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

UNITED STATES OF AMERICA, et al.,	)	
	)	
Plaintiffs,	)	
	)	
v.	)	1:23-cv-108 (LMB/JFA)
	)	
GOOGLE LLC,	)	
	)	
Defendant.	)	

MEMORANDUM OPINION

The federal government and seventeen states ("Plaintiffs") have brought this antitrust action against Google LLC ("Google" or "Defendant"), in which they claim that Google has monopolized three digital advertising technology markets in violation of Section 2 of the Sherman Act, and has tied its products in these markets together in violation of Sections 1 and 2 of the Sherman Act.

With the benefit of a three-week bench trial and extensive post-trial filings, the Court finds that Plaintiffs have failed to prove that there is a relevant market for open-web display advertiser ad networks, but have proven that Google has violated Section 2 of the Sherman Act by willfully acquiring and maintaining monopoly power in the open-web display publisher ad server market and the open-web display ad exchange market, and has unlawfully tied its publisher ad server (DFP) and ad exchange (AdX) in violation of Sections 1 and 2 of the Sherman Act. Having found Google liable, the Court will set a briefing schedule and hearing date to determine the appropriate remedies for these antitrust violations.

I. Procedural History

On January 24, 2023, the United States and eight states—California, Colorado, Connecticut, New Jersey, New York, Rhode Island, Tennessee, and Virginia—filed a five-count

Complaint against Google under Section 4 of the Sherman Act, 15 U.S.C. § 4, and Section 16 of the Clayton Act, 15 U.S.C. § 26,[1] [Dkt. No. 1] at 135, alleging monopolization of the publisher ad server market (Count I), monopolization or attempted monopolization of the ad exchange market (Count II), and monopolization of the advertiser ad network market (Count III), all in violation of Section 2 of the Sherman Act. Id. at 136–42. They also alleged unlawful tying in violation of Sections 1 and 2 of the Sherman Act (Count IV), and claimed that the United States had suffered monetary damages from Google's violations of antitrust law under 15 U.S.C. § 15a (Count V). Id. at 142–43. Based on this claim for damages, the Complaint sought a jury trial. Id. at 144. For remedies, in addition to seeking monetary damages, the Complaint sought an order requiring the divesture of Google's publisher ad server and ad exchange products, enjoining Google from engaging in anticompetitive practices, providing such relief as necessary to restore competitive conditions in the markets affected by Google's conduct, and awarding costs and reasonable attorneys' fees. Id. at 143–44.

On February 17, 2023, Google moved to transfer the case to the Southern District of New York under 28 U.S.C. § 1404(a), [Dkt. No. 44] at 1, alleging that transfer was in the interest of justice because nineteen civil antitrust actions brought against Google for its advertising technology practices had been transferred to that district and consolidated under a single district judge by the Judicial Panel on Multidistrict Litigation in August 2021. [Dkt. No. 44-2] at 7. The Court denied the Motion to Transfer because 28 U.S.C. § 1407(g) exempts antitrust suits brought by the United States and state governments from multidistrict litigation. [Dkt. No. 60] at 12–13,

[1] 15 U.S.C. § 4 authorizes the U.S. Department of Justice to institute proceedings in equity to prevent and restrain violations of the Sherman Act. 15 U.S.C. § 26 allows any person, firm, corporation, or association to obtain injunctive relief against threatened loss or damage from a violation of federal antitrust law. States may bring civil actions under 15 U.S.C. § 26 on behalf of their citizens. See California v. Am. Stores Co., 495 U.S. 271, 282–83 (1990).

18–19. The Court also found that "the strong public policy and congressional intent evinced in § 1407(g) to prioritize expeditious enforcement of antitrust laws by federal and state governments and the balance of the remaining § 1404(a) factors" counseled against transfer. Id. at 18–19.

Plaintiffs filed an Amended Complaint on April 17, 2023, solely to add nine additional states—Arizona, Illinois, Michigan, Minnesota, Nebraska, New Hampshire, North Carolina, Washington, and West Virginia—as plaintiffs. [Dkt. No. 120] at 1–3, 146–56. On April 28, 2023, the Court heard and denied Google's Motion to Dismiss for Failure to State a Claim. See [Dkt. No. 163]. The parties engaged in extensive fact and expert discovery from March 27, 2023 to March 15, 2024. See [Dkt. No. 69]; [Dkt. No. 546].

On June 11, 2024, Google's Motion to Dismiss the United States' Damages Claim as Moot and to Strike the Jury Demand was granted after the Court found that Google had mooted the damages claim in Count V by tendering a cashier's check for $2,289,751.00, which was the full amount of monetary damages that the United States claimed it had suffered due to Google's alleged anticompetitive conduct, trebled with prejudgment interest. See [Dkt. No. 748] at 20–21; [Dkt. No. 749] at 1. The Court therefore dismissed Count V and, because the remaining claims only requested equitable relief, struck Plaintiffs' demand for a jury trial. See [Dkt. No. 748] at 23.

After Google's Motion for Summary Judgment was denied without prejudice, [Dkt. No. 773], a bench trial was held. The evidence presented during the three-week trial included testimony of thirty-nine live witnesses, deposition excerpts from an additional twenty witnesses, and hundreds of exhibits. Based on this evidence, the Court makes the following findings of fact and conclusions of law.

II. The Emergence of Digital Advertising

Successful advertising has long been essential for businesses. Since the days of merchants marketing their wares on papyrus billboards and colorful storefront signs in ancient civilizations, advertisements have been used to expand brand awareness and increase sales. See, e.g., Fred K. Beard, The Ancient History of Advertising, 57 J. of Advertising Rsch. 3, 239–40 (2017). The professionalization of the advertising industry, however, did not begin in earnest until the founding of newspapers and other periodical print publications, which served as timely and efficient means to present sought-after content. See Frank Presbrey, The History and Development of Advertising 35–139 (1929). Their frequency of publication provided significant opportunities for businesses to advertise their latest products and services, as well as for publishers to generate revenue by selling ad space in their publications. Id. at 35–70.

Advertising agencies formed in mid-nineteenth century America to match advertisers to newspaper ad spaces. See Stephen R. Fox, The Mirror Makers: A History of American Advertising and Its Creators 14 (1984). These agencies initially served as brokers between advertisers and newspapers by facilitating the placement of advertisements in available ad spaces. See id. Eventually, they evolved into more holistic service providers by combining creativity and business acumen to run advertising campaigns across multiple print publications, thereby helping their clients achieve marketing objectives. See id. at 33–44.

Over the course of the twentieth century, advertising campaigns came to be delivered through increasingly diverse media. As the development of radio and television enabled the mass distribution of audio and video content, radio jingles and TV commercials emerged as core advertising methods. See id. at 47, 303–18. The continuous nature and geographic segmentation

of these broadcasting media helped advertisers target consumers with greater frequency and specificity.

Little more than half a century after the first television commercial aired, the media and advertising industries were revolutionized by the Internet. The rapid and widespread adoption of the Internet over the past three decades has resulted in a paradigm shift in the way content is created, viewed, and monetized. See Andrew McStay, Digital Advertising 14–15 (2d ed. 2016). The Internet placed a vast and indefinitely growing amount of information at individuals' fingertips. The ease of uploading text, audio, and video content to websites—such as blogs, message boards, forums, question-and-answer pages, and, more recently, social media platforms—has dramatically expanded the amount of information that can be consumed and monetized, and has greatly diversified the sources of its creation. See Defendant's Trial Exhibit ("DTX") 173 at -173. At the same time, search engines and web-based applications have made online content widely accessible to a global audience, empowering anyone with an Internet connection to explore the World Wide Web and find content that matches their needs and interests. See id.

This explosion of the Internet as the world's primary communications channel, combined with the ability to collect granular data about those who search for and access information online, has made the Internet a gold mine for advertisers. With nearly five billion people carrying Internet-connected smartphones and more than thirty websites receiving over a billion visits per month, never before have advertisers been able to reach such broad audiences. See The State of Mobile Internet Connectivity Report 2024, GSMA (Oct. 2024), https://www.gsma.com/r/somic; Most Visited Websites in the World, Semrush, https://www.semrush.com/website/top (last visited Mar. 27, 2025). Moreover, the data-rich nature of the digital environment has made it easier than

ever for publishers to monetize their content. See, e.g., Plaintiffs' Trial Exhibit ("PTX") 792 at -665, -674; Trial Transcript ("Tr.") Sept. 9 AM 107:22–108:16 (Casale (Index Exchange)).[2] Digital advertisers can target Internet users based not only on what content they are viewing, but also on who they are, where they are located, what they are interested in, what they have purchased, and with whom they interact, among a plethora of other attributes. See PTX792 at -665; PTX904 at -543; PTX1674 at -040; Tr. Sept. 13 AM 52:22–53:17 (LaSala (Google)); Tr. Sept. 25 PM 125:25–126:11 (Borgia (Google)). Digital advertisers employ this personalized understanding to place specific advertisements in front of specific users at specific times to maximize their return on advertising expenditures. See PTX792 at -665; PTX904 at -543; Tr. Sept. 11 PM 99:11–22, 105:21–106:15 (Dederick (The Trade Desk)). By 2016, global digital ad spending had surpassed global television ad spending, in large part due to the breadth and depth of consumer targeting available online. See Emanuel Bayer et al., The Impact of Online Display Advertising, 4 Int'l J. of Rsch. in Mktg. 37 (2020) at 789.

Digital advertising has, in turn, fueled the Internet's growth. Some of the world's most popular websites, such as Bing, Facebook, Google, Instagram, MSN, Pinterest, Reddit, Spotify, TikTok, Twitch, Weather.com, WhatsApp, and X, allow users to access much or all of their content and services at no financial cost. See, e.g., The Weather Channel, https://www.weather.com. The revenue that these popular websites generate from selling ad space to advertisers has not only made their owners' free-to-use models sustainable, but has also provided millions and, in some cases, billions of dollars each year for the maintenance and development of these websites. See, e.g., PTX792 at -693; Tr. Sept. 9 AM 53:12–54:12 (Wolfe

[2] For ease of reference, citations to trial and deposition transcripts contain the last name of the witness and the organization with which they are associated.

(Gannett)); Tr. Sept. 18 AM 151:1–20 (Wheatland (Daily Mail)). Smaller online websites have also largely kept their content freely accessible by monetizing it with advertisements, thereby establishing an open digital ecosystem of information. See DTX76 at -477; DTX506 at -306; Tr. Sept. 20 PM 102:6–103:6 (Sheffer (Google)).

Alternative revenue models have also supported the proliferation of online content. Many traditional print media publishers, such as The New York Times, The Wall Street Journal, and The Washington Post, use a hybrid model of subscriptions and advertisements, placing much of their content behind paywalls—digital barriers that limit access to online content to paying customers. See Tr. Sept. 9 AM 53:19–53:21 (Wolfe (Gannett)); Tr. Sept. 10 AM 18:20–20:9 (Layser (News Corp)) (discussing The Wall Street Journal's paywall). Creators of production-quality video content that is expensive to make, such as Disney, HBO, and Netflix, primarily rely on paid subscriptions. See, e.g., Choose Your Plan, HBO Max, https://auth.max.com/product (last visited Mar. 27, 2025). Meanwhile, e-commerce websites such as Nike and Target function much like physical storefronts, recouping their web infrastructure expenses by selling physical goods and services online. See, e.g., Nike, https://www.nike.com (last visited Mar. 27, 2025). And a small minority of large websites have no revenue models at all, including those funded by government, such as healthcare.gov, or by nonprofit donations, such as Wikipedia. See, e.g., Wikipedia, https://en.wikipedia.org (last visited Mar. 27, 2025). Yet despite these alternative approaches, digital advertising has been the lifeblood of the Internet, funding much of its development while providing free access to an extraordinary quantity of content and services.

III. Digital Advertising Stakeholders

Digital publishers ("publishers") are the organizations and individuals that control websites and publish content on them. See [Dkt. No. 1309] ("Joint Glossary") at 7. Most

sophisticated publishers view selling advertising space on their websites as a major source of income. See Tr. Sept. 9 AM 53:12–54:8 (Wolfe (Gannett)); Tr. Sept. 18 AM 130:11–24 (Wheatland (Daily Mail)).[3]

Digital advertisers ("advertisers") are the organizations and individuals that pay to place advertisements on publishers' websites to promote their goods or services or to present their messages to Internet users. Advertisers vary in size and include small businesses, large corporations, government agencies, charitable organizations, political campaigns, and public interest groups. See Tr. Sept. 10 AM 130:17–131:1 (Friedman (Goodway Group)); Tr. Sept. 25 PM 73:19–25 (Stewart (Google)).[4] More sophisticated advertisers with larger marketing budgets often contract with advertising agencies that specialize in running multi-channel advertising campaigns to buy advertisements on their behalf. See Tr. Sept. 9 PM 54:25–55:7 (Lowcock (IPG)); Tr. Sept. 10 AM 130:11–22 (Friedman (Goodway Group)); Tr. Sept. 13 PM 26:2–12 (Lambert (OMD)); Tr. Sept. 23 PM 71:12–18, 101:4–6 (Oliphant (U.S. Census Bureau)).[5]

[3] Publishers whose employees provided testimony in this litigation include Buzzfeed, Gannett / USA Today, News Corp / The Daily Mail, The New York Times, The Walt Disney Company, and Vox Media. See Designated Deposition Transcript ("Dep.") 78:24–79:19 (Blom (Buzzfeed)); Tr. Sept. 9 AM 49:10–50:7 (Wolfe (Gannett)); Tr. Sept. 10 AM 8:18–23 (Layser (News Corp)); Tr. Sept. 17 PM 114:8–104:23, 129:25–130:5 (Helfand (Disney)); Tr. Sept. 18 AM 125:3–18 (Wheatland (Daily Mail)); Tr. Sept. 26 PM 123:7–22 (Glogovsky (New York Times)); Tr. Sept. 27 AM 5:24–6:9; 9:19–10:2 (Pauley (Vox)).

[4] Advertisers whose employees provided testimony in this litigation include the U.S. Census Bureau and Zulily. Tr. Sept. 23 PM 65:3–66:14 (Oliphant (U.S. Census Bureau)); Tr. Sept. 27 AM 22:22–23:11 (Bumpers (Zulily)).

[5] Advertising agencies whose employees provided testimony in this litigation include Goodway Group, GroupM, GSD&M, IPG / Universal McCann, and OMD. Tr. Sept. 9 PM 53:6–17 (Lowcock (IPG)); Tr. Sept. 10 AM 130:11–16 (Friedman (Goodway Group)); Tr. Sept. 13 PM 25:4–5, 49:3–22 (Lambert (OMD)); Tr. Sept. 17 PM 137:5–138:3 (Schiekofer (GroupM)); Tr. Sept. 19 PM 6:11–20 (Bradbury (GSD&M)).

Advertising technology providers are the organizations that develop digital products and services to help match publishers' ad spaces with advertisers' ads. See Tr. Sept. 9 AM 53:12–54:25, 84:1–84:5 (Wolfe (Gannett)). These products and services, and the companies that develop and operate them, are discussed at greater length in the next section.

IV. The Technology Behind Digital Advertising

Underpinning the rapid rise of digital advertising is an assortment of web-based technologies that help place advertisements on webpages so that online publishers can monetize their content and advertisers can promote their goods, services, and messages. See Tr. Sept. 9 AM 53:12–54:25, 84:1–5 (Wolfe (Gannett)). These technologies match publishers selling ad space to advertisers buying ad space so that the right advertisement can be placed on the right website in front of the right user at the right time. See PTX581 at -980–83; Tr. Sept. 11 PM 12:6–18 (Ravi (Pls. Expert)). The ad tech industry is best described as having "buy-side" tools used by advertisers to buy digital ads, and "sell-side" tools used by publishers to sell digital ad space. Joint Glossary at 5, 8 (defining buy-side and sell-side); PTX581 at -980–83; Tr. Sept. 11 PM 12:6–18 (Ravi (Pls. Expert)).

A. The Rise of Programmatic Advertising

In the early days of the Internet, online advertisements were typically sold through "direct deals." See PTX792 at -667; PTX1031 at -527; Joint Glossary at 6. Buyers employed by major brands or the advertising agencies that represented them would negotiate directly with the sales teams of established publishers, such as national newspapers, to place digital ads on the publishers' websites. See Joint Glossary at 6; PTX792 at -670 (stating direct sales are "[i]nventory bought at fixed prices directly from media owners through in-house or external sales teams"). In this way, monetization of publishers' digital content on the early Internet, much

of which was text-based, reflected the advertising industry's roots in newspaper and print advertising. See PTX792 at -670; PTX1031 at -527.

Advertisers and publishers soon realized, however, that the direct-deal approach left much value on the table. See PTX792 at -670; Tr. Sept. 9 AM 63:10–64:2 (Wolfe (Gannett)); Tr. Sept. 10 AM 34:25–36:9 (Layser (News Corp)). Negotiations between sales teams were cumbersome, and the "three martini lunches" that Madison Avenue executives had long relied upon to make ad deals could not keep pace with the instantaneous interactions between publishers and consumers online. PTX1814 at -743; see also Tr. Sept. 9 AM 63:10–64:2 (Wolfe (Gannett)); Tr. Sept. 10 PM 74:6–22 (Lipkovitz (Google)); Sept. 27 AM 64:2–10 (Wheatland (Daily Mail)). Millions of businesses sought to advertise on the Internet, but they did not have anywhere close to the time or resources needed to negotiate individual contracts with each publisher. See Tr. Sept. 9 AM 63:10–19 (Wolfe (Gannett)); Tr. Sept. 9 AM 129:22–13 (Casale (Index Exchange)); Tr. Sept. 9 PM 54:3–55:10 (Lowcock (IPG)); Tr. Sept. 19 PM 9:23–10:25 (Bradbury (GSD&M)). The dynamic nature of the digital domain also posed significant challenges to anticipating how many visits a website would receive, making it difficult for publishers to scope direct deals appropriately. See Tr. Sept. 9 AM 63:10–64:2 (Wolfe (Gannett)). The selling of publisher ad space solely via direct deals therefore resulted in much ad space going unsold. See Tr. Sept. 9 AM 63:10–64:6 (Wolfe (Gannett)); Tr. Sept. 10 AM 34:25–36:9 (Layser (News Corp)). Another disadvantage of direct deals, which involved buying bulk ad space at fixed prices, was that they often made little use of the significant data about Internet users that publishers, advertisers, and intermediaries possessed—leaving one of the largest sources of value of digital advertising, personalized targeting, largely untapped. See DTX1514 at -922–23; PTX792 at -670, -674; PTX1031 at -527.

To address these deficits, advertising technology providers created "programmatic advertising," which automated the matching of advertisers' ads to publishers' webpages. See PTX792 at -669 ("Programmatic advertising is the automation of [the] buying and selling of digital advertising."); Tr. Sept. 10 PM 74:6–22 (Lipkovitz (Google)); Tr. Sept. 17 PM 120:8–13 (Helfand (Disney)). Programmatic advertising, also referred to as "indirect advertising," dramatically improved the effectiveness of digital advertising by allowing publishers to auction the ad space on their websites in real-time to a wide swath of advertisers. Joint Glossary at 5, 7; DTX1514 at -922–23; Tr. Sept. 12 PM 58:25–59:15 (Goel (PubMatic)).

In automating the matchmaking process, programmatic advertising vastly reduced the time that digital advertising professionals spent inking deals with individual publishers, freeing them to devise higher-level campaign strategies. See Tr. Sept. 19 PM 9:23–10:25 (Bradbury (GSD&M)); Tr. Sept. 23 PM 104:11–23 (Oliphant (U.S. Census Bureau)). Programmatic advertising also enabled publishers to sell their ad space (i.e., "inventory") to a much broader range of advertisers, including small and medium-sized businesses, by eliminating the need for direct negotiations and dealmaking. See PTX579 at -509; Tr. Sept. 19 PM 9:23–10:25 (Bradbury (GSD&M)). Moreover, programmatic advertising helped advertisers place ads on a broader array of publisher websites, including on niche pages that catered to users interested in specific products and services. See Tr. Sept. 23 PM 104:11–23 (Oliphant (U.S. Census Bureau)). In addition to improving the matching of ad buyers and ad sellers, programmatic advertising enhanced the matching of advertisements to consumers by greatly increasing advertisers' ability to target specific Internet users. See Tr. Sept. 20 PM 78:4–25 (Sheffer (Google)).

As advertising technology matured, programmatic advertising became more and more effective. Advertisers refined their ability to estimate the value of each impression—each

opportunity for a publisher to place a given ad in a given ad space in front of a given user at a given time—based on factors such as publisher quality, ad space quality, user attributes, and ad relevance. See Joint Glossary at 6–7 (defining "impression"); PTX792 at -665, -674; PTX904 at -543; PTX1674 at -040; Tr. Sept. 9 AM 59:24–60:23 (Wolfe (Gannett)); Tr. Sept. 10 PM 56:15–57:6 (Friedman (Goodway Group)). Publishers developed a deeper understanding of what the impressions they were selling were worth to advertisers, and they became adept at estimating advertisers' willingness to pay for a particular impression. See Tr. Sept. 9 AM 136:1–21 (Casale (Index Exchange)). The net result was that programmatic advertising has enabled advertisers to better reach targeted consumers, and publishers to better monetize their content and earn more advertising revenue. See PTX792 at -665, -674; Tr. Sept. 9 AM 130:14–22 (Casale (Index Exchange)); Tr. Sept. 12 PM 84:25–85:4 (Goel (PubMatic)).

B. Ad Networks and The Ad Tech Stack

A few core digital advertising tools enabled the rise of programmatic advertising and the increased monetization of online content. At first, publishers and advertisers primarily used "ad networks," third-party software products that sign up advertisers and publishers as their customers, and then match their advertisers' ads with their publishers' inventory. See DTX1514 at -924; PTX579 at -509; Tr. Sept. 9 AM 109:24–110:2 (Casale (Index Exchange)). The advertiser side, or buy-side, of an ad network gave advertisers the ability to create or upload an advertisement's visuals and any accompanying audio, to specify how much the advertiser was willing to pay for the advertisement to be placed on websites of publishers within the ad network, and to control the scope of the advertising campaign. See Joint Glossary at 5–6. The network would, in turn, match these ads to inventory that publishers had placed in the network. DTX1514 at -924. On the publisher side, or sell-side, the ad network gave publishers the ability

to specify where and how ads appear on their websites, as well as to select types of ads based on quality and relevance. See id. Google's ad network was called the Google Content Network.[6] Tr. Sept. 13 AM 10:21–11:5 (Bender (Google)); Tr. Sept. 9 AM 129:1–6 (Casale (Index Exchange)). AdWords is the advertiser-facing side of the Google Content Network, i.e., the Google product through which advertisers buy inventory from publishers that are in the network.[7] See DTX549 at -188; PTX939 at -993; PTX1096 at -609. AdSense is publisher-facing side of the Google Content Network, i.e., the Google product through which publishers sell their inventory to advertisers that are in the network. See DTX549 at -186, -218; PTX939 at -993; PTX1096 at -608–09.[8]

Ad networks provide a simple way to connect advertising demand with publisher inventory, and are now primarily used by smaller advertisers and publishers. See PTX579 at -509; PTX1031 at -484; Tr. Sept. 11 PM 104:25–105:20 (Dederick (The Trade Desk)); Tr. Sept. 12 PM 76:10–77:16 (Goel (PubMatic)). Larger, more sophisticated advertisers and publishers have generally moved away from ad networks and turned to modern ad tech products that facilitate large-scale advertising campaigns and increase their control over where, how, when, and to whom ads are shown. See PTX1031 at -484; Tr. Sept. 10 AM 140:11–141:24, 145:9–19 (Friedman (Goodway)); Tr. Sept. 13 PM 101:5–11 (Boland (Meta)); Tr. Sept. 19 PM 99:6–14

[6] The Google Content Network, or GCN, is also called the Google Display Network, or GDN. See PTX1096 at -609; Tr. Sept. 20 PM 52:22–53:5 (Sheffer (Google)).

[7] Although this opinion will use "AdWords" to describe the advertiser-facing side of GCN, Google rebranded AdWords as Google Ads in 2018. See PTX1096 at -609.

[8] Other ad network providers whose employees testified in this litigation are Criteo and Meta, which operated the Facebook Audience Network. DTX376 at -975; DTX1257 at 4, 10; Tr. Sept. 13 AM 97:13–98:15 (Boland (Meta)); Tr. Sept. 13 PM 158:1–20 (Parsons (Criteo)).

(Lee (Pls. Expert)). These more modern programmatic advertising products are collectively referred to as the "ad tech stack." See, e.g., PTX0551 at -048.

On the buy-side, sophisticated advertisers and their ad agencies have reduced their reliance on ad networks and started using two primary tools to buy ads and execute their advertising campaigns: "advertiser ad servers" and "demand-side platforms." See Joint Glossary at 5; PTX1031 at -483; Tr. Sept. 23 PM 5:11–22 (Stefaniu (Google)). Advertiser ad servers help advertisers manage digital advertising campaigns, serve ads, and track ad performance. For example, advertiser ad servers enable advertisers to see how their ads perform across different publishers, track user activity after interacting with ads (e.g., determine if the user visited the advertiser's website or made a purchase), and adjust their advertising campaigns based on user behavior. See Tr. Sept. 23 PM 5:11–22 (Stefaniu (Google)) (discussing functionality of Google's advertiser ad server); Tr. Sept. 25 PM 49:11–50:3 (Stewart (Google)). Google's advertiser ad server is called Campaign Manager 360, or CM360. See Tr. Sept. 23 PM 5:11–22 (Stefaniu (Google)).

