a non-Google exchange. The figure includes only impressions purchased through indirect transactions transacted through exchanges (this includes Header Bidding, Private Auction, Open Bidding, and DoubleClick First Look). Denominator includes impressions from Google and ad exchanges that produced data in this matter, and impressions estimated from exchanges that did not produce data on this matter. See table notes for Figure 47 and Appendix H for details.

(744) By withholding access to Google Ads demand, Google reduced publisher payouts on other exchanges, making them less competitive. The following evidence from documents highlight how Google Ads' participation on an exchange can meaningfully affect the expected monetization, and hence attractiveness, of that exchange to publishers:

- A 2011 Google presentation titled "Implications of Adwords's and AdX's bidders" discussed the "expected impact" from Google Ads bidding more widely on AdMeld, Rubicon, and Pubmatic: "4% more inventory to [Ads]", reducing AdSense and AdX average CPM by 1.1%, and increasing CPMs on those rivals by 2.2%.[1086]

[1086] GOOG-DOJ-14826585, at -590 (11/02/2016). The presentation noted that assumptions used for the analysis included AdX losing 30% of its projected 2011 customers and 50% of its projected 2012 customers, "based on sales

Figure 74. AdX and AdX Direct share of worldwide open-web display indirect impressions transacted through ad exchanges (2018–2022)



Source: Google AdX data (DOJ RFP 53); Exchange data panel (*See* Appendix H.1.c for details)
Notes: AdX impressions are limited to all worldwide indirect open-web display impressions purchased by AdX (indirect transactions include Open Auction, Private Auction, Exchange Bidding, Header Bidding, and First Look). AdX Direct transactions include indirect open-web display impressions from AdX (which may be served through third-party ad servers, proprietary ad servers, or DFP; *see* GOOG-DOJ-03634896, at -902, 904, 905, 908 (01/25/2018). AdX Direct transactions are identified using the *is_adx_direct* field native to the RFP 53 data. Denominator includes impressions from Google and ad exchanges that produced data in this matter, and impressions estimated from exchanges that did not produce data on this matter. See table notes for Figure 47 and Appendix H for details.

(766) Google's exclusive provision of real-time bids from AdX to DFP thus meaningfully differentiates DFP from rival publisher ad servers and limits rival publisher ad servers' abilities to compete with DFP, as rival servers are unable to offer the same unrestricted access to an exchange with a substantial share of transaction volume.

(767) Further, as I described in Section VII.E, Google's acquisition of AdMeld eliminated an option previously available to open-web publishers working with third-party publisher ad servers to multihome across (and thereby receive and manage real-time bids from) multiple exchanges and demand sources, and a product that could have emerged as a potential competitor to DFP.

Appendix D. Additional market shares figures

D.1. Additional exchange shares figures

D.1.a. Summary of exchange shares specifications

Figure 88. Summary of AdX's worldwide indirect open-web display shares among ad exchanges

Metric	Specification	2018	2019	2020	2021	2022
Impressions	[1] AdX share (baseline)	54%	60%	65%	60%	56%
	[2] AdX share (including DSP-to-PAS transactions)	53%	58%	63%	58%	54%
	[3] AdX share (excluding Verizon)	55%	62%	66%	61%	58%
	[4] AdX share (relative to parties that produced data)	67%	65%	71%	67%	63%
Fees	[1] AdX share (baseline)	47%	52%	51%	47%	43%
	[2] AdX share (including DSP-to-PAS transactions)	47%	48%	47%	45%	42%
	[3] AdX share (excluding Verizon)	49%	53%	52%	49%	46%
	[4] AdX share (relative to parties that produced data)	66%	60%	61%	59%	56%

Source: Google AdX data (DOJ RFP 53); Exchange panel (*See* Appendix H.1.c).
Notes: Specifications 1–3 are AdX's annual weighted average share of impressions and fees among exchanges that produced data in this matter as well as impressions and fees I estimate coming from exchanges that did not produce data on this matter. Appendix H.3 contains a description of how I perform this estimation. Specification 4 is AdX's annual weighted average share of impressions and fees among only exchanges that produced data in this matter. See Appendix H.1.c, which lists the exchanges that produced data in this matter.

Figure 89. Summary of AdX's US indirect open-web display shares among ad exchanges

Metric	Specification	2018	2019	2020	2021	2022
Impressions	[1] AdX share (baseline)	46%	48%	56%	51%	47%
	[2] AdX share (including DSP-to-PAS transactions)	46%	47%	54%	50%	46%
	[3] AdX share (excluding Verizon)	47%	49%	56%	52%	48%
	[4] AdX share (relative to parties that produced data)	58%	52%	61%	56%	52%
Fees	[1] AdX share (baseline)	43%	45%	45%	41%	36%
	[2] AdX share (including DSP-to-PAS transactions)	43%	43%	43%	40%	36%
	[3] AdX share (excluding Verizon)	45%	46%	45%	43%	39%
	[4] AdX share (relative to parties that produced data)	60%	52%	53%	51%	46%

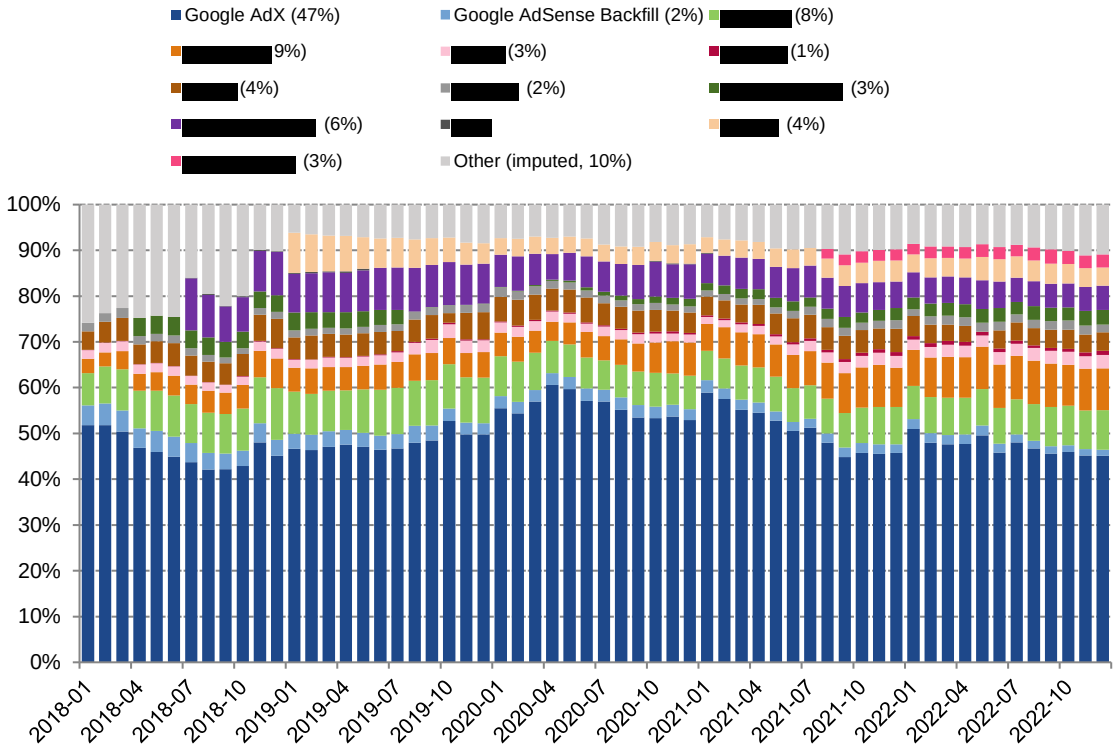
Source: Google AdX data (DOJ RFP 53); Exchange panel (*See* Appendix H.1.c).
Notes: Specifications 1–3 are AdX's annual weighted average share of impressions and fees among exchanges that produced data in this matter as well as impressions and fees I estimate coming from exchanges that did not produce data on this matter. Appendix H.3 contains a description of how I perform this estimation. Specification 4 is AdX's annual weighted average share of impressions and fees among only exchanges that produced data in this matter. See Appendix H.1.c, which lists the exchanges that produced data in this matter.

D.1.b. US market shares in the exchange market (baseline specification)

(846) Below, I include versions of the exchange market shares analyses I presented in my report, limited to impressions served to users in the United States.[1272]

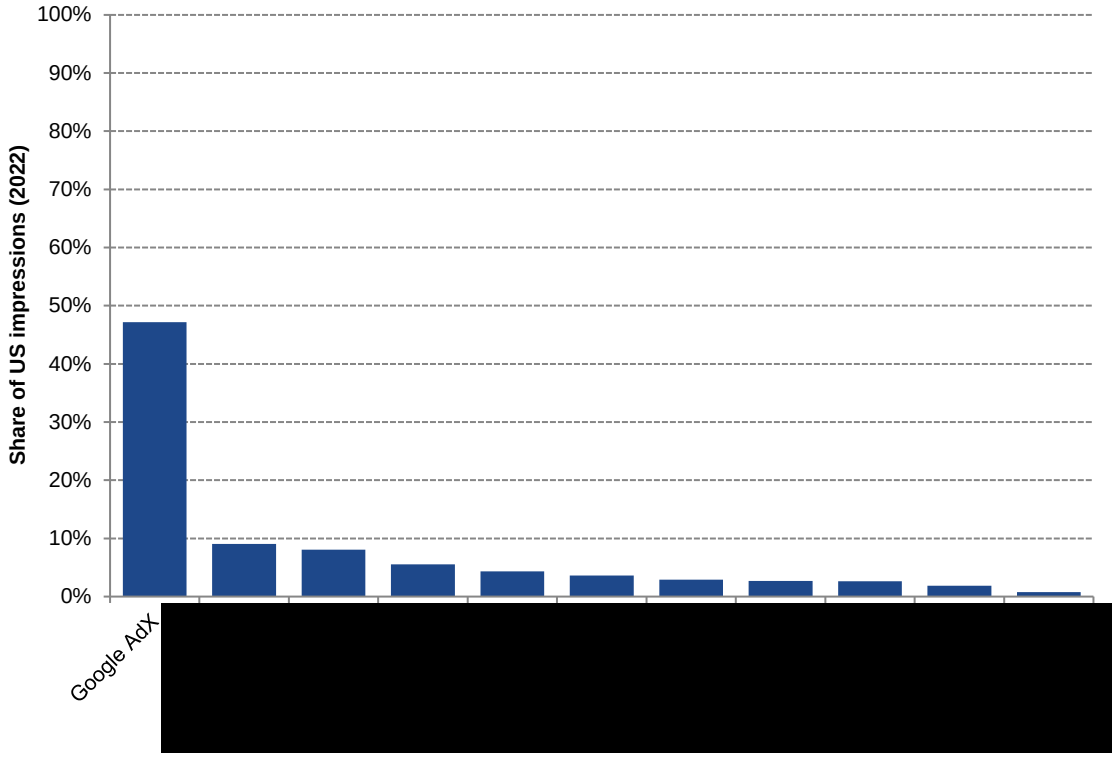
[1272] Due to data limitations, I cannot reliably identify user location in all datasets. See Appendix H.4.a.

Figure 90. AdX maintains a substantial share of US indirect open-web display impressions transacted through ad exchanges (2018–2022)



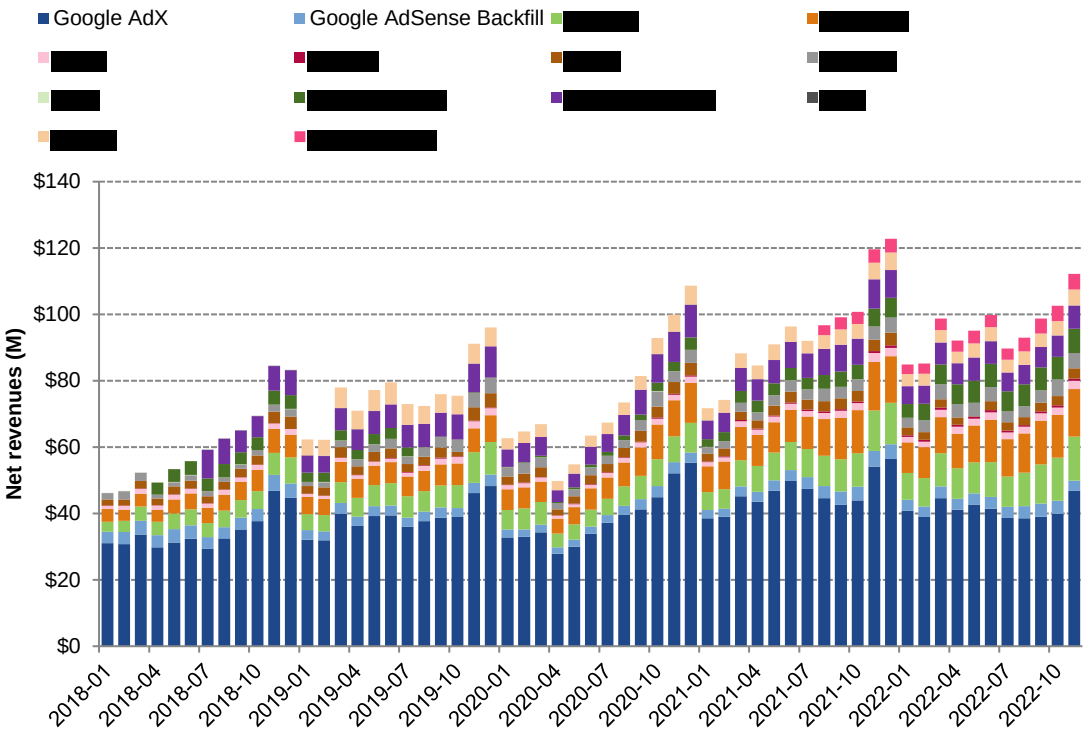
Source: Google AdX data (DOJ RFP 53); Exchange panel (*See* Appendix H.1.c)
Notes: Denominator includes impressions from Google and ad exchanges that produced data in this matter, and impressions estimated from exchanges that did not produce data on this matter ("Other (imputed)"). The set of exchanges within "Other (imputed)" varies during the time period shown due to incomplete data from certain third-party exchanges. Appendix H provides a description of how I perform this estimation. The legend contains the share of indirect open-web display impressions in 2022 in parenthesis for those exchanges that produced data on indirect open-web display impressions in 2022.

Figure 91. AdX and third-party exchanges' shares of US indirect open-web display impressions among ad exchanges (2022)



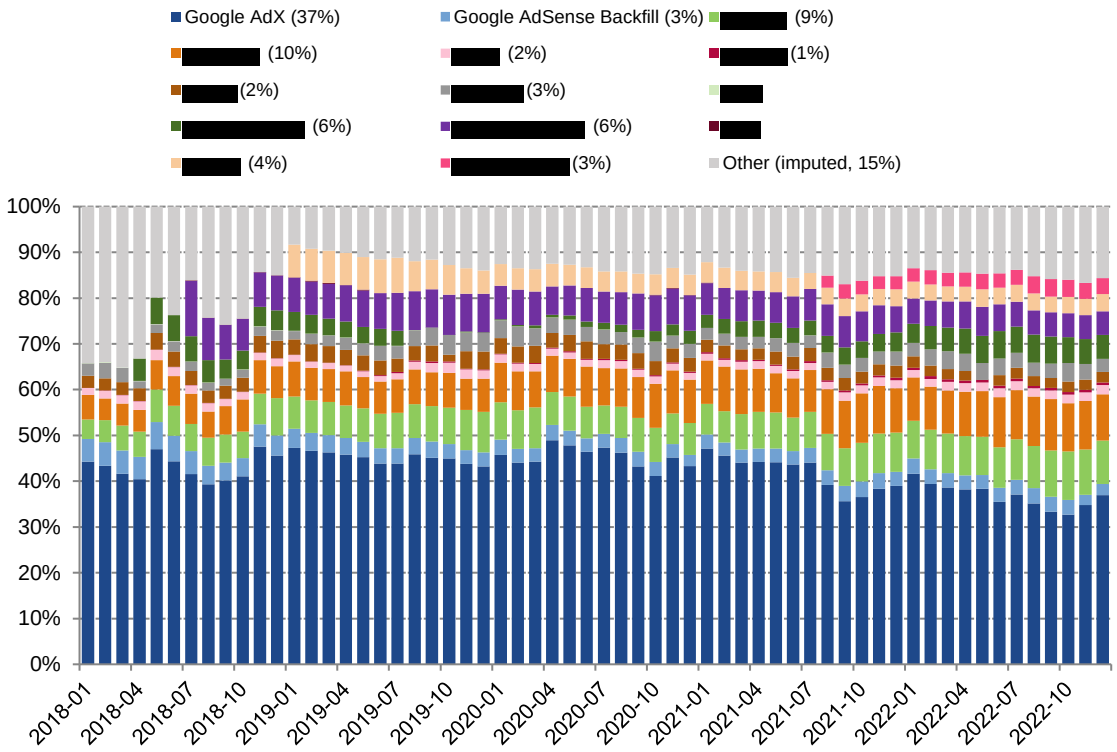
Source: Google AdX data (DOJ RFP 53); Exchange panel (See Appendix H.1.c).
Notes: 2022 US indirect open-web display impression market shares for ad exchanges shown in Figure 90 (see table notes). In 2022, exchanges that did not produce data are estimated to represent 10% of US indirect open-web display impressions. [redacted] provides only worldwide data; US impressions for [redacted] are obtained by using the average ratio of US-to-worldwide impressions among other exchanges.