Demand-side platforms provide large advertisers with significant control over the sources of inventory from which they purchase impressions and how they bid on those impressions. See Joint Glossary at 5; PTX1031 at -483; Tr. Sept. 11 PM 104:25–105:20 (Dederick (The Trade Desk)). Demand-side platforms do this, in part, by providing a single interface for advertisers to manage programmatic and direct ad buying, to synthesize data about publisher inventory and users, and to bid into ad exchanges. See Joint Glossary at 5; DTX1514 at -903, -929, -952; Tr. Sept. 10 AM 140:11–141:19 (Friedman (Goodway Group)); Tr. Sept. 11 PM 104:1–107:2 (Dederick (The Trade Desk)); Tr. Sept. 25 PM 83:19–25 (Stewart (Google)). A demand-side platform lets an advertiser control where and when its ads appear and to which user they are

displayed. PTX1031 at -483. Given the complexity of demand-side platforms, advertisers typically delegate day-to-day management of the campaigns they run through these platforms to ad agencies or, for some of the largest advertisers, to in-house teams of digital advertising professionals. See DTX1514 at -947; Tr. Sept. 25 PM 83:3–11 (Stewart (Google)). Google's demand-side platform is known as Display & Video 360, or DV360, and was previously called DoubleClick Bid Manager, or DBM. See Joint Glossary at 6; PTX939 at -991; PTX1031 at -483; DTX1514 at -929, -950–953; Tr. Sept. 12 AM 18:17–21 (Srinivasan (Google)).[9]

"Ad exchanges" serve as the critical intermediary between advertisers' ads and publishers' inventory by facilitating real-time auctions in which advertisers can bid on inventory. See Joint Glossary at 5; PTX1031 at -480–81, -501–02; Tr. Sept. 9 AM 67:8–18 (Wolfe (Gannett)). Ad exchanges do this by aggregating available inventory from publishers, flagging impressions as they become available (i.e., as users visit webpages), integrating with buy-side tools to solicit advertisers' bids for each impression, and evaluating those bids within a fraction of a second to determine auction winners. See PTX1031 at -480, -501–02; Tr. Sept. 9 AM 67:8–18 (Wolfe (Gannett)). As the central transaction platforms for connecting sophisticated advertisers with sophisticated publishers, ad exchanges are involved in much of the world's programmatic advertising. See PTX847; PTX1242; Tr. Sept. 9 AM 63:1–64:6 (Wolfe (Gannett)); Tr. Sept. 19 PM 54:13–22 (Lee (Pls. Expert)). Google's ad exchange is called AdX. Joint Glossary at 5.[10]

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[9] Microsoft and The Trade Desk are other companies offering demand-side platforms whose employees testified in this litigation. Tr. Sept. 11 PM 87:21–22, 105:12–14 (Dederick (The Trade Desk)); Tr. Sept. 20 PM 129:12–17 (John (Microsoft)).

[10] Other organizations with ad exchanges whose employees testified in this litigation include Index Exchange, Kargo, Magnite, Microsoft (formerly Xandr and AppNexus), OpenX, and PubMatic. Tr. Sept. 9 AM 106:16–107:3 (Casale (Index Exchange)); Tr. Sept. 12 PM 56:8–57:8 (Goel (PubMatic)); Tr. Sept. 13 AM 5:8–5:21 (Kershaw (Magnite)); Tr. Sept. 17 PM 45:2–46:6

On the sell-side, most sophisticated publishers stopped using ad networks and started using "publisher ad servers" to manage and sell their ad inventory. See Joint Glossary at 8. When a user visits a website, a publisher ad server instantaneously alerts sources of advertising demand that it has an impression for sale, decides in real-time which ad to show the user, and runs the back-end processes to display the ad. See id.; Tr. Sept. 9 AM 68:16–69:25 (Wolfe (Gannett)); Tr. Sept. 9 AM 121:1–16 (Casale (Index Exchange)). Publisher ad servers make it easier for publishers to place multiple sources of advertising demand in competition against each other, as well as to run advertisements pursuant to direct deals with large advertisers. See DTX1016 at -503. Publisher ad servers also enable sophisticated publishers to manage inventory across multiple web pages, set inventory price floors, and create detailed reports on inventory performance. See Tr. Sept. 9 AM 66:1–8 (Wolfe (Gannett)); Tr. Sept. 19 PM 61:18–25 (Lee (Pls. Expert)); Tr. Sept. 23 AM 30:9–31:9 (Korula (Google)). As such, publisher ad servers are "mission-critical" tools for large publishers, Tr. Sept. 20 PM 78:4–25 (Sheffer (Google)), which "couldn't really manage their display advertising revenue without" them. Tr. Sept. 16 AM 22:12–14 (Mohan (Google)). Google's publisher ad server is called DoubleClick for Publishers, or DFP. [11] Joint Glossary at 6; Tr. Sept. 16 AM 27:24–28:7 (Mohan (Google)).[12]

(Cadogan (OpenX)); Tr. Sept. 19 PM 38:11–39:1, 39:15–17 (Shaughnessy (Kargo)); Tr. Sept. 20 PM 121:2–14, 129:9–17; 136:10–12 (John (Microsoft)).

[11] DFP has since been combined with Google's ad exchange, AdX, under a single brand called Google Ad Manager, or GAM. Tr. Sept. 9 AM 66:19–67:3 (Wolfe (Gannett)). Google employees, testifying witnesses, and other industry participants nevertheless refer to Google's publisher ad server as DFP and identify it as a separate product from AdX, as each product serves its own distinct functions. See id.; Joint Glossary at 5; PTX847; PTX1242; PTX1392.

[12] Other organizations with publisher ad servers whose employees testified in this litigation include Equativ, Kevel, and Microsoft. Tr. Sept. 9 PM 116:19–23 (Avery (Kevel)); Tr. Sept. 13 PM 62:11–63:14 (Creput (Equativ)); Tr. Sept. 20 PM 129:12–17 (John (Microsoft)).

These products in the ad tech stack work together to place advertisers' ads on publishers' websites. When a user visits a website, one or more ad exchanges receive a bid request from a publisher ad server that contains information about the impression and provides the amount of time that the exchange has to respond. See PTX1031 at -501–02; Tr. Sept. 9 AM 68:16–69:16 (Wolfe (Gannett)). During this time, which is usually a fraction of a second, each ad exchange that received the bid request runs an auction for the impression, soliciting bids from demand-side platforms, such as DV360, and the advertiser side of ad networks, such as AdWords. See Joint Glossary at 8 (defining "real-time bidding"); PTX1031 at -501–02; Tr. Sept. 9 AM 73:10–25 (Wolfe (Gannett)); Tr. Sept. 12 PM 160:20–161:18 (Kershaw (Magnite)). The ad exchange helps these ad buyers formulate their real-time bids by sharing information about the impression, including the website on which the impression appears, attributes about the user who is visiting the site, and the pricing information that the ad exchange has received from the publisher ad server. See PTX1031 at -480, -486, -501–02; Tr. Sept. 9 AM 68:16–70:13 (Wolfe (Gannett)). Within the extremely short amount of time that it has to respond to the publisher ad server, the ad exchange collects all buy-side bids, determines the highest bid, and shares that bid with the publisher ad server. See PTX1031 at -502; Tr. Sept. 9 AM 68:16–70:13 (Wolfe (Gannett)).

The publisher ad server, in turn, selects the winning bid for the impression based on the bids it has received. See Joint Glossary at 7–8; PTX1031 at -532; Tr. Sept. 9 AM 121:1–16 (Casale (Index Exchange)). Bids that do not meet or exceed the publisher's floor price—the minimum amount of money that the publisher is willing to accept for the impression—are screened out. See PTX1096 at -605; Tr. Sept. 9 AM 148:12–150:24 (Casale (Index Exchange)); Tr. Sept. 9 PM 34:6–11 (Casale (Index Exchange)). Publisher ad servers originally selected the winning bid for an impression in a process called the waterfall, but have since evolved to pitting

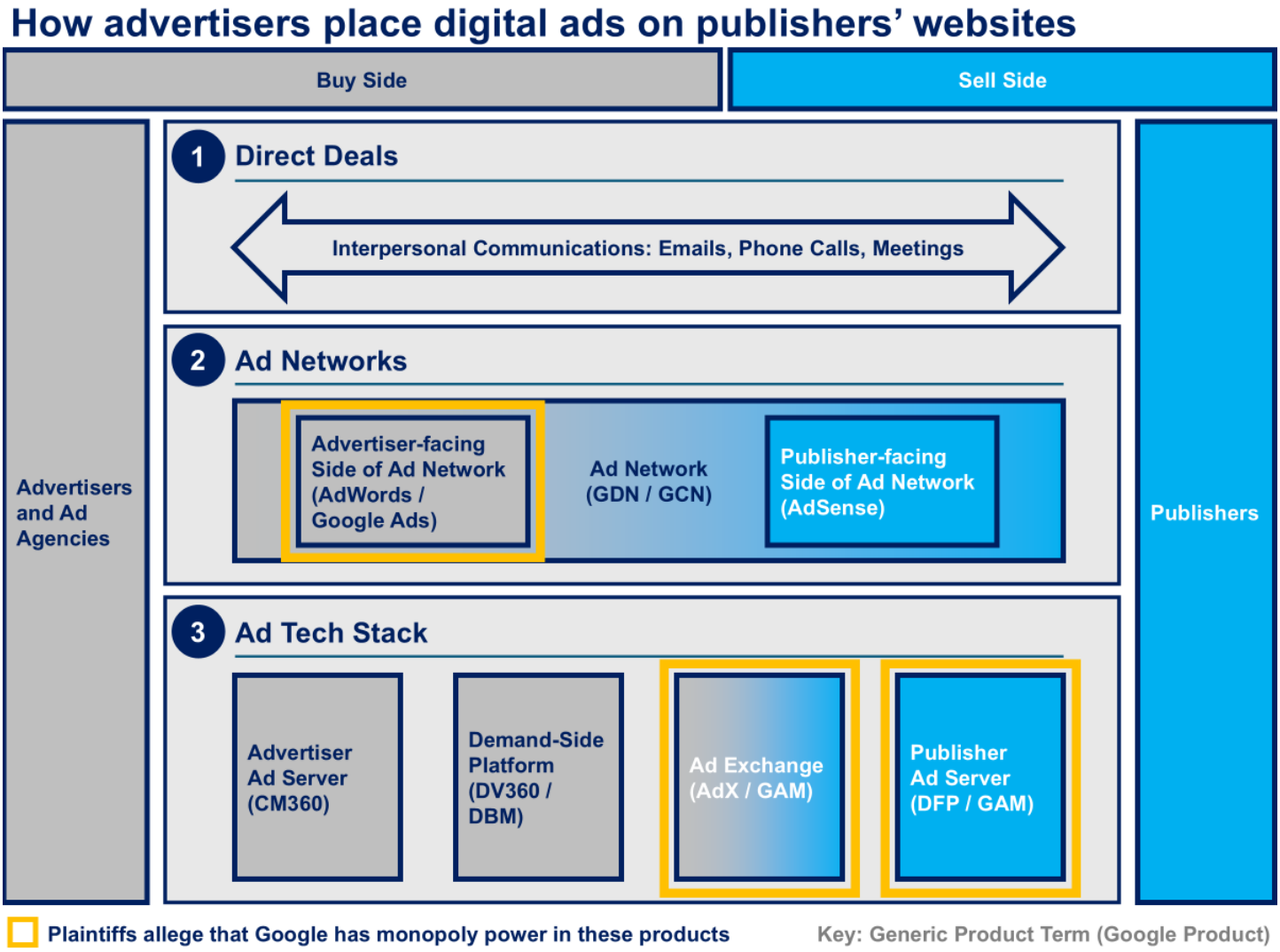
exchanges' bids against each other in real-time auctions. See Joint Glossary at 8; PTX520 at -388; PTX1031 at -501–03; PTX1096 at -605; PTX1650 at -042; PTX1677 at -694; PTX1710 at -407; Tr. Sept. 9 AM 148:3–150:12 (Casale (Index Exchange)); Tr. Sept. 12 PM 60:19–62:14 (Goel (PubMatic)). Once a winning bid is selected by the publisher ad server, the advertisement associated with it is served on the publisher's webpage and displayed to the user. See Joint Glossary at 8. If no eligible buyer is found for the impression, the ad space may go unfilled. See Tr. Sept. 17 PM 51:1–15 (Cadogan (OpenX)).

For every programmatic advertising transaction, the companies that develop and operate these ad tech tools extract fees. See PTX794 at -738. Publisher ad servers, ad exchanges, demand-side platforms, advertiser ad servers, and ad networks typically each collect fees from the revenue-generating transactions in which they are involved, which means that ad exchanges and buy-side tools only collect fees when they submit a winning bid and place an ad in front of a user. See id.; Tr. Sept. 9 AM 142:21–143:18 (Casale (Index Exchange)); Tr. Sept. 16 PM 17:15–18:10 (Weintraub (Pls. Expert)). Industry participants often assess the total cost of these fees based on their percentage of the price paid by the advertiser to obtain the underlying impression, and refer to an ad tech tool's percentage-based fees as its "take rate." See PTX1031 at -514; Tr. Sept. 13 AM 59:19–60:6 (LaSala (Google)); Tr. Sept. 9 AM 111:1–12 (Casale (Index Exchange)). Typically, between $20 to $40 of every $100 spent on digital advertising goes to the ad tech companies that develop and operate these tools. See PTX794 at -738; Tr. Sept. 13 AM 59:23–60:1 (LaSala (Google)).

Programmatic digital advertising is remarkable in its speed, frequency, and complexity. Most of the world's popular websites are monetized with programmatic advertisements. Every time a user visits any webpage that runs programmatic advertisements, the bidding process

described above occurs for each advertisement on the page. From start to finish, the process takes no more than the time it takes the webpage to load, which is often well under half a second. See Tr. Sept. 12 PM 160:20–161:16 (Kershaw (Magnite)); Tr. Sept. 12 PM 61:13–62:14 (Goel (PubMatic)); Tr. Sept. 17 PM 54:6–14 (Cadogan (OpenX)). This bidding process occurs many billions of times per day across the Internet. See PTX208 at -544 (stating major ad exchanges represented more than one trillion monthly impressions as of 2014); PTX657 at -351; Tr. Sept. 12 PM 160:20–161:9 (Kershaw (Magnite)) ("We had 250 milliseconds to [run the auction]; so you had to do it quite quickly, and we did it billions of times an hour."). For each impression sold, the ad tech stack examines information about the impression and the associated user, aggregates bids from various advertising sources, places those bids in competition with each other, employs complex bidding and selling strategies, and ultimately causes an ad to be displayed on a webpage for a user.

A simplified visualization of the three ways that advertisers purchase ad inventory from publishers—(1) direct deals, (2) ad networks, and (3) the ad tech stack—is shown below. The major tools that comprise the ad tech stack are placed on a spectrum between advertisers on the buy-side and publishers on the sell-side. The three areas which Plaintiffs claim that Google has monopolized—publisher ad servers, ad exchanges, and the advertiser-facing side of ad networks—are highlighted in orange. The names of the associated Google products are abbreviated in parentheses.



C. Types of Digital Advertisements

These advertising technologies are used to run "display ads": online ads that engage users with text or image-based marketing content, link to the advertiser's webpage, and often appear in rectangular spaces on publishers' websites. See Joint Glossary at 6 (defining "display advertising"); Tr. Sept. 9 AM 56:17–59:20 (Wolfe (Gannett)); Tr. Sept. 9 AM 113:1–8 (Casale (Index Exchange)) (explaining that display ads are often called banner ads); Tr. Sept. 17 PM 122:17–123:1 (Helfand (Disney)). Users view display ads when they visit websites using web browsers on both personal computers and mobile devices. See Tr. Sept. 9 AM 64:7–19 (Wolfe

(Gannett)). Although these ads are often shown as static images, they can include animations or video clips. See Tr. Sept. 19 PM 15:16–16:10 (Cox (Google)). Display ads that include video content are sometimes referred to as outstream video ads. See id.

Those in the digital advertising industry often draw a distinction between display ads that run on the open web and display ads that run on "walled gardens." See Tr. Sept. 9 PM 60:13–61:1 (Lowcock (IPG)); Tr. Sept. 12 PM 70:25–72:23 (Goel (PubMatic)); Tr. Sept. 19 PM 51:11–21 (Lee (Pls. Expert)). Open-web display ads are display ads that run on websites that use third-party ad tech infrastructure to match advertisers' ads to publishers' inventory. See Tr. Sept. 9 PM 60:13–20 (Lowcock (IPG)); Tr. Sept. 18 AM 136:12–24 (Wheatland (Daily Mail)). Most publishers that run advertisements on their websites, including the vast majority of newspapers and other traditional media organizations, use third-party ad tech tools to sell open-web display inventory because it is cost-prohibitive to build an in-house ad tech stack, particularly for entities whose primary competencies do not involve software engineering. See Tr. Sept. 9 AM 73:1–8 (Wolfe (Gannett)); Tr. Sept. 18 AM 132:7–17 (Wheatland (Daily Mail)); Tr. Sept. 26 PM 141:15–142:13 (Glogovsky (New York Times)).

Walled gardens, conversely, are publishers that control the infrastructure through which advertisers buy and place advertisements on their websites. See Tr. Sept. 9 PM 60:13–20 (Lowcock (IPG)); Tr. Sept. 12 PM 70:25–72:23 (Goel (PubMatic)). Walled-garden publishers maintain their own in-house ad tech and require advertisers to use those tools to buy and place advertisements on the publishers' owned-and-operated web properties. See Tr. Sept. 9 PM 60:13–20 (Lowcock (IPG)); Tr. Sept. 12 PM 70:25–72:23 (Goel (PubMatic)). Large digital technology firms like Amazon, Google, Meta, and Microsoft are more likely to operate their websites as walled gardens, as they possess the rare combination of commercial scale and

technical sophistication to make the development and maintenance of in-house advertising tools feasible. See Tr. Sept. 9 AM 73:1–8 (Wolfe (Gannett)); Tr. Sept. 9 AM 114:7–115:25 (Casale (Index Exchange)); Tr. Sept. 11 PM 160:22–161:3 (Dederick (The Trade Desk)); Tr. Sept. 18 AM 132:7–17, 136:18–22 (Wheatland (Daily Mail)); Tr. Sept. 19 PM 62:1–19, 64:18–25 (Lee (Pls. Expert)).

Although walled-garden publishers sell display ads, they more often focus on alternative digital advertising formats, including social media ads, search ads, and instream video ads. See Tr. Sept. 9 AM 112:1–118:22 (Casale (Index Exchange)) (differentiating display ads on the open web from social, mobile app, and instream video ads); Tr. Sept. 10 AM 157:22–158:19 (Friedman (Goodway Group)); Tr. Sept. 17 PM 138:7–140:23 (Schiekofer (GroupM)). Meta, for example, sells social media ads in a walled-garden environment, requiring advertisers to use Meta's in-house technology to place ads on Facebook and Instagram. See Tr. Sept. 19 PM 62:1–19 (Lee (Pls. Expert)). Search engines including Google Search and Microsoft Bing sell ad space within their respective walled gardens for search ads, which allow advertisers to place ads alongside search results. See PTX764 at -251, -254. Digital streaming providers like Amazon Prime, Google's YouTube, and Disney also use in-house technology to sell space for instream video or connected TV ads, which play before, during, or after video content and are akin to television commercials. Tr. Sept. 19 PM 15:16–16:10 (Cox (Google)); See Tr. Sept. 17 PM 122:9–16, 131:24–132:3, 133:11–13 (Helfand (Disney)); Tr. Sept. 17 PM 138:14–139:11 (Schiekofer (GroupM)).

Social, search, instream video, and other alternatives to open-web display advertising are not limited to walled gardens. For example, open-web publishers that deliver video-based content to their users will often use instream video ads to monetize that content. See, e.g., CNN

Videos, CNN, https://www.cnn.com/videos (last visited Mar. 27, 2025). Publishers additionally use native ads, which consist of sponsored content that appears in the style and format of the content that surrounds it, to increase user engagement. See PTX764 at -259; Tr. Sept. 9 PM 68:20–70:21 (Lowcock (IPG)). Larger open-web publishers often have mobile applications for sharing content with smartphone and tablet users which they monetize using mobile app ads. See PTX764 at -251–52, -260; PTX904 at -549–51.

V. Google's Activities in Programmatic Advertising

Google evolved from a garage-based startup to a multitrillion dollar company in little more than twenty years. Much of that growth was funded by digital advertising. In keeping with its professed mission to "organize the world's information and make it universally accessible and useful," Google provides many of its key services at no financial cost to Internet users. Tr. Sept. 23 AM 7:22–8:3 (Korula (Google)). These free services include Google's search engine (Google Search), web browser (Chrome), email service (Gmail), mapping tools (Google Maps and Waze), file storage and collaboration service (Google Drive), word processor (Google Docs), translation service (Google Translate) and video sharing platform (YouTube). See DTX527 at -159; Google Products, Google, https://about.google/intl/ALL_us/products/#all-products (last visited Mar. 27, 2025). In exchange, Google collects data from and about the users of these free services, and monetizes that data by selling advertisements targeted to these users. See DTX76 at -479; Tr. Sept. 11 PM 99:11–100:5, 105:21–106:15 (Dederick (The Trade Desk)); Tr. Sept. 13 AM 52:18–53:17 (LaSala (Google)). Over the past two decades, Google has established increasingly detailed knowledge about the billions of people who have used its products, including by collecting data pertaining to their web browsing, search activity, physical location, demographic characteristics, app usage, communications, shopping activity, and device and network

information. See DTX76 at -479; Tr. Sept. 11 PM 99:11–100:5, 105:21–106:15 (Dederick (The Trade Desk)) (asserting that "Google arguably sits on the most valuable data asset in the world"); Tr. Sept. 13 AM 52:18–53:17 (LaSala (Google)). Google uses this data to improve the matching of advertisements to users, thereby increasing its advertiser customers' return on ad expenditures. See DTX76 at -479; Tr. Sept. 11 PM 99:11–100:5, 105:21–106:15 (Dederick (The Trade Desk)); Tr. Sept. 13 AM 52:18–53:17 (LaSala (Google)). As these targeted advertisements provide the company with much of its revenue, Google is fundamentally in the business of advertising. See United States v. Google LLC, 2024 WL 3647498, at *6 (D.D.C. Aug. 5, 2024) ("Google Search") ("The vast majority of [Google parent company] Alphabet's revenues (nearly 80%) come from digital advertisements.").

A. The Google Content Network

Google's evolution into the data-driven digital advertising enterprise it is today has been powered by its flagship product, Google Search ("Search"). See Tr. Sept. 13 AM 52:18–53:17 (LaSala (Google)); Tr. Sept. 11 PM 153:9–19 (Dederick (The Trade Desk)); Tr. Sept. 19 PM 99:18–100:2 (Lee (Pls. Expert)). Since its introduction in 1998, Search has rapidly become the world's most popular tool for retrieving information. See Google Search, 2024 WL 3647498, at *24. With that rise came significant advertiser demand, because Search offered a unique opportunity for advertisers to place digital ads that matched precisely what an Internet user was looking for at that moment. See Tr. Sept. 11 PM 98:19–99:7 (Dederick (The Trade Desk)) (stating that placing ads alongside Search results "really is the most sought-after ad placement"); Tr. Sept. 13 AM 52:18–53:17 (LaSala (Google)); Tr. Sept. 19 PM 99:18–100:2 (Lee (Pls. Expert)). In 2000, to meet this demand, Google launched AdWords, which originated as a self-service advertising platform for buying search ads. Tr. Sept. 20 PM 49:1–10 (Sheffer (Google));

Google Launches Self-Service Advertising Program, News from Google (Oct. 23, 2000), https://googlepress.blogspot.com/2000/10/google-launches-self-service.html.

AdWords grew rapidly, gaining over 100,000 advertiser customers by 2003. See Google Expands Advertising Monetization Program for Websites, News from Google (Jun. 18, 2003) https://googlepress.blogspot.com/2003/06/google-expands-advertising-monetization.html. Although the platform first offered only text-based keyword advertising that appeared alongside Search results, it quickly expanded to offer ads across both Google's owned-and-operated websites and third-party websites. See id.; DTX1514 at -939 (describing how Google's ad platform "[i]ncludes ads on Google search results pages, our network of partner sites, YouTube, Gmail, Maps, Discovery Feed, and apps"); Tr. Sept. 20 PM 49:23–51:4 (Sheffer (Google)).

Google expanded the number of publishers with which its advertisers could place ads by forming strategic partnerships with popular websites such as AOL, CNN, MapQuest, and The New York Times.[13] Google also launched AdSense, a self-service platform on which publishers could serve ads tailored to the content of their webpages. See PTX904 at -549; Tr. Sept. 20 PM 50:16–51:4 (Sheffer (Google)); Google Expands Advertising Monetization Program for Websites, News from Google (Jun. 18, 2003), https://googlepress.blogspot.com/2003/06/google-expands-advertising-monetization.html.

[13] See, e.g., Google Expands Advertising Monetization Program for Websites, News From Google (Jun. 18, 2003), https://googlepress.blogspot.com/2003/06/google-expands-advertising-monetization.html; MapQuest Selects Google to Provide Sponsored Links, News from Google (Jun. 23, 2003), https://googlepress.blogspot.com/2003/06/mapquest-selects-google-to-provide.html; CNN.com Inks Multi-Year Advertising Agreement with Google, News From Google (Aug. 28, 2007), https://googlepress.blogspot.com/2007/08/cnncom-inks-multi-year-advertising_28.html.

By 2007, Google's advertiser-facing AdWords and publisher-facing AdSense, which together comprised the Google Content Network, constituted the largest digital ad network in the world. See Tr. Sept. 16 AM 21:17–22:4 (Mohan (Google)); Tr. Sept. 20 PM 50:16–51:4 (Sheffer (Google)). That year, over one million advertisers used AdWords, with many placing display advertisements on a vast multitude of AdSense publishers' websites. See Miguel Helft, Google: 1 Million Advertisers in 2007, More Now, N.Y. Times (Jan. 8, 2009), https://bits.blogs.nytimes.com/2009/01/08/google-1-million-advertisers-in-2007-more-now.

Google worked to increase its growing ad network's functionality by offering advertisers the ability to insert videos into display ads, as well as to create text-based display ads customized for mobile device-friendly websites.[14] Google also improved its advertisers' ability to run digital advertising campaigns by creating a reporting system that showed where ads were being placed, how often they were being viewed, and how they were driving advertiser page visits and sales. See DTX1514 at -922; Tr. Sept. 20 PM 53:15–23, 112:22–113:12 (Sheffer (Google)); Tr. Sept. 24 AM 33:24–35:3 (Milgrom (Def. Expert).

B. DoubleClick Acquisition

In 2008, Google purchased a company called DoubleClick for $3.1 billion to improve Google's ad serving capabilities and to prevent Microsoft from acquiring "the leading ad serving company" and thus becoming "a major competitive threat" to Google's publisher-facing ad tech business. See PTX15 at -990–91 (an email from Google's General Counsel and SVP for Corporate Development to Google's Board explaining that "Google's Rationale for Acquiring

[14] See Google opens new content distribution channel on AdSense, News from Google (Oct. 9, 2007), https://googlepress.blogspot.com/2007/10/google-opens-new-content-distribution_09.html; Google AdSense for Mobile unlocks the potential of the mobile advertising market, News from Google (Sept. 17, 2007), https://googlepress.blogspot.com/2007/09/google-adsense-for-mobile-unlocks_17.html.

DoubleClick" included "accelerat[ing] time to market for our own advertiser and publisher ad serving products" and preventing the "major competitive threat to [] AdSense" posed by a "Microsoft-owned DoubleClick"); PTX1507 at -416. With DoubleClick, Google significantly expanded the third-party publisher base on which it could run its advertisers' ads. See PTX15 at -990–91. DoubleClick's flagship product was the market's leading publisher ad server, DoubleClick For Publishers ("DFP"). PTX14 at -246–48. DFP had a 60% share of the publisher ad serving market, and counted nine of the top ten U.S. websites among its customers. Id. at -246. By acquiring DFP, Google was able to keep the sell-side control that DFP offered out of the hands of Microsoft, Yahoo, and other digital advertising rivals. See PTX15 at -990–91 (stating that "[a]ccess [to indirect] inventory from Double[C]lick's publisher ad server customer base" would help Microsoft "quickly scale its ad network"); PTX41 at -005. Indeed, Google understood that DFP was the "must-call" publisher ad server, PTX611 at -801, and that owning it was critical to winning the "most strategic battle" in the emerging open-web ad tech ecosystem. PTX41 at -005.

Google's bolstering of its publisher-facing business through the DoubleClick acquisition helped it establish a dominant position on both sides of the ad tech stack. Google's ad tech business thus benefited from network effects, as the more advertiser customers Google had, the more publishers wanted to use DFP, and the more publisher customers Google had, the more advertisers wanted to use Google's buy-side services, thereby creating a self-reinforcing positive feedback loop. Tr. Sept. 20 PM 159:10–160:14 PM (John (Microsoft)) (discussing the importance of network effects in open-web display ad tech); see also Tr. Sept. 19 PM 75:3–76:8 (Lee (Pls. Expert)). In the DoubleClick acquisition, Google also obtained a nascent ad exchange,

AdX, that connected the two sides of the ad tech stack by matching advertiser bids with publisher inventory. See Tr. Sept. 16 AM 14:21–15:4 (Mohan (Google)); PTX51 at -723–26.

C. Connection of AdWords, AdX, and DFP

After acquiring DoubleClick, Google implemented two policies that incentivized both advertisers and publishers to use AdX. First, with limited exceptions, Google made AdX the only ad exchange into which AdWords advertising demand was permitted to bid. See PTX110 at -009; PTX882 at -719; Tr. Sept. 13 PM 67:16–21 (Creput (Equativ)).[15] Second, Google required publishers to use DFP as their ad server if they wanted to access real-time bids from AdX. See PTX116 at -462–63; PTX555 at -115; PTX1031 at -500, -797; Tr. Sept. 9 PM 144:7–145:1 (Avery (Kevel)); Tr. Sept. 13 PM 67:11–15 (Creput (Equativ)).[16]

Through these two policies, AdX became the "glue that seal[ed] DFP" inventory to AdWords demand. PTX41 at -006. AdWords was a singularly powerful source of digital

[15] Beginning in 2015, Google allowed some AdWords demand to bid into non-Google ad exchanges through a program called AWBid. Because AWBid focused on a small set of impressions related to specialized advertising campaigns, AdX remained the "nearly exclusive" source of AdWords demand. PTX639 at -965; PTX1247; see PTX278 at -613; Tr. Sept. 16 PM 132:20–133:16 (Abrantes-Metz (Pls. Expert)) ("[F]rom 2015, approximately only on average 3 percent of impressions transacted from [AdWords] were placed outside of AdX."); Tr. Sept. 13 AM 8:9–19 (Kershaw (Magnite)); Tr. Sept. 10 PM 87:3–7 (Lipkovitz (Google)).

[16] Google offered publishers not using DFP a way to access AdX demand via "AdX Direct," but this product was not an "economically viable substitute to accessing AdX through DFP" because it had rudimentary functionality, did not show the price that AdX was offering, did not provide access to real-time bids, increased latency, and did not permit publishers to place bids from AdX into real-time auctions with bids from other exchanges. Tr. Sept. 27 AM 70:9–24 (Wheatland (Daily Mail)); see also PTX555 at -115; PTX758 at -945; PTX933 at -183 (Google employee suggesting AdX Direct exists in part as a "concept for antitrust"); Tr. Sept. 10 AM 11:23–12:18 (Layser (News Corp)); Tr. Sept. 16 PM 124:5–18 (Abrantes-Metz (Pls. Expert)); Tr. Sept. 17 PM 50:4–51:20 (Cadogan (OpenX)); Tr. Sept. 18 AM 137:2–138:6 (Wheatland (Daily Mail)); Tr. Sept. 23 AM 139:8–17 (Korula (Google)). As a result, AdX Direct generated less than two percent of AdX's revenue. Tr. Sept. 16 PM 124:19–25 (Abrantes-Metz (Pls. Expert)) (stating AdX Direct was "not effective" and "not widely used").

advertising demand. See PTX624 at -169; PTX639 at -965; PTX719 at -004–05; PTX759 at -751. Its ease of use, association with a preeminent Internet company, and ability to place targeted advertisements alongside Search results attracted millions of unique advertisers, including countless small and medium-sized businesses. See PTX624 at -169; PTX719 at 004–05; Tr. Sept. 9 AM 129:22–130:22 (Casale (Index Exchange)); Tr. Sept. 10 AM 121:3–12 (Layser (News Corp)); Tr. Sept. 11 PM 153:6–154:20 (Dederick (The Trade Desk)). Although publishers could offer their impressions on non-Google ad exchanges, large publishers were greatly attracted to the unique advertising demand offered by AdWords, and as a result viewed using DFP as essential because it was the only publisher ad server that could effectively access AdX and, consequently, AdWords demand. See PTX551 at -048. Google recognized the unique attractiveness of its extensive advertiser demand, and its employees understood that limiting access to AdWords demand in this way "compel[led] publishers" to use AdX and DFP. Dep. 108:18–109:3 (Rowley (Google)); see also Tr. Sept. 16 PM 128:21–129:5 (Abrantes-Metz (Pls. Expert)).

D. First Look

Google used its control of DFP, the world's most popular ad server for large publishers, to implement additional policies that benefited its ad tech products. With a feature called "First Look," Google required publishers using DFP to offer AdX a first right of refusal for each impression. See PTX551 at -048. In other words, a publisher using DFP had to give AdX the opportunity to buy the publisher's impression before any rival exchanges were permitted to bid for that impression. See Tr. Sept. 12 PM 99:14–22 (Goel (PubMatic)); Tr. Sept. 16 PM 135:19–136:20 (Abrantes-Metz (Pls. Expert)); Tr. Sept. 16 PM 21:23–22:4 (Weintraub (Pls. Expert)). In addition to giving AdX the opportunity to bid before other exchanges, DFP permitted AdX to bid

in real-time, whereas other exchanges were required to make static bids that were set in advance and could not account for contemporaneous information about the value of the specific impression. See PTX373 at -092; PTX1539 at -105; Tr. Sept. 10 AM 39:4–40:24 (Layser (News Corp)); Tr. Sept. 11 AM 104:6–105:13 (Ravi (Pls. Expert)); Tr. Sept. 12 PM 98:19–99:13 (Goel (PubMatic)). AdX received a First Look at DFP impressions even if the publisher preferred other exchanges and wanted to rank them first. Tr. Sept. 10 AM 40:25–41:3 (Layser (News Corp)).

The First Look functionality benefited AdX advertisers, as they could win the auction even when advertisers using rival ad exchanges were willing to pay a higher price for the impression (i.e., when bids from other exchanges offered publishers more revenue for the impression). See PTX551 at -048; Tr. Sept. 10 AM 40:18–24 (Layser (News Corp)). For example, if AdX offered $1.07 CPM[17] for an impression, and that amount met or exceeded the publisher's floor price for the impression, AdX would win the auction before any other exchanges' bids were examined, even if other exchanges were offering $1.10 CPM and $1.08 CPM for the same impression. Tr. Sept. 11 AM 99:24–101:2 (Ravi (Pls. Expert)); see also PTX368 at -315; PTX468 at -551. Thus, under First Look, advertisers using AdX could win the auction even if they did not offer the highest revenue for the impression. See Tr. Sept. 11 AM 99:24–101:2 (Ravi (Pls. Expert)). This inherent inefficiency limited the ability and incentive for advertisers using other ad exchanges to compete on price, and resulted in publishers not obtaining the maximum value for their impressions. See PTX368 at -315; PTX551 at -048;

[17] Display ads purchased programmatically sell, on average, for significantly less than one cent per impression. See Tr. Sept. 19 PM 78:12–13 (Lee (Pls. Expert)). At trial, the parties and witnesses followed the industry convention of discussing prices in cost per thousand impressions (CPM), even when discussing the price of an individual impression. See, e.g., Tr. Sept. 19 PM 21:11–20 (Levitte (Google)).

PTX1539 at -105; Tr. Sept. 10 AM 42:13–21 (Layser (News Corp)); Tr. Sept. 12 PM 86:2–16, 99:14–100:6 (Goel (PubMatic)); Tr. Sept. 16 PM 135:16–137:2 (Abrantes-Metz (Pls. Expert)). The "unfair advantage" that First Look offered Google was built into the software that controlled the auction logic within DFP, and publishers could not toggle it off. PTX1710 at -497; see also PTX1099 at -865–66; PTX1539 at -105.

By giving AdX "an advantage in winning the transaction," Dep. 106:1–21 (Lipkovitz (Google)), First Look "made it difficult" for other exchanges "to compete on a level playing field with AdX," PTX308 at -243, thereby impeding their ability to enter the market, grow, and compete. See Tr. Sept. 16 PM 137:3–12 (Abrantes-Metz (Pls. Expert)). In addition to providing a revenue advantage, First Look also gave Google a data advantage that helped the AdX team train its auction bidding models more effectively. See Dep. 106:1–21 (Lipkovitz (Google)).

Some large publishers expressed frustration with Google policies that benefited Google and its advertiser customers at its publisher customers' expense, but the vast majority of them continued using DFP as their sole publisher ad server. See PTX254 at -238–39; PTX551 at -048; PTX587 at -794; Tr. Sept. 10 AM 10:16–13:2, 26:22–24, 51:19–52:3, 55:6–56:3 (Layser (News Corp)). DFP remained the "defacto, [sic] preferred ad server of choice for 90% of publishers," PTX254 at -238, because of its guaranteed access to the unique AdWords demand sourced through AdX, the high switching costs associated with changing to another publisher ad server, and the lack of competitive alternatives. See PTX110 at -009; Tr. Sept. 10 AM 10:16–13:2, 26:22–24, 51:19–52:3, 55:6–56:3 (Layser (News Corp)).

E. Admeld Acquisition

Google continued to pursue strategic opportunities to increase its power and scale in the open-web ad tech ecosystem. In 2011, Google acquired Admeld, a yield manager that helped

publishers decide which ad networks and other demand sources to transact with based on supply, demand, and pricing data. See PTX112 at -975, -979; Tr. Sept. 16 AM 46:24–47:1 (Mohan (Google)). Before acquiring Admeld, Google viewed it as a direct competitor that could "disintermediat[e]" Google's control over advertiser-publisher relationships, PTX56 at -783, that risked "break[ing]" Google's ability to enforce policies such as First Look, PTX88 at -597, and that offered a "better publisher base" and improved audience data integration. PTX112 at -981; see also PTX56 at -780, -788–790.

After acquiring Admeld, Google incorporated some of Admeld's features, such as its network yield management functionality, into AdX and DFP to improve Google's sell-side ad tools. See DTX101 at -109; DTX126 at -563–64, -575; Dep. 86:20–87:23 (O'Kelley (Xandr)). But Google also shut down some of Admeld's features, including its ability to pass real-time AdX pricing into non-DFP publisher ad servers. See PTX141 at -448; PTX159 at -002–04; Tr. Sept. 18 AM 47:3–12 (Abrantes-Metz (Pls. Expert)). Google did so, even though some believed that maintaining this functionality would have required "[m]inimal effort," because allowing AdX to submit real-time bids to publishers using non-Google ad servers would have "[t]ake[n] away a key differentiator for DFP." PTX113 at -804; see also Tr. Sept. 18 AM 47:3–23 (Abrantes-Metz (Pls. Expert)). The deprecation of Admeld features was consistent with Google's pre-acquisition plan to "pick[] up the [yield manager] with the most traction and park[] it somewhere." PTX58 at -800.

F. Header Bidding and Open Bidding

By early 2014, AdX had emerged as the world's leading ad exchange and was winning 53% of publisher inventory that DFP made available for auction. PTX174 at -635. Publishers, concerned about Google's dominance, sought to improve competition between AdX and other

exchanges by negating Google's First Look advantage. See PTX587 at -794; PTX1710 at -407; Tr. Sept. 9 AM 152:9–153:7 (Casale (Index Exchange)); Tr. Sept. 9 PM 136:12–19 (Avery (Kevel)). Working together, non-Google industry members and open-source advocates formed an organization called Prebid which developed header bidding, a technical solution that allowed publishers using DFP to solicit real-time bids from multiple ad exchanges. See Joint Glossary at 6; PTX284 at -290; PTX587 at -794; Tr. Sept. 9 PM 136:12–19 (Avery (Kevel)). Specifically, header bidding was a workaround that involved a publisher inserting a string of code into the header of its webpage to solicit bids from multiple ad exchanges and hold fair auctions for the publisher's inventory outside of Google's technical architecture. See Joint Glossary at 6; PTX1677 at -692–93; Tr. Sept. 9 PM 136:12–19 (Avery (Kevel)); Tr. Sept. 12 PM 97:8–98:7 (Goel (PubMatic)). The winning bid in a header bidding auction would often be placed into DFP as a floor price against which AdX would compete. See Tr. Sept. 23 AM 34:23–36:19 (Korula (Google)). Header bidding rapidly gained popularity and achieved widespread adoption by large publishers in 2015. See DTX2085; PTX507 at -218; Tr. Sept. 9 AM 74:24–75:5 (Wolfe (Gannett)); Tr. Sept. 10 AM 45:6–21 (Layser (News Corp)). By introducing head-to-head competition among ad exchanges, header bidding "dramatically increase[d]" publisher revenue. PTX507 at -218; see also PTX587 at -794.

Google was wary of header bidding, seeing it as a risk to its revenue model that relied upon AdX having a real-time First Look at publisher inventory. See PTX234 at -236; PTX433 at -601; PTX587 at -794 (Google email recognizing that header bidding "gives many publishers better yield, so it's a no-brainer for a publisher to adopt it"). Google declined to have AdX participate in header bidding, thereby avoiding direct head-to-head competition between AdX

and other ad exchanges, such as Index Exchange, Magnite, OpenX, and PubMatic. See Tr. Sept. 11 AM 112:19–113:12 (Ravi (Pls. Expert)); Tr. Sept. 13 AM 31:2–21 (Kershaw (Magnite)).

Instead, Google implemented new features and policy changes to counteract the growing threat of header bidding. In 2018, Google developed Open Bidding—a tool that mimicked the functionality of header bidding but occurred within DFP—with the goal of creating a "slightly better" version of header bidding, PTX1543 at -604; Tr. Sept. 9 AM 158:15–159:10 (Casale (Index Exchange)); Tr. Sept. 19 AM 148:8–12 (Bellack (Google)), so that rival exchanges would conduct their bidding within Google's ad tech ecosystem. See Tr. Sept. 19 PM 23:22–24:23 (Levitte (Google)); Tr. Sept. 23 AM 38:19–39:16 (Korula (Google)). In moving rival ad exchanges' bidding to Open Bidding, Google sought to mitigate the competitive pressure those rival exchanges could exert on AdX and DFP. See Tr. Sept. 13 AM 10:19–12:8 (Kershaw (Magnite)). But Open Bidding was not a substitute for header bidding because it discriminated against non-AdX exchanges, including by extracting a 5% fee from their bids, by prohibiting them from submitting any bids that originated from their own demand-side platforms or ad networks, and by requiring them to share their bid data with Google. See Tr. Sept. 9 AM 160:4–23 (Casale (Index Exchange)); Tr. Sept. 13 AM 11:9–12:9 (Kershaw (Magnite)); Tr. Sept. 19 PM 21:21–22:20, 24:9–25:19 (Levitte (Google)).

G. Last Look

Through a process called Last Look, AdX was able to outbid the winner of the header bidding auction for every impression in DFP. See Tr. Sept. 11 AM 111:18–112:18 (Ravi (Pls. Expert)); Tr. Sept. 11 PM 143:14–22 (Dederick (The Trade Desk)). DFP publishers that wanted to place the winning bid of a header bidding auction in competition with AdX's bids were required to incorporate that winning bid as a price floor in DFP. See Tr. Sept. 16 PM 24:18–25:1

(Weintraub (Pls. Expert)). AdX would then have the unique opportunity to adjust its bid in response to the highest bid from rival ad exchanges. See id.; Dep. 123:6–126:19 (O'Kelley (Xandr)). In what was otherwise a sealed auction, Last Look let AdX "open the envelope for the winning bid, know what the winning bid [wa]s, and be able . . . to bid after everybody else." Tr. Sept. 18 AM 37:7–38:1 (Abrantes-Metz (Pls. Expert)). Being able to view its competitors' bids provided Google and its advertising customers with a "significant informational advantage," PTX816 at -161, that "significantly disadvantage[d] other competitors" in the ad exchange space. PTX1709 at -934; see also Tr. Sept. 11 AM 121:17–21 (Ravi (Pls. Expert)); Tr. Sept. 12 PM 101:24–102:15 (Goel (PubMatic)). Last Look also harmed publishers using DFP, who were not compensated as much as they would have been for their inventory had Google's AdX demand been required to compete with third-party exchanges (i.e., non-Google exchanges) on a level playing field. See Tr. Sept. 11 AM 120:23–121:16 (Ravi (Pls. Expert)). Because AdX could "see all the other bids" with Last Look, it could "just bid 1 cent more," which "harm[ed] publishers" by reducing their revenue in comparison to a situation in which AdX had to bid without knowledge of competing bids. Tr. Sept. 12 PM 101:13–23 (Goel (PubMatic)).

H. Sell-side Dynamic Revenue Share

Google further expanded AdX's Last Look advantage by using a pricing model called sell-side dynamic revenue share. This dynamic pricing model allowed AdX to adjust its take rate—the percentage fee it charged—on an impression-by-impression basis to "exploit the last look advantage." PTX542 at -335. Although AdX maintained an overall take rate of around 20%, it would lower its take rate below 20% on competitive impressions that had received relatively high offers from third-party exchanges via header bidding. Tr. Sept. 11 AM 114:5–116:16 (Ravi (Pls. Expert)). Selectively lowering its take rate on competitive impressions made

AdX's advertisers more likely to win auctions for those impressions, as publishers ranked bids by the revenue they offered net of fees. See id. AdX would compensate for such temporary losses in revenue by charging a take rate above 20% for impressions where its advertisers faced less competition from third-party exchanges. Id. For example, AdX would charge a 15% or lower take rate for competitive impressions, and a 25% or higher take rate for less competitive impressions, all the while maintaining an average take rate of around 20%. See id. This dynamic approach helped AdX advertisers win more auctions, and caused advertisers using third-party exchanges, including those exchanges that participated in header bidding, to win fewer auctions. See id. Because third-party exchanges did not have Last Look to "see all the bids" and vary their take rate accordingly, they lost scale and revenue from AdX's use of sell-side dynamic revenue share. Dep. 163:9–165:11 (O'Kelley (Xandr)); see also PTX1328; PTX1329; Tr. Sept. 16 PM 28:9–29:3 (Weintraub (Pls. Expert)). Through the advantages provided by Last Look and sell-side dynamic revenue share, Google helped mitigate the risk that header bidding posed to its ad tech products, and enabled AdX to remain the world's largest ad exchange. See PTX819 at -318; PTX1258; PTX1326; Tr. Sept. 16 PM 28:9–29:8 (Weintraub (Pls. Expert)).

I. Project Poirot

In 2017, while Google was still facing what some of its employees viewed as "the existential threat posed by Header Bidding" and the concomitant growth of third-party ad exchanges, Google launched Project Poirot. PTX433 at -601; see also PTX284 at -290; PTX545 at -115; PTX786 at -716; PTX1545 at -142. With Project Poirot, Google "shaded," or lowered, bids from its demand-side platform DV360 on impressions offered for sale on non-AdX exchanges. See Tr. Sept. 11 AM 125:24–126:4 (Ravi (Pls. Expert)); Tr. Sept. 17 AM 84:12–

86:13 (Jayaram (Google)). Publishers more frequently rejected these shaded bids from non-AdX exchanges, which offered them less revenue, and increasingly accepted bids from AdX. See PTX545 at -115; PTX734 at -596 (stating Project Poirot "generate[d] margins by shifting inventory to AdX"); Tr. Sept. 17 AM 84:12–86:13 (Jayaram (Google)). The first version of Project Poirot resulted in advertisers that used DV360 spending an average of 9% more on AdX and 10% less on non-AdX exchanges. See PTX545 at -115; PTX587 at -794. In late 2018, after the second version of Project Poirot was launched, DV360 bids on non-AdX exchanges decreased in value by as much as 90%, resulting in DV360 advertisers dedicating an even higher proportion of their advertising spending to AdX. See Tr. Sept. 16 PM 32:18–33:5 (Weintraub (Pls. Expert)). AdX's main competitors, meanwhile, saw their revenue from DV360 advertisers decrease by an average of 15%. See PTX860 at -683–84. One main ad exchange competitor, OpenX, experienced a 40% decrease in revenue from DV360, which "damaged" the company "very severely" and contributed to 45% of its staff being laid off. Tr. Sept. 17 PM 66:15–67:25 (Cadogan (OpenX)); see also PTX860 at -684; PTX1600 at -011.

J. Unified Pricing Rules

By 2019, Google was facing pressure from publishers to improve the transparency and fairness of its advertising auction processes. There was also an increasing belief within Google that its size in the ad tech space and the policies it had implemented to benefit its products across the ad tech stack posed regulatory and "competition concerns." PTX816 at -161. In response, Google agreed to remove Last Look. See id.; Tr. Sept. 23 AM 152:3–153:13 (Korula (Google)). But Google simultaneously introduced Unified Pricing Rules, a policy that prohibited publishers using DFP from setting higher price floors for AdX than for other exchanges. See PTX762 at -291; Tr. Sept. 10 AM 60:3–14 (Layser (News Corp)); Tr. Sept. 18 AM 149:1–8 (Wheatland

(Daily Mail)). Unified Pricing Rules also prohibited DFP publishers from setting higher price floors for Google AdWords demand than for demand from other ad networks or demand-side platforms. See Tr. Sept. 10 AM 119:9–120:2 (Layser (News Corp)).

Google advertised Unified Pricing Rules as consistent with the removal of Last Look, positing that both policy changes would make auctions safer and simpler. See Tr. Sept. 23 AM 93:24–94:9 (Korula (Google)); Sept. 24 AM 134:8–21 (Milgrom (Def. Expert)). Google knew, however, that many publishers using DFP had been setting higher pricing floors for AdX than for other exchanges so that they could reduce their high dependence on Google's ad tech stack. See PTX609 at -146; PTX611 at -792, -802; PTX698 at -021; Tr. Sept. 10 AM 49:16–50:9 (Layser (News Corp)). Google recognized that publisher "revenue diversity" was beneficial, and that publishers were willing to "tolerate some revenue loss in exchange for reduced dependance" on Google. PTX609 at -146; see also PTX469 at -512. Publishers also set higher floor prices on AdX to screen out low-quality ads, which were more likely to originate from smaller advertisers using AdWords. See PTX534 at -306; PTX609 at -146; Tr. Sept. 10 AM 49:25–50:3, 119:9–21 (Layser (News Corp)). Despite its name, Unified Pricing Rules did not require a level playing field between exchanges, as it permitted publishers to set higher price floors on third-party exchanges than on AdX. See Tr. Sept. 10 AM 60:7–14 (Layser (News Corp)); Tr. Sept. 18 AM 149:1–8 (Wheatland (Daily Mail)); Tr. Sept. 23 AM 157:8–158:20 (Korula (Google)).

Some of Google's largest publisher customers were disgruntled with the implementation of Unified Pricing Rules, which reduced their ability to control ad pricing, maintain ad quality, and diversify their sources of revenue. See PTX751 at -120–21; PTX763 at -165–66; PTX1854 at 25:1–6, 55:1–56:20. But these same publishers continued using DFP as their sole publisher ad server, believing that they had "very little" ability to switch given DFP's tie to the unique

advertising demand from AdX and AdWords. Tr. Sept. 18 AM 147:1–12, 150:20–151:9 (Wheatland (Daily Mail)); see also PTX754 at -321; Tr. Sept. 10 AM 51:14–52:7, 53:8–10, 55:6–57:25, 109:23–110:9 (Layser (News Corp)).

Unified Pricing Rules increased the number of impressions AdX won and the revenue it received, while decreasing impressions won and revenue received by third-party exchanges. See DTX768 at -933; PTX819 at -318; Tr. Sept. 12 AM 20:16–20 (Srinivasan (Google)); Tr. Sept. 18 AM 41:20–42:11, 43:8–17 (Abrantes-Metz (Pls. Expert)). For at least one major publisher, The Daily Mail, Unified Pricing Rules also resulted in lower revenue per impression. See PTX1633 at -123. The overall result of Unified Pricing Rules was that Google's ad tech products continued to gain scale in the display advertising space while rival ad tech products lost scale. See PTX1035 at -360; PTX1331; PTX1621 at -158; Tr. Sept. 16 PM 29:18–25, 31:8–15 (Weintraub (Pls. Expert)). This was consistent with what one Google employee said was the "primary objective" of the 2019 changes to DFP: "to help the buyside" of Google's ad tech products, namely AdWords and DV360. PTX763 at -165.

K. Google's Ad Tech Today

Since Unified Pricing Rules were implemented in 2019, Google has remained the dominant force in open-web display advertising. On the sell-side, DFP has remained the leading publisher ad server, and AdX has continued to be the leading ad exchange. See PTX1236; PTX1236A; PTX1237; PTX1237A; PTX1238; PTX1238A; PTX1258; PTX1277; PTX1277A; PTX1278; PTX1278A; PTX1314. On the buy-side, DV360 has remained one of the leading demand-side platforms, see Tr. Sept. 12 PM 11:13–21 (Dederick (The Trade Desk)), and AdWords has remained the leading source of small and medium-sized online advertisers, having benefited greatly from being the platform through which advertisers purchase Search ads. See

PTX1243; PTX1243A: Tr. Sept. 9 AM 129:18–130:22 (Casale (Index Exchange)); Tr. Sept. 11 PM 153:6–154:11 (Dederick (The Trade Desk)) (describing the pool of advertisers that use AdWords to purchase Search ads as the "greatest source of demand in the history of advertising").