Figure 92. AdX earns consistently high net revenues from the sale of US indirect open-web display impressions (2018–2022)



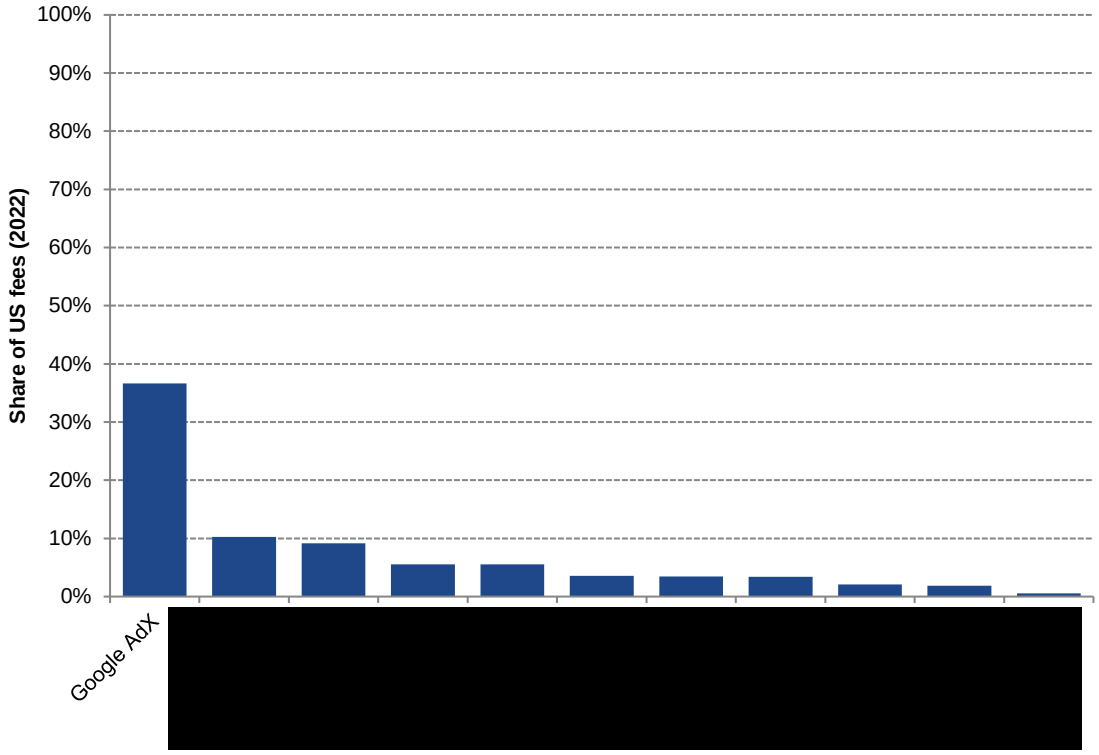
Source: Google AdX data (DOJ RFP 53); Exchange panel (*See* Appendix H.1.c)
Notes: 1. Includes net revenues from Google and exchanges that produced data in this matter. 2. AdSense Backfill refers to the set of transactions that are served from AdSense through DFP. Google charges a single 32% take rate for transactions through AdSense (including those through AdSense Backfill) and does not separate the take rate into buy-side and sell-side components. For the purposes of these share calculations, I apply the full 32% take rate to transactions through AdSense Backfill.

Figure 93. AdX maintains a substantial share of ad exchange fees from US indirect open-web display impressions (2018–2022)



Source: Google AdX data (DOJ RFP 53); Exchange panel (*See* Appendix H.1.c)
Notes: 1. Includes net revenues from Google and exchanges that produced data in this matter. 2. AdSense Backfill refers to the set of transactions that are served from AdSense through DFP. Google charges a single 32% take rate for transactions through AdSense (including those through AdSense Backfill) and does not separate the take rate into buy-side and sell-side components. For the purposes of these share calculations, I apply the full 32% take rate to transactions through AdSense Backfill. 3. For exchanges from which I have data on gross revenue but not net revenue, I apply the weighted average take rate among third-party exchanges that produced both gross and net revenue data to those exchanges' spend.

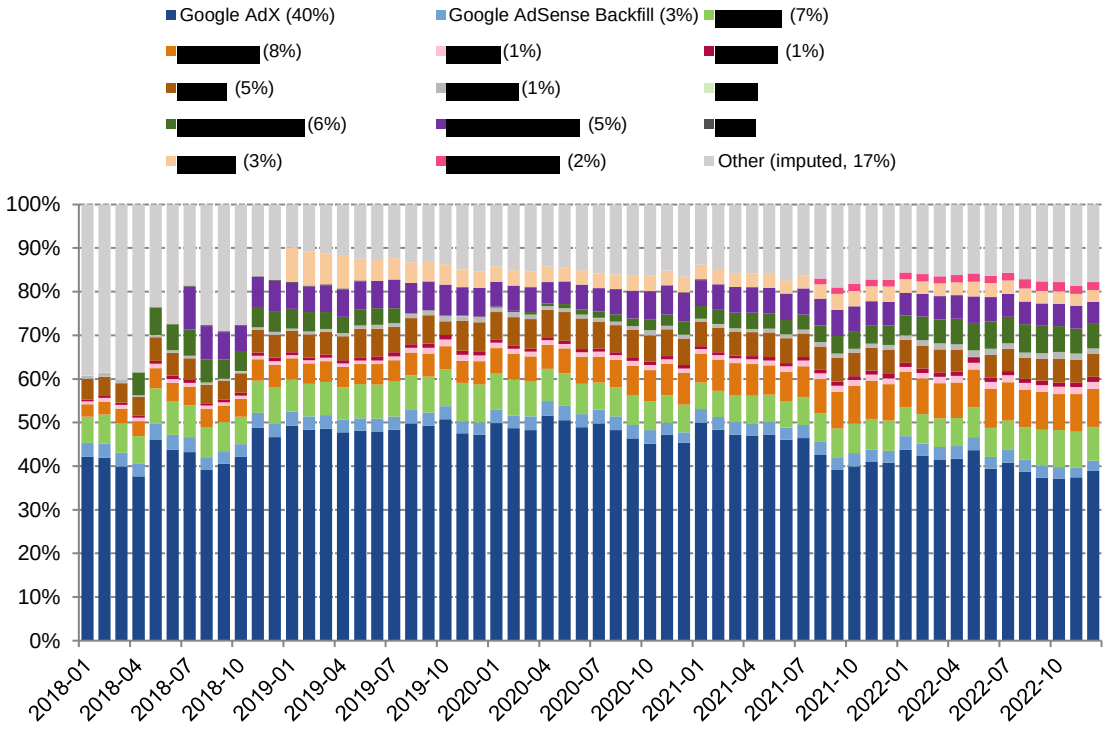
Figure 94. AdX and third-party exchanges' shares of ad exchange fees from US indirect open-web display transactions (2022)



Source: Exchange panel (*See* Appendix H.1.c)
Notes: 2022 US indirect open-web display net revenue market shares for ad exchanges shown in Figure 93 (See table notes). In 2022, exchanges that did not produce data are estimated to represent 15% of US indirect open-web display spend. [redacted] provides only worldwide data; US impressions for [redacted] are obtained by using the average ratio of US-to-worldwide impressions among other exchanges.

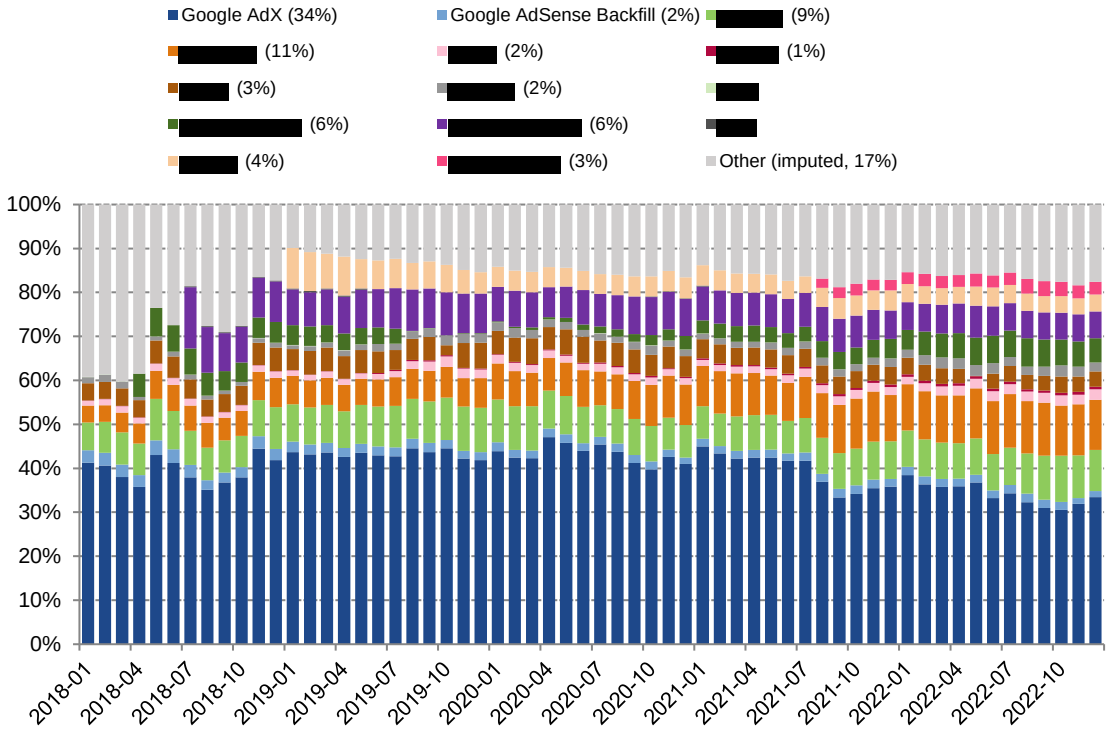
D.1.c. Spend shares in the exchange market

Figure 95. AdX maintains a substantial share of worldwide indirect open-web display spend transacted through ad exchanges (2018–2022)



Source: Google AdX data (DOJ RFP 53); Exchange panel (*See* Appendix H.1.c for details).
Notes: Denominator includes spend from Google and exchanges that produced data in this matter, and spend estimated from exchanges that did not produce data on this matter ("Other (imputed)"). Appendix H provides a description of how I perform this estimation. The legend contains the share of indirect open-web display spend in 2022 in parenthesis for those exchanges that produced data on indirect open-web display spend in 2022.

Figure 96. AdX maintains a significant share of US indirect open-web display spend



Source: Google AdX data (DOJ RFP 53); Exchange panel (*See* Appendix H.1.c)
Notes: Denominator includes spend from Google and exchanges that produced data in this matter, and spend estimated from exchanges that did not produce data on this matter ("Other (imputed)"). Appendix H provides a description of how I perform this estimation. The legend contains the share of indirect open-web display spend in 2022 in parenthesis for those exchanges that produced data on indirect open-web display spend in 2022.

D.2. Additional advertiser ad network shares figures

D.2.a. Summary of advertiser ad network shares specifications

Figure 97. Summary of Google Ads' worldwide indirect open-web display shares among advertiser ad networks, and among bidding tools (advertiser ad networks and DSPs)

Metric	Specification	2018	2019	2020	2021	2022
Impressions	[1] Google Ads share (baseline)	86%	88%	90%	90%	87%
	[2] Google Ads share (excluding Google Ads-AdSense transactions)	76%	80%	85%	84%	78%
	[3] Google Ads share (including imputed other bidding tools, which contain DSPs)	57%	60%	69%	67%	65%
Fees	[1] Google Ads share (baseline)	66%	69%	73%	78%	81%
	[2] Google Ads share (excluding Google Ads-AdSense transactions)	37%	43%	52%	59%	58%
	[3] Google Ads share (including imputed other bidding tools, which contain DSPs)	33%	33%	35%	42%	48%

Source: Google Ads data (DOJ RFP 7, 54); Bidding tools panel (*See* Appendix H.1.b).
Notes: Specifications 1–2 are Google Ads' annual weighted average share of impressions and fees among advertiser ad networks that produced data in this matter. Specification 3 is Google Ads' annual weighted average share of impressions and fees among advertiser ad networks that produced data in this matter as well as impressions and fees I estimate coming from bidding tools that did not produce data on this matter, which include DSPs. Appendix H.3 contains a description of how I perform this estimation. See Appendix H.1.b, which lists the ad networks that produced data in this matter.

Figure 98. Summary of Google Ads' US indirect open-web display shares among advertiser ad networks, and among bidding tools (advertiser ad networks and DSPs)

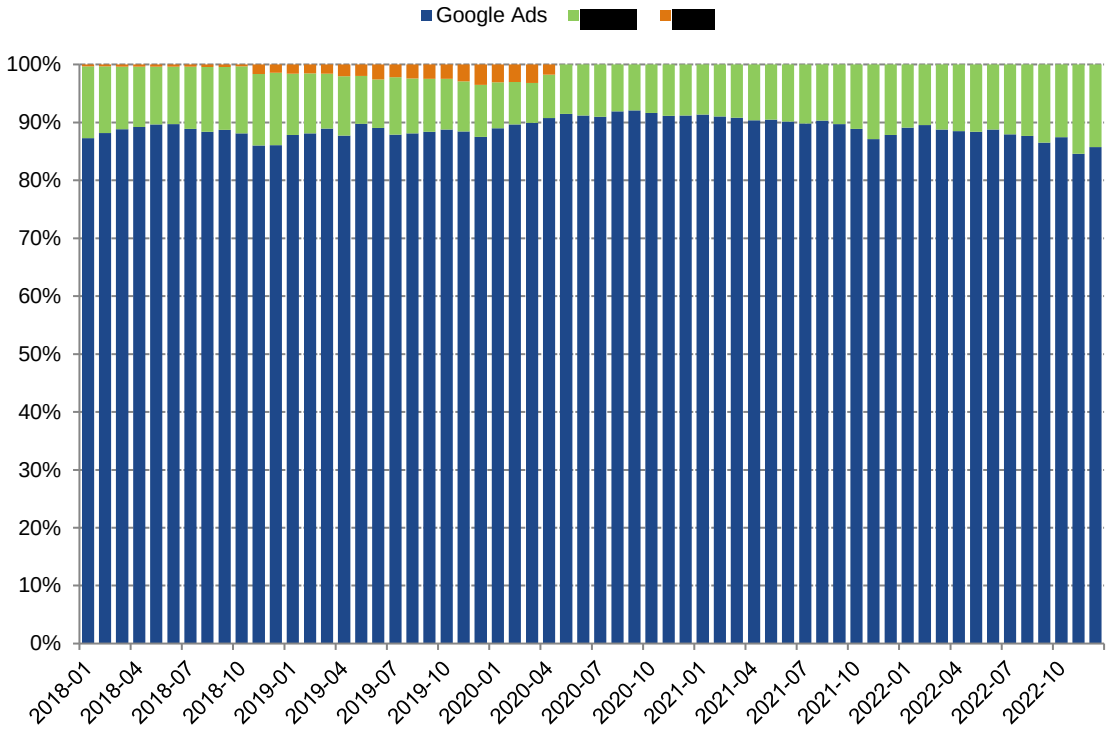
Metric	Specification	2018	2019	2020	2021	2022
Impressions	[1] Google Ads share (baseline)	88%	88%	91%	90%	88%
	[2] Google Ads share (excluding Google Ads-AdSense transactions)	81%	83%	87%	86%	82%
	[3] Google Ads share (including imputed other bidding tools, which contain DSPs)	48%	45%	58%	54%	55%
Fees	[1] Google Ads share (baseline)	72%	71%	75%	81%	83%
	[2] Google Ads share (excluding Google Ads-AdSense transactions)	43%	45%	55%	63%	61%
	[3] Google Ads share (including imputed other bidding tools, which contain DSPs)	33%	29%	31%	38%	44%

Source: Google Ads data (DOJ RFP 7, 54); Bidding tools panel (*See* Appendix H.1.b).
Notes: Specifications 1–2 are Google Ads' annual weighted average share of impressions and fees among advertiser ad networks that produced data in this matter. Specification 3 is Google Ads' annual weighted average share of impressions and fees among advertiser ad networks that produced data in this matter as well as impressions and fees I estimate coming from bidding tools that did not produce data on this matter, which includes DSPs. Appendix H.3 contains a description of how I perform this estimation. See Appendix H.1.b, which lists the ad networks that produced data in this matter.

D.2.b. US market shares in the advertiser ad network market (baseline)

(847) Below, I include versions of the market shares analyses I presented in my report, limited to impressions served to users in the United States.[1273]

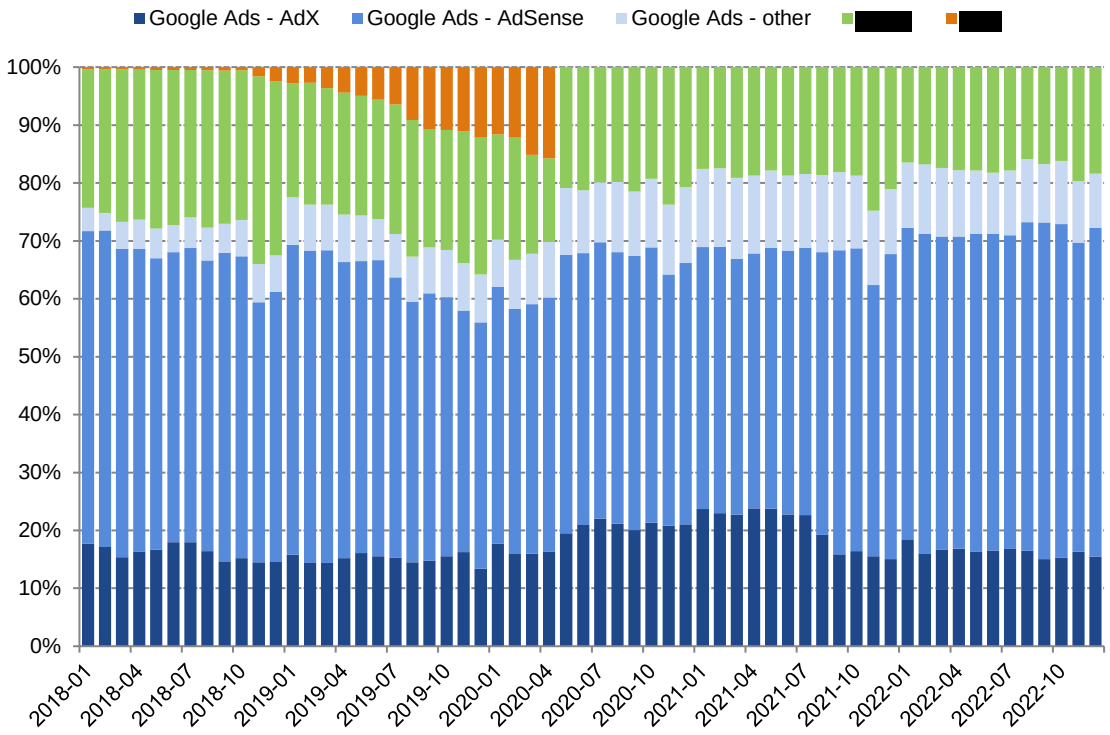
Figure 99. Google Ads has maintained a substantial share of US indirect open-web display impressions in the ad network market



Source: Google Ads data (DOJ RFP 54); [redacted]
Notes: Denominator includes open-web display impressions from Google Ads, [redacted] and [redacted] Impressions include all indirect open-web display transactions from these parties. [redacted] exited the open-web display market in April 2020. Google Ads data only provides information for advertiser geography, while data for [redacted] and [redacted] provides only user geography information. This figure limits to US advertiser transactions for Google Ads and US user transactions for [redacted] and [redacted]

[1273] Due to data limitations, I cannot reliably identify user location in all datasets. See Appendix H.4.a.

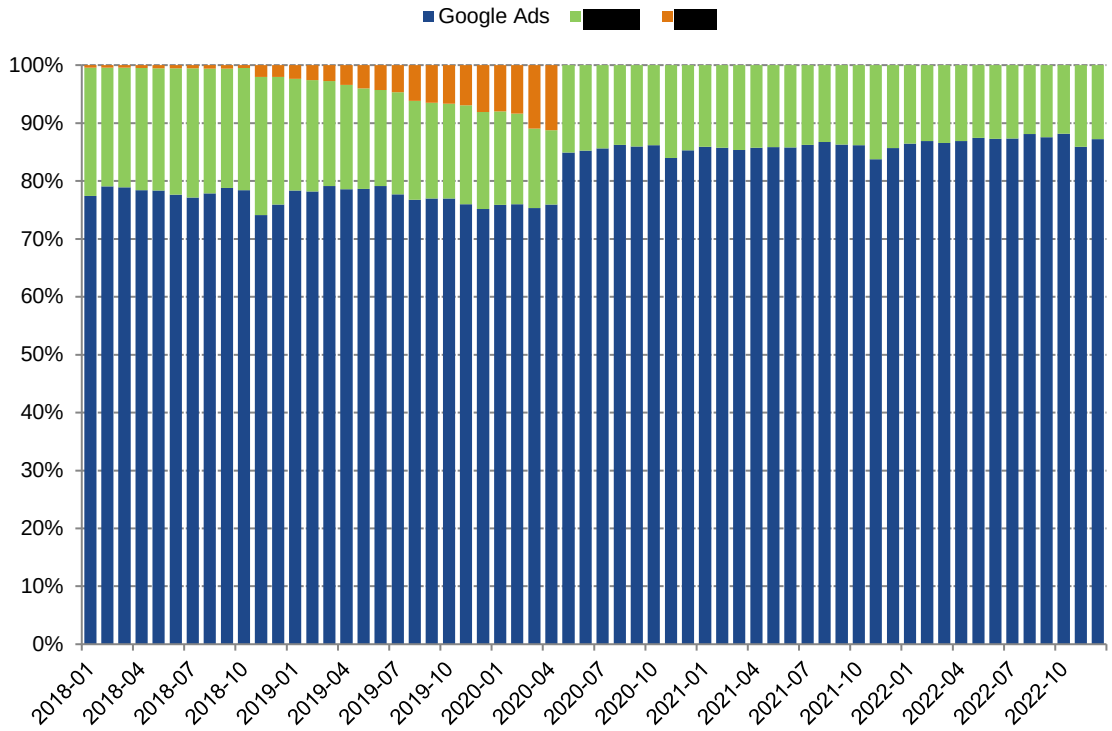
Figure 100. Google Ads has maintained a substantial share of net revenues from the sale of US indirect open-web display impressions



Source: Google Ads data (DOJ RFP 7); [redacted]
Notes: 1. Includes net revenues from open-web display impressions from Google Ads (separated into transactions through AdX, AdSense, and other third-party exchanges), [redacted] and [redacted] 2. Google aggregates buy-side and sell-side fees for transactions through AdSense ("Google Ads - AdSense" net revenues reflect a reported 32% take rate). 3. [redacted] exited the open-web display market in April 2020. 4. Google Ads data only provides information for advertiser geography, while data for [redacted] and [redacted] provides only user geography information. This figure limits to US advertiser transactions for Google Ads and US user transactions for [redacted] and [redacted]

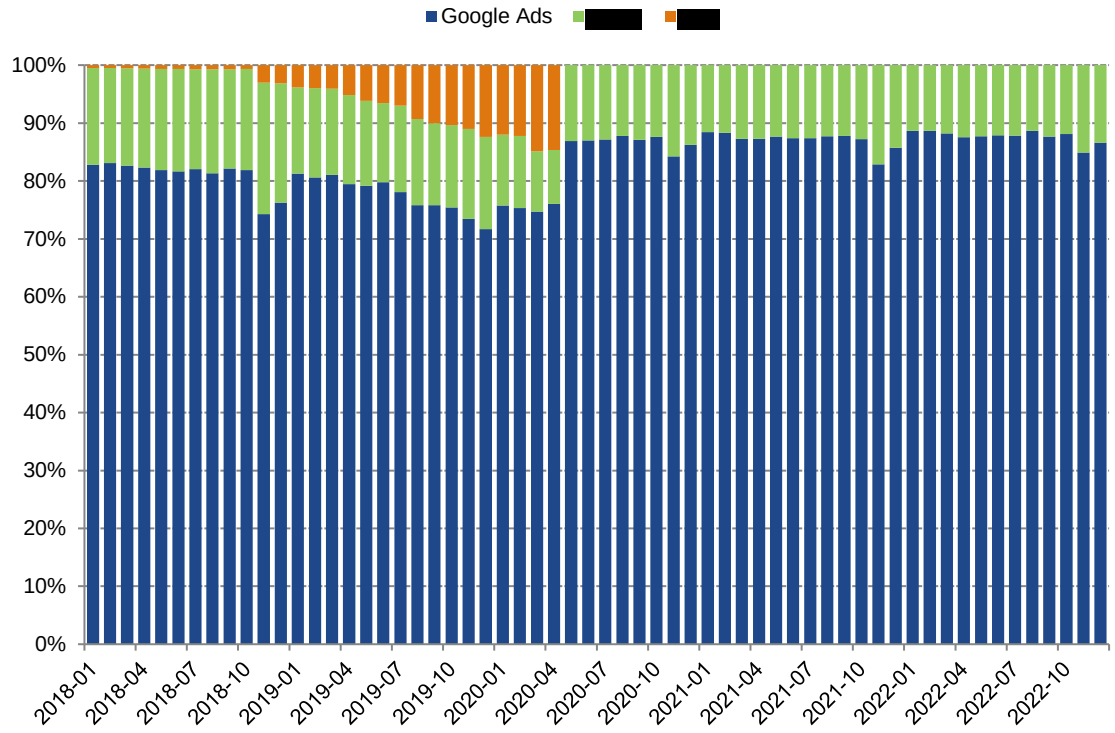
D.2.c. Spend shares in the advertiser ad network market (baseline)

Figure 101. Google Ads has maintained a substantial share of worldwide indirect open-web display spend in the advertiser ad network market



Source: Google Ads data (DOJ RFP 7); [redacted]
Notes: Denominator includes open-web display spend from Google Ads, [redacted] and [redacted]
Spend includes all indirect open-web display transactions from these parties. [redacted] exited the open-web display market in April 2020.

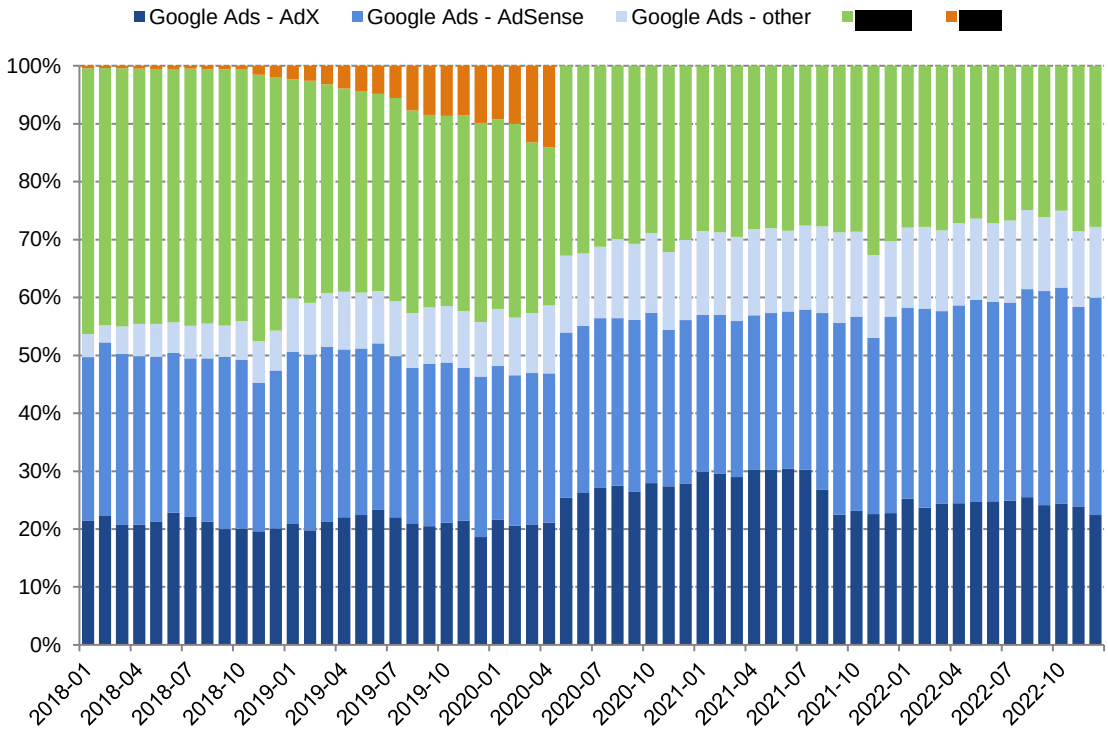
Figure 102. Google Ads has maintained a substantial share of US indirect open-web display spend in the advertiser ad network market



Source: Google Ads data (DOJ RFP 7); [redacted]
Notes: Denominator includes open-web display spend from Google Ads, [redacted] and [redacted] Spend includes all indirect open-web display transactions from these parties. [redacted] exited the open-web display market in April 2020. Google Ads data only provides information for advertiser geography, while data for [redacted] and [redacted] provides only user geography information. This figure limits to US advertiser transactions for Google Ads and US user transactions for [redacted] and [redacted]

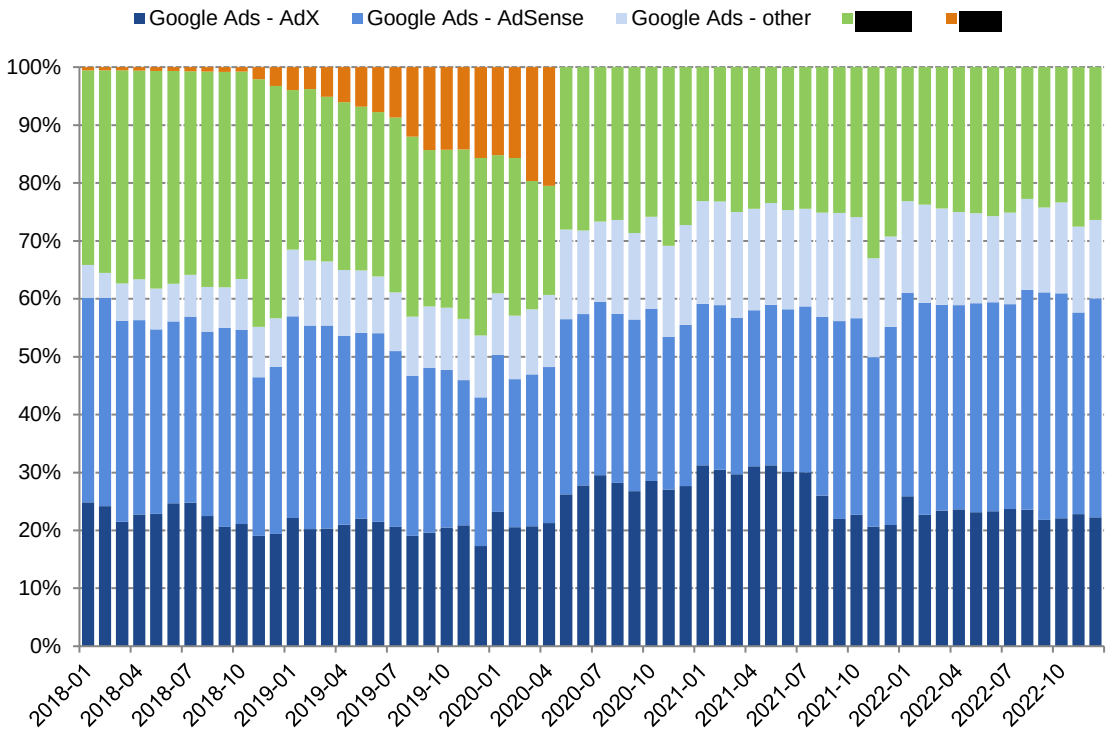
D.2.d. Fee shares in the ad network market, adjusting Google Ads–AdSense take rates

Figure 103. Google Ads has maintained a substantial share of buyside net revenues from the sale of worldwide indirect open-web display impressions, adjusting Google Ads-AdSense take rate



Source: Google Ads data (DOJ RFP 7, 54); [redacted]
Notes: 1. Includes net revenues from open-web display impressions from Google Ads (separated into transactions through AdX, AdSense, and other third-party exchanges), [redacted] and [redacted] 2. Google aggregates buy-side and sell-side fees for transactions through AdSense. I limit "Google Ads - AdSense" net revenues to only include the buy-side fees Google collects from these transactions by adjusting "Google Ads - AdSense" net revenues to reflect a 15% take rate. 3. [redacted] exited the open-web display market in April 2020.