Google's unparalleled scale in programmatic advertising has given it significant advantages over rival firms. Scale is a crucial factor for ad tech companies' ability to compete because of the importance of big data analytics for optimizing ad tech services and the significant network effects that exist in programmatic advertising. See Tr. Sept. 9 AM 144:20–147:17 (Casale (Index Exchange)); Tr. Sept. 11 PM 110:21–25 (Dederick (The Trade Desk)); Tr. Sept. 12 PM 103:2–21 (Goel (PubMatic)); Tr. Sept. 16 PM 7:9–16:7 (Weintraub (Pls. Expert)). The unmatched scale that Google has achieved across the open-web ad tech stack helps the company test products more quickly and make higher-quality matches between advertisers and publishers. See Tr. Sept. 13 PM 74:13–75:6 (Creput (Equativ)); Tr. Sept. 16 PM 9:15–16:7 (Weintraub (Pls. Expert)); Tr. Sept. 23 PM 136:7–137:2 PM (John (Microsoft)). As ad tech products continue to integrate artificial intelligence and machine learning capabilities, Google's vast repositories of data about advertisers, publishers, and Internet users, combined with the company's scale and technical sophistication, will further benefit its open-web display advertising business. See Tr. Sept. 9 AM 146:4–147:17 (Casale (Index Exchange)); Tr. Sept. 11 AM 138:7–139:8 (Ravi (Pls. Expert)); Tr. Sept. 11 PM 95:18–96:7 (Dederick (The Trade Desk)); Tr. Sept. 12 PM 137:9–19 (Goel (PubMatic)); Tr. Sept. 13 PM 75:7–20 (Creput (Equativ)); Tr. Sept. 20 PM 160:13–161:8 (John (Microsoft)); Tr. Sept. 23 AM 48:13–49:15 (Korula (Google)); Tr. Sept. 23 PM 32:8–12 (Stefaniu (Google)); Tr. Sept. 24 PM 49:15–50:6 (Bjorke (Google)).

VI. Monopolization Claims

Plaintiffs contend that Google violated Section 2 of the Sherman Act by monopolizing three markets within the open-web display advertising technology ecosystem: the publisher ad server market, the ad exchange market, and the advertiser ad network market. See Amended Complaint at 136–42. Section 2 of the Sherman Act, in relevant part, makes it unlawful to "monopolize, or attempt to monopolize, . . . any part of the trade or commerce among the several States, or with foreign nations." 15 U.S.C. § 2. Considering the purpose of the Sherman Act and its use of broad language, the Supreme Court has determined that it was "enacted for 'the protection of competition, not competitors.'" Atlantic Richfield Co. v. USA Petroleum Co., 495 U.S. 328, 338 (1990) (quoting Brown Shoe Co. v. United States, 370 U.S. 294, 320 (1962)); see also Nat'l Collegiate Athletic Ass'n v. Alston, 594 U.S. 69, 73 (2021) ("In the Sherman Act, Congress tasked courts with enforcing a policy of competition."); N. Pac. Ry. Co. v. United States, 356 U.S. 1, 4 (1958). Accordingly, "[t]he purpose of the Act is not to protect businesses from the working of the market; it is to protect the public from the failure of the market." Spectrum Sports, Inc. v. McQuillan, 506 U.S. 447, 458 (1993); see also Reiter v. Sonotone Corp., 442 U.S. 330, 343 (1979) (suggesting Congress intended the Sherman Act to be a "consumer welfare prescription").

The offense of monopolization "has two elements: (1) the possession of monopoly power in the relevant market and (2) the willful acquisition or maintenance of that power as distinguished from growth or development as a consequence of a superior product, business acumen, or historic accident." Eastman Kodak Co. v. Image Tech. Servs., Inc., 504 U.S. 451, 481 (1992) (quoting United States v. Grinnell Corp., 384 U.S. 563, 570–71 (1966)); accord E.I.

du Pont de Nemours & Co. v. Kolon Indus., Inc., 637 F.3d 435, 441 (4th Cir. 2011) ("Kolon"). Plaintiffs bear the burden of proving each element. Kolon, 637 F.3d at 441.

Google disagrees with Plaintiffs' contention that it has willfully acquired and maintained monopoly power in three distinct product markets, and instead claims that the entire digital ad tech ecosystem—which includes publisher ad servers, ad exchanges, ad networks, and other tools that facilitate transactions between advertisers and publishers—should be analyzed as a single, two-sided market. Google also disputes Plaintiffs' focus on open-web display advertising, arguing that ad technology which facilitates the buying and selling of other types of digital ads, such as mobile app ads, social media ads, and instream video ads, should be included in the relevant market. Plaintiffs and Google further clash over the geographic scope of the relevant market, with Plaintiffs arguing that a worldwide market is most appropriate and Google arguing that only the U.S. market should be considered.

Because the scope of the relevant market is central to this litigation, the Court's analysis of Plaintiffs' claims starts "with a preliminary inquiry into market definition, which serves as a tool to determine the defendant's market power." Kolon, 637 F.3d at 441. Defining the relevant market first is crucial here because "without a definition of the market there is no way to measure the defendant's ability to lessen or destroy competition." Ohio v. Am. Express Co., 585 U.S. 529, 543 (2018) ("Amex") (internal quotation and brackets omitted).

A. Market Definition

The relevant market is "the area of effective competition." Id. (internal citation omitted). This is often the "arena within which significant substitution in consumption or production occurs." Id. (quoting Phillip E. Areeda & Herbert Hovenkamp, Fundamentals of Antitrust Law § 15.02[B] (4th ed. 2017)). In other words, a relevant product market is one that includes

"reasonably interchangeable" products from the perspective of the consumers of those products. It's My Party, Inc. v. Live Nation, Inc., 811 F.3d 676, 683 (4th Cir. 2016) (quoting United States v. E.I. du Pont de Nemours & Co., 351 U.S. 377, 395 (1956)); accord Kodak, 504 U.S. at 482. Determining the relevant market should be grounded in "commercial realities," Kodak, 504 U.S. at 482, and involves a "pragmatic, factual" analysis, "not a formal, legalistic" one. Brown Shoe, 370 U.S. at 336. As such, courts often consider "practical indicia" of the relevant market, such as "industry or public recognition of the [market] as a separate economic entity, the product's peculiar characteristics and uses, unique production facilities, distinct customers, distinct prices, sensitivity to price changes, and specialized vendors." Id. at 325; see, e.g., Regeneron Pharm., Inc. v. Novartis Pharma AG, 96 F.4th 327, 339 (2nd Cir. 2024). Delineating the bounds of the relevant market necessarily involves considering "the relevant product market and the relevant geographic market." Kolon, 637 F.3d at 441; accord Brown Shoe, 370 U.S. at 324.

1. Product Markets

a. Publisher Ad Server Market

The Court finds that publisher ad servers for open-web display advertising constitute a distinct relevant product market. Publisher ad servers for open-web display advertising are uniquely suited for managing ad inventory for large web publishers, are priced differently than other ad tech tools, and are recognized as a distinct product by ad tech industry participants. Consequently, other ad tech tools are not reasonably interchangeable with publisher ad servers. The lack of substitutability between publisher ad servers and alternative tools is evidenced by how successful Google's publisher ad server has been in maintaining dominant market share among the largest open-web publishers. Indeed, the commercial realities of the publisher ad server market suggest that a monopolist could engage in anticompetitive conduct by raising

prices or degrading product quality without seeing significant diminution of its customer base. For these reasons, publisher ad servers for open-web display advertising constitute the area of effective competition and form a relevant antitrust market.

Publisher ad servers for open-web display advertising have a distinct purpose: they help publishers manage and monetize their web ad inventory. Tr. Sept. 9 AM 119:9–21 (Casale (Index Exchange)); Tr. Sept. 16 AM 22:5–14 (Mohan (Google)) ("By definition, publishers couldn't really manage their display advertising without an ad server."). Publisher ad servers do this by offering a number of unique product features to publishers, such as allocating ad inventory between direct sales and programmatic sales; placing ad exchange bids in competition with bids from header bidding, programmatic direct sales,[18] and other ad exchanges; rendering an advertisement on the publisher's webpage for each impression; billing for ads rendered; and providing inventory and revenue analytics. See DTX376 at -940, -943; PTX1572 at -693; Tr. Sept. 9 AM 119:9–121:16 (Casale (Index Exchange)); Tr. Sept. 19 PM 61:18–65:20 (Lee (Pls. Expert)); Tr. Sept. 20 PM 78:4–25 (Sheffer (Google)).

Publisher ad servers, which charge publishers a flat fee per impression sold, are priced differently than ad exchanges, which charge publishers a percentage-based fee per impression sold, and demand-side platforms, which charge advertisers a percentage-based fee per impression purchased. See PTX188 at -963; Tr. Sept. 26 AM 120:20–121:3 (Israel (Def. Expert)). Moreover, publisher ad servers are much less expensive than other ad tech tools. For large open-web publishers, publisher ad server fees typically average about 1% to 2% of the revenue generated by the sale of the impression, which is significantly lower than the double-digit

[18] Programmatic direct sales are a type of programmatic advertising in which a certain amount of a publisher's inventory is reserved for a specific advertiser. See Joint Glossary at 7; Tr. Sept. 10 PM 22:2–14 (Friedman (Goodway Group)).

percentage take rate charged by ad exchanges—the other primary ad tech tool that large publishers use for open-web display advertising. See DTX1977; PTX188 at -963; Tr. Sept. 20 PM 79:13–18 (Sheffer (Google)); Tr. Sept. 26 AM 121:10–16, 132:22–25 (Israel (Def. Expert)) (stating that DFP fees equate to a "take rate[]" of "1.7 percent to 1.3 percent," whereas take rates are around 20% "for an auction run on AdX").

The unique purpose, features, and pricing of the publisher ad server has resulted in its being recognized as a distinct product within the ad tech industry. In the ordinary course of business, Google regularly identified its publisher ad server, DFP, as being a unique product, and the firm has assessed its market share in display web publisher ad serving. See, e.g., PTX15 at -990–91; PTX847 at -261 (identifying DFP alongside other publisher ad servers in a "display ads landscape" chart); PTX946 at -807 (differentiating between AdX and DFP revenue). Google marketed DFP as a distinct product until it rebranded DFP as part of the Google Ad Manager product suite in 2018. See, e.g., PTX847 at -261; PTX993 at -310; see also Tr. Sept. 9 AM 121:20–122:10 (Casale (Index Exchange)). Other technology firms that participate in the ad tech ecosystem, including AppNexus, Equativ, Index Exchange, Meta, and Microsoft, also recognize the publisher ad server as a unique product. See, e.g., DTX1487 at -850–51; PTX580 at -802–05; PTX1709 at -937; Tr. Sept. 9 AM 119:9–122:10 (Casale (Index Exchange)); Tr. Sept. 13 PM 62:11–63:1 (Creput (Equativ)); Tr. Sept. 20 PM 131:5–21 (John (Microsoft)). As do publishers, such as Gannett and News Corp. Tr. Sept. 9 AM 66:1–67:7 (Wolfe (Gannett)); Tr. Sept. 10 AM 30:17–32:7 (Layser (News Corp)). Even Dr. Mark Israel, Google's market definition expert who contended that there was not a relevant market for publisher ad servers, agreed that publisher ad servers are "components" of the ad tech stack that "serve different purposes" from buy-side

tools, ad exchanges, and in-house ad tech used by social media companies. See Tr. Sept. 26 PM 45:9–19, 47:18–48:3 (Israel (Def. Expert)).

Moreover, the commercial realities of the publisher ad server market support the conclusion that a monopolist could engage in anticompetitive conduct without realizing significant customer loss. Dr. Robin Lee, an economics professor and Plaintiffs' market definition expert, provided credible testimony that a hypothetical monopolist of publisher ad servers for open-web display advertising could profitably increase price or degrade quality without the risk of significant substitution due to the lack of close alternative products available to publishers. Tr. Sept. 19 PM 55:10–57:15, 60:4–67:17 (Lee (Pls. Expert)). Indeed, although Google decreased DFP's quality by "plac[ing] restrictions on how publishers could work with rival ad exchanges" (e.g., giving AdX advantages over third-party exchanges with First Look and Last Look) and by removing features that its publishers used (e.g., eliminating variable price floors with Unified Pricing Rules), DFP still maintained 99 of its top 100 publisher customers in the ensuing years. Tr. Sept. 19 PM 66:7–67:11, 68:21–70:1 (Lee (Pls. Expert)); see Sections V(C–G) and V(J), supra. Moreover, Google estimated internally that it could increase net revenue by at least $40 million by raising DFP prices by 20%. PTX611 at -798. Both Google's dominant grip on the publisher ad server market even after ill-received product changes and its internal estimates indicating a lack of customer sensitivity to price increases support the Court's conclusion that publisher ad servers constitute a distinct relevant product market.

Google nevertheless contends that Plaintiffs' focus on publisher ad servers for open-web display advertising is too narrow because publisher ad servers can be used to manage other ad types. For example, Google points out that DFP helps publishers manage not only display ads shown on the open web, but also mobile app ads and instream video ads. Google also observes

that companies operating walled-garden websites with integrated ad tech stacks, such as Amazon and Meta, show display ads on their websites using in-house technology that offers much of the functionality of publisher ad servers.

Although digital advertising is not limited to open-web display advertising, the evidence in the record supports the conclusion that publisher ad servers for open-web display advertising constitute a distinct, relevant market because they are uniquely capable of performing ad-serving functions for websites, which are essential components of news, media, and other online publishers' businesses. Organizations that publish primarily text-based news content online, such as The New York Times or The Wall Street Journal, cannot monetize the primary content on their websites with instream video ads. See Tr. Sept. 10 AM 31:1–17 (Layser (News Corp)); Tr. Sept. 19 PM 59:16–60:3, 62:1–15, 64:4–65:3, 72:1–17 (Lee (Pls. Expert)). Nor can they feasibly forgo monetizing their websites and publish revenue-generating content only through alternative digital channels, such as via mobile apps or social media pages. See Tr. Sept. 27 AM 59:20–60:18 (Wheatland (Daily Mail)); Tr. Sept. 10 AM 31:1–33:2 (Layser (News Corp)); Tr. Sept. 20 PM 78:4–25 (Sheffer (Google)); Tr. Sept. 26 PM 47:18–49:3 (Israel (Def. Expert)) (agreeing that publishers cannot use social media platforms to sell display ad inventory on their websites).

Unlike on the open web, publishers using apps and social media are subject to content regulation by and revenue sharing with the large technology firms that control mobile app stores and social media platforms, such as Apple, Google, Meta, and TikTok. See Tr. Sept. 12 PM 71:18–72:10 (Goel (PubMatic)); id. at 72:24–73:21 (explaining how "the app environment tends to be controlled by a couple of large [operating system and mobile device] providers, like Apple or Google"); Tr. Sept. 27 AM 66:11–17 (Wheatland (Daily Mail)); see, e.g., Community Guidelines, YouTube, https://www.youtube.com/howyoutubeworks/policies/community-

guidelines (last visited Mar. 27, 2025). Monetizing their websites, instead of just their content on app and social media pages, is therefore crucial for publishers who wish to retain a greater degree of editorial independence. The economic sustainability of publishers' open-web properties also benefits those Internet users who would prefer not to have much of the information that they consume online directly captured and regulated by a few large corporations.

It is also infeasible for publishers to shift their users away from their websites to apps or social media pages. See Tr. Sept. 27 AM 59:20–60:18, 65:6–21 (Wheatland (Daily Mail)). Many web publishers rely on users reaching their content via search engines or hyperlinks from other websites, and would only have a fraction of their current users if they required users to download mobile apps or follow them on social media in order to access their content. See id. at 66:2–66:5 ("[I]t is hugely difficult to convert a web user to be a loyal app user . . . 2 percent of our . . . readership is on [our] apps."); Tr. Sept. 10 AM 31:20–33:2 (Layser (News Corp)); Tr. Sept. 19 PM 76:21–77:11 (Lee (Pls. Expert)). Open-web display ads are therefore not reasonably interchangeable with social media, in-app, and instream video ads from the perspective of news, media, and other online publishers. Accordingly, publisher ad servers for social media, in-app, or instream video advertising are not reasonably interchangeable with, or significantly substitutable for, publisher ad servers for open-web display advertising. See Amex, 585 U.S. at 543; Kodak, 504 U.S. at 482 (explaining that interchangeability is assessed from the perspective of the consumer); It's My Party, Inc., 811 F.3d at 683.

Nor are in-house technologies developed by publishers to serve display ads on their websites reasonably interchangeable with publisher ad servers. Building an in-house ad server is "incredibly sophisticated and incredibly complex," and is not within the "core competencies" of

most organizations that publish news or other content online. Tr. Sept. 9 AM 73:1–8 (Wolfe (Gannett)); see also Tr. Sept. 9 AM 125:2–25 (Casale (Index Exchange)); Tr. Sept. 18 AM 132:7–17 (Wheatland (Daily Mail)). The "extremely major investment" required to develop a publisher ad server makes doing so infeasible for companies that do not specialize in enterprise software development. Tr. Sept. 13 PM 82:6–17, 91:8–15 (Creput (Equativ)); see also Tr. Sept. 18 AM 132:7–17 (Wheatland (Daily Mail)). Once built, maintaining an in-house publisher ad server is also difficult given the significant "operational support," "infrastructure[, and] capital resources required" for both day-to-day maintenance and continuous evolution to keep apace with third-party publisher ad servers. Tr. Sept. 26 PM 141:15–142:5 (Glogovsky (New York Times)); see also PTX174 at -633. As a result, very few publishers have successfully developed and used an in-house publisher ad server, and almost all of those publishers are large digital technology companies. See Tr. Sept. 19 PM 65:4–20 (Lee (Pls. Expert)); Tr. Sept. 26 AM 126:5–127:19 (Israel (Def. Expert)) (identifying Amazon, Google, Meta, Reddit, Snapchat, and TikTok as companies that "have their own ad tech, including their own ad server"). Even fewer publishers use their in-house publisher ad servers for open-web display advertising. Instead, they more often use in-house servers to meet site-specific needs, such as serving customized, native ad formats like social media ads or sponsored listings. See Tr. Sept. 9 PM 66:11–67:24 (Lowcock (IPG)); Tr. Sept. 17 PM 122:3–16, 123:12–14, 131:24–132:3, 133:11–13 (Helfand (Disney)); Tr. Sept. 19 PM 68:21–70:1 (Lee (Pls. Expert)); Tr. Sept. 26 AM 66:2–22, 126:5–129:16 (Israel (Def. Expert)). For example, Meta uses in-house ad serving technology to show ads that are "blended well into the experience of Instagram," and Amazon's in-house ad serving technology lets brands pay to "move their [product] listing[s] higher" in Amazon.com's shopping search results. Tr. Sept. 9 PM 128:8–25 (Avery (Kevel)).

Lastly, other technologies capable of serving display ads on open-web publishers' websites are not reasonably interchangeable with—and cannot serve as effective substitutes for—publisher ad servers. For example, the publisher-facing side of an ad network, such as Google AdSense, is not a reasonable alternative for large publishers because an ad network cannot place a variety of advertising demand sources in competition with each other for each impression; instead, an ad network is limited to sourcing bids from advertisers who have signed up for the network. See PTX88 at -603; Tr. Sept. 16 AM 92:24–93:14 (Mohan (Google)); Tr. Sept. 18 AM 202:18–203:16 (Pappu (Google)); Tr. Sept. 27 AM 58:2–6 (Wheatland (Daily Mail)); see also Sections IV(B) and V(A), supra. Therefore, a publisher relying on an ad network alone cannot use that network to display ads sold via direct deals, which remain a significant proportion of large publishers' ad revenue. See Tr. Sept. 10 AM 29:8–30:10 (Layser (News Corp)); Tr. Sept. 20 PM 110:23–111:5 (Sheffer (Google)).

b. Ad Exchange Market

The Court also finds that ad exchanges for open-web display advertising constitute a distinct relevant product market. Ad exchanges play a distinct role in the open-web display ad tech stack by connecting publishers using publisher ad servers with advertisers using programmatic buying tools such as demand-side platforms and ad networks. Due to their unique ability to collect and rank ad bids from multiple buying tools in mere milliseconds, ad exchanges are involved in most programmatic open-web display transactions, are recognized as a distinct product by industry participants, and are priced differently than other ad tech tools. Accordingly, there is no other ad tech tool that is reasonably interchangeable with ad exchanges. The lack of substitutability between ad exchanges and alternative tools means that a monopolist could profitably raise prices significantly above competitive levels, as Google determined in a study

that showed its ad exchange price changes had limited effect on its customers' behavior. For these reasons, ad exchanges for open-web display advertising constitute "the area of effective competition" and form a relevant antitrust market. Amex, 585 U.S. at 543.

The ad exchange is the only ad tech tool through which publishers can auction their ad inventory at scale and in real-time to the largest sources of programmatic advertising demand. Advertisers and their ad agencies use demand-side platforms like DV360 and The Trade Desk, or advertiser-facing sides of ad networks like AdWords, to purchase open-web display advertising programmatically. See Joint Glossary at 5–6; PTX1231; Tr. Sept. 11 PM 104:25–105:17 (Dederick (The Trade Desk)); Tr. Sept. 19 PM 30:2–3 (Kim (Google)). These buying tools bid into ad exchanges, which run real-time auctions to rank sources of advertising demand and select winning bids to be sent to a publisher ad server. Joint Glossary at 5; PTX1031 at -480; Tr. Sept. 9 AM 67:8–18 (Wolfe (Gannett)). Although there are ways for advertising demand to circumvent ad exchanges, such as only buying ads from a closed ad network, the majority of programmatic ad spending flows through ad exchanges. See Tr. Sept. 9 AM 63:1–64:6 (Wolfe (Gannett)) (stating that most of Gannett's programmatic inventory is sold via ad exchange auctions); Tr. Sept. 19 PM 54:13–22 (Lee (Pls. Expert)).

Industry participants consider ad exchanges to be a distinct product that they categorize separately from other ad tech tools. See Tr. Sept. 19 PM 81:11–19 (Lee (Pls. Expert)). Google regularly identifies ad exchanges as a distinct product that differs from publisher ad servers, ad networks, and demand-side platforms. See, e.g., DTX435 at -062; PTX847 at -261; PTX1031 at -478–84; PTX1646 at -469–71. Publishers similarly view ad exchanges as a distinct product. See, e.g., Tr. Sept. 9 AM 67:8–18 (Wolfe (Gannett)). As do third-party ad tech developers,

including companies that specialize in creating ad exchanges. See, e.g., Tr. Sept. 9 AM 109:22–111:12, 122:23–123:6 (Casale (Index Exchange)).

The discrete nature of the ad exchange market is reflected in the distinct prices that ad exchanges charge publishers. Ad exchanges typically charge publishers a percentage of the total winning bid for each impression, while publisher ad servers typically charge publishers a flat fee per impression sold and demand-side tools charge advertisers directly. See Section VI(A)(1)(a), supra. Moreover, given the unique role that ad exchanges play in holding real-time auctions to identify the highest advertiser bids, ad exchanges charge much higher fees than publisher ad servers do, often taking between 10% and 20% of revenue from the winning bid. See Tr. Sept. 13 AM 43:7–17; Tr. Sept. 26 AM 120:20–121:16, 132:17–25 (Israel (Def. Expert)).

Because ad exchanges have unique functionality—as reflected by their distinct pricing structure and the industry's recognition of them as a distinct product—other ad tech tools are not reasonably interchangeable or substitutable with ad exchanges. Although ad networks are another tool for connecting advertisers to publishers, the sophisticated publishers who receive the majority of open-web display advertising revenue do not view ad networks as substitutes for ad exchanges because ad networks offer very limited control and are unable to place bids from disparate demand sources in competition with each other. See PTX88 at -603; PTX1646 at -469–71; Tr. Sept. 18 AM 202:18–203:16 (Pappu (Google)); Tr. Sept. 20 PM 110:23–25 (Sheffer (Google)); Tr. Sept. 27 AM 58:4–6 (Wheatland (Daily Mail)).[19]

[19] "Supply path optimization" tools also offer a way to bypass ad exchanges by connecting advertiser buying tools and publisher ad servers directly. See DTX1544 at -698; Tr. Sept. 19 PM 78:22–79:19 (Lee (Pls. Expert)). But, unlike ad exchanges, these tools do not conduct auctions, are not focused on open-web display advertising, serve many fewer customers, and are not focused on serving publishers' interests. See Tr. Sept. 11 PM 117:6–118:14 (Dederick (The Trade Desk)); Tr. Sept. 19 PM 78:22–79:19 (Lee (Pls. Expert)). That is why the leading developers of supply path optimization tools do not consider them to be viable alternatives to ad

Direct deals with advertisers are also not reasonable substitutes for ad exchanges, given the distinct advantages of programmatic advertising. See Section IV(A), supra. As an internal Google document observes, it would be "highly unlikely" for programmatic advertising to shift to direct deals, in part due to the "[e]fforts required to make and maintain direct connections." PTX978 at -625; see also Tr. Sept. 10 AM 33:5 –36:9 (Layser (News Corp)); Tr. Sept. 18 AM 135:15–136:3 (Wheatland (Daily Mail)); Tr. Sept. 19 PM 78:1–21 (Lee (Pls. Expert)).

The conclusion that ad exchanges lack reasonable substitutes is bolstered by economic analysis suggesting that a monopolist of open-web display ad exchanges could charge anticompetitive prices without significant substitution. For example, an internal Google study projected that a 25% decrease in the price AdX charged would have limited impact on AdX's market share, indicating customer stickiness and inelastic demand. See PTX188 at -979, -012–17; see also Tr. Sept. 19 PM 82:22–85:15 (Lee (Pls. Expert)) (stating PTX188 shows that for "publishers representing over 70 percent of AdX's gross revenue," Google calculated that "their elasticity or expected elasticity is one or less," meaning those publishers would be unlikely to switch away from AdX due to an increase in price). Publishers have particularly inelastic demand for ad exchanges given their inability to turn to alternative tools for placing demand sources in competition with each other and for maximizing the monetization of their web inventory. See Tr. Sept. 19 PM 73:24–74:22, 82:22–85:15 (Lee (Pls. Expert)); see also Tr. Sept. 18 PM 36:14–19 (Simcoe (Pls. Expert)). Therefore, a monopolist for open-web display ad exchanges could likely charge supracompetitive prices[20] without seeing customers switch to rival

exchanges for bidding on open-web display ads. See Tr. Sept. 11 PM 118:5–14 (Dederick (The Trade Desk)); Tr. Sept. 12 PM 154:12–24 (Goel (PubMatic)).

[20] Supracompetitive prices are prices above those that could be sustained in a competitive market. Tr. Sept. 16 PM 129:22–130:2 (Abrantes-Metz (Pls. Expert)).

products in sufficient numbers to constrain the monopolist's prices. See Tr. Sept. 18 PM 7:13–8:3 (Simcoe (Pls. Expert)); Tr. Sept. 19 PM 81:20–82:14, 85:1–89:12 (Lee (Pls. Expert)).