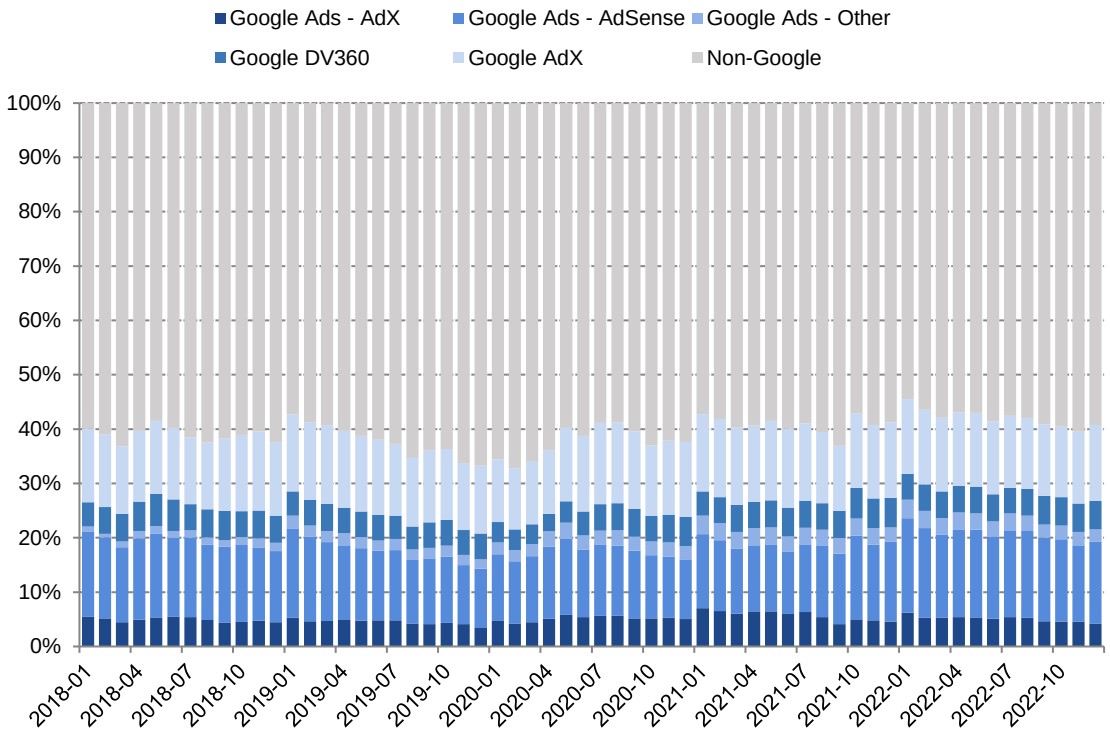
Figure 104. Google Ads has maintained a substantial share of buyside net revenues from the sale of US indirect open-web display impressions, adjusting Google Ads-AdSense take rate



Source: Google Ads data (DOJ RFP 7, 54); [redacted]
Notes: 1. Includes net revenues from open-web display impressions from Google Ads (separated into transactions through AdX, AdSense, and other third-party exchanges), [redacted] and [redacted] 2. Google aggregates buy-side and sell-side fees for transactions through AdSense. I limit "Google Ads - AdSense" net revenues to only include the buy-side fees Google collects from these transactions by adjusting "Google Ads - AdSense" net revenues to reflect a 15% take rate. 3. [redacted] exited the open-web display market in April 2020. 4. Google Ads data only provides information for advertiser geography, while data for [redacted] and [redacted] provides only user geography information. This figure limits to US advertiser transactions for Google Ads and US user transactions for [redacted] and [redacted]

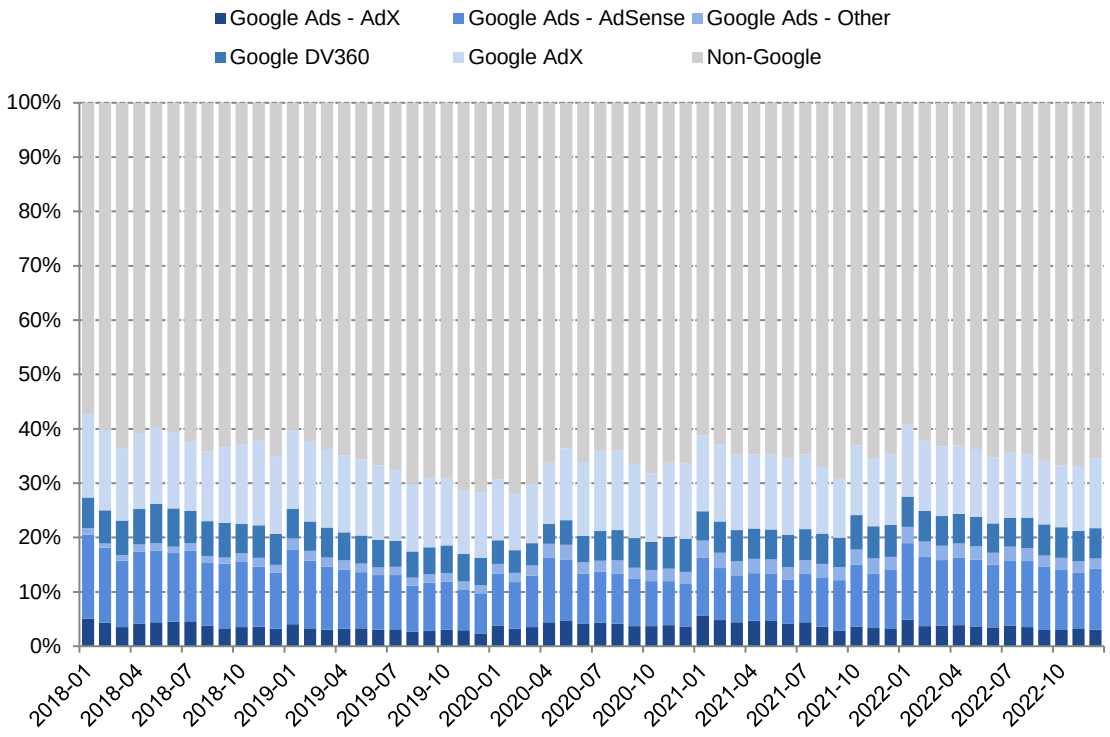
D.3. Google's share of net revenues collected by ad networks and exchanges

Figure 105. Google's share of net revenues collected by bidding tools and exchanges from the sale of worldwide indirect open-web display impressions



Source: Google Ads data (DOJ RFP 7); DV360 data (DOJ RFP 7); AdX data (DOJ RFP 53); AdSense Backfill data (DOJ RFP 52); Bidding tools panel (*See* Appendix H.1.b); Exchange panel (*See* Appendix H.1.c).
Notes: Includes net revenues from open-web display impressions from Google Ads, DV360, AdX, and third-party bidding tools and exchanges that produced data in this matter as well as net revenues I estimate coming from bidding tools and exchanges that did not produce data on this matter. Appendix H.3.c contains a description of how I perform this estimation.

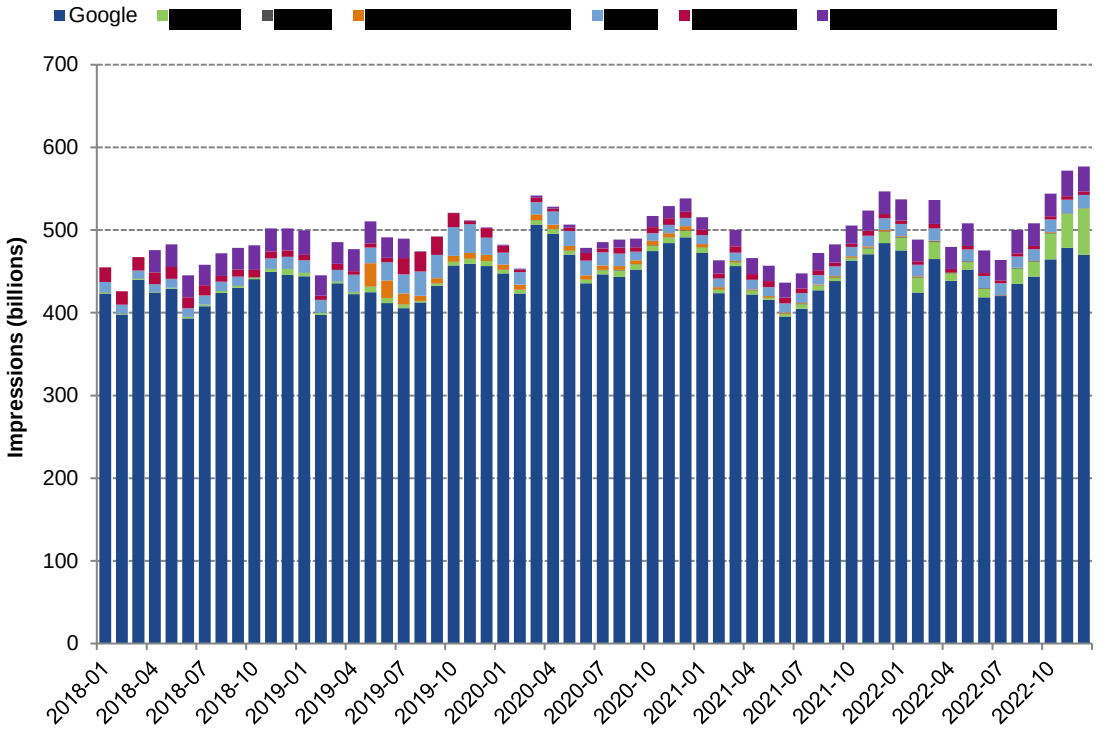
Figure 106. Google's share of net revenues collected by bidding tools and exchanges from the sale of US indirect open-web display impressions



Source: Google Ads data (DOJ RFP 7); DV360 data (DOJ RFP 7); AdX data (DOJ RFP 53); AdSense Backfill data (DOJ RFP 52); Bidding tools panel (See Appendix H.1.b); Exchange panel (See Appendix H.1.c).
Notes: Denominator includes net revenues from open-web display impressions from Google and third-party bidding tools and exchanges that produced data in this matter as well as net revenues I estimate coming from bidding tools and exchanges that did not produce data on this matter. Appendix H.3.c contains a description of how I perform this estimation.

D.4. Additional publisher ad-server shares

Figure 107. US open-web display impressions served by publisher ad servers (2018–2022)

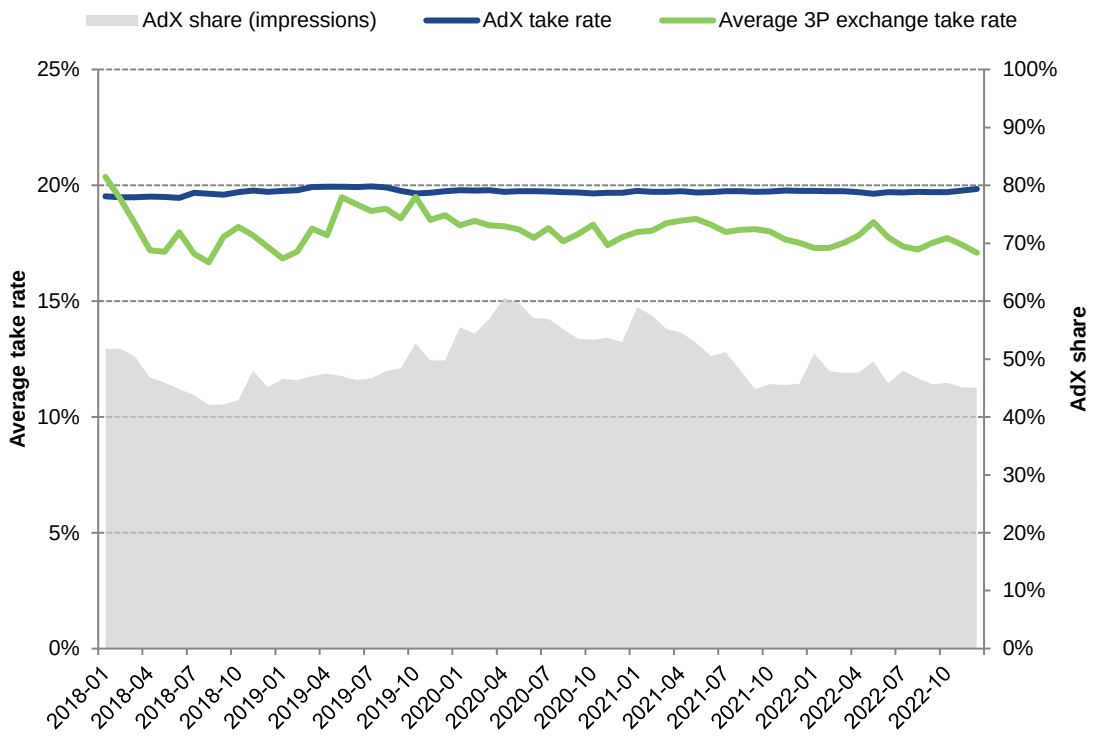


Source: Publisher ad server panel (see Appendix H.)
Notes: 1. Limited to open-web display impressions on mobile and desktop devices through US publishers (includes house ads). 2. The [redacted] and [redacted] data do not contain information on device type, transaction type, ad type, instream/outstream or mobile channel. Since the data do not allow me to identify [redacted] and [redacted] open-web display impressions, I conservatively include all [redacted] and [redacted] impressions. 3. Similarly, the [redacted] data does not distinguish between ad types. Therefore, I conservatively include all [redacted] ad types. 4. [redacted] data and the [redacted] data do not distinguish between instream and outstream video ads, so I conservatively include all video impressions on in-market devices. 5. The [redacted] and [redacted] data do not distinguish between US and ROW publishers, so I conservatively include all [redacted] and [redacted] publishers. Geography information is unavailable for many of One Ad Server's impressions, so I conservatively include all of these impressions in the US share calculations The [redacted] data groups US and Canadian publishers, so both countries are included in this figure. Geography information is unavailable for some publishers in the Google data. To be conservative, I consider all of these publishers to be non-US publishers. 6. Due to reported data issues, [redacted] data is missing in July 2022. [redacted] data is missing in May, July, and November of 2018. [redacted] data is unavailable prior to May 2019; [redacted] data is unavailable prior to April 2018; [redacted] data is missing in October 2018 and April 2022.

Appendix E. Additional take rate and margin figures

E.1. AdX and third-party exchange take rates, US

Figure 109. US open-web indirect display take rates for AdX and third-party exchanges (average), and AdX's worldwide indirect open-web display market share (2018–2022)



Source: Google AdX data (DOJ RFP 53); Exchange data panel (See Appendix H.1.c for details).
Notes Limited to open-web display advertisements transacted through indirect transactions (including open auction, private auction, or header bidding). "Average 3P exchange take rate" is the monthly weighted average take rate by exchange spend among all third-party exchanges that produced both gross and net revenue data sufficient to identify transactions served to US users. "AdX share (impressions)" (shaded grey area in chart) is AdX's share of US indirect open-web display impressions. See Figure 21 and Appendix H for details.

E.2. Aggregate take rates among exchanges and ad networks

Figure 110. Summary of worldwide open-web indirect display take rates among ad exchanges

Exchange	Average take rate					Share of impressions (2022)
	Jan. 2018	Jan. 2019	Jan. 2020	Jan. 2021	Jan. 2022	
Google AdX	20%	20%	20%	20%	20%	56%
[redacted]	12%	14%	15%	16%	18%	6%
[redacted]	26%	21%	19%	19%	17%	5%
[redacted]	-	17%	18%	17%	16%	4%
[redacted]	-	-	9%	8%	8%	4%
[redacted]	-	9%	20%	18%	17%	3%
[redacted]	24%	21%	17%	19%	18%	1%
[redacted]	-	-	-	-	20%	1%
[redacted]	37%	37%	38%	37%	29%	1%
[redacted]	-	0%	-	13%	-	-
[redacted]	20%	20%	20%	20%	-	-
[redacted]	-	19%	-	-	-	3%
[redacted]	-	20%	-	-	-	1%

Source: Google AdX data (DOJ RFP 53); Exchange panel (*See* Appendix H.1.c); [redacted]

Notes: The take rates presented in this table are weighted averages in January of each year. I calculate take rates as net revenue divided by gross revenue. Figure 54 in Section V.C.3 presents monthly average take rates in each month from 2018–2022 among a limited set of exchanges that produced data on gross and net revenues. The table above includes all exchanges that produced gross and revenue data, as well as exchanges that produced data in this matter but did not produce data sufficient to calculate take rates (indicated with an asterisk). For those exchanges, the take rates presented above are those represented in the party's produced financial documents. The products in this table do not represent the universe of products in the ad exchanges market but represent the full list of exchanges that produced data in this matter. AdSense Backfill take rates are excluded as they include the take rate for Google Ads as well.

Figure 111. Summary of worldwide open-web indirect display margins among ad networks

Ad network	Inventory source	Average margin					Share of impressions (2019)
		Jan. 2018	Jan. 2019	Jan. 2020	Jan. 2021	Jan. 2022	
Google Ads	AdX	13%	12%	13%	15%	14%	88%
	AdSense	32%	33%	32%	32%	32%	
	3PE	12%	34%	34%	34%	32%	
	Other (Demand Product, unknown)	0%	24%	37%	31%	35%	
[redacted]		42%	39%	42%	40%	40%	11%
[redacted]		20%	19%	24%			1%

Source: Google Ads data (DOJ RFP 7); Bidding tools panel (*See* Appendix H.1.b).

Notes: The take rates presented in this table are weighted averages in January of each year. I calculate margins as net revenue divided by gross revenue. For Google Ads transactions through AdX, I remove the 20% fee taken by AdX from Google's net revenues to isolate fees collected by Google Ads. Google aggregates buy-side and sell-side fees for transactions through AdSense. The table above includes all ad networks that produced gross and net revenue data. [redacted] exited the open-web display market in mid-2020 and exits the data after June 2021.

Appendix F. Additional Section VII.F figures

Figure 117. Google's coverage of worldwide indirect open-web display impressions transacted through exchanges (2018–2022)

Year	Google Ads - AdX	DV360 - AdX	Non-Google bidding tools - AdX	AdSense Backfill	AWBid (Google Ads - other exchanges)	DV360 - other exchanges	Other (non-Google)
2018	38%	9%	6%	6%	4%	7%	30%
2019	42%	12%	6%	5%	4%	7%	23%
2020	46%	15%	5%	5%	4%	6%	19%
2021	38%	17%	5%	4%	4%	7%	24%
2022	34%	17%	6%	4%	4%	10%	25%

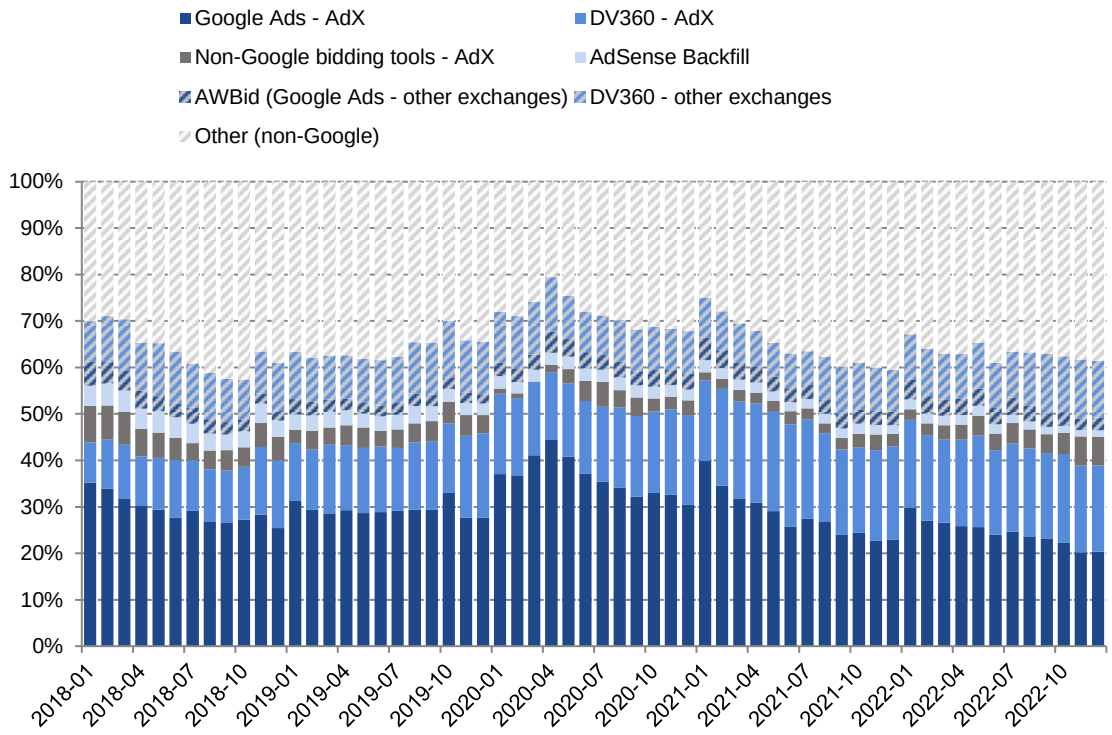
Source: Google Ads data (DOJ RFP 54); Google DV360 data (DOJ RFP 7); Exchange panel (*See* Appendix H.1.c for details)
Notes: Ads-AdX impressions include all open-web display impressions purchased by Google Ads from AdX, excluding AWBid and any inventory that originates from Google's O&O properties. AWBid impressions include all open-web display impressions purchased by Google Ads from third-party exchanges. The figure includes only impressions purchased through indirect transactions transacted through exchanges (this includes Header Bidding, Private Auction, Open Bidding, and DoubleClick First Look). Denominator includes impressions from AdX, AdSense Backfill, and exchanges that produced data as well as impressions I estimate for exchanges that did not produce data on this matter. Appendix H contains a description of how I perform this estimation.

Figure 118. Google's coverage of US indirect open-web display impressions transacted through exchanges (2018–2022)

Year	Google Ads - AdX	DV360 - AdX	Non-Google bidding tools - AdX	AdSense Backfill	AWBid (Google Ads - other exchanges)	DV360 - other exchanges	Other (non-Google)
2018	29%	12%	5%	4%	3%	10%	37%
2019	29%	15%	4%	3%	3%	10%	36%
2020	36%	17%	3%	3%	3%	10%	28%
2021	28%	20%	2%	2%	3%	9%	35%
2022	24%	19%	4%	2%	3%	11%	37%

Source: Google Ads data (DOJ RFP 54); Google DV360 data (DOJ RFP 7); Exchange panel (*See* Appendix H.1.c for details)
Notes: Ads-AdX impressions include all open-web display impressions purchased by Google Ads from AdX, excluding AWBid and any inventory that originates from Google's O&O properties. AWBid impressions include all open-web display impressions purchased by Google Ads from third-party exchanges. The figure includes only impressions purchased through indirect transactions transacted through exchanges (this includes Header Bidding, Private Auction, Open Bidding, and DoubleClick First Look). Denominator includes impressions from AdX, AdSense Backfill, and exchanges that produced data as well as impressions I estimate for exchanges that did not produce data on this matter. Appendix H contains a description of how I perform this estimation.

Figure 119. Google Ads-AdX share of US indirect open-web display impressions transacted through exchanges (2018–2022)



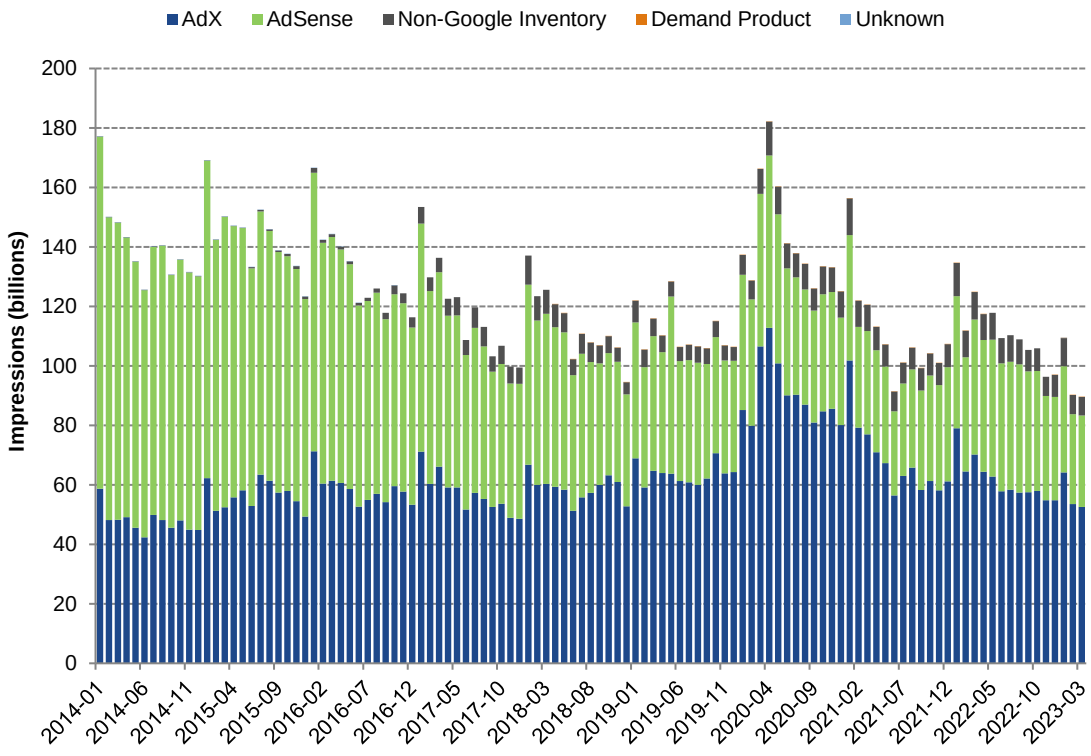
Source: Google Ads data (DOJ RFP 54); Exchange panel (*See* Appendix H.1.c for details)
Notes: Ads-AdX impressions include all open-web display impressions purchased by Google Ads from AdX, excluding AWBid and any inventory that originates from Google's O&O properties. AWBid impressions include all open-web display impressions purchased by Google Ads from third-party exchanges. The figure includes only impressions purchased through indirect transactions transacted through exchanges (this includes Header Bidding, Private Auction, Open Bidding, and DoubleClick First Look). Denominator includes impressions from AdX, AdSense Backfill, and exchanges that produced data as well as impressions I estimate for exchanges that did not produce data on this matter. Appendix H contains a description of how I perform this estimation.

Figure 120. AdX and AdX Direct yearly share of worldwide open-web display indirect impressions transacted through ad exchanges

Year	AdX	AdX Direct	Other
2018	42.1%	11.6%	46.3%
2019	52.9%	7.6%	39.5%
2020	59.4%	6.1%	34.5%
2021	56.2%	4.2%	39.5%
2022	54.7%	1.8%	43.5%

Source: Google AdX data (DOJ RFP 53); Exchange data panel (*See* Appendix H.1.c for details)
Notes: AdX impressions are limited to all worldwide indirect open-web display impressions purchased by AdX (indirect transactions include Open Auction, Private Auction, Exchange Bidding, Header Bidding, and First Look). AdX Direct transactions include indirect open-web display impressions from AdX (which may be served through third-party ad servers, proprietary ad servers, or DFP; *see* GOOG-DOJ-03634896, at -902, 904, 905, 908 (01/25/2018). AdX Direct transactions are identified using the *is_adx_direct* field native to the RFP 53 data. Denominator includes impressions from Google and ad exchanges that produced data in this matter, and impressions estimated from exchanges that did not produce data on this matter. See table notes for Figure 47 and Appendix H for details.

Figure 121. Google Ads purchases primarily through AdX and AdSense (US advertiser impressions)

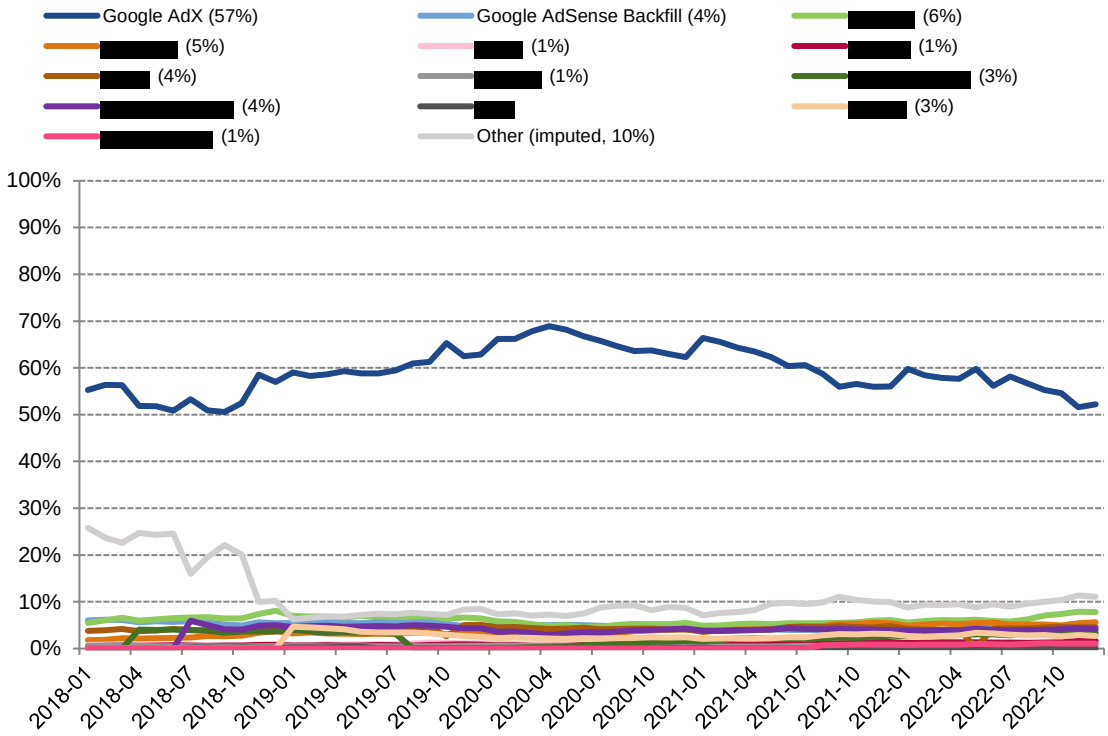


Source: Google Ads data (DOJ RFP 54).
Notes: Limited to indirect open-web display impressions purchased by US advertisers. Excludes impressions on Google properties.

Appendix G. Line charts

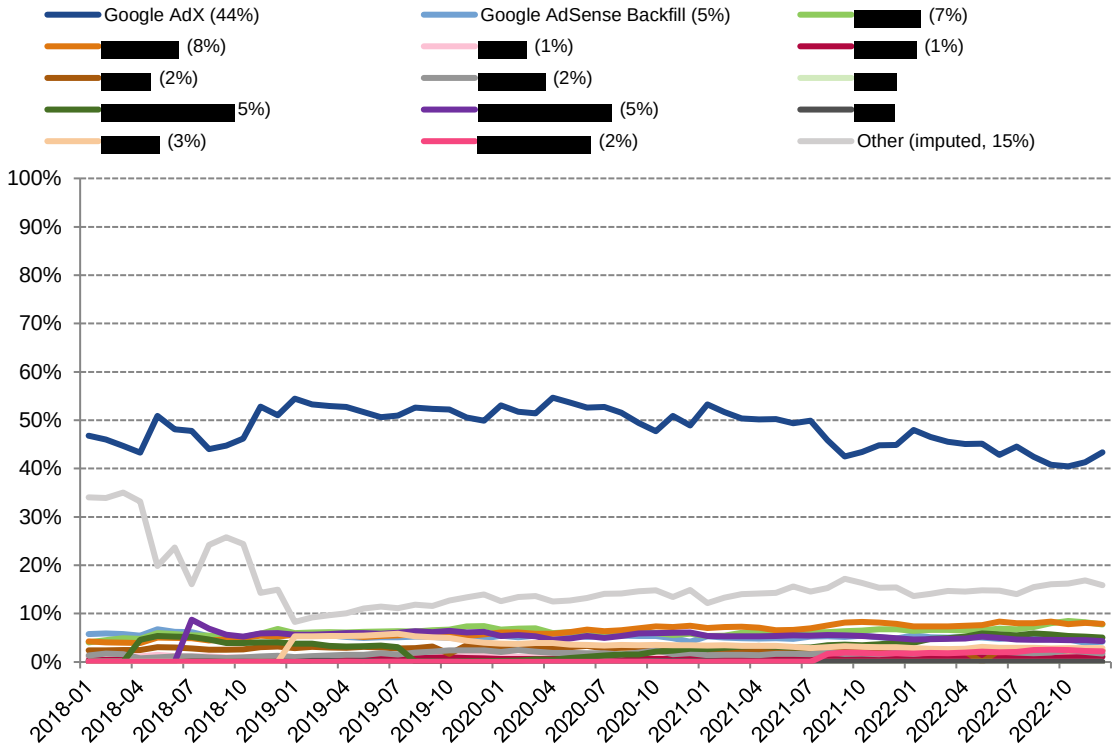
G.1. Section V

Figure 122. AdX maintains a substantial share of worldwide indirect open-web display impressions transacted through ad exchanges (2018–2022)



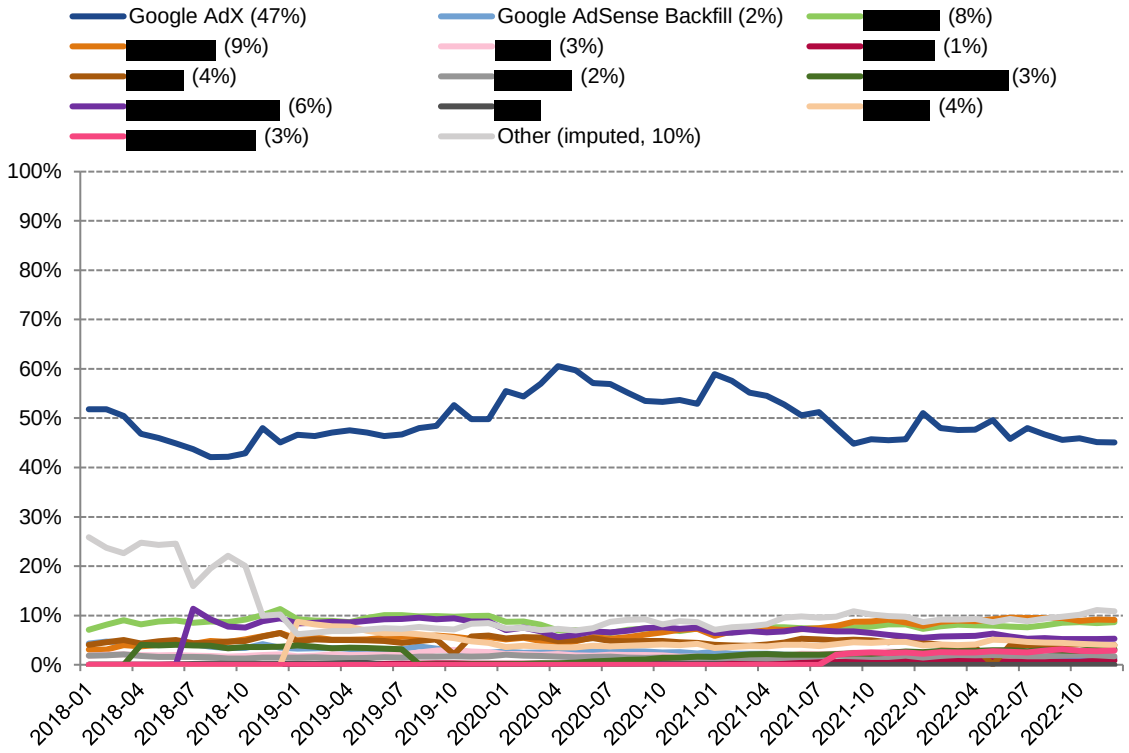
Source: Google AdX data (DOJ RFP 53); Exchange panel (See Appendix H.1.c).
Notes: Figure is a replication of Figure 47 in Section V.C.2. Denominator includes impressions from Google and ad exchanges that produced data in this matter, and impressions estimated from exchanges that did not produce data on this matter ("Other (imputed)"). The set of exchanges within "Other (imputed)" varies during the time period shown due to incomplete data from certain third-party exchanges. Appendix H provides a description of how I perform this estimation. The legend contains the share of indirect open-web display impressions in 2022 in parenthesis for those exchanges that produced data on indirect open-web display impressions in 2022.