Google contends that Plaintiffs' expert Dr. Lee drew the ad exchange market too narrowly by focusing only on exchanges that facilitate the sale of open-web display inventory. But just as with publisher ad servers, ad exchanges that facilitate the sale of only instream video, mobile app, or social media ads are not helpful for publishers seeking to monetize their open-web display inventory. See PTX764 at -251–54, -259–61 (Google document categorizing its "display web" business as distinct from its "display app," "search," "native web," and "video instream" businesses); Tr. Sept. 9 AM 112:1–118:22 (Casale (Index Exchange)). For example, a publisher of a text-based website that does not host video content cannot use an ad exchange that runs auctions solely for instream video ads to monetize the ad inventory on its website, because instream video ads are akin to television ads and designed to run inside a website's video player. See Tr. Sept. 9 AM 117:12–118:22 (Casale (Index Exchange)); Tr. Sept. 19 PM 53:4–18, 64:23–25 (Lee (Pls. Expert)). To monetize its display ad inventory, the publisher must instead use an ad exchange that facilities the sale of open-web display ads. See Tr. Sept. 9 AM 117:12–118:22 (Casale (Index Exchange)); Tr. Sept. 19 PM 53:4–18, 64:23–25 (Lee (Pls. Expert)). And so the only other products that are reasonably interchangeable with an ad exchange that facilitates the sale of open-web display ads are other ad exchanges that facilitate the sale of open-web display ads.

c. Advertiser Ad Network Market

The Court finds that Plaintiffs have failed to show that advertiser ad networks for open-web display advertising constitute a relevant product market. In proposing a market for "advertiser ad networks," Plaintiffs use a term that is not common in the digital advertising

industry and unduly exclude the publisher-facing side of two-sided ad networks. Moreover, the segmentation of advertiser ad networks for open-web display advertising as its own market is inconsistent with the substitution that occurs from the perspective of advertisers between open-web display ads and other types of display ads, including in-app and walled-garden display ads.

Ad networks were created to connect publishers' inventory with advertisers' ads by aggregating advertisers and publishers within a single, two-sided platform. See Sections IV(B) & V(A), supra; Tr. Sept. 10 PM 28:8–21, 29:5–7 (Friedman (Goodway Group)); Tr. Sept. 16 PM 47:15–25 (Weintraub (Pls. Expert)). In performing this connection, ad networks "typically represent[] both the interests of the publisher or media, as well as the marketer or the advertisers." Tr. Sept. 9 AM 109:22–110:8 (Casale (Index Exchange)). Considering solely the advertiser-facing portion of an ad network, which is Plaintiffs' position, would unduly ignore that ad networks intermediate between two groups, benefit from indirect network effects, and compete for transactions with other two-sided platforms. See Amex, 585 U.S. at 534–46.

In accordance with their two-sided nature, "ad networks" are typically referred to as a single product by industry participants, who generally do not draw a distinction between "advertiser ad networks" and the publisher-facing side of ad networks. See, e.g., Tr. Sept. 9 AM 109:22–110:8 (Casale (Index Exchange)); Tr. Sept. 10 AM 139:23–140:6 (Friedman (Goodway Group)); Tr. Sept. 11 PM 102:24–104:24, 105:21–106:15, 156:21–157:19 (Dederick (The Trade Desk); Tr. Sept. 20 PM 54:4–13 (Sheffer (Google)). For example, industry participants generally consider AdWords, which is the advertising-facing side of Google's ad network, and AdSense, the publisher-facing side of its ad network, to be the two components of Google's ad network—the Google Content Network. See DTX259 at -090, -092; Tr. Sept. 12 PM 14:3–24 (Dederick (The Trade Desk)). Plaintiffs' expert Dr. Weintraub recognized that each ad network has a buy-

side component that serves the network's advertisers and a sell-side component that serves the network's publishers. See Tr. Sept. 16 PM 47:15–25, 110:21–24 (Weintraub (Pls. Expert)). And Dr. Lee, who selected the term "advertiser ad networks" in setting out his proposed market definitions, testified that he had not heard the term before this litigation. Tr. Sept. 20 AM 137:12–15 (Lee (Pls. Expert)).

As previously discussed, in the modern programmatic advertising business, the closed two-sided ad network has faded from prominence. See Tr. Sept. 10 PM 33:14–34:14 (Friedman (Goodway Group)) (quoting Friedman for the proposition that ad networks have been obsolete since 2012). Sophisticated digital advertisers and publishers have "moved more towards programmatic versus . . . a more simple transactional network model." Tr. Sept. 17 PM 126:13–17 (Helfand (Disney)); see also Section IV(A–B), supra. The rise of programmatic advertising has resulted in large and sophisticated advertisers using demand-side platforms like Google's DV360 instead of advertiser-facing sides of ad networks as their primary buying tools. See DTX1508 at -876; PTX579 at -509; Tr. Sept. 10 AM 141:20–24 (Friedman (Goodway Group)); Tr. Sept. 11 AM 24:6–13, 40:5–41:2 (Bender (Google)).[21] Large and sophisticated open-web publishers, similarly, have used ad exchanges like AdX and publisher ad servers like DFP, instead of the publisher-facing sides of ad networks like AdSense, to source and place ads on their websites. See PTX88 at -603; Tr. Sept. 18 AM 202:18–203:16 (Pappu (Google)); Tr. Sept. 20 PM 110:23–25 (Sheffer (Google)); Tr. Sept. 27 AM 58:4–6 (Wheatland (Daily Mail)). Small

[21] Although large advertisers use demand-side platforms, which offer them more customization of and control over their ad campaigns, as their primary buying tools, see Section IV(B), supra, many large advertisers also use AdWords as a secondary buying tool because of its ability to predict when users will click on ads, its proprietary sell-side data that enables audience targeting, and its ability to manage campaigns that combine open-web display ads with Search, YouTube, and Gmail ads. See DTX1514 at 950–53; Tr. Sept. 19 PM 101:23–103:4 (Lee (Pls. Expert)); Tr. Sept. 26 PM 85:22–87:13 (Israel (Def. Expert)).

and medium-sized advertisers and publishers, conversely, primarily use ad networks like the Google Content Network. See PTX1235; Tr. Sept. 19 PM 99:6–12 (Lee (Pls. Expert)).

This evolution has resulted in AdWords emerging as open-web publishers' primary source of small and medium-sized businesses' advertising. Over four million advertisers use only AdWords to purchase open-web display advertising. See PTX1231. Instead of confining these advertisers to AdSense websites, AdWords bids into Google's ad exchange, AdX, and places ads on websites that operate outside of the Google Content Network (i.e., websites that use publisher ad servers to manage their inventory). See PTX333 at -486. In doing so, AdWords provides large publishers with a unique source of revenue from smaller advertisers that lack the scale and sophistication to use demand-side platforms as their ad buying tools. See PTX290 at -983; PTX624 at -169; Tr. Sept. 18 AM 121:21–122:12 (Abrantes-Metz (Pls. Expert)).

Plaintiffs, through their market expert Dr. Lee, contend that this evolution means that a relevant market exists for "advertiser ad networks." Plaintiffs observe that small and medium-sized advertisers lack the sophistication to operate a demand-side platform or the means to hire an ad agency to operate one on their behalf. Therefore, according to Plaintiffs, the advertiser side of ad networks—principally, the AdWords side of the Google Content Network—provides the only place for these less sophisticated advertisers to reach users with open-web display ads. And because the Google Content Network no longer operates as a closed network, they argue that it would ignore commercial realities to place AdWords within a two-sided market instead of viewing it primarily as a buying tool that participates in programmatic advertising and reaches publishers' inventory across the open web.

These arguments have some merit. But even if the buy-side of ad networks were categorized as constituting a distinct market, that does not explain why such a market should be

limited to open-web display advertising. Substantial trial evidence showed that advertisers reallocate resources among different digital advertising channels based on perceived return on advertising expenditures. See, e.g., Tr. Sept. 23 PM 117:25–119:8 (Hardie (U.S. Census Bureau)) ("Ultimately, advertisers are following eyeballs. They are trying to reach people wherever they are."). Advertisers are often "agnostic" as to particular platforms or channels, id. at 118:15–119:21, and focus more on how "the audience [i]s responding to the ad" rather than on through what method or format the advertisement is delivered. Tr. Sept. 23 PM 83:11–84:7, 85:3–86:11, 92:6–10 (Oliphant (U.S. Census Bureau)). When one ad format or channel shows better return on investment, advertisers and the ad agencies that represent them will shift ad spending to that different format or channel to optimize performance. See id. at 92:11–14; Tr. Sept. 9 PM 93:1–21 (Lowcock (IPG)); Tr. 10 PM 6:11–7:7 (Friedman (Goodway Group)) (stating marketers "should not be biased toward one medium or another"); Tr. Sept. 27 AM 24:21–27:7, 29:14–30:2 (Bumpers (Zulily)). Moreover, the data-rich nature of the digital environment allows advertisers to measure the outcomes of their campaigns and quickly reallocate resources across channels to maximize effectiveness. See DTX439 at -414; Tr. Sept. 25 PM 28:6–30:1 (Stewart (Google)).

Cross-channel optimization is not limited to large advertisers; smaller advertisers that use AdWords reallocate advertising spending across channels. For example, Courtney Caldwell, the owner of a beauty tech start-up, testified that she shifted ad spending from AdWords to Instagram based on the relative user engagement and campaign performance that she experienced on each platform. See Tr. Sept. 25 PM 9:9–10:11 (Caldwell (ShearShare)). In addition to smaller advertisers having easy access to social media and other channels, automated tools are increasingly facilitating the reallocation of advertising budgets across channels without manual

involvement. For example, AdWords' Performance Max uses artificial intelligence to buy ads across multiple channels—including open-web display ads, walled-garden display ads on Google's owned-and-operated properties, in-app ads, and instream video ads. See DTX1248 at -406–07; Tr. Sept. 25 PM 34:12–22 (Stewart (Google)). Although advertisers using Performance Max may opt out of channels, Google has warned that doing so "will limit performance." DTX1248 at -420. Meta offers a similar automated cross-channel buying tool, which typically outperforms campaigns that run on only one of its available channels. See DTX498 at -913. Given the ease and benefits of allocating advertising spending across channels, Plaintiffs' assertion that advertiser ad networks for open-web display ads constitute a relevant market is unpersuasive.

By contrast, as discussed above, the market for publisher ad servers and the market for ad exchanges are each properly limited to tools that facilitate open-web display transactions. In those two markets, the publisher is the primary consumer of the ad tech tools and is focused on monetizing channel-specific inventory; whereas in the proposed market for advertiser ad networks, the advertiser is the consumer and is focused on reaching users regardless of which channel they are using. As the Supreme Court has held, interchangeability is assessed from the perspective of the consumer. See Kodak, 504 U.S. at 482. It is therefore appropriate to find that the proper scope of the proposed advertiser ad network market should include other buying tools that enable advertisers to purchase digital advertisements in reasonably interchangeable formats, including walled-garden display ads, in-app ads, and social media ads. Because Plaintiffs have

failed to consider ad networks that facilitate buying ads in these alternative channels in their market definition, they have failed to properly define the ad network market.[22]

d. Google's Contention that the Entire Ad Tech Ecosystem Fits within a Two-Sided Market

Relying heavily on Amex, a Supreme Court decision that stated that "in two-sided transaction markets," such as the market for credit-card networks, "only one market should be defined," 585 U.S. at 546, Google claims that the digital ad tech ecosystem constitutes a single two-sided market. In Amex, the Supreme Court held that American Express, Discover, MasterCard, and Visa compete with each other in a single two-sided market because it found that credit-card networks are two-sided transaction platforms that can only compete with other two-sided transaction platforms. Id. at 544–46. Google invokes Amex to contend that all ad tech tools should be placed in a single market for the purposes of this litigation because all of them exist to facilitate matches between advertisers and users viewing ads on digital platforms. In support of this position, Google cites its market expert Dr. Israel, who testified that any analysis of competition within the ad tech industry should be conducted using a single two-sided market. See Tr. Sept. 26 AM 37:13–38:18, 42:11–20 (Israel (Def. Expert)).

The Court finds this argument unpersuasive. Distinct products should not be grouped into a single omnibus market simply because they work together to achieve the same overarching purpose. Although Google correctly argues that, under Amex, both sides of a two-sided

[22] Other courts have segmented digital ad buying tools by the types and formats of ads that they transact. See, e.g., Fed. Trade Comm'n v. IQVIA Holdings Inc., 710 F. Supp. 3d 329, 367–68 (S.D.N.Y. 2024) (defining demand-side platforms for health care professional programmatic advertising as a relevant market, and excluding social media and healthcare-focused websites as not reasonably interchangeable); Google Search, 2024 WL 3647498, at *65 ("The court finds that Plaintiffs have established two relevant markets—search advertising and general search text advertising."). The weight of the evidence presented in this trial, however, clearly supports the conclusion that walled-garden display ads, in-app display ads, and social media ads are reasonably interchangeable with open-web display ads for many AdWords advertisers.

transaction platform should be considered in defining a market, many of the ad tech products at issue in this trial do not fit within Amex's definition of two-sided transaction platforms. Defining an omnibus market to include buy-side tools built for advertisers that compete with other buy-side tools built for advertisers—and sell-side tools built for publishers that compete with other sell-side tools built for publishers—would ignore commercial realities and contradict the bedrock principle of antitrust law that any Sherman Act inquiry must focus on the protection of competition, not competitors.

As previously explained, the distinct products that comprise the ad tech ecosystem are not reasonably interchangeable. A publisher cannot use a demand-side platform to render ads on its website. See Joint Glossary at 5; Tr. Sept. 9 AM 131:3–23 (Casale (Index Exchange)); Tr. Sept. 25 PM 75:23–25 (Stewart (Google)). An advertiser cannot use a publisher ad server to bid into ad exchanges and purchase ad inventory. See Joint Glossary at 8; Tr. Sept. 20 PM 78:4–25 (Sheffer (Google)); Tr. Sept. 9 AM 66:1–8 (Wolfe (Gannett)). Uncontroverted trial testimony established that advertiser buying tools, ad exchanges, and publisher ad servers each serve distinct functions, are priced differently, and cannot be substituted for each other. See Section VI(A)(1)(a–c), supra. And the advertisers who are the customers of buy-side tools such as demand-side platforms are largely distinct from the publishers who are the customers of sell-side tools such as publisher ad servers.

Dr. Israel's assessment that the digital advertising tools at issue must be considered as part of a single market disregards Amex's explicit limitation of its holding to two-sided *transaction* platforms, as opposed to two-sided platforms more broadly. Compare 585 U.S. at 546 ("[I]n two-sided transaction markets, only one market should be defined.") with id. at 544 ("To be sure, it is not always necessary to consider both sides of a two-sided platform."). The

Supreme Court was clear that "[t]he key feature of transaction platforms is that they cannot make a sale to one side of the platform without simultaneously making a sale to the other." Id. at 535; see also id. at 545.[23] The Supreme Court explicitly differentiated credit-card networks from "[n]ontransaction platforms" such as "newspaper[s] that sell[] advertising" in determining that the former should be assessed as a two-sided market and the latter as a one-sided market; it stated that credit-card platforms "are different" because they "facilitate a single, simultaneous transaction between participants." Id. at 545 & 546 n.9. In other words, "whenever a credit-card network sells one transaction's worth of card-acceptance services to a merchant it also must sell one transaction's worth of card-payment services to a cardholder. It cannot sell transaction services to either cardholders or merchants individually." Id. at 545. The Court in Amex accordingly found that "[e]valuating both sides of a two-sided transaction platform is . . . necessary to accurately assess competition" because "[o]nly other two-sided platforms can compete with a two-sided platform for transactions." Id. at 546.

In contrast to credit-card networks, most of the core ad tech products at issue in this litigation do not fit within this definition of a two-sided transaction platform. For example, a publisher ad server sells transaction-related services, such as inventory management, bid evaluation, ad rendering, and sales performance tracking, only to publishers, and does not simultaneously sell any services to advertisers. Cf. id. 545 (Two-sided transaction platforms "cannot make a sale unless both sides of the platform simultaneously agree to use their services."). And unlike in the credit-card network market, it is not "[o]nly other two-sided

[23] More specifically, in the credit card context, when an American Express cardholder uses the card to purchase a product from a merchant, the cardholder is billed by American Express for the price of the product, and the merchant is paid by American Express the price of the product minus a service charge. See id. at 533.

platforms [that] can compete with" publisher ad servers "for transactions." Id. at 546. Google's primary competitors in the open-web publisher ad server space, such as Equativ and Kevel, do not operate two-sided transaction platforms, but rather specialize in serving only publishers and do not offer buy-side advertising tools. See, e.g., Tr. Sept. 13 PM 62:11–14, 62:22–63:1 (Creput (Equativ)); Tr. Sept. 9 PM 116:19–23, 119:6–21 (Avery (Kevel)). Cf. Amex, 585 U.S. at 546 ("A credit-card company that processed transactions for merchants, but that had no cardholders willing to use its card, could not compete with Amex.").

The same is true for demand-side platforms, which Google contends are part of a broader two-sided market for digital advertising. Demand-side platforms are not two-sided transaction platforms because they "sell transaction services," such as ad inventory search, audience targeting, centralized ad buying, and real-time bidding, "to [advertisers] individually," and do not simultaneously sell any services to publishers. Amex, 585 U.S. at 545. Moreover, demand-side platforms do not "compete" "for transactions" with "[o]nly other two-sided platforms." Id. Rather, demand-side platforms serve only advertisers and compete with other advertiser-facing tools. See Joint Glossary at 5; Tr. Sept. 10 AM 140:11–18 (Friedman (Goodway Group)). For example, one of the largest demand-side platforms, The Trade Desk, is run by a company that does not serve publishers and does not operate its own two-sided network. See, e.g., Tr. Sept. 11 PM 87:21–88:13, 105:12–14 (Dederick (The Trade Desk)) ("[O]ur company exclusively represents the interests of advertisers and ad buyers.").

The Court recognizes that there are aspects of the digital advertising ecosystem, such as ad exchanges, that resemble two-sided transaction platforms. Despite sometimes being referred to as "supply-side platforms" in the industry, the core function of ad exchanges is to match advertiser demand with publisher inventory. See Joint Glossary at 5 (defining ad exchange as

"[a] tool that connects owners of digital content where people see ads ('publishers'), who have ad inventory to sell, with advertisers looking to place ads."); PTX1031 at -480–81 (explaining how the term supply-side platform refers to the publisher-facing tools within an ad exchange, even though "both names are used interchangeably" as industry shorthand); Tr. Sept. 9 AM 67:8–18 (Wolfe (Gannett)). Unlike publisher ad servers and demand-side platforms, ad exchanges "cannot make a sale unless both sides of the platform [i.e., the publishers selling impressions and the advertisers buying impressions] simultaneously agree to use their service." Id. at 545. Moreover, "[o]nly other two-sided platforms can compete with" ad exchanges "for transactions." Id. at 546. For these reasons, in analyzing whether Google has monopoly power, the Court will "[e]valuat[e] both sides" of the ad-exchange market. Id.[24]

Antitrust analysis of the digital advertising industry is thus conducted much the same way as is antitrust analysis of the consumer payments industry. In each industry, a diverse set of products exist to match (i.e., enable transactions between) buyers and sellers. The shared high-level purpose of these products, however, is far too broad for defining an antitrust market. Rather, courts delineate the "the area[s] of effective competition" to define the relevant markets within an industry. Amex, 585 U.S. at 543; see also FTC v. Staples, Inc., 970 F. Supp. 1066, 1075 (D.D.C. 1997) ("The mere fact that a firm may be termed a competitor in the overall

[24] Although they resemble two-sided transaction platforms, ad exchanges differ somewhat from the credit-card networks at issue in Amex because ad exchanges do not merely provide technology to facilitate transactions between buyers and sellers, but also function as auction houses by evaluating multiple potential buyers and selecting the buyer with the highest willingness to pay. See Joint Glossary at 5; Section IV(B), supra. Indeed, ad exchanges primarily exist to place multiple buyers in competition with each other for available inventory, whereas credit-card networks primarily exist to make it easier for a buyer to pay a seller after the two parties have independently found each other and decided to conduct a transaction.

marketplace does not necessarily require that it be included in the relevant product market for antitrust purposes.").

One consideration for defining areas of effective competition is the channels through which transactions occur. In analyzing the consumer payments industry, courts have found that there is a credit-card market that does not include debit cards, private-label credit cards, checks, or digital payment apps, even though each is "an option for payment by consumers." United States v. Visa U.S.A., Inc., 163 F. Supp. 2d 322, 337–38 (S.D.N.Y. 2001); see also Amex, 585 U.S. at 547 ("[W]e will analyze the two-sided market for credit-card transactions."); In re Payment Card Interchange Fee & Merch. Disc. Antitrust Litig., 2024 WL 1556931, at *11 (E.D.N.Y. Apr. 10, 2024) ("[C]redit-card transactions and other payment methods (e.g., cash or checks) are not reasonable substitutes for debit-card transactions."). In digital advertising, there are similar distinctions between direct deals, ad network advertising, programmatic advertising, and walled-garden advertising, even though each is a channel through which advertisers purchase ad space on publishers' websites. Two recent opinions have defined relevant antitrust markets in the digital advertising industry with significant channel specificity. Google Search, 2024 WL 3647498, at *89 (holding that "general search text advertising [i]s a relevant product market"); Fed. Trade Comm'n v. IQVIA Holdings Inc., 710 F. Supp. 3d 329, 356 (S.D.N.Y. 2024) (finding that healthcare professional programmatic advertising is a relevant market).

Google has recognized the importance of not unduly placing all its digital advertising products at issue into a single market. In another federal court, Google argued that combining the "distinct" products in the ad tech ecosystem into one market would be improper given that some products such as demand-side platforms "are used only by advertisers," whereas others such as publisher ad servers "are used only by publishers." Mot. to Dismiss, In re Google Digital

Advertising Antitrust Litig., 5:20-cv-3556, 2021 WL 7083558, at *6 (N.D. Cal. Jan. 15, 2021). In Google's own words, "[a]lthough business practices impacting the products and services offered to *publishers* surely could have important consequences for *advertisers,* that is not sufficient, absent other allegations not made here, to support the broad overarching services market." Id. at *5 n.2 (emphases in original).[25]

The nature of commercial competition also requires courts to avoid classifying products as part of two-sided transaction platforms merely because they help customers on one side of a transaction-facilitating industry improve their capacity to transact. Courts have found that buy-side consumer payments products that facilitate credit-card transactions—such as checking accounts, consumer loan services, bill splitting apps, and digital wallets—are not reasonably interchangeable with credit-card networks and are not to be analyzed within the credit-card network market. See Amex, 585 U.S. at 537 (stating "Amex, Visa, MasterCard, and Discover are the four dominant participants in the credit-card market" and identifying the four firms as controlling 100% of the market); see also Visa, 163 F. Supp. 2d at 327 (defining the "U.S. credit and charge card industry" as only including these "four significant network services competitors"). The same is true on the sell-side of the consumer payments industry. Courts have not included merchant-facing products such as point-of-sale terminals and digital payment

[25] Google made this argument in its motion to dismiss a putative antitrust class action brought by advertisers who used Google's services to purchase display and search ads. See In re Google Digital Advertising Antitrust Litig., 5:20-cv-3556, 2021 WL 7083558, at 6 (N.D. Cal. Jan. 15, 2021); id. [Dkt. No. 52] at 2–3. The district court granted the motion to dismiss with leave to amend, in part due to its agreement with Google that plaintiffs' proposed relevant market "improperly include[d] services for both advertisers and publishers." In re Google Digital Advertising Antitrust Litig., 5:20-cv-3556, 2021 WL 2021990, at *3 (N.D. Cal. May 13, 2021). Before an amended complaint was filed, the civil action was consolidated by the Judicial Panel on Multidistrict Litigation and transferred to the Southern District of New York. See id. [Dkt. No. 157] at 8–9.

gateways from companies like Fiserv, Shopify, Square, and Stripe in the two-sided credit-card network market because they are not reasonably interchangeable with credit-card networks. See 585 U.S. at 537; see also Brown Shoe, 370 U.S. at 325 ("[W]ithin [a] broad market, well-defined submarkets may exist which, in themselves, constitute product markets for antitrust purposes."). This case law makes clear that just because two-sided transaction platforms reside at the heart of an industry that matches buyers and sellers does not mean that every industry product that helps facilitate those matches must be analyzed within an industry-wide, two-sided market. Rather, products that serve economic actors on one side of the industry and can be sustainably sold by firms that specialize only in that side of the industry—such as publisher ad servers that serve publishers and demand-side platforms that serve advertisers—are to be analyzed in markets that consist of reasonably interchangeable products on that side of the industry.

Because Plaintiffs have shown that there are two relevant product markets, one for publisher ad servers for open-web display advertising and another for ad exchanges for open-web display advertising, the geographic scope of these markets must be determined.

2. Geographic Market

To determine the relevant geographic scope of a market, courts consider the "area within which the defendant's customers . . . can practicably turn to alternative supplies if the defendant were to raise its prices." It's My Party, 811 F.3d at 682 (quoting Kolon, 637 F.3d at 441) (ellipses in original). "The commercial realities considered when defining the relevant geographic market include: where the parties market their products; the size, cumbersomeness, and perishability of the products; regulatory requirements impeding the free flow of competing goods into or out of the area; shipping costs and limitations; the area within which the defendant

and its competitors view themselves as competing; and other factors bearing upon where customers might realistically look to buy the product." Kolon, 637 F.3d at 442–43.

Although Plaintiffs and Google agree that the United States is a suitable geographic market, Plaintiffs contend that a worldwide[26] market is optimal for assessing Google's conduct, which "crosse[d] country boundaries and affect[ed] customers worldwide." Tr. Sept. 19 PM 126:13–127:3 (Lee (Pls. Expert)). The Sherman Act does not authorize federal courts to "regulate the competitive conditions of other nations' economies." Matsushita Elec. Indus. Co. v. Zenith Radio Corp., 475 U.S. 574, 582 (1986). Rather, the "foremost concern" of federal antitrust law is the "protection of Americans"—here, American publishers, advertisers, and Internet users. Pfizer, Inc. v. Gov't of India, 434 U.S. 308, 314 (1978). But to meet this concern, courts frequently look beyond our nation's shores in delineating the competitive boundaries of increasingly globalized markets. See, e.g., United States v. Eastman Kodak Co., 63 F.3d 95, 109 (2d Cir. 1995) (affirming district court's definition of a worldwide geographic market for film). Considering global markets is particularly common in cases involving software products that can be distributed around the world with a single click. See, e.g., United States v. Microsoft, 253 F.3d 34, 52 (D.C. Cir. 2001) (en banc); In re Google Play Store Antitrust Litig., 2024 WL 4438249, at *4 (N.D. Cal. Oct. 7, 2024); United States v. Oracle Corp., 331 F. Supp. 2d 1098, 1164 (N.D. Cal. 2004).