Figure 123. AdX maintains a significant share of ad exchange fees from worldwide indirect open-web display transactions (2018–2022)



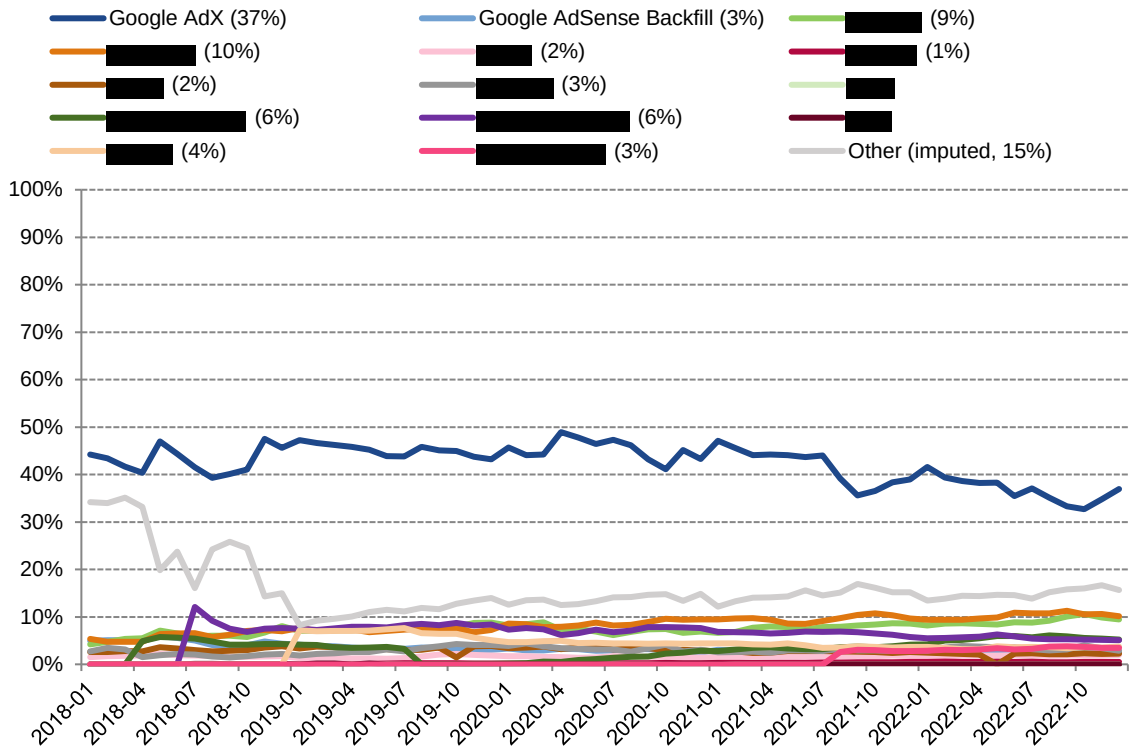
Source: Google AdX data (DOJ RFP 53); Exchange panel (*See* Appendix H.1.c).
Notes: Figure is a replication of Figure 50 in Section V.C.2. 1. Includes net revenues from Google and exchanges that produced data in this matter as well as net revenues that I estimate coming from exchanges that did not produce data on this matter. Appendix H contains a description of how I perform this estimation. For exchanges that produced fees data in 2022, the legend lists the exchange's share of fees in 2022 in parentheses. 2. AdSense Backfill refers to the set of transactions that are served from AdSense through DFP. Google charges a single 32% take rate for transactions through AdSense (including those through AdSense Backfill) and does not separate the take rate into buy-side and sell-side components. For the purposes of these share calculations, I apply the full 32% take rate to transactions through AdSense Backfill. 3. For imputed "other" exchanges as well as exchanges from which I have data on gross revenue but not net revenue apply the weighted average take rate among third-party exchanges that produced both gross and net revenue data to those exchanges' spend.

Figure 124. AdX maintains a substantial share of US indirect open-web display impressions transacted through ad exchanges (2018–2022)



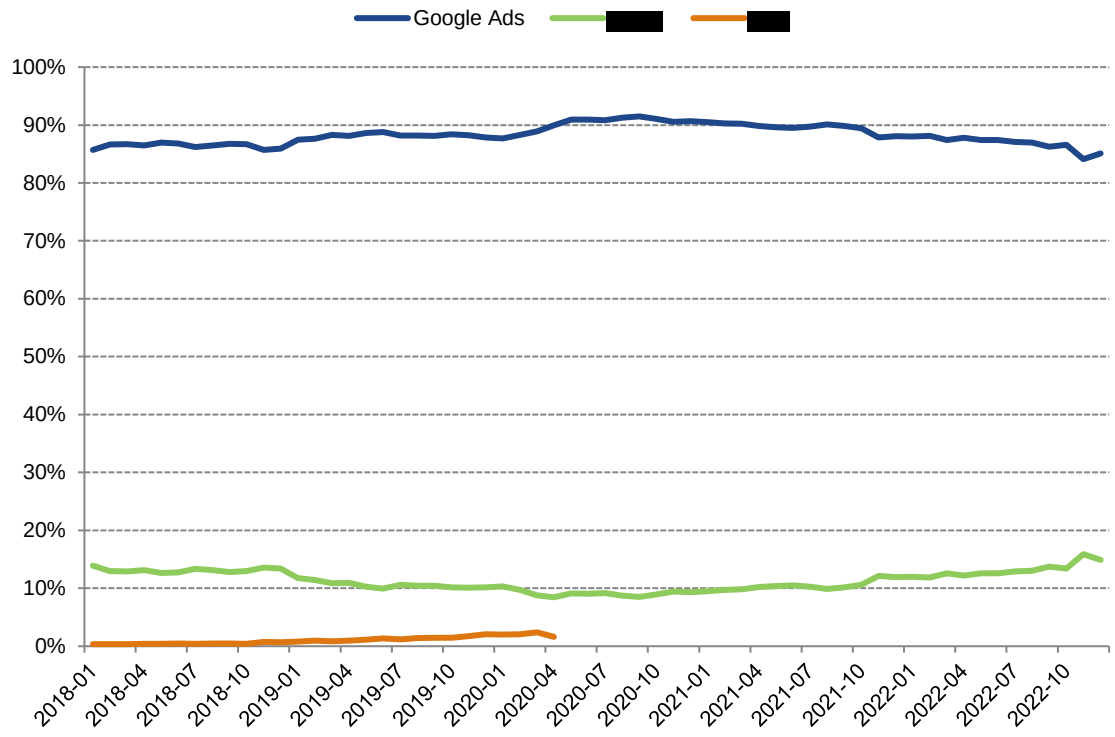
Source: Google AdX data (DOJ RFP 53); Exchange panel (See Appendix H.1.c).
Notes: Figure is a replication of Figure 90 in Appendix Section D.1.d. Denominator includes impressions from Google and ad exchanges that produced data in this matter, and impressions estimated from exchanges that did not produce data on this matter ("Other (imputed)"). The set of exchanges within "Other (imputed)" varies during the time period shown due to incomplete data from certain third-party exchanges. Appendix H provides a description of how I perform this estimation. The legend contains the share of indirect open-web display impressions in 2022 in parenthesis for those exchanges that produced data on indirect open-web display impressions in 2022.

Figure 125. AdX earns consistently high net revenues from the sale of US indirect open-web display impressions (2018–2022)



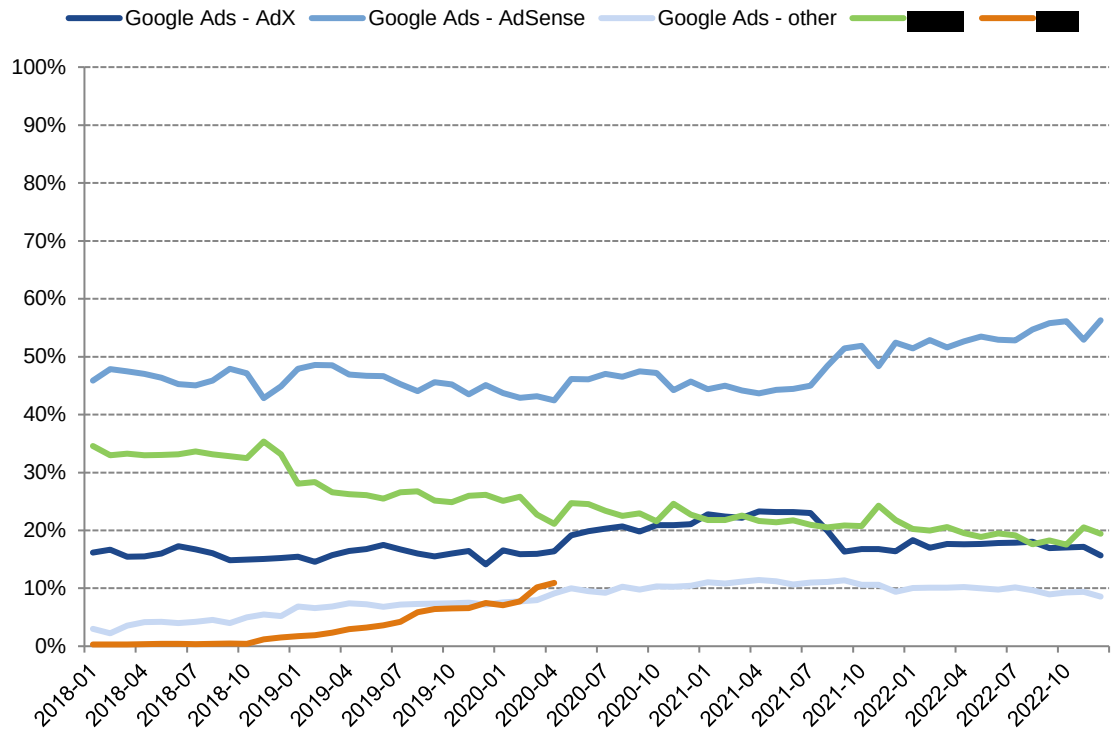
Source: Google AdX data (DOJ RFP 53); Exchange panel (See Appendix H.1.c)
Notes: Figure is a replication of Figure 92 in Appendix Section D.1.b. 1. Includes net revenues from Google and exchanges that produced data in this matter. 2. AdSense Backfill refers to the set of transactions that are served from AdSense through DFP. Google charges a single 32% take rate for transactions through AdSense (including those through AdSense Backfill) and does not separate the take rate into buy-side and sell-side components. For the purposes of these share calculations, I apply the full 32% take rate to transactions through AdSense Backfill. 3. For exchanges from which I have data on gross revenue but not net revenue, I apply the weighted average take rate among third-party exchanges that produced both gross and net revenue data to those exchanges' spend. 4. [redacted] and [redacted] provide only worldwide data; US impressions for these exchanges are obtained by using the average ratio of US-to-worldwide fees among other exchanges.

Figure 126. Google Ads has maintained a substantial share of worldwide indirect open-web display impressions among advertiser ad networks (2018–2022)



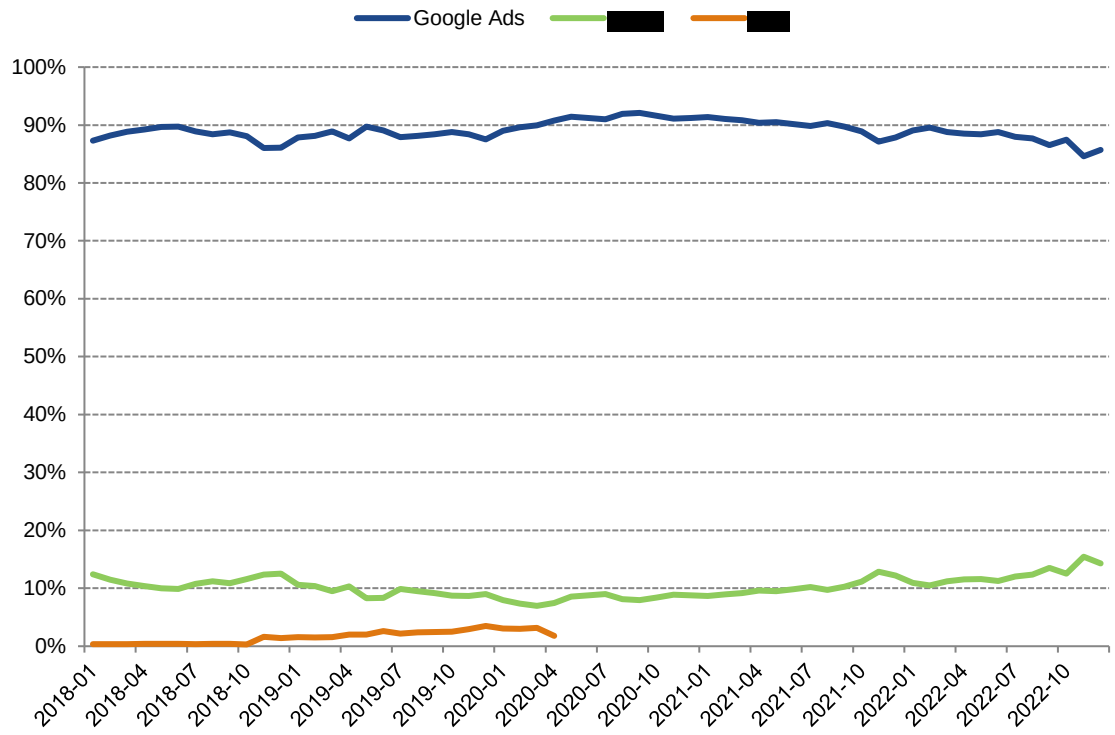
Source: Google Ads data (DOJ RFP 54); Bidding tools panel (See Appendix H.1.b).
Notes: Figure is a replication of Figure 56 in Section V.D.2. Denominator includes open-web display impressions from Google Ads, [redacted] and [redacted]). Impressions include all indirect open-web display transactions from these parties. [redacted] exited the open-web display market in April 2020.

Figure 127. Google Ads has maintained a substantial share of fees from worldwide indirect open-web display transactions among advertiser ad networks (2018–2022)



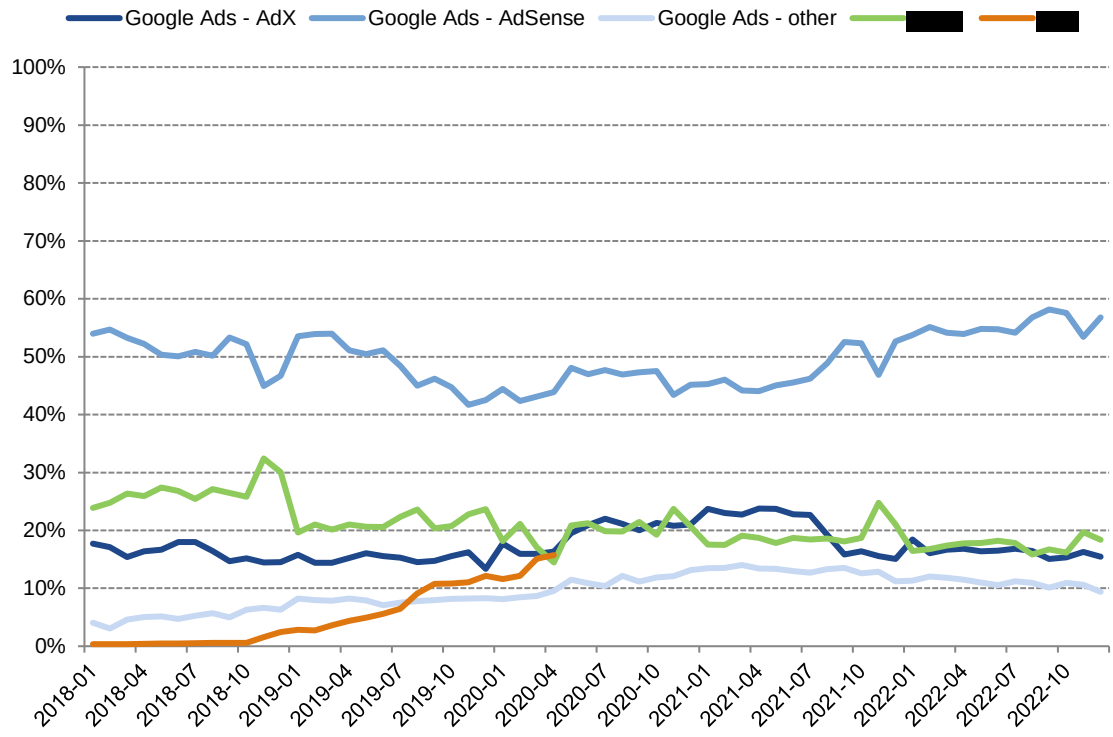
Source: Google Ads data (DOJ RFP 7, 54); [redacted]
Notes: Figure is a replica of Figure 57 in Section V.D.2. 1. Includes net revenues from open-web display impressions from Google Ads (separated into transactions through AdX, AdSense, and other third-party exchanges), [redacted] and [redacted] 2. Google aggregates buy-side and sell-side fees for transactions through AdSense ("Google Ads - AdSense" net revenues reflect a reported 32% take rate). 3. [redacted] exited the open-web display market in April 2020.

Figure 128. Google Ads has maintained a substantial share of US indirect open-web display impressions in the ad network market



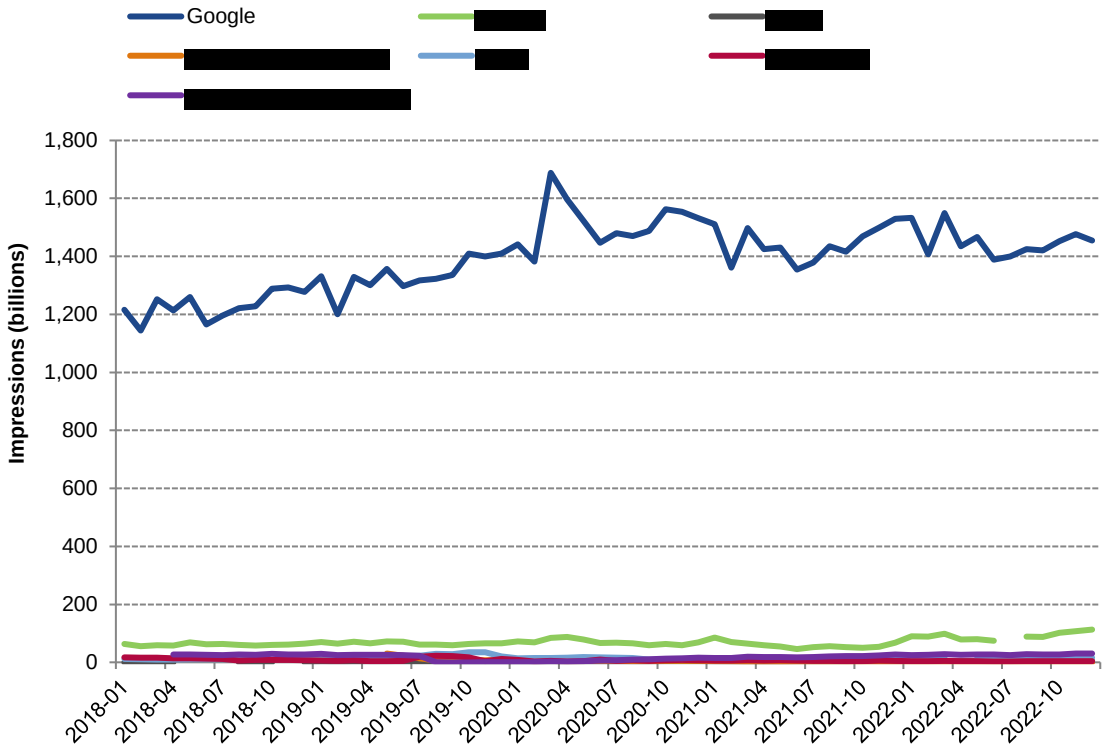
Source: Google Ads data (DOJ RFP 54); [redacted]
Notes: Figure is a replica of Figure 99 in Appendix Section D.2.b. Denominator includes open-web display impressions from Google Ads, [redacted] and [redacted]. Impressions include all indirect open-web display transactions from these parties. [redacted] exited the open-web display market in April 2020. Google Ads data only provides information for advertiser geography, while data for [redacted] and [redacted] provides only user geography information. This figure limits to US advertiser transactions for Google Ads and US user transactions for [redacted] and [redacted]

Figure 129. Google Ads has maintained a substantial share of net revenues from the sale of US indirect open-web display impressions



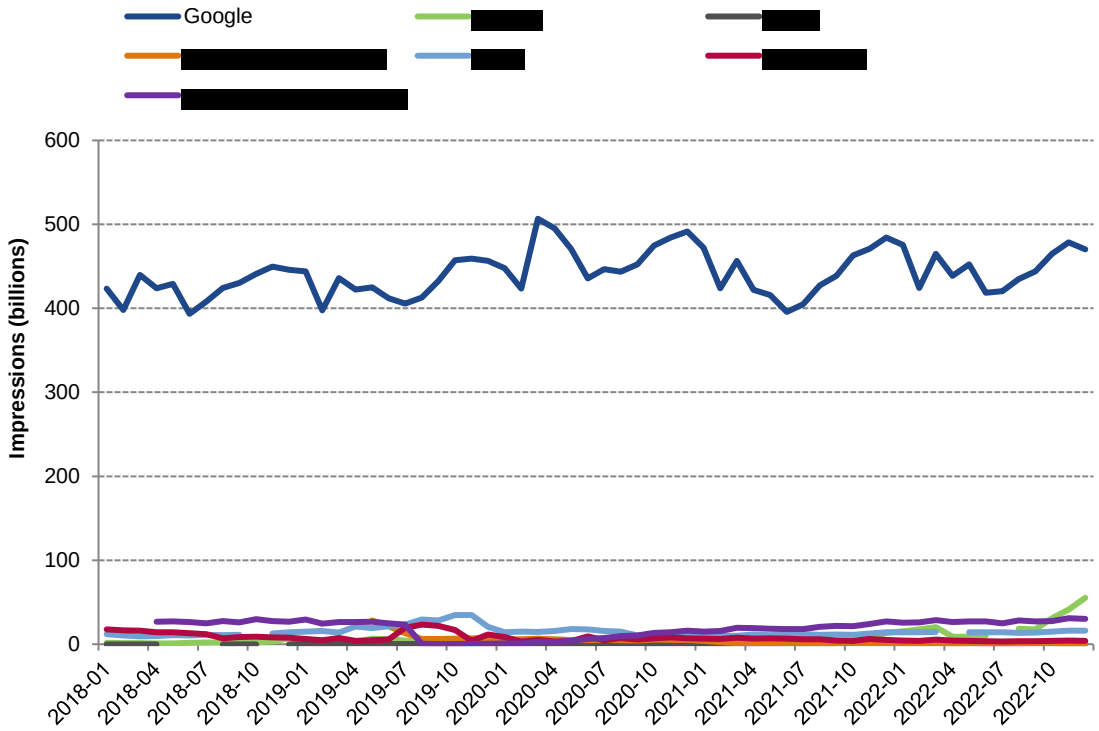
Source: Google Ads data (DOJ RFP 7); [redacted]; [redacted]
Notes: Figure is a replica of Figure 100 in Appendix D.2.b. 1. Includes net revenues from open-web display impressions from Google Ads (separated into transactions through AdX, AdSense, and other third-party exchanges), [redacted] and [redacted] 2. Google aggregates buy-side and sell-side fees for transactions through AdSense ("Google Ads - AdSense" net revenues reflect a reported 32% take rate). 3. [redacted] exited the open-web display market in April 2020. 4. Google Ads data only provides information for advertiser geography, while data for [redacted] and [redacted] provides only user geography information. This figure limits to US advertiser transactions for Google Ads and US user transactions for [redacted] and [redacted]

Figure 130. Worldwide open-web display impressions served by publisher ad servers (2018–2022)



Source: Publisher ad server panel (see Appendix H).
Notes: Figure is a replica of Figure 45 in Section V.B.2. 1. Limited to open-web display impressions on mobile and desktop devices (includes house ads). 2. [redacted] and [redacted] data do not contain information on device type, transaction type, ad type, instream/outstream or mobile channel. Since the data do not allow me to identify open-web display impressions, I conservatively include all [redacted] and [redacted] impressions. 3. [redacted] data do not distinguish between ad types; hence, I conservatively include all [redacted] ad types. 3. [redacted] and [redacted] data do not distinguish between instream and outstream video ads; I conservatively include all [redacted] and [redacted] video impressions, excluding impressions served on TVs for [redacted] 4. Due to issues with the reported data, [redacted] data is missing in July 2022; [redacted] data is missing in May, July, and November of 2018; [redacted] data is unavailable prior to May 2019; [redacted] data is unavailable prior to April 2018; [redacted] data is missing in October 2018 and April 2022.

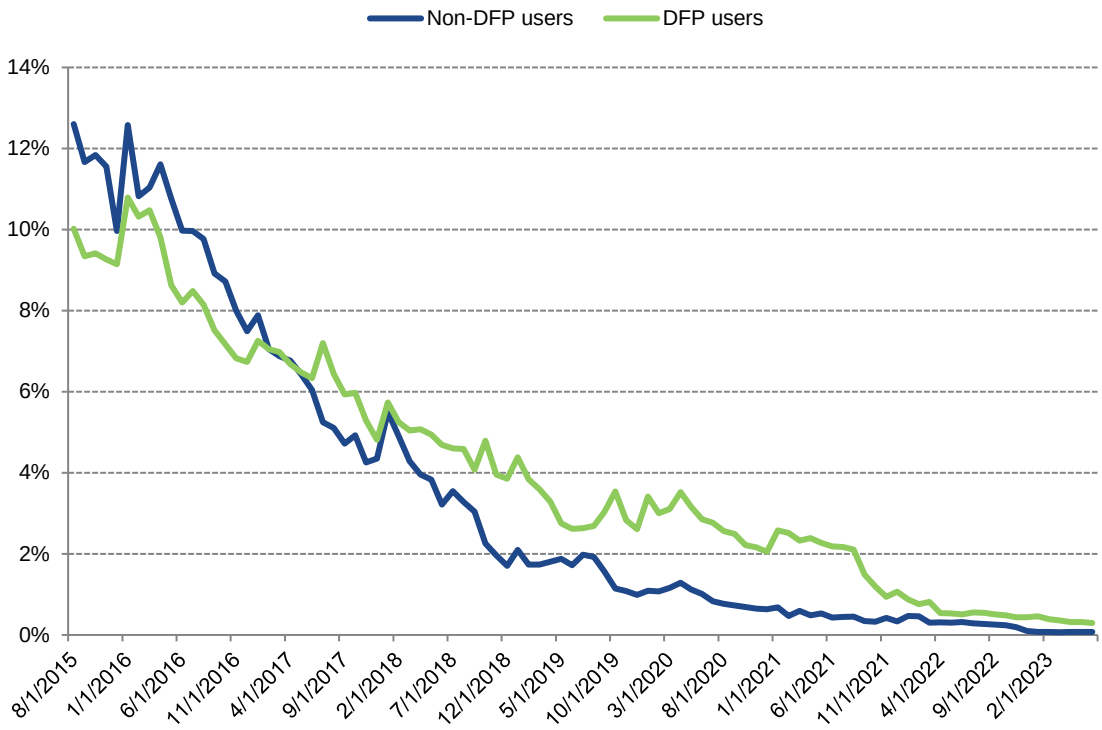
Figure 131. US open-web display impressions served by publisher ad servers (2018–2022)



Source: Publisher ad server panel (see Appendix H).
Notes: Figure is a replica of Figure 107. in Appendix D.4. 1. Limited to open-web display impressions on mobile and desktop devices through US publishers (includes house ads). 2. The [redacted] and [redacted] data do not contain information on device type, transaction type, ad type, instream/outstream or mobile channel. Since the data do not allow me to identify [redacted] and [redacted] open-web display impressions, I conservatively include all [redacted] and [redacted] impressions. 3. Similarly, the [redacted] data does not distinguish between ad types. Therefore, I conservatively include all [redacted] ad types. 4. [redacted] data and the [redacted] data do not distinguish between instream and outstream video ads, so I conservatively include all video impressions on in-market devices. 5. The [redacted] and [redacted] data do not distinguish between US and ROW publishers, so I conservatively include all [redacted] and [redacted] publishers. The [redacted] data groups US and Canadian publishers, so both countries are included in this figure. Geography information is unavailable for some publishers in the Google data. To be conservative, I consider all of these publishers to be non-US publishers. 6. Due to reported data issues, [redacted] data is missing in July 2022. [redacted] data is missing in May, July, and November of 2018. [redacted] data is unavailable prior to May 2019; [redacted] data is unavailable prior to April 2018; [redacted] data is missing in October 2018 and April 2022.

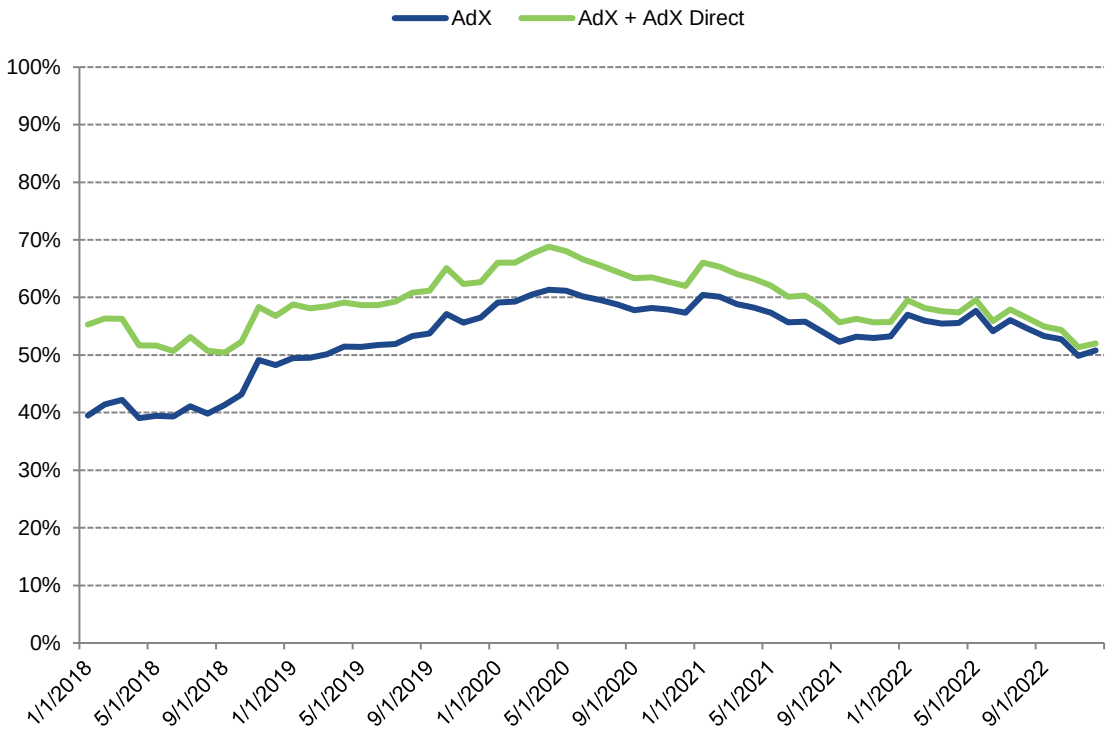
G.2. Section VII

Figure 132. AdX Direct's share of AdX worldwide indirect open-web display advertising revenue



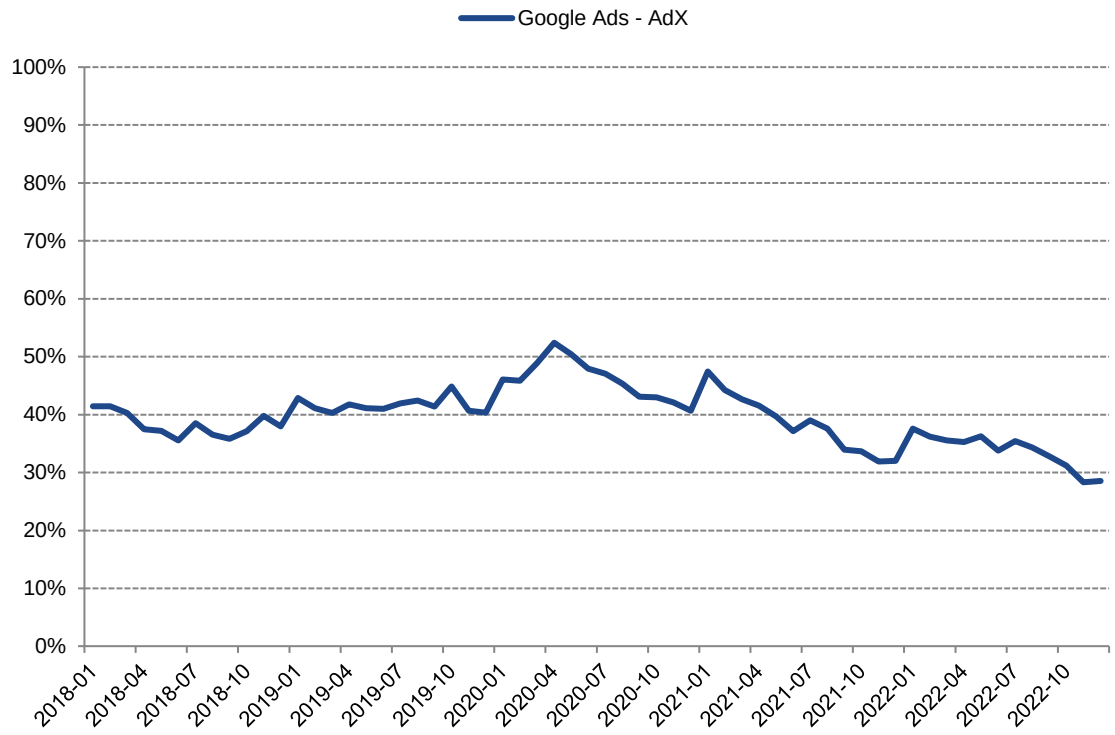
Source: DRX internal stats data (DOJ RFP 57).
Notes: Figure is a replica of Figure 67 in Section VII.C.3. Limited to indirect open-web display revenue. A publisher is defined at the web property code level due to limited publisher information at the GFP network level in the DRX data. A publisher is considered a DFP user in each month where that publisher collected revenue through DFP. This figure excludes impressions won by exchange bidders.