The Court finds that the worldwide market as defined by Dr. Lee is the relevant geographic market for both the open-web display publisher ad server market and open-web

[26] The term "worldwide," as used by Dr. Lee and adopted in this opinion, excludes countries where the operation of ad tech companies is substantially restricted by government censorship of the Internet (e.g., China) or U.S. economic sanctions (e.g., Iran). See Tr. Sept. 19 PM 122:6–9 (Lee (Pls. Expert)).

display ad exchange market. The globally networked nature of the Internet has resulted in worldwide competition among ad tech providers, with the speed of light serving as a primary impediment to intercontinental ad serving. See Tr. Sept. 11 AM 124:18–22 (Ravi (Pls. Expert)). "[C]ustomers interact across country boundaries" and "supplier competition is global." Tr. Sept. 19 PM 126:13–127:3 (Lee (Pls. Expert)). Many U.S.-based advertisers target international Internet users, and many international advertisers target U.S.-based users, including by advertising on U.S.-based publishers' webpages. See id. at 123:7–124:22; PTX904 at -553. Similarly, advertisers bid to target international users who visit U.S.-based publishers' pages, and Americans consume digital content from international publishers. See PTX904 at -553; Tr. Sept. 9 AM 111:15–25 (Casale (Index Exchange)); Tr. Sept. 19 PM 123:7–124:22 (Lee (Pls. Expert)). Ad tech providers, in turn, have built global infrastructure and often manage, price, sell, and track performance of their products globally. See DTX1524 at 5–6; PTX946 at -807; Tr. Sept. 9 AM 111:17–25, 142:6–21 (Casale (Index Exchange)); Tr. Sept. 9 PM 117:19–118:1 (Avery (Kevel)); Tr. Sept. 19 AM 119:25–120:5 (Bellack (Google)); Tr. Sept. 19 PM 126:13–127:3 (Lee (Pls. Expert)). Google, for example, charges consistent ad exchange fees worldwide, and often tests and implements product and policy changes, including much of the conduct at issue in this litigation, on a global basis. See PTX326 at -837; PTX1099 at -866–67; PTX1199; Tr. Sept. 16 PM 20:21–21:10 (Weintraub (Pls. Expert)); Tr. Sept. 19 PM 126:13–127:3 (Lee (Pls. Expert)).

Google disagrees that a worldwide market is applicable, curiously contending that the "smallest relevant market principle" should govern in the same filing in which it claimed that there is an omnibus product market for the entire ad tech ecosystem. See [Dkt. No. 1375] (Google's Proposed Findings of Fact – Redacted Version) at 359 (quoting Tr. Sept. 20 AM 98:15–99:6 (Lee (Pls. Expert)). Google observes that over 70% of U.S. sell-side revenue comes

from U.S. advertisers, and points to regulatory, cultural, and language differences between global regions. See DTX358 at -010–11; PTX904 at -553; Tr. Sept. 20 AM 99:7–24 (Lee (Pls. Expert)); Tr. Sept. 25 AM 19:23–20:18 (Chevalier (Def. Expert)); Tr. Sept. 26 AM 110:1–18 (Israel (Def. Expert)). In part due to these distinctions, Google structures some of its ad tech business units regionally, and its strategy teams have considered the United States as a distinct market in their competitive analyses. See, e.g., DTX399 at -465; DTX733 at -396; DTX758 at -024; PTX657 at -328–30.

Google's arguments are unpersuasive in light of the global nature of digital advertising. The World Wide Web publishers that are Google's customers for these two products compete for global audiences and advertising dollars. See, e.g., Tr. Sept. 18 AM 125:9–12 (Wheatland (Daily Mail)). Publisher ad servers and ad exchanges are "market[ed]" globally. Kolon, 637 F.3d at 442. They are not "cumbersome[]" or "perishab[le]" physical products with high "shipping costs." Id. at 442–43. Moreover, despite some variance in regulatory regimes, the balance of evidence at trial did not establish that supply-side competitors face substantially different "regulatory requirements impeding" the sale of their publisher ad servers and ad exchanges across countries within the worldwide market as defined by Dr. Lee. Id. at 442; see Tr. Sept. 9 PM 117:19–118:1 (Avery (Kevel)); Tr. Sept. 13 PM 63:3–7 (Creput (Equativ)); Tr. Sept. 16 PM 20:21–21:6 (Weintraub (Pls. Expert)). Although publisher-facing ad tech providers sometimes break down their sales numbers by region, they often view themselves as competing globally. See, e.g., Tr. Sept. 9 AM 116:15–20 (Casale (Index Exchange)); Tr. Sept. 20 PM 153:17–24 (John (Microsoft)); see also Consul, Ltd. v. Transco Energy Co., 805 F.2d 490, 495 (4th Cir. 1986) (citing Justice Frankfurter for the proposition that the relevant geographic market is "the area in which buyers or sellers of the relevant product effectively compete"). Therefore, under

the factors set out by the Fourth Circuit in Kolon, the Court finds that the relevant geographic market for both publisher ad servers for open-web display advertising and ad exchanges for open-web display advertising is worldwide. 637 F.3d at 442–43.

B. Monopoly Power

"Monopoly power is the power to control prices or exclude competition." Kolon Indus. Inc. v. E.I. DuPont de Nemours & Co., 748 F.3d 160, 173 (4th Cir. 2014) ("Kolon II") (quoting United States v. E.I. du Pont de Nemours & Co., 351 U.S. 377, 391 (1956)). A plaintiff can show that a defendant had monopoly power in a relevant antitrust market either directly or indirectly. See Epic Games, Inc. v. Apple, Inc., 67 F.4th 946, 998 (9th Cir. 2023); Broadcom Corp. v. Qualcomm Inc., 501 F.3d 297, 307 (3d Cir. 2007); Geneva Pharms. Tech. Corp. v. Barr Labs. Inc., 386 F.3d 485, 500 (2d Cir. 2004); Microsoft, 253 F.3d at 51. Direct proof of monopoly power includes evidence that a defendant profitably charged supracompetitive prices. See Microsoft, 253 F.3d at 51. Indirect proof is derived "from the structure and composition of the relevant market." Broadcom, 501 F.3d at 307; see, e.g., Grinnell, 384 U.S. at 571.

One factor often cited as indirect proof of monopoly power is market share. "The existence of [monopoly] power ordinarily may be inferred from the predominant share of the market." Grinnell, 384 U.S. at 571; see also United States v. Swift & Co., 286 U.S. 106, 116 (1932) (Cardozo, J.) ("[S]ize carries with it an opportunity for abuse that is not to be ignored when the opportunity is proved to have been utilized in the past."). But case law varies as to what percentage is dispositive. Compare, for example, the following: defendants found to possess monopoly power typically control at least 70% of the market, Kolon, 637 F.3d at 451 (citing White Bag Co. v. Int'l Paper Co., 579 F.2d 1384, 1387 (4th Cir. 1974)); there is "no minimum percentage" necessary to prove monopoly power indirectly, Google Search, 2024 WL

3647498, at *76; although a "market share of less than 60% during the relevant period does not necessarily foreclose a finding of monopoly power," it does "weigh heavily against such a finding," Kolon II, 748 F.3d at 174; and "absent special circumstances, a defendant must have a market share of at least fifty percent before he can be guilty of monopolization," Domed Stadium Hotel, Inc. v. Holiday Inns, Inc., 732 F.2d 480, 489 (5th Cir. 1984). The Supreme Court has held, however, that a market share of "87% . . . leaves no doubt that the . . . defendant[] ha[d] monopoly power." Grinnell, 384 U.S. at 571.

Courts are more willing to infer monopoly power from high market share when there are "high barriers to entry." Kolon II, 748 F.3d at 174; see Lenox MacLaren Surgical Corp. v. Medtronic, Inc., 762 F.3d 1114, 1123–26 (10th Cir. 2014). This is because the true measure of monopoly power lies not in a firm's high market share, but in its ability to maintain that share. United States v. Syufy Enters., 903 F.2d 659, 665–66 (9th Cir. 1990); see Matsushita Elec. Indus. Co. v. Zenith Radio Corp., 475 U.S. 574, 591 n.15 (1986). In assessing barriers to entry that enhance "durability of the defendant's market power," Kolon, 637 F.3d at 451, courts have considered "factors, such as regulatory requirements, high capital costs, or technological obstacles, that prevent new competition from entering a market." Broadcom, 501 F.3d at 307. In the digital services context, the network effects begot by scale and the previous failed entry of a well-resourced rival have been cited as additional indicators of high barriers to entry. See, e.g., Microsoft, 253 F.3d at 55–56; Klein v. Facebook, Inc., 580 F. Supp. 3d 743, 780–81 (N.D. Cal. 2022); In re Google Play Store, 2024 WL 4438249, at *6; Google Search, 2024 WL 3647498, at *78, *111–13.

1. Publisher Ad Server

Plaintiffs have proven that Google possesses monopoly power in the publisher ad server for open-web display advertising market. Google's publisher ad server DFP has a durable and "predominant share of the market" that is protected by high barriers both to entry and expansion. Grinnell, 384 U.S. at 571. This conclusion is reinforced by evidence that Google has acted to degrade DFP's features without fear that its customers would switch to alternative publisher ad servers.

Dr. Lee's market calculations showed that in 2022, Google had a 91% market share of the worldwide publisher ad server market for open-web display advertising as measured by the number of impressions served. PTX1278; PTX1278A; see also PTX1236; PTX1236A. From 2018 through 2022, Google's share of this worldwide market held steady between 91.0% and 93.5%, and its U.S. market share stayed between 86.5% and 92.3%. PTX1278; PTX1278A. Dr. Lee's analysis is relatively consistent with Google's internal estimates, which assessed DFP to have between 84% and 90% market share at different points over the past decade. See PTX254 at -238 ("[W]e are the defacto, [sic] preferred ad server of choice for 90% of publishers."); PTX604 at -314; PTX767 at -775; PTX946 at -807. Industry participants perceive DFP to be the "dominant" publisher ad server, Tr. Sept. 9 PM 150:4–11 (Avery (Kevel)); Tr. Sept. 19 PM 39:18–20 (Shaughnessy (Kargo)), with some even referring to Google as having a monopoly in the publisher ad server market. PTX758 at -946; PTX1709 at -933–34. Within Google, a DFP engineering manager speculated that "losing some market share" would have the "positive" effect of "demonstrating to regulators that viable alternatives exist / we're not a monopoly." PTX949 at -481.

The significant barriers to entry and expansion that exist in the publisher ad server market make DFP's high market share durable. As multiple witnesses testified, including those from Gannett, Index Exchange, The Daily Mail, and The New York Times, building a publisher ad server is a complex, resource-intensive process, even for a large corporation. See Section VI(A)(1)(a), supra (citing witnesses); see also PTX581 at -977, -983; PTX1572 at -699–700; Tr. Sept. 19 PM 68:25–70:1 (Lee (Pls. Expert)); Tr. Sept. 20 PM 23:18–25:4 (Lee (Pls. Expert)). Perhaps more importantly, it is very challenging to gain publisher ad server customers. Publishers almost always use a single ad server for open-web display ads because operating two or more publisher ad servers would not be practical due to challenges with forecasting, integration, and latency (i.e., the delay in an ad being displayed to a user, which is increased by data having to be sent between multiple publisher ad servers). See PTX949 at -481–82; Tr. Sept. 10 AM 14:8–11, 15:16–17:24 (Layser (News Corp)); Tr. Sept. 17 PM 133:2–10 (Helfand (Disney)); Tr. Sept. 18 AM 138:20–139:23 (Wheatland (Daily Mail)); Tr. Sept. 20 PM 151:7–152:22 (John (Microsoft)). To gain market share from DFP, a rival would have to convince publishers to stop using DFP and switch to the rival's publisher ad server. This, however, is very difficult to do. As the evidence showed, publisher ad servers are "sticky" products that take "a lot of work" to change. Dep. 216:1–13, 305:14–20 (Lipkovitz (Google)); see also PTX114 at -049. In the words of a former Google and DoubleClick executive, switching publisher ad servers "[t]akes an act of God to do" and is a "nightmare" because "[n]othing has such high switching costs." PTX1814 at -745. A publishing executive described his experience switching ad servers as a year-long process that was "akin to . . . changing the tires on the race car mid race." Tr. Sept. 9 AM 70:20–71:25 (Wolfe (Gannett)). These assessments are consistent with general industry sentiment. See, e.g., DTX404 at -134; PTX114 at -049; PTX1572 at -694; Tr. Sept. 10

AM 27:11–28:20, 108:2–20 (Layser (News Corp)); Tr. Sept. 13 AM 89:3–22 (LaSala (Google)); Tr. Sept. 16 AM 13:2–14 (Mohan (Google)).

The large difficulties that publishers face in switching ad servers are exacerbated by the lack of meaningful alternatives to DFP. See Tr. Sept. 9 AM 70:20–23 (Wolfe (Gannett)); Dep. 305:14–20 (Lipkovitz (Google)). It is no wonder, then, that open-web publishers very rarely switch from DFP to another ad server, even when Google makes product changes with which they disagree. See PTX882 at -717; PTX1854 at 25:1–11, 36:5–37:20, 44:1–14, 52:11–16; Tr. Sept. 9 PM 122:19–123:12; 135:19–136:2 (Avery (Kevel)); Tr. Sept. 10 AM 51:24–55:3, 109:23–110:16 (Layser (News Corp)); Tr. Sept. 17 PM 46:25–50:3 (Cadogan (OpenX)); Tr. Sept. 19 PM 66:7–70:1 (Lee (Pls. Expert)). Recognizing this dynamic, many once-large rival ad servers have either left the ad serving business entirely (e.g., OpenX), or sought to compete in channels other than open-web display advertising (e.g., Kevel). See PTX758 at -945; Tr. Sept. 9 PM 120:21–122:18, 126:5–128:22 (Avery (Kevel)) (describing Kevel's pivot to native ads and sponsored listings due to its inability to compete with DFP in open-web display); Tr. Sept. 17 PM 46:4–48:16, 51:18–52:20 (Cadogan (OpenX)). Even Meta shut down its project to build a publisher ad server due to the significant barriers to gaining scale in a market dominated by Google. See PTX1709 at -934; Tr. Sept. 13 PM 100:20–24, 128:21–129:21 (Boland (Meta)).

Google has acted in accordance with its dominant market position and these high barriers to entry and expansion. For example, Google degraded some DFP features, such as by removing publishers' ability to set a higher price floor on AdX as part of its Unified Pricing Rules update, despite negative publisher feedback. See PTX1854 at 25:1–11, 36:5–37:20, 44:1–14, 52:11–16; Tr. Sept. 10 AM 51:24–55:3, 109:23–110:16 (Layser (News Corp)); Tr. Sept. 19 PM 66:7–20 (Lee (Pls. Expert)). In estimating the impact of this change, Google was not concerned about

whether publishers would switch away from DFP, and publishers did not switch despite other publisher ad servers allowing variable price floors. See PTX1035 at -360; Tr. Sept. 9 PM 135:19–136:9 (Avery (Kevel)); Tr. Sept. 10 AM 52:23–53:7 (Layser (News Corp)). Moreover, although Google has not exercised its monopoly power to raise DFP's prices, the company has internally estimated that the "market w[ould] bear" a price increase and projected that a 10% to 20% increase in DFP fees "could have a substantial positive impact on . . . overall profitability." PTX712 at -648.

Google contests that Unified Pricing Rules and other actions that allegedly degraded DFP's product quality constitute direct evidence of monopoly power, arguing that Dr. Lee did not show what DFP's quality would have been in a but-for competitive world and therefore failed to provide a way to measure whether Google's alleged degradations rendered DFP's quality below a competitive level. See Tr. Sept. 20 AM 146:4–23 (Lee (Pls. Expert)); Tr. Sept. 26 AM 117:15–118:1 (Israel (Def. Expert)). The Court agrees that examples of customer-disfavored product changes, without evidence that overall product quality decreased, are insufficient direct evidence of monopoly power. But the lack of airtight direct evidence is immaterial here. DFP's 91% share of the worldwide market "leaves no doubt" as to Google's monopoly power, particularly when viewed in light of the high barriers to entry and expansion in the publisher ad server market. Grinnell, 384 U.S. at 571. Plaintiffs' evidence that Google exercised this market power to harm its publisher customers, while not definitive in isolation, only reinforces this conclusion.

2. Ad Exchange

Plaintiffs have proven that Google possesses monopoly power in the ad exchange for open-web display advertising market. Google's AdX has long been the dominant exchange for facilitating open-web display advertising. For over a decade, Google has charged durable

supracompetitive prices for AdX—taking 20% of each open-web display transaction—and has exhibited an unwillingness to lower AdX's take rate even as the market matured and other ad exchanges reduced their prices. Despite the availability of lower priced exchanges, customers generally have not left AdX due to Google's substantial market power in the ad exchange market. That market power has been fortified by high barriers to entry that resulted from Google's scale and network effects across the open-web display ecosystem. Accordingly, Google has maintained a high share of the open-web display ad exchange market, with AdX having a market share roughly nine times greater than that of its next-largest competitor.

AdX's charging a durable 20% take rate for well over a decade is direct evidence that Google has possessed monopoly power in the open-web display ad exchange market. See PTX1199; Tr. Sept. 13 AM 42:16–21, 43:15–17 (LaSala (Google)); Tr. Sept. 19 PM 81:20–82:9 (Lee (Pls. Expert)). Google employees recognized that AdX's 20% take rate was higher than that of rival ad exchanges like IndexExchange, Magnite, and Xandr, which often charged closer to 10%. See PTX188 at -013; PTX686 at -044; PTX712 at -646; PTX719 at -004–05; Tr. Sept. 18 AM 220:7–221:3 (Pappu (Google)); Dep. 165:21–167:5 (O'Kelley (Xandr)). But Google has profitably maintained AdX's 20% take rate, even when other exchanges further decreased their take rates. See PTX1199; Tr. Sept. 18 AM 134:3–12 (Wheatland (Daily Mail)) (explaining that AdX's "20 percent" take rate was "around double" the take rate that The Daily Mail paid to other exchanges); Tr. Sept. 18 AM 220:7–221:3 (Pappu (Google)). At the same time, Google has refused to negotiate AdX's take rate with almost all of its customers, only offering minimal discounts to a handful of very large publishers. PTX549 at -079, -086 (showing that only six of AdX's 3,815 largest publisher customers received discounts); Tr. Sept. 10 AM 150:8–23, 152:7–19 (Friedman (Goodway Group)) (testifying that Google refused to negotiate take rates, unlike

rival exchanges); Tr. Sept. 13 AM 42:25–43:17, 67:11–13 (LaSala (Google)); Tr. Sept. 27 AM 6:24–7:25 (Pauley (Vox)).

Google employees have recognized the durability of AdX's pricing by describing how the exchange's market power left both publishers and advertisers with very little choice but to keep using it. See PTX188 at -979, -013–17; Tr. Sept. 19 PM 82:15–84:25 (Lee (Pls. Expert)). For example, in 2014, an internal Google study projected that a 25% decrease in AdX's take rate would have limited impact on its customer retention. See PTX188 at -979, -013–17; see also Tr. Sept. 19 PM 82:15–84:25 (Lee (Pls. Expert)). A few years later, after a non-Google industry consortium embraced header bidding to mitigate Google's dominance across the ad tech stack, Google considered reducing AdX's 20% take rate. See PTX421 at -227; PTX423 at -043–44; Dep. 258:16–21 (Lipkovitz (Google)). But an internal study showed that reducing the take rate "d[id]n't win many queries compared to the profit lost," and the sales team "d[id] not think" such a reduction would "help them win deals." PTX417 at -758; see also PTX421 at -227; PTX423 at -043–44. This study proved prescient. Google has never reduced its overall 20% take rate and has continued to deny discount requests, yet AdX's customers have not left and AdX has not lost market share. See PTX639; PTX1258; Tr. Sept. 13 AM 49:15–20 (LaSala (Google)). As further evidence of Google's power in the ad exchange market, a competing ad exchange conducted experiments over the years to reduce its take rate, including at one point setting its take rate to zero, but found only a "nominal, at best, effect on win rate." Tr. Sept. 9 AM 138:8–139:17 (Casale (Index Exchange)). Competitors' "inability to constrain [AdX's] pricing" constitutes direct evidence of Google's monopoly power in the ad exchange market. McWane, Inc. v. FTC, 783 F.3d 814, 832 (11th Cir. 2015).

Broader industry dynamics also support the conclusion that Google's maintenance of AdX's 20% take rate required monopoly power. As programmatic advertising emerged in the late 2000s through mid-2010s, firms in the space could command a substantial premium for their innovative products due to the significant advantages programmatic advertising offered over direct deals and the complex technology infrastructure required to run billions of real-time auctions each day. See Section IV(A–B), supra. But by 2017, a Google product director observed that ad exchange "margins [we]re coming down, way down, because the technology, demand and supply that [ad exchanges] offer ha[d] been commoditized to a large extent." PTX562 at -259–61. Google employees repeatedly questioned the viability of AdX's take rate, often stating that the product was no longer worth 20%. See, e.g., PTX612 at -035 (Google publisher-side executive stating "I don't think there is 20% of value in comparing two bids" and questioning whether AdX should "continu[e] to extract irrationally high rent"); see also PTX198 at -703; PTX562 at -259–60; PTX639 at -965; Tr. Sept. 18 AM 220:13–221:3, 228:11–229:12 (Pappu (Google)). Nevertheless, Google has maintained AdX's 20% take rate for over a decade and has kept a relatively steady share of the ad exchange market. See PTX1199A; PTX1199B; PTX1258; Tr. Sept. 13 AM 42:16–21, 43:15–17 (LaSala (Google)). Google's ability to maintain AdX's 20% take rate under these market conditions is further direct evidence of the firm's sustained and substantial power in the open-web display ad exchange market. Tr. Sept. 19 PM 81:20–82:14 (Lee (Pls. Expert)).

Google and its market expert Dr. Israel contest this conclusion. They maintain that Google's long-standing 20% take rate originated well before the firm had any alleged monopoly power, and that Google's decision not to raise prices is indicative of a lack of monopoly power. They also criticize Dr. Lee for not defining what prices would have been in a competitive

market, and for not factoring in the quality of AdX versus the quality of other exchanges when comparing their respective prices.

None of Google's arguments undermines the Court's conclusion that AdX's durable 20% take rate constitutes direct evidence of monopoly power. The steadiness with which Google has charged a 20% fee in a rapidly maturing market involving transactions with minimal variable costs, the repeated recognition by Google employees that the services AdX provided were no longer worth 20% of publisher revenue, and the strong evidence that customers were unable to switch from AdX even when other ad exchanges lowered their prices all support the finding that AdX charged supracompetitive prices. See Tr. Sept. 19 PM 81:20–84:25 (Lee (Pls. Expert)). As other courts have found, prices that remain consistent or fall over time may still indicate monopoly power, so long as those prices are supracompetitive. See Allen-Myland, Inc. v. Int'l Bus. Machs. Corp., 33 F.3d 194, 211 (3d Cir. 1994); Red Lion Med. Safety, Inc. v. Ohmeda, Inc., 63 F. Supp. 2d 1218, 1229 (E.D. Cal. 1999).

Another direct sign of monopoly power is that Google has used its market power in adjacent segments of the ad tech ecosystem to make it more difficult for customers on both sides of the ad exchange market to switch to rival exchanges. See Tr. Sept. 18 AM 121:10–122:12 (Abrantes-Metz (Pls. Expert)). On the buy-side, Google's policies made AdX the only ad exchange that had "exclusive access to [AdWords]," PTX290 at -983, which publishers highly valued as "a large and unique demand source." Tr. Sept. 16 PM 128:21–129:5 (Abrantes-Metz (Pls. Expert)). Google has largely limited AdWords' exchange bidding to AdX despite internal recognition that allowing AdWords to bid on other exchanges would be valuable for AdWords' advertiser customers. See PTX198 at -703; Tr. Sept. 18 AM 13:5–14:1 (Spencer (Google)). By so limiting AdWords, Google has ensured that publishers would view AdX as a "must call"

exchange. Dep. 220:12–16, 222:4–17, 226:24–227:4 (Lipkovitz (Google)); see also Tr. Sept. 9 AM 76:9–77:7, 104:9–23 (Wolfe (Gannett)); Tr. Sept. 10 AM 62:12–18 (Layser (News Corp)); Tr. Sept. 12 AM 43:7–12 (Srinivasan (Google)). The unique advertising demand from AdWords has helped Google maintain the power to keep charging AdX publishers a 20% take rate. See PTX639 (Google sell-side executive stating that "[i]f [AdWords] bought liberally through all 3PEs [i.e., third-party exchanges], I think the 20% would crater.").

On the sell-side, Google's power in the two-sided ad exchange market and its power in the publisher ad server market have been mutually reinforcing. See PTX551 at -048. For example, Google limited AdX to send real-time bids only to DFP, thereby forgoing a desirable AdX feature for non-DFP publishers to entrench the firm's monopoly power in the publisher ad server market. See PTX128 at -045–47; PTX1031 at -500. Google did so despite requests by customers of other publisher ad servers to access AdX's real-time bids. See, e.g., Tr. Sept. 9 PM 139:13–140:24 (Avery (Kevel)). This was one of the reasons why publishers felt they had to use DFP to obtain effective access to AdX and, consequently, to AdWords' unique demand. See Section VI(B)(1), supra; see also Tr. Sept. 9 AM 104:9–23 (Wolfe (Gannett)); Tr. Sept. 10 AM 12:19–13:2 (Layser (News Corp)). Once DFP had obtained near-total market share, Google combined DFP and AdX under a single publisher-facing product, Google Ad Manager, which further intertwined DFP and AdX. See PTX1031 at -500 ("Google Ad Manager is the only way to access [AdX] as a publisher."). These practices on both the advertiser buy-side and publisher sell-side are evidence that Google could set its terms of dealing with its customers "without considering rivals[,]" and constituted behavior that is "difficult to explain unless" Google had monopoly power. Microsoft, 253 F.3d at 57–58.

AdX's relatively high and durable market share is consistent with the Court's conclusion that Google has monopoly power in the open-web display ad exchange market. Dr. Lee found that, from 2018 to 2022, AdX was the exchange for 63% to 71% of the worldwide open-web display transactions among the ad exchanges that produced data for this litigation, and he estimated that AdX handled between 54% and 65% of the market's total transactions. See PTX1258; Tr. Sept. 19 PM 90:14–92:19 (Lee (Pls. Expert) (discussing PTX1258)). AdX's market share has remained durable over time. See PTX1258; PTX1314; Tr. Sept. 16 PM 12:5–24 (Weintraub (Pls. Expert)). Moreover, AdX's share of the worldwide ad exchange market was roughly nine times larger than the share held by Google's next-largest competitor, which had only 6% of the market. See PTX1237; PTX1237A; PTX1238; PTX1238A; Tr. Sept. 13 PM 72:9–18 (Creput (Equativ)); Tr. Sept. 19 PM 94:3–94:22 (Lee (Pls. Expert)); see also United States v. Dentsply Int'l, Inc., 399 F.3d 181, 187 (3d Cir. 2005) (stating "the size and strength of competing firms" is a key consideration in evaluating monopoly power). It is no surprise, then, that numerous industry participants testified that AdX had the dominant position in the ad exchange market. See, e.g., Tr. Sept. 9 AM 135:8–12 (Casale (Index Exchange)); Tr. Sept. 10 AM 156:18–157:4 (Friedman (Goodway Group)); Tr. Sept. 13 AM 20:3–16 (Kershaw (Magnite)); Tr. Sept. 13 PM 72:9–18 (Creput (Equativ)); Tr. Sept. 17 PM 87:17–21 (Cadogan (OpenX)); Tr. Sept. 27 AM 7:8–25 (Pauley (Vox)).

Google argues that AdX's market share is insufficiently high to establish monopoly power, particularly given that its market share is lower when calculated by its percentage of total fees received instead of by its percentage of transactions processed, or when based on U.S.-only instead of worldwide data. See PTX1258, PTX1259. This argument fails because, as previously explained, worldwide, not U.S., market share is the appropriate geographic market for measuring

the area of competition. See Section VI(A)(2), supra. Moreover, transactions processed (i.e., the number of impressions sold on the exchange), not fees received, are the best measure of market share and power because they "speak to scale advantages" from data and indirect network effects "that different exchanges have." Tr. Sept. 19 PM 91:3–19 (Lee (Pls. Expert)); see also Amex, 585 U.S. at 537 (using transaction volume to assess market share).

The Court recognizes that Google's relatively high market share alone is not dispositive of whether the firm has monopoly power in the ad exchange market. Indeed, in different circumstances, a market share between 50% and 70% would not necessarily suggest that a firm had monopoly power. See Kolon II, 748 F.3d at 174. But here, the direct evidence of AdX charging durable and supracompetitive prices, in combination with its maintaining a market share nine times that of its next closest rival, provides strong support for the conclusion that Google has possessed and still possesses monopoly power in the open-web display ad exchange market.

This conclusion is buttressed by the evidence of AdX's high barriers to entry and expansion. Scale and network effects are crucial for ad exchanges because these exchanges exist to create matches between publisher inventory and advertiser demand. See Tr. Sept. 9 AM 143:19–145:13 (Casale (Index Exchange)); Tr. Sept. 16 PM 8:25–19:9 (Weintraub (Pls. Expert)); Tr. Sept. 19 PM 75:3–76:8 (Lee (Pls. Expert)). Ad exchanges benefit not only from having large groups of customers on both sides of the platform, but also from processing a high number of transactions. See Tr. Sept. 9 AM 135:17–137:21, 145:14–147:17, 160:24–161:4 (Casale (Index Exchange)); Tr. Sept. 16 PM 8:25–19:9 (Weintraub (Pls. Expert)). Such economies of scale help mitigate the significant capital expenditures required to build an ad exchange. See Tr. Sept. 17 PM 55:25–56:8 (Cadogan (OpenX)); Tr. Sept. 16 PM 17:15–18:21 (Weintraub (Pls. Expert)).

Large groups of customers also provide exchanges with auction and targeting data that can be used to run rapid experiments on the effects of price and quality changes, to train machine learning algorithms, and to improve publisher-advertiser matching. See Tr. Sept. 9 AM 135:19–139:17, 145:14–147:17 (Casale (Index Exchange)); Tr. Sept. 13 PM 74:13–75:6 (Creput (Equativ)); Tr. Sept. 16 PM 13:2–16:16 (Weintraub (Pls. Expert)); Tr. Sept. 23 PM 136:7–137:2 PM (John (Microsoft)) (stating scale is necessary for match quality). In sum, the high barriers to entry and expansion that protect AdX's dominant position in the open-web display ad exchange market are further evidence of its monopoly power.

The Court therefore agrees with Dr. Lee that "the totality of evidence is consistent with substantial and sustained market power on the part of AdX." Tr. Sept. 20 AM 111:20–22 (Lee (Pls. Expert)). Direct pricing evidence shows that Google "could profitably price significantly above competitive levels because enough customers would keep buying those products and not go elsewhere." Tr. Sept. 19 PM 50:2–6 (Lee (Pls. Expert)). Trial evidence also shows that Google placed limitations on AdX and adjacent products' functionality in ways that indicated it had substantial market power. Moreover, AdX's relatively high market share, viewed in conjunction with the high barriers to entry and expansion that exist for ad exchanges, supports the conclusion that Google has had and continues to maintain monopoly power.

Having found that Google has monopoly power in two relevant markets within the open-web display advertising ecosystem, the worldwide market for publisher ad servers and the worldwide market for ad exchanges, the next issue is whether Google willfully acquired and maintained this monopoly power.

C. Willful Acquisition or Maintenance of Monopoly Power

For Google to be found liable under Section 2 of the Sherman Act, Plaintiffs must prove that the company engaged in "the willful acquisition or maintenance of [monopoly] power." Kodak, 504 U.S. at 481 (quoting Grinnell, 384 U.S. at 570–71). Plaintiffs cannot prevail if Google acquired its monopoly power through "conduct [that] is procompetitive and thus increases consumer welfare," such as by having developed "a superior product" or grown due to "business acumen," Duke Energy Carolinas, LLC v. NTE Carolinas II, LLC, 111 F.4th 337, 353 (4th Cir. 2024), or if Google's monopoly power has resulted from other "valid business reasons," Kodak, 504 U.S. at 483, or "historic[al] accident." Duke Energy, 111 F.4th at 353 (quoting Grinnell, 384 U.S. at 571). Rather, "the possession of monopoly power will not be found unlawful unless it is accompanied by an element of anticompetitive *conduct*." Verizon Commc'ns Inc. v. Law Offs. of Curtis V. Trinko, LLP, 540 U.S. 398, 407 (2004) (emphasis in original).

In determining whether a company's conduct is anticompetitive, courts consider the conduct's effect on competitors, its "impact on consumers," and "whether it has impaired competition in an unnecessarily restrictive way." Aspen Skiing Co. v. Aspen Highlands Skiing Corp., 472 U.S. 585, 605 & n.1 (1985). "Some 'common forms' of anticompetitive conduct are tying, exclusive dealing, predatory pricing, and defrauding regulators or consumers." Chase Mfg., Inc. v. Johns Manville Corp., 84 F.4th 1157, 1170 (10th Cir. 2023) (quoting Novell, Inc. v. Microsoft Corp., 731 F.3d 1604, 1072 (10th Cir. 2013)). A monopolist may offer procompetitive justifications for seemingly anticompetitive conduct, but may still be liable under Section 2 of the Sherman Act if the plaintiff can "demonstrate that the anticompetitive harm of the conduct outweighs the procompetitive benefit." Microsoft, 253 F.3d at 59.

Anticompetitive conduct "comes in many different forms that cannot always be categorized." Duke Energy, 111 F.4th at 354; see also Novell, 731 F.3d at 1072; In re EpiPen Mktg., Sales Pracs. & Antitrust Litig., 44 F.4th 959, 982 (10th Cir. 2022). For some forms of anticompetitive conduct, such as "predatory pricing, refusing to deal, price fixing, or dividing markets," courts have "developed tests for analyzing such claims." Duke Energy, 111 F.4th at 354. But "when a court is faced with allegations of a complex or atypical exclusionary campaign," the "alleged anticompetitive conduct must be considered as a whole" instead of "in manufactured subcategories." Id. 354–55; see also Cont'l Ore Co. v. Union Carbide & Carbon Corp., 370 U.S. 690, 698–99 (1962) ("[P]laintiffs should be given the full benefit of their proof without tightly compartmentalizing the various factual components and wiping the slate clean after scrutiny of each."). A holistic assessment of whether a monopolist's conduct "harm[ed] the competitive *process* and thereby harm[ed] consumers" is thus the touchstone for determining whether a monopolist alleged to have engaged in an exclusionary campaign violated Section 2 of the Sherman Act. Duke Energy, 111 F.4th at 355 (quoting Microsoft, 253 F.3d at 58) (emphasis in original); see also NYNEX Corp. v. Discon, Inc., 525 U.S. 128, 135 (1998); Viamedia, Inc. v. Comcast Corp., 951 F.3d 429, 453 (7th Cir. 2020).

Plaintiffs allege that Google engaged in a series of anticompetitive acts to acquire and maintain its monopoly power. These acts generally fall into three categories: (1) establishing a dominant position across the ad tech stack through the acquisitions of DoubleClick and Admeld; (2) tying DFP to AdX to lock publishers into exclusively using Google's sell-side ad tech tools rather than those offered by competitors; and (3) leveraging its tied ad tech tools to engage in a series of acts that diminished rivals' scale, thwarted their ability to compete, and harmed customers. The Court takes each in turn, while recognizing that the ultimate conclusion of

whether Google violated Section 2 turns on whether the company's conduct, when considered as a whole, harmed competition and therefore harmed consumers. See Duke Energy, 111 F.4th at 354–55; Microsoft, 253 F.3d at 58.

1. Acquisitions of DoubleClick and Admeld

The Court finds that Plaintiffs have failed to show that the DoubleClick and Admeld acquisitions were anticompetitive. Although these acquisitions helped Google gain monopoly power in two adjacent ad tech markets, they are insufficient, when viewed in isolation, to prove that Google acquired or maintained this monopoly power through exclusionary practices.

The 2008 acquisition of DoubleClick gave Google the largest publisher ad server, DFP, and provided the company with a nascent ad exchange for matching DFP publishers with AdWords advertisers. See PTX14 at -246; PTX15 at 7; PTX41 at -006; Dep. 69:15–70:9, 72:13–74:15 (O'Kelley (Xandr)). Google knew that acquiring DFP and connecting it to AdWords using an ad exchange would increase Google's scale, network effects, and power across the ad tech ecosystem. See PTX14 at -278; PTX41 at -006; PTX51 at -726; PTX551 at -048; Tr. Sept. 13 AM 7:21–8:4 (Kershaw (Magnite)). According to Plaintiffs, Google paid $1 billion more than its corporate strategy team's valuation of DoubleClick to secure sell-side infrastructure and to prevent another large technology company from standing between Google's buy-side business and publishers. Compare PTX15 at 11 (Google's estimation that acquiring DoubleClick would provide the company with $1.5 billion to $2.2 billion in net present value) with PTX1507 at -414 (stating Google paid $3.1 billion for DoubleClick); See also PTX41 at -005 (discussing how DoubleClick acquisition mitigated risk that Google's buy-side business would be "disintermediated" by a non-Google publisher ad server).

Even assuming Plaintiffs are correct in their assessment of Google's strategy, they have not shown that the acquisition of DoubleClick was anticompetitive. Plaintiffs do not assert that Google had monopoly power in any of the relevant markets when it acquired DoubleClick. Indeed, the DoubleClick acquisition occurred at a time when Magnite (then known as Rubicon), Microsoft, OpenX, and Yahoo were vigorous participants in open-web display advertising markets. See PTX22 at 14. The acquisition was reviewed and cleared by the Federal Trade Commission by a four to one vote after a determination that "Google's proposed acquisition of DoubleClick is unlikely to substantially lessen competition."[27]

Nor did the 2011 acquisition of Admeld constitute anticompetitive conduct. Plaintiffs argue that the Admeld acquisition was problematic because Google intentionally acquired a "key competitor[]," PTX88 at -597, and then terminated its core yield management functionality, thereby ending a competitive threat to Google's sell-side businesses. See Section V(B), supra. According to Plaintiffs' expert Dr. Abrantes-Metz, the Admeld acquisition reduced competition in both the ad exchange and publisher ad server markets for open-web display advertising. Tr. Sept. 18 AM 46:4–48:22 (Abrantes-Metz (Pls. Expert)).

It is true that Admeld, along with Magnite and PubMatic, was one of the three leading yield managers in 2011, and that Google had identified Admeld as being its "largest concern," PTX88 at -597, because it had a "stronger product offering" and "better publisher base" than its

[27] Fed. Trade Comm'n Closes Google/DoubleClick Investigation, FTC (Dec. 20, 2007), https://www.ftc.gov/news-events/news/press-releases/2007/12/federal-trade-commission-closes-googledoubleclick-investigation. This conclusion can be challenged with the benefit of hindsight, as it has been by one of the FTC commissioners who initially reached it. See Steve Lohr, This Deal Helped Turn Google Into an Ad Powerhouse. Is That a Problem?, N.Y. Times (Sept. 21, 2020), https://www.nytimes.com/2020/09/21/technology/google-doubleclick-antitrust-ads.html. But it would be a substantial step to find that an acquisition violated the Sherman Act after it was reviewed and approved by federal antitrust regulators.

competitors. PTX112 at -981; see also PTX85 at -717. As a leading yield manager, Admeld threatened to undermine Google's strategy to "own the tag," i.e., to control which advertising demand sources would be used to "monetize [indirect] inventory for a publisher." PTX56 at -788. But evidence shows that Google did not merely buy Admeld to sideline it; rather, Google sought to fill a gap in its portfolio and drew upon Admeld's engineers and technology to rebuild some of Admeld's capabilities within AdX and other aspects of Google's ad tech architecture. See DTX126 at -572–75; PTX60 at -489; PTX112 at -979; Tr. Sept. 16 AM 108:23–109:17, 112:14–113:24 (Mohan (Google)). In doing so, Google at least partially improved the effectiveness of AdX, which before the Admeld acquisition "was struggling to win business" due to being "very expensive," "inflexible," and "[not] great at optimizing for yield." Dep. 86:20–87:23 (O'Kelley (Xandr)). The Admeld acquisition also provided Google with "the skill set and the knowledge [it] needed to make the AdX value proposition more compelling." Id. Acquiring technology and talent to offer customers a more flexible, affordable, and effective product is not anticompetitive when motivated by "valid business reasons." Kodak, 504 U.S. at 483. That may be one reason why the Antitrust Division of the U.S. Department of Justice chose not to pursue legal action against Google for its Admeld acquisition after conducting an investigation that "obtained extensive information from Google, Admeld and a wide range of market participants."[28]

[28] See Statement of the Dep't of Justice's Antitrust Div. on Its Decision to Close Its Investigation of Google Inc.'s Acquisition of Admeld Inc., U.S. Dep't of Justice (Dec. 2, 2011), https://www.justice.gov/opa/pr/statement-department-justices-antitrust-division-its-decision-close-its-investigation-google. In a pre-trial order, the Court prohibited Google from introducing "evidence or argument about antitrust enforcers' review, comments, and decisions not to challenge Google's acquisitions" of DoubleClick and Admeld so that the parties would focus their arguments at trial on the merits of these acquisitions, [Dkt. 1303] at 1; however, the Court has taken judicial notice of the fact that the acquisitions were approved by antitrust regulators. See United States v. Garcia, 855 F.3d 615, 621 (4th Cir. 2017) (stating that courts "routinely take

Because Plaintiffs have not shown that Google's acquisitions of DoubleClick and Admeld constituted anticompetitive conduct, the Court next examines Plaintiffs' claim that Google tied DFP to AdX, and then used its power in the products' two adjacent markets to harm competition at consumers' expense.

2. Tying DFP to AdX

"[T]he vice of tying arrangements lies in the use of economic power in one market to restrict competition on the merits in another." N. Pac. Ry. Co., 356 U.S. at 11. Accordingly, "the essential characteristic" of unlawful tying is "the seller's exploitation of its control over the tying product to force the buyer into the purchase of a tied product that the buyer either did not want at all, or might have preferred to purchase elsewhere on different terms." Jefferson Parish Hosp. Dist. No. 2 v. Hyde, 466 U.S. 2, 12 (1984); see also It's My Party, 811 F.3d at 684. "Tying suppresses competition in two ways: First, the buyer is prevented from seeking alternative sources of supply for the tied product; second, competing suppliers of the tied product are foreclosed from that part of the market which is subject to the tying arrangement." It's My Party, 811 F.3d at 684 (internal quotation omitted).

Tying is per se unlawful under Section 1 of the Sherman Act, which prohibits unreasonable restraints on trade. Serv. & Training, Inc. v. Data Gen. Corp., 963 F.2d 680, 683 (4th Cir. 1992). To prove a tying claim, a plaintiff must establish four elements: "(1) the existence of two separate products, (2) an agreement conditioning purchase of the tying product upon purchase of the tied product (or at least upon an agreement not to purchase the tied product from another party), (3) the seller's possession of sufficient economic power in the tying product

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judicial notice of information contained on state and federal government websites"). That such approval was given when the acquisitions occurred does not prohibit a finding that the use of these acquisitions over time has resulted in violations of the Sherman Act.

market to restrain competition in the tied product market, and (4) a not insubstantial impact on interstate commerce." Id. (citing Hyde, 466 U.S. at 12–16). Although tying under Section 1 "do[es] not require that the defendant have a monopoly" in "the market for a tying product," U.S. Steel Corp. v. Fortner Enter., Inc., 429 U.S. 610, 620 (1977), tying by a monopolist can satisfy the anticompetitive conduct element under Section 2 of the Sherman Act. See Viamedia, 951 F.3d at 468–69 (citing Phillip E. Areeda & Herbert Hovenkamp, Antitrust Law: An Analysis of Antitrust Principles and Their Application ¶ 777, at 325 (4th ed. 2015)); Microsoft, 253 F.3d at 84–85 (considering tying allegations under both Section 1 and Section 2); Md. & Va. Milk Producers Ass'n, Inc. v. United States, 362 U.S. 458, 463 & n.8 (1960) (stating that Sections 1 and 2 "closely overlap, and the same kind of predatory practices may show violations of all"). When a defendant facing a tying claim is a monopolist, courts consider whether the tie "contribute[d] significantly to the maintenance or creation of monopoly power . . . even though it [wa]s unilaterally imposed." Viamedia, 951 F.3d at 469.

Here, Plaintiffs allege that Google tied DFP, its publisher ad server, to AdX, its ad exchange. Specifically, Plaintiffs cite to Google's technical and policy restrictions that prohibited publishers from receiving real-time bids from AdX (the tying product) unless they also used DFP (the tied product). These restrictions, according to Plaintiffs, compelled publishers to use DFP, not because they viewed it as a superior product, but rather due to Google's exploitation of its control over AdX's preeminent position in the open-web display ad exchange market. Partly as a result, Plaintiffs claim that DFP became, and has remained, the dominant publisher ad server for open-web display advertising.

Plaintiffs have proven the four elements of their tying claim. First, publisher ad servers and ad exchanges are "two separate products" that are not reasonably interchangeable. Serv. &

Training, 963 F.2d at 683; see Section VI(A)(1–2), supra. Publisher ad servers and ad exchanges serve different functions, use different pricing structures, and are recognized as different products by industry participants. See Section VI(A)(1–2), supra. Moreover, there is "sufficient demand for the purchase of [publisher ad servers] separate from [ad exchanges]" such that there is a "distinct product market" for publisher ad servers. Serv. & Training, 963 F.2d at 684 (quoting Hyde, 466 U.S. at 121–22); see Section VI(A)(1–2), supra (identifying a product market for publisher ad servers and a distinct product market for ad exchanges). Google's rebranding DFP and AdX under a unified name, Google Ad Manager, cannot overcome these "market realities." Alston, 594 U.S. at 93.

Second, the policy and technology restrictions that Google has placed within AdX "condition[ed] purchase of the tying product [AdX] upon purchase of the tied product [DFP]." Serv. & Training, 963 F.2d at 683. The function of an ad exchange is to match publishers with advertisers by facilitating real-time auctions for publishers' inventory. See Section IV(B), supra. An ad exchange does this by aggregating advertisers' bids for each available impression, then submitting the best of those bids to the publisher ad server with the goal of outbidding competing bids from other ad exchanges. See id. Access to real-time bids from AdX is considered particularly valuable by publishers because of the unique advertising demand that AdX receives from the millions of advertisers who exclusively use AdWords. See Sections V(A) & VI(B)(2), supra. By restricting AdX's submission of real-time bids only to DFP, and by not allowing AdX to provide real-time bids to other publisher ad servers, Google made AdX ineffective at its core function when used by publishers who did not also use DFP. See Section IV(B), supra. In practice, therefore, Google's restriction of AdX's real-time bidding to DFP required Google's publisher customers who wanted to use AdX's core feature to use DFP. This coercive policy

made purchasing DFP, the tied product, together with AdX, the tying product, "the only viable economic option" for publishers who wanted to gain effective real-time access to AdWords, which they could only accomplish by using AdX. Nobel Sci. Indus., Inc. v. Beckman Instruments, Inc., 670 F. Supp. 1313, 1324 (D. Md. 1986); see also Tire Sales Corp. v. Cities Serv. Oil Co., 637 F.2d 467, 473 (7th Cir. 1980); Philip E. Areeda & Herbert Hovenkamp, Antitrust Law: An Analysis of Antitrust Principles and Their Application ¶ 1752b (4th ed. 2020) (defining a tie as the improper imposition of "conditions that explicitly *or practically* require buyers to take the second product if they want the first one") (emphasis added).

As discussed previously, overwhelming evidence has established that it is not economically feasible for publishers to use multiple publisher ad servers. See Section VI(B)(1), supra. For all practical purposes, then, Google's tying DFP to AdX communicated to publishers that if they used a rival publisher ad server, they would be shut out of AdX's core functionality. This coercive pressure was akin to a "threat[] to stop selling needed products to its customers if they bought from a new market entrant offering a superior product for less money"—conduct a court found to be anticompetitive in Chase Mfg. 84 F.4th at 1173; see also Lorain Journal Co. v. United States, 342 U.S. 143, 154 (1951) (deeming anticompetitive a local newspaper's refusal to sell advertising space to customers who advertised on a local radio station); Viamedia, 951 F.3d at 471 (finding monopolist's "refusing to deal with [its customers'] chosen intermediary had the [anticompetitive] effect of forcing them into much less desirable relationships" with the monopolist).

Google staff understood the coercive power of the AdX-DFP tie. For example, a Google sell-side manager told his leadership that "AdX can serve as a tool to pull publishers onto [D]FP." PTX114 at -049. Google decided against "giv[ing] AdX to non-[D]FP partners," and

instead worked to "'lock in' impressions by offering [D]FP to publishers with full AdX dynamic allocation" (i.e., real-time bidding), id., so that Google could maintain "a key differentiator for DFP." PTX113 at -804; see also PTX159 at -003 (Google employee stating that he was "more of the mindset of getting folks to flip to DFP" to access real-time AdX bids as opposed to offering such bids on third-party exchanges). Google made this decision despite acquiring Admeld's technology for offering real-time bids to publishers using third-party ad servers, PTX159 at -002–04, which was a capability that Google had beta tested and which some at the company believed would have taken "[m]inimal effort" to implement at scale. PTX113 at -804; see also Tr. Sept. 18 AM 47:3–12 (Abrantes-Metz (Pls. Expert)). By tying DFP to AdX, Google took advantage of its "owning the platform, the exchange, and a huge network" of advertising demand, which a senior Google manager analogized to "Goldman or Citibank own[ing] the NYSE [i.e., the New York Stock Exchange]." PTX367 at -464.

Google's publisher customers similarly understood the coercive power of the AdX-DFP tie. They "felt locked-in by dynamic allocation in DFP, which only gave AdX [and not other exchanges the] ability to compete" with real-time bids. PTX587 at -794. That is why industry participants worked together to create header bidding, a technical workaround that partially diminished the power of the AdX-DFP tie. See id.; PTX1710 at -407; Dep. 111:7–114:2 (O'Kelley (Xandr)); see also Section V(F), supra. But header bidding has failed to erode DFP's dominance because subsequent Google product changes such as Last Look enhanced the power of the AdX-DFP tie. See Sections V(G) and VI(B)(1), supra. Open-web publishers were therefore stuck using DFP, even if they would have preferred to use a different publisher ad server.

Google argues that publishers who used AdX were free to use a publisher ad server other than DFP, and those that used DFP did not necessarily have to use AdX. But by prohibiting publishers that used a non-DFP ad server from having access to the essential AdX feature of real-time bidding by AdWords advertisers, Google effectively has "coerce[d] the abdication of [publishers'] independent judgment as to the 'tied' product's merits and insulate[d] it from the competitive stresses of the open market." Hyde, 466 U.S. at 13 (quoting Times-Picayune Pub. Co. v. United States, 345 U.S. 594, 605 (1953)). The unique value of real-time access to AdWords through AdX has essentially forced Google's publisher customers "into the purchase of a tied product that the[y] either did not want at all, or might have preferred to purchase elsewhere on different terms." It's My Party, 811 F.3d at 684 (quoting Hyde, 466 U.S. at 12). The high degree of effort that Google has used to insulate DFP from the competitive stresses of the open market is sufficient to satisfy the second element of the tying test, particularly as the central focus of the overall inquiry is whether Google's actions harmed competition and therefore harmed consumers.

Third, Google has possessed "sufficient economic power in the tying product market to restrain competition in the tied product market." Serv. & Training, 963 F.2d at 683. The Court has found that Google has monopoly power in the open-web display ad exchange market because AdX charges supracompetitive prices, is nine times larger than the next largest ad exchange, and is protected by high barriers to entry and expansion. See Section VI(B)(2), supra. Such proof of monopoly power in the tying product market is more than sufficient to show that Google has had the requisite level of economic power to establish the third element of a tying claim. See U.S. Steel, 429 U.S. at 620; In re Deere & Co. Repair Serv. Antitrust Litig., 703 F. Supp. 3d 862, 909 (N.D. Ill. 2023).

A primary source of Google's monopoly power in the ad exchange market is AdWords' uniquely large and diverse array of advertising demand. See Sections V(A, C) & VI(B)(2), supra. Google has been able to amass this unparalleled group of mostly small and medium-sized advertisers in large part due to the dominance of Search, which another district court has found to be the source of Google's monopoly power in the markets for general search services and general search text ads. See Google Search, 2024 WL 3647498, at *75, *89–91 (D.D.C. Aug. 5, 2024); see also Tr. Sept. 11 PM 153:6–154:20 (Dederick (The Trade Desk)); Tr. Sept. 13 AM 7:21-8:4 (Kershaw (Magnite)); Tr. Sept. 19 PM 99:18–100:2 (Lee (Pls. Expert)). By effectively restricting the unique advertising demand offered by AdWords advertisers to AdX, Google has ensured that publishers would lose significant revenue if they did not use AdX. See Section VI(B)(2), supra; Dep. 108:19–109:3 (Rowley (Google)) (admitting AdWords demand "compel[led] publishers to work with" Google's sell-side products). Google's monopoly power in the open-web display ad exchange market, bolstered by its significant Search-derived power on the buy-side of the digital advertising industry, constitutes "sufficient economic power in the tying product market to restrain competition in the tied product market." Serv. & Training, 963 F.2d at 683.