Figure 133. AdX and AdX Direct share of worldwide open-web display indirect impressions transacted through ad exchanges (2018–2022)



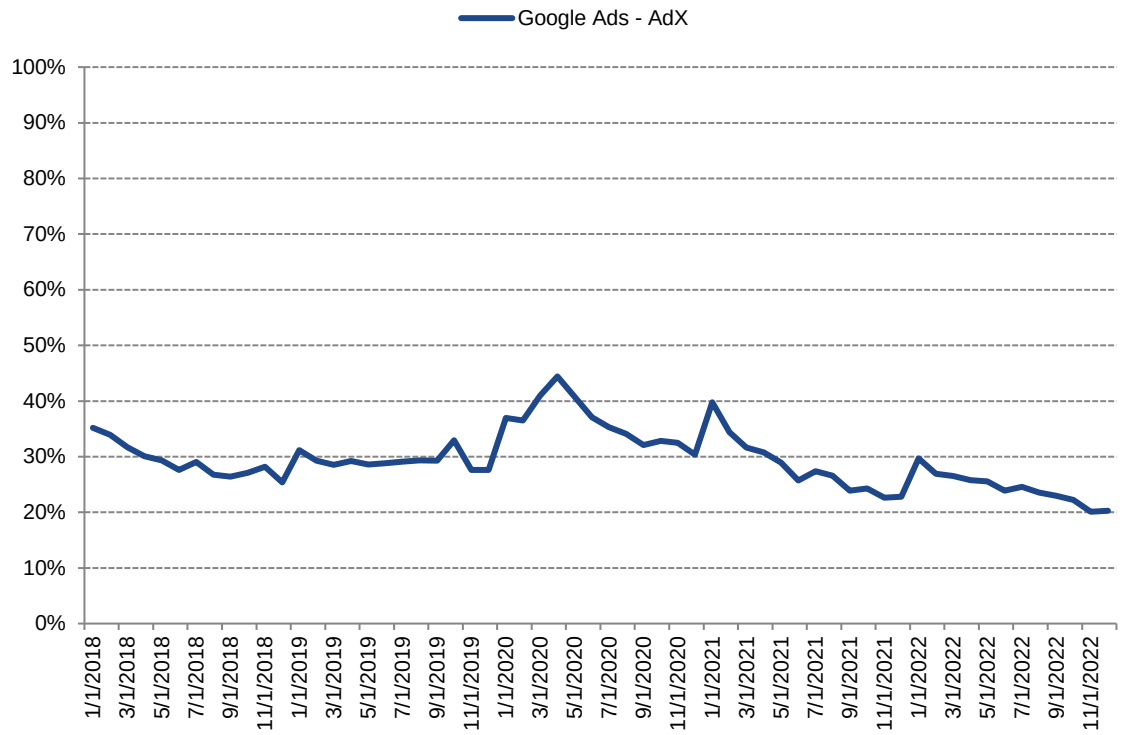
Google AdX data (DOJ RFP 53); Exchange data panel (*See* Appendix H.1.c for details)
Notes: Figure is a replication of Figure 74. in Section VII.F.2. AdX impressions are limited to all worldwide indirect open-web display impressions purchased by AdX (indirect transactions include Open Auction, Private Auction, Exchange Bidding, Header Bidding, and First Look). AdX Direct transactions include indirect open-web display impressions from AdX (which may be served through third-party ad servers, proprietary ad servers, or DFP; *see* GOOG-DOJ-03634896, at -902, 904, 905, 908 (01/25/2018). AdX Direct transactions are identified using the *is_adx_*direct field native to the RFP 53 data. Denominator includes impressions from Google and ad exchanges that produced data in this matter, and impressions estimated from exchanges that did not produce data on this matter. See table notes for Figure 47 and Appendix H for details.

Figure 134. Google Ads-AdX share of worldwide indirect open-web display impressions transacted through exchanges (2018–2022)



Source: Google Ads data (DOJ RFP 54); Exchange data panel (*See* Appendix H.1.c for details)
Note: Figure is based on Figure 73 in Section VII.F.1. Google Ads-AdX impressions include all open-web display impressions purchased by Google Ads from AdX, excluding AWBid and any inventory that originates from Google's O&O properties. The figure includes only impressions purchased through indirect transactions transacted through exchanges (this includes Header Bidding, Private Auction, Open Bidding, and DoubleClick First Look). Denominator includes impressions from Google and ad exchanges that produced data in this matter, and impressions estimated from exchanges that did not produce data on this matter. See table notes for Figure 47 and Appendix H for details.

Figure 135. Google Ads-AdX share of US indirect open-web display impressions transacted through exchanges (2018–2022)



Source: Google Ads data (DOJ RFP 54); Exchange panel (See Appendix H.1.c for details)
Notes: Figure is based on Figure 119 in Section VIII.B.2. Ads-AdX impressions include all US open-web display impressions purchased by Google Ads from AdX, excluding AWBid and any inventory that originates from Google's O&O properties. The figure includes only impressions purchased through indirect transactions transacted through exchanges (this includes Header Bidding, Private Auction, Open Bidding, and DoubleClick First Look). Denominator includes impressions from AdX, AdSense Backfill, and exchanges that produced data as well as impressions I estimate for exchanges that did not produce data on this matter. Appendix H contains a description of how I perform this estimation.

Appendix L. Background for Google's Conduct

(11) This appendix contains useful background context to understand Google's market power and conduct analyzed in other parts of this report.

- In Appendix L.1, I discuss Google's acquisition of DoubleClick. This acquisition gave Google control of two products—DoubleClick's publisher ad server DFP and the exchange that became AdX—which facilitated its exclusionary conduct in the relevant markets.
- In Appendix L.2, I explain how header bidding facilitated publisher multihoming across real-time bidding sources and was described by Google employees as a threat to Google's control of the ad tech stack.
- In Appendix L.3, I summarize some of Google's responses to header bidding, including 1) launching Exchange Bidding (thereby opening up Dynamic Allocation within DFP to exchanges other than AdX); 2) adjusting its bidding strategies for DV360, including by introducing Demand Product and Project Poirot.
- In Appendix L.4, I discuss Google's Dynamic Revenue Sharing (DRS) Programs for Google Ads, including Project Bernanke and Project Bell.

L.1. Google's acquisition of DoubleClick

(12) As I noted in Section VII.A, Google documents indicated that controlling the publisher ad server (and the "tag" on publishers' pages) could lock-in customers and enhance its market power across the ad tech stack, and that there was concern that if a rival gained control of the publisher ad tag, Google instead might be locked out from accessing display inventory.

(13) Here, I provide background on Google's acquisition of DoubleClick, completed in 2008. This acquisition brought DoubleClick's publisher ad server DFP and the exchange that became AdX under Google's control.

(14) According to a Google document, Google's display advertising business captured less than 1% of the $5 billion spent on online display advertising in 2005.[1356] The document noted that "[most] AdSense sites are too small for Comscore or Nielsen to report their audience profile—removing them from the display advertiser's consideration set" and that "Google's AdSense product does not meet the revenue threshold or predictability needs of publishers for anything other than remnant inventory."[1357] Further,

[1356] GOOG-DOJ-06267628, at -630 (10/20/2006).
[1357] GOOG-DOJ-06267628, at -630 (10/20/2006).

Google documents suggest the company was concerned by a lack of sufficient third-party advertising space to meet the demand generated by its advertisers.[1358] For example, a 2006 Google document acknowledged that a key challenge to Google's display ads business is that ad buyers "want scale" but Google has a "lack [of] critical mass of premium inventory."[1359]

(15) Internal Google documents acknowledged benefits from operating across all layers of the ad tech stack. A 2005 email chain between Google employees acknowledged that Google "hope[d] and plan[ned] to be the be-all, end-all location for all ad serving," and that "the short-term win of accepting 3rd party ad serving cripples [Google's] long-term strategy."[1360] In a separate email chain, Tim Armstrong, the President of Google Americas at the time, wrote that "once you own the pipes, all 3rd party served rev, and all unused impressions – and you control billing and accountability – you systematically replace the parts of the system with a cross media platform where there is one advertiser input desktop and one place to get measurement outputs."[1361] Armstrong also noted that when you own these things, "there is really high lock-in."[1362] Further, a Google presentation states that to "build the largest pool of liquid inventory" they needed to "become the primary ad server to get a 'first look'."[1363]

(16) In 2006 Google began developing their own publisher ad server, which they referred to as Google Ad Manager for Publishers (GFP).[1364] However, according to a 2007 white paper submitted to the FTC by Google's lawyers the launch of GFP faced a "number of significant shortcomings," GFP "received serious negative feedback from actual and prospective beta test partners" and its development timeline "slipped considerably."[1365]

(17) In April 2007, Google announced its acquisition of DoubleClick, the market-leading publisher ad-server at the time, for $3.1 billion.[1366] This was consistent with a 2006 Google document that stated, "We need to aggressively use acquisitions to solve" problems in their display ads business, including

[1358] A 2004 Google presentation on AdSense acknowledged that one risk to AdSense for Content is "Advertiser Opt-Out" due to a "[l]ack of premium brand names [which] decreases perceived value to advertisers" GOOG-DOJ-00134248, at -255 (10/25/2004). Further, a 2007 Google document regarding DoubleClick noted that "the winner will be the company with the largest pool of liquid [inventory]" GOOG-DOJ-01657697, at -888 (03/15/2007).

[1359] GOOG-DOJ-13009671, at -674 (07/26/2007).

[1360] GOOG-DOJ-01856500, at -503 (06/27/2005).

[1361] GOOG-DOJ-01657697, at -829 (03/15/2007).

[1362] GOOG-DOJ-01657697, at -829 (03/15/2007).

[1363] GOOG-DOJ-01657697, at -888 (03/15/2007). (Google's usage of first look to secure additional supply for its advertisers is further discussed in Section K.2)

[1364] GOOG-DOJ-01654477, at -482 (08/31/2007).

[1365] GOOG-DOJ-01654477, at -480 (08/31/2007).

[1366] Google estimated that DoubleClick had a "60% share of publisher ad serving market" at the time of the acquisition. *See* GOOG-DOJ-01657697, at -845 (03/15/2007); GOOG-DOJ-00970889, at -891 (05/19/2007); Louise Story and Miguel Helft, "Google Buys DoubleClick for $3.1 Billion," *New York Times*, April 14, 2007, https://www.nytimes.com/2007/04/14/technology/14DoubleClick.html.

a lack of "critical mass of premium inventory" and "AdSense sites are not part of planning process for agencies."[1367]

(18) An April 2007 Google document entitled "Project Liberty BoD Review" noted two strategic rationales for the acquisition: DoubleClick's "Agency Ad Server (Buyside)", and its "Publisher Ad Server (Sellside)," known as DART for Publishers (DFP).[1368] The document stated that the publisher ad server would provide "[a]ccess to potential 2B+ incremental AFC impressions per day," estimating "AFC Network Growth" as contributing $2 billion worth of value through "access to DFP publishers' inventory."[1369] A 2006 Google document noted the value of premium inventory to "create 'pull-through' demand for AdSense on tail properties."[1370]

(19) The acquisition also provided Google with an advertiser ad server product known as DART for Advertisers (DFA).[1371] By 2006, Google had begun working on a new product for advertisers which it referred to as both CMO Dashboard and GFA.[1372] While Google's existing AdWords product served "Smaller Advertisers," Google's Dashboard product intended to serve "F[ortune] 500 and Larger Advertisers" (see Figure 150 below).[1373] A 2007 Google slide deck on the potential acquisition of DoubleClick noted that the "vision" of DoubleClick's DFA product was "the same as CMO Dashboard."[1374] A separate Google acquisition slide deck expressed interest in Google acquiring DoubleClick or Atlas and "convert[Ing] it into v1.0 of CMO Dashboard."[1375] When DFA was ultimately acquired by Google as part of the DoubleClick acquisition, it had contracts with "9 of 10 Top 10 global agencies" and a "~50% share of 3PA serving."[1376]

[1367] GOOG-DOJ-13009671, at -674 (07/26/2006).

[1368] GOOG-DOJ-01657697, at -744 (03/15/2007).

[1369] GOOG-DOJ-01657697, at -744, -745 (03/15/2007).

[1370] GOOG-DOJ-13009671, at -675 (07/26/2006).

[1371] Google describes DFA as the "centralized planning, third-party ad serving, reporting and creative optimization solution for all major agency holding companies and the internet's leading advertisers." *See* GOOG-DOJ-01657697, at -721 (2007 Google "Strategic Opportunities" report on DoubleClick).

[1372] GOOG-DOJ-02107055, at -056 (06/14/2006); GOOG-DOJ-01657697, at -775.

[1373] GOOG-DOJ-01657697, at -760 (03/15/2007).

[1374] GOOG-DOJ-00970889, at -891 (05/19/2007).

[1375] GOOG-DOJ-13009671, at -674 (07/26/2006). In the "Project Liberty BoD Review" document, Google listed "jumpstar[ing] our organic efforts (GFP)" as a "Strategic Rationale" for acquiring DFA. *See* GOOG-DOJ-01657697, at -744 (03/15/2007).

[1376] GOOG-DOJ-00970889, at (05/19/2007) -891, -894.

bolstering the attractiveness of Google Ads. Similarly, DFP experienced significant growth following the acquisition. (See Sections V.D and V.B for discussion on the market power of Google Ads and DFP.)

(24) The DoubleClick acquisition also provided the foundation for Google's ad exchange that became AdX. In 2007, prior to its acquisition by Google, DoubleClick began developing the DoubleClick Ad Exchange.[1386] DoubleClick viewed the exchange as "the centerpiece of a growth plan" through which it may derive the majority of its revenue within five years.[1387] Following the acquisition, Google started building upon the exchange and launched AdX just two years later.[1388] The exchange grew rapidly. AdX's revenue increased by nearly 300% in 2009 and by over 800% in 2010.[1389] By 2011, just three years after the acquisition, Google's "Display Advertising OC Business Review" presentation labeled Google as the "#1 player in US display."[1390]

L.2. The emergence of header bidding

(25) In Section VII.A, I explained the important role that DFP's market power played in supporting and sustaining its market power elsewhere in the ad tech stack. In this Section, I describe how Google employees viewed header bidding as a competitive threat to Google's control of the Ad Tech stack. Additionally, the following discussion also illustrates how, by harming the competitiveness of rivals in the ad exchange market, Google could protect DFP's market power in the publisher ad server market.

(26) This section is organized as follows.

- In Appendix L.2.a, I show that publishers viewed header bidding as a way around Google's restrictive policies regarding the use of its ad tech products, and benefited from header bidding allowing them to pit multiple demand sources in real-time competition against one another.
- In Appendix L.2.b, I discuss how Google employees perceived header bidding as an "existential threat" to its control of the Ad Tech stack. I discuss how header bidding (in a manner similar to yield managers), by assisting publishers with accessing multiple real-time demand sources and

[1386] Greg Sterling, "Google Formally Announces New DoubleClick Ad Exchange," *Search Engine Land*, Sept. 18, 2009, https://searchengineland.com/googles-doubleclick-formally-announces-new-ad-exchange-26042.

[1387] Louise Story, "DoubleClick to Set Up an Exchange for Buying and Selling Digital Ads," The New York Times, April 4, 2007, *The New York Times*, https://www.nytimes.com/2007/04/04/business/media/04adco.html

[1388] Greg Sterling, "Google Formally Announces New DoubleClick Ad Exchange," *Search Engine Land*, Sept. 18, 2009, https://searchengineland.com/googles-doubleclick-formally-announces-new-ad-exchange-26042. The original AdX product was built out of the DART platform. *See* GOOG-DOJ-04292352 at -352 (01/06/2011).

[1389] GOOG-DOJ-13097233, at -238 (06/01/2011) (Google presentation, "Display Advertising OC Business Review," June 2011).

[1390] GOOG-DOJ-13097233, at -235 (06/01/2011) (Google presentation, "Display Advertising OC Business Review," June 2011).

wrote that "our strategy is to ensure that we continue to be the must-call system, by ensuring as much of a publisher's demand flows through our platform, rather than header bidding."[1420]

(47) A 2018 email from Payam Shodjai, at the time Google's Director of Product Management for Display and Video Ads, noted that Google's response to header bidding was a "multi-pronged effort," and included launching Exchange Bidding (later renamed to Open Bidding) and changes to DV360's bidding behavior (including Demand Product, described above, and Project Poirot).[1421] I discuss these briefly below, providing background context for the discussion regarding these products and projects elsewhere in this Report.

L.3.a. Exchange and Open Bidding

(48) Google introduced Exchange Bidding (EB) in alpha in April 2016 and made the product broadly available in April 2018; this would later develop into Open Bidding (OB).[1422] A 2017 Google document describes Open Bidding as DFP functionality "allowing 3rd party-exchanges to bid in RTB alongside AdX in Dynamic Allocation."[1423,1424] It is also identified in a Google document as part of Google's "holistic counter-response" to header bidding.[1425]

(49) As discussed in Section VII.D.1, Google did not provide AdX with a Last Look advantage over the exchanges participating in Exchange Bidding, but maintained this advantage over header bidding participants.[1426] Documents indicate that Google considered maintaining the Last Look advantage over Exchange Bidding participants,[1427] but gave it up to give publishers and exchanges an incentive to switch from header bidding to Exchange Bidding.[1428]

[1420] GOOG-TEX-00138844 at -844 (02/06/2017).

[1421] GOOG-DOJ-05276794 at -794 (03/16/2018) ("Our response to HB has been a multi-pronged effort, which includes a few projects (none of them are silver bullets): 1. Exchange Bidding (EB) 2. Demand Product (DP) 3. First-Price Auction Defense in DBM (since all HB is transacted through first-price auctions)").

[1422] GOOG-AT-MDL-006217592 at -592 and -606 (10/31/2022) (noting Google "alpha" tested Exchange bidding in April 2016, entered it into beta testing in June 2017, and "rolled out to general availability" in April 2018).

[1423] GOOG-DOJ-04429792 at -808 (04/2017).

[1424] Third-party ad exchanges could not bid for DFP inventory in real-time against AdX in the waterfall setup.

[1425] GOOG-DOJ-04429792 at -794 (04/2017). *See* also GOOG-DOJ-1343955 (Internal meeting notes listing "Evolve / accelerate EB" as a response to header bidding) (10/2016).

[1426] GOOG-TEX-00000655 at -660 (01/04/2017) ("…exchanges that go through HB are subject to last look, and those that go through EB are not."); GOOG-TEX-00103579 at -580 (07/12/2016) ("…our exchange bidding product works just like HB. When a publisher is using HB, AdX still submits a real time bid to compete with all the HB bids that are input into DFP line items via key values. The only difference is that our solution has not [sic] latency and doesn't require 1000's of additional line items to implement").

[1427] A Google presentation slide contains the text "Issues: Should we give up last look." One risk of keeping last look is identified as "Exchanges more likely to keep pushing HB." GOOG-TEX-00104789 at -808 (01/19/2017); GOOG-TEX-00121116 at -117 (12/13/2016) ("Is there a definitive reason to drop the last look now? I think we should take this decision only following the Beta results if we observe the last look for EB is limiting the adoption.").

[1428] GOOG-TEX-00000655 at -660 (01/04/2017) (Dec. 15, 2016 email from Jim Giles responding to "why we should give away [Last Look]" with Exchange Bidding: "[R]e last look, there are several important reasons … 1) Because both