Fourth and finally, the tying of AdX and DFP has had a "not insubstantial impact on interstate commerce." Serv. & Training, 963 F.2d at 683. "Wholly apart from market characteristics, a prerequisite to application of the Sherman Act is an effect on interstate commerce." Hyde, 466 U.S. at 37 n.5 (O'Connor, J., concurring). Like in Hyde, "[i]t is not disputed that such an impact is present here." Id. AdX and DFP are used by publishers across the United States and worldwide. See Section VI(A)(2), supra. And the AdX-DFP tie, which facilitates the billions of dollars of revenue that AdX generates annually, has a large and

substantial impact on interstate commerce. See PTX1710 at -407. Cf. It's My Party, Inc. v. Live Nation, Inc., 88 F. Supp. 3d at 490 (suggesting $200,000 is a "not insubstantial" amount of interstate commerce). Because they have established these four elements, Plaintiffs have shown that Google has engaged in unlawful tying under Section 1 of the Sherman Act.

Google's tying of DFP to AdX also violates Section 2 of the Sherman Act because it "contribute[d] significantly to the maintenance or creation of monopoly power . . . even though it [wa]s unilaterally imposed." Viamedia, 951 F.3d at 469. As Google employees recognized, the "value of Google's ad tech stack is less in each individual product, [than] in the connections across all of them." PTX551 at -048 (emphasis omitted). To deepen these connections, Google "artificially handicap[ped] [its] buyside ([AdWords]) to boost the attractiveness of [its] sellside (AdX)," PTX110 at -009, by effectively limiting its programmatic open-web advertisers in AdWords to bidding for inventory from publishers that used AdX and DFP. Google did this despite knowing that its advertiser customers would benefit from AdWords' bidding for open-web display ad inventory on non-Google exchanges. See PTX198 at -703. Indeed, the leadership of Google's buy-side team "want[ed AdWords] to buy into all auctions regardless of what the AdX margin is." Id. But Google limited where its advertisers could bid to "[p]rotect [DFP's] position" as the dominant "operating system for publishers globally" and to disincentivize publishers from switching away from DFP. DTX76 at -477; see also Section VI(B)(1), supra.

The limitations on AdWords and AdX expanded Google's dominance in the publisher ad server market, with rival publisher ad servers exiting the market and DFP maintaining more than 90% market share from 2018 through 2022. See Section VI(B)(1), supra; Tr. Sept. 11 PM 153:6–154:11 (Dederick (The Trade Desk)). Even though some industry participants thought Google's

DFP "wasn't the best ad server," almost "every other publisher ad server either went out of business or was sold for scrap" because Google has "destroyed all competition" in the ad server market through its AdX-DFP tie and associated activities. Dep. 74:17–75:21 (O'Kelley (Xandr)); see also PTX758 at -946 (Kevel founder and CEO James Avery stating in a 2019 email that "[a]lmost every [publisher] ad server has gone out of business because of this integration between AdX and [DFP]. [P]ublishers may want to use another ad server but they would end up giving up a chunk of revenue from AdX. It turns out monopolies are pretty effective.").

By forcing Google's publisher customers to use a product they would not necessarily have otherwise used, by making it difficult for rival publisher ad servers to compete on the merits, and by significantly reducing rivals' market share, the tying of DFP to AdX has had a substantial anticompetitive effect in the publisher ad server market for open-web display advertising. Accordingly, the AdX-DFP tie has violated both Section 1 and Section 2 of the Sherman Act. See Viamedia, 951 F.3d at 471–75; LePage's Inc. v. 3M, 324 F.3d 141, 154–57, 159–63 (3rd Cir. 2003) (en banc); Microsoft, 253 F.3d at 64–67, 78–80.

3. Entrenching Monopoly Power with Anticompetitive Actions

Google's monopolies in the publisher ad server and ad exchange markets, enhanced by the AdX-DFP tie, have enabled Google to introduce a series of anticompetitive policies, practices, and technology changes to its sell-side ad tech tools that were not in its publisher customers' best interests. These changes decreased product quality and harmed competition by further entrenching Google as the dominant company in open-web display advertising. Google made these changes, despite customer complaints, by exploiting its durable monopoly power in the open-web display ad exchange and publisher ad server markets. The changes are further

evidence that Google has engaged in "anticompetitive conduct," Trinko, 540 U.S. at 407, by its "willful acquisition or maintenance of [monopoly] power." Kodak, 504 U.S. at 481.

The first of these anticompetitive policies was First Look, which required publishers using DFP to offer AdX a first right of refusal for each impression. See Section V(D), supra (citing PTX551 at -048). First Look exacerbated the anticompetitive effect of the unlawful AdX-DFP tie by artificially advantaging AdX within DFP's auction logic at the expense of Google's publisher customers. See id. If Google did not have monopoly power in the ad exchange or publisher ad server markets, then running a fundamentally unfair auction process to preference its own ad exchange over third-party ad exchanges might have been a permissible design choice. But Google's use of its monopoly power to impose artificial technical limitations that made it harder for customers to do business with rivals, instead of competing on the merits by "making [its ad exchange] more attractive to customers," constituted anticompetitive conduct. Microsoft, 253 F.3d at 65. Moreover, Google's "bundling of its [AdX and DFP] products . . . reinforced the exclusionary effect" of First Look. LePage's, 324 F.3d at 162.

Google's Last Look was another anticompetitive policy that entrenched Google's monopoly power, disadvantaged Google's publisher customers, and harmed the competitive process. This DFP feature, which gave AdX the ability to see competing exchanges' bids in an otherwise sealed auction before AdX would bid, harmed publishers, rival ad exchanges, and advertisers using non-Google ad buying technologies. See Section V(G), supra. That is why three experts testified that Last Look was anticompetitive. See Tr. Sept. 11 AM 120:23–121:21 (Ravi) (Pls. Expert)) (testifying Last Look created inefficiencies, reduced publisher revenue, and reduced the amount of impressions non-Google exchanges were able to win); Tr. Sept. 18 AM 39:4–14, 40:2–41:3 (Abrantes-Metz (Pls. Expert)) (testifying Last Look was exclusionary); Tr.

Sept. 20 PM 7:1–8 (Lee (Pls. Expert)) (testifying Last Look involved Google using its market power in the publisher ad server market to diminish the competitiveness of rivals in the ad exchange market).

The anticompetitive effects of Last Look have been compounded by Google's sell-side dynamic revenue share. See Section V(H), supra. By using the Last Look informational advantage to vary AdX fees and win impressions that it would have lost in a fair auction, Google has further enhanced AdX's market power at the expense of rivals, thereby reducing competition and harming its publisher customers' ability to diversify their revenue sources away from Google. See id.[29]

In an environment of increased regulatory and "competition concerns," PTX816 at -161, Google eventually eliminated its Last Look advantage. See Section V(J), supra. But in implementing Unified Pricing Rules, Google simultaneously took away publishers' ability to set higher price floors on AdX than on third-party exchanges, which was a primary tool that publishers had used to maintain revenue diversity and to mitigate Google's dominance of the ad exchange market. See id. Publishers viewed Unified Pricing Rules as not in their best interests, but felt stuck using DFP given its tie to AdX. See PTX1854 at 25:1–11, 36:5–37:20, 44:1–14, 52:11–16; Tr. Sept. 10 AM 51:24–55:3, 109:23–110:16 (Layser (News Corp)). Unified Pricing Rules is another example of Google exploiting its monopoly power and tying arrangement to

[29] Project Poirot also enhanced AdX's market power by adjusting some of DV360's bids in a way that preferenced AdX over third-party ad exchanges. See Section V(I), supra. But Project Poirot occurred within DV360, a Google ad buying tool which is not within any of the relevant antitrust markets, and the evidence suggests that Project Poirot was a reasonable method for protecting Google's advertiser customers from third-party ad exchanges that were running unfair auctions. See Tr. Sept. 11 PM 53:2–54:4 (Ravi (Pls. Expert)); Tr. Sept. 19 AM 137:14–138:5 (Bellack (Google)); Tr. Sept. 24 AM 115:16–25 (Milgrom (Def. Expert)). Therefore, the Court does not consider Project Poirot as part of the anticompetitive conduct through which Google willfully acquired and maintained its monopoly power.

restrict its customers' ability to deal with its rivals, thereby reducing its rivals' scale, limiting their ability to compete, and further compounding the harm to customers. Under these circumstances, Unified Pricing Rules constituted anticompetitive conduct because it involved Google using its coercive monopoly power to deprive its publisher customers of a choice that they had previously exercised to promote competition. See New York ex rel. Schneiderman v. Actavis PLC, 787 F.3d 638, 652–54 (2d Cir. 2015); Lorain Journal, 342 U.S. at 154.

4. Google's Contention that Refusal to Deal Precedent Precludes Liability

One of the primary legal defenses that Google has raised in this litigation is that its actions to build and shape an integrated ad tech infrastructure, including the tying of DFP to AdX and the subsequent use of that tie to preference Google products over rival products, cannot result in antitrust liability under the "refusal to deal" doctrine articulated by the Supreme Court in Verizon Communications, Inc. v. Law Offices of Curtis V. Trinko, LLP, 540 U.S. 398, 409 (2004), and reaffirmed in Pacific Bell Telephone Co. v. LinkLine Communications, Inc., 555 U.S. 438, 448 (2009). In Trinko, the Supreme Court held that, "as a general matter, the Sherman Act 'does not restrict the long recognized right of [a] trader or manufacturer engaged in an entirely private business, freely to exercise his own independent discretion as to parties with whom he will deal.'" 540 U.S. at 408 (quoting United States v. Colgate & Co., 250 U.S. 300, 307 (1919)) (alteration in original). The Court provided three reasons for this rule. First, firms should be incentivized to "establish[] infrastructure that renders them uniquely suited to serve their customers," even if doing so causes them to gain monopoly power. Id. at 407. Second, "[e]nforced sharing also requires antitrust courts to act as central planners, identifying the proper price, quantity, and other terms of dealing—a role for which they are ill suited." Id. at 408.

Third, "compelling negotiation between competitors may facilitate the supreme evil of antitrust: collusion." Id.

The Supreme Court also recognized in Trinko that "the right to refuse to deal with other firms" is not "unqualified." Id. (quoting Aspen Skiing, 472 U.S. at 601). It identified Aspen Skiing as "[t]he leading case for § 2 liability based on refusal to cooperate with a rival," id., and described how the evidence in that case supported the conclusion that the defendant forwent the "short-run benefits" of dealing with a rival "because it was more interested in reducing competition . . . over the long run by harming its smaller competitor." Id. at 409 (quoting Aspen Skiing, 472 U.S. at 608). Yet the Trinko decision described Aspen Skiing as being "at or near the outer boundary of § 2 liability," and warned that courts should exercise caution in recognizing exceptions to the general rule that firms have no obligation to deal with rivals. Id. at 408–09. When it decided LinkLine four years later, the Supreme Court stated that "[a]s a general rule, businesses are free to choose the parties with whom they will deal, as well as the prices, terms, and conditions of that dealing," although in doing so, the Court reacknowledged the "limited circumstances in which a firm's unilateral refusal to deal with its rivals can give rise to antitrust liability." 555 U.S. at 448 (citing Aspen Skiing, 472 U.S. at 608–11). In a recent Sherman Act Section 2 case, the Fourth Circuit identified an "important distinction" between Trinko and Aspen Skiing: Trinko involved assessing the defendant's conduct in a regulated market, where courts should apply antitrust laws more cautiously given "the existence of a regulatory structure designed to deter and remedy anticompetitive harm," whereas Aspen Skiing did not involve a regulated market. Duke Energy, 111 F.4th at 363 (quoting Trinko, 540 U.S. at 412).

The refusal to deal doctrine in Trinko does not apply to Google's conduct at issue. Courts have declined to "extend[] a refusal-to-deal-with-rivals analysis" to anticompetitive restraints

that a monopolist places on its customers, as opposed to its competitors. Chase Mfg., 84 F.4th at 1173; see also Kodak, 504 U.S. at 463 n.8; Lorain Journal, 342 U.S. at 152–53. Courts have also "contrast[ed]" the "[r]efusal to deal doctrine" from "a monopolist's more direct interference with rivals," such as "limit[ing] the abilities of third parties to deal with rivals (exclusive dealing)" or "requir[ing] third parties to purchase a bundle of goods rather than just the ones they really want (tying)." Novell, 731 F.3d at 1072, 1076. Here, Google has engaged in tying that effectively has compelled its publisher customers to use DFP if they want to use AdX and receive real-time bids from AdWords advertisers. See Section VI(C)(2), supra. This tying has had the anticompetitive effect of limiting Google's publisher customers' choice of publisher ad server for reasons other than competition on the merits. See id. Moreover, the tie increased Google's scale, decreased rivals' scale, caused some rivals to exit the publisher ad server market, and harmed competition, customers, and Internet users. See id. Although such tying, like other anticompetitive and restrictive conditions on customers, can be conceptualized as a "conditional refusal[] to deal," that does not mean it should be assessed as a "simple refusal to deal" with rivals, which was the alleged harm in Trinko. Viamedia, 951 F.3d at 453. Rather, as the Supreme Court reasoned in Kodak, even if the refusal to sell a product to rivals could "be characterized as a unilateral refusal to deal," the sale of a tying product to "third parties" on the "condition that they buy" a tied product does not fit within the ambit of the refusal to deal exception to antitrust liability. 504 U.S. at 463 n.8. That is why a tying claim "does not fail as a matter of law simply because it was implemented by refusing to deal with an intermediary." Viamedia, 951 F.3d at 472.

Beyond the unsuitability of the refusal to deal doctrine to Google's tying of DFP to AdX, two other aspects of Google's conduct differ significantly from the conduct at issue in Trinko. Unlike in Trinko, Google's ad tech business has not operated in a highly regulated industry in

which state and federal regulators require the leading firms to share access to capital-intensive infrastructure. Cf. 540 U.S. at 402–04. Rather, Google's ad tech products operate in markets where there is no industry-specific "regulatory structure designed to deter and remedy anticompetitive harm" or otherwise "perform[] the antitrust function." Id. at 412. Moreover, like in Aspen Skiing but unlike in Trinko, Plaintiffs presented evidence that Google sacrificed "short-run benefits because it was more interested in reducing competition . . . over the long run by harming its smaller competitor[s]." Trinko, 540 U.S. at 409 (quoting Aspen Skiing, 472 U.S. at 608) (ellipses in original). For example, after acquiring Admeld, Google shut down its feature of providing real-time bids to third-party exchanges. See Section V(E), supra. Google's decision to shut down this feature was consistent with the strategy to "pick[] up the [yield manager] with the most traction and park[] it somewhere." PTX58 at -800. Google also refused to implement real-time bidding outside of its ad tech infrastructure despite its buy-side team emphasizing the benefits that doing so would have for its advertiser customers. See Section VI(C)(2), supra.

Given all these significant differences, the Court finds that the refusal to deal doctrine articulated in Trinko does not protect Google from antitrust liability in this civil action. As established above, Google conducted anticompetitive tying to maintain its monopoly power, and thereafter engaged in a series of exclusionary acts that compounded harms to customers and competition in the two ad tech markets at issue.

5. Google's Contention that Its Conduct is Protected by Procompetitive Justifications

Google also contends that the actions Plaintiffs have challenged were procompetitive product design choices made for valid business reasons, and therefore cannot serve as a basis for subjecting the firm to antitrust liability. Specifically, Google claims that its challenged actions

improved safety and privacy, countered fraud, reduced latency, promoted investment, and decreased prices.

A defendant shown to have engaged in exclusionary conduct to maintain a monopoly may avoid Section 2 liability by proving that the conduct was done for "valid business reasons." Kodak, 504 U.S. at 483; see LePage's, 324 F.3d at 163. Accordingly, procompetitive rationales may justify "an otherwise per se illegal tying arrangement." Mozart Co. v. Mercedes-Benz of N. Am., Inc., 833 F.2d 1342, 1348 (9th Cir. 1987). A court must assess the "validity and sufficiency of each claimed [procompetitive] justification." Kodak, 504 U.S. at 483; see also Duke Energy, 111 F.4th at 362, 365; Viamedia, 951 F.3d at 464; Microsoft, 253 F.3d at 66. Because pretextual and unsubstantiated justifications are not "valid," Kodak, 504 U.S. at 483; see Actavis, 787 F.3d at 658; McWane, 783 F.3d at 841–42, courts may give "greater weight to the contemporaneous statements contained in the company's internal records, than [to] later trial testimony in which [its] employees declined to ratify those statements." Google Search, 2024 WL 3647498, at *41 n.2; see also United States v. U.S. Gypsum Co., 333 U.S. 364, 395–400 (1948). In assessing whether proffered procompetitive justifications are "sufficient," Kodak, 504 U.S. at 483, courts frequently "balance the restriction's anticompetitive harms against its procompetitive benefits." Epic Games, 67 F.4th at 994; see Alston, 594 U.S. at 96–97; Microsoft, 253 F.3d at 59, 66; FTC v. Qualcomm Inc., 969 F.3d 974, 991 (9th Cir. 2020).

Google has failed to proffer a sufficient procompetitive justification for its AdX-DFP tie, as each procompetitive benefit it alleged was either invalid or significantly outweighed by the tie's anticompetitive effects. Google contends that the integration of its products across the ad tech stack, including the AdX-DFP tie, reduced spam, fraud, malware, latency, and other quality issues; however, Google documents show that the buy-side AdWords team, which was

responsible for ensuring its advertiser customers had their ads published without undue latency on high-quality websites that were not fraudulent, Tr. Sept. 13 AM 73:6–8 (LaSala (Google), internally advocated for AdWords to buy on most other ad exchanges because those exchanges had "acceptable levels" of spam and fraud, PTX199 at -240–41, that were "comparable" to the spam and fraud levels on AdX, PTX835 at -867. See also Tr. Sept. 17 PM 24:1–20 (Jayaram (Google)). These other exchanges submitted real-time bids to third-party publisher ad servers, just as AdX would have if AdX and DFP were not tied. And so Google's buy-side team "d[id] not like the idea of AdWords being given a disadvantage compared to the other buyers in order to strengthen the publisher pitch (e.g. uphold the 20% margin [on AdX])." PTX198 at -703. But the sell-side managers within Google shut down the plan to let AdWords bid on third-party exchanges for fear that it would undermine AdX and DFP's dominance among publishers. See PTX116 at -462–63. Google therefore "artificially handicapp[ed] [its] buyside ([AdWords]) to boost [its] sellside (AdX)." PTX110 at -009; see also PTX41 at -005–06 (stating bundling DFP, AdX, and AdWords was to obtain "access to [publisher] inventory" and to win "the most strategic battle [which wa]s about the publisher platform"); PTX183 at -717 (stating AdWords' exclusivity on AdX was "purely [a] decision to hold back a set of advertisers ([AdWords] customers) in order to promote [AdX]"); Tr. Sept. 17 AM 21:3–16 (Jayaram (Google)). Instead of reducing spam, fraud, and malware for its customers, the AdX-DFP tie "greatly weaken[ed] [AdWords'] position in the market," PTX110 at -009, to entrench AdX as the dominant ad exchange and DFP as the dominant publisher ad server. See DTX85 at -539 (documenting internal Google projection that permitting AdWords to bid on rival exchanges would cause "AdX [to] lose 20% to 30% of its publishers" and "DFP [to] lose 20% of its publishers").

Nor were any security or quality concerns on the sell-side sufficient to justify the AdX-DFP tie. Numerous industry participants and customers testified that Google did not have lower levels of spam, fraud, or malware than other reputable ad tech providers. See Tr. Sept. 9 AM 157:1–9 (Casale (Index Exchange)) (stating header bidding posed no greater risk of fraud or malware than bidding within Google's ad tech stack); Tr. Sept. 10 AM 46:13–47:13 (Layser (News Corp)) (stating AdX was not better than other ad exchanges at preventing fraud, malware, or spam, and that publishers used third-party software to mitigate malware and spam); Tr. Sept. 10 AM 153:23–154:16 (Friedman (Goodway Group)) (stating all large ad exchanges provide "similar quality inventory to . . . any of the other ones"); Tr. Sept. 27 AM 74:5–75:1 (Wheatland (Daily Mail)). This evidence, therefore, showed that the proffered spam, fraud, latency, and other quality justifications of the AdX-DFP tie were either pretextual or, at best, incidental to the primary purpose of the tie, which was to acquire and maintain market power in the open-web ad exchange and publisher ad server markets. To the extent these quality justifications have any validity, they were significantly outweighed by the anticompetitive effect of the AdX-DFP tie, through which Google has driven nearly all competitors out of the publisher ad server market and secured a durable market share of over 90%.

Google's procompetitive justifications for the actions it took to entrench its monopoly power and strengthen the AdX-DFP tie similarly fall short. Google claims that First Look and Last Look increased revenue for Google's publisher customers and gave advertisers more opportunities to bid on inventory. Some aspects of "Dynamic Allocation," such as the addition of AdX as a new source of advertiser demand to publisher customers and the "process that allow[ed] AdX to provide real-time bids," did increase publishers' revenue substantially. Tr. Sept. 18 AM 53:3–54:12 (Abrantes-Metz (Pls. Expert)); see also Tr. Sept. 24 AM 58:14–62:5

(Milgrom (Def. Expert)) (citing DTX117 at -415 and DTX80 at -322). But Plaintiffs have not argued that these aspects of Dynamic Allocation were anticompetitive. See Tr. Sept. 18 AM 53:3–54:12 (Abrantes-Metz (Pls. Expert)). Rather, the anticompetitive aspect of Dynamic Allocation was First Look, i.e., Google's preferencing AdX over non-Google ad exchanges within DFP, which resulted in less revenue for publishers, fewer impressions going to the advertisers who were willing to pay the most for them, enhanced AdX market power, and reduced competition in the ad exchange market. See Sections V(D) and VI(C)(3), supra; see also Tr. Sept. 11 PM 71:18–23 (Ravi (Pls. Expert)) ("[T]he advertiser willing to pay the highest price may not get [an impression] as a result of first look."); Tr. Sept. 16 PM 135:16–139:1 (Abrantes-Metz (Pls. Expert)) (describing how First Look was exclusionary and harmed publishers).

Last Look, which was implemented after Google had established dominance in the ad exchange and publisher ad server markets, similarly did not provide publishers with as much revenue as they would have received in a fair auction. The advantage that Last Look provided to AdX enabled AdX to win auctions despite offering less than its advertisers were willing to pay. See Section V(G), supra (citing Tr. Sept. 12 PM 101:13–23 (Goel (PubMatic))). For example, if an AdX advertiser was willing to bid $1.50 CPM for an impression but non-AdX advertisers were only offering $1.00 CPM, then in a fair auction, AdX would win the auction and pay the publisher $1.50 CPM. See id. But because Last Look let AdX "open the envelope for the [highest] bid [among the non-AdX advertisers], know what the winning bid [wa]s, and be able . . . to bid after everybody else," AdX could bid $1.01 CPM and still win the auction, resulting in the publisher receiving $0.49 CPM less than it would have in a fair auction. Tr. Sept. 18 AM 37:7–38:1 (Abrantes-Metz (Pls. Expert)). This advantage, which Google was only able to implement because of AdX and DFP's market power, reduced publisher revenue, decreased

rivals' scale, dampened ad exchange price competition, and further entrenched Google's market power in the two adjacent product markets. See PTX438 at -478; PTX1709 at -934; Sept. 18 AM 39:4–41:3 (Abrantes-Metz (Pls. Expert)).

Google contends that Last Look was procompetitive because publishers using header bidding could choose not to request a bid from AdX, and so they would only activate Last Look if doing so increased their revenue. See Tr. Sept. 24 AM 74:18–25 (Milgrom (Def. Expert)). But given AdX's monopoly power in the ad exchange market, this offer was a "Hobson's choice;" it was not financially viable for large publishers to forgo using AdX and the access it offered to the unique advertising demand from AdWords. Viamedia, 951 F.3d at 435. Google therefore did not establish any valid and sufficient procompetitive justifications for Last Look.

The exclusionary nature of sell-side dynamic revenue share similarly cannot be shielded by the proffered procompetitive justifications. Google argues that sell-side dynamic revenue share helped create matches for impressions that would not have sold to any advertisers without it. See DTX212 at -484. But the primary purpose of sell-side dynamic revenue share was to outbid rival exchanges by using AdX's anticompetitive Last Look advantage. See Sections V(H) and VI(C)(3), supra. That is why a Google engineer stated that sell-side dynamic revenue share was "just yet another way for AdX to exploit the last look advantage," and observed that "AdX gets to pay high and win whenever AppNexus [another ad exchange] is present with a high CPM, and can pay low when AppNexus bids low. AppNexus in contrast can't reliably save money on queries where AdX bids low, because it doesn't know AdX bids." PTX542 at -335. Therefore, just as with Last Look, Google's proffered procompetitive justification for sell-side dynamic revenue share was pretextual.

Google contends that its Unified Pricing Rules established a level playing field for advertisers, simplified the ad tech bidding landscape for publishers, improved matches, and increased publisher revenue. Google knew that publishers were "rational[] when they decide to diversify their source[s] of revenue[]" by setting higher price floors for bids coming through AdX than for bids coming through other ad exchanges, because doing so "help[ed] them to keep Google at bay and put pressure on [Google] (similar to any industry)." PTX469 at -512. Google also knew that some publishers set higher price floors on AdX to "protect" their businesses, as they had "the perception that undesirable ads on AdX (primarily from AdWords unclassified advertisers) [were] correlated with low" revenue and posed quality issues. PTX609 at -146; see also PTX611 at -802; PTX715 at -429-001; Tr. Sept. 10 AM 49:25–50:3, 119:9–21 (Layser (News Corp)) (stating that setting higher floors on AdX resulted in higher quality ads). Nevertheless, Google imposed Unified Pricing Rules—which prohibited publishers using DFP from setting higher price floors for bids coming through AdX—at the request of the "Ad[X] team," who wanted to use the termination of Last Look "as an opportunity to significantly limit the ability of publishers to set floor prices per buyers." PTX762 at -291; see Section V(J), supra. This is strong evidence that Google implemented Unified Pricing Rules to enhance the AdX-DFP tie, and not for its proffered justifications of helping its publisher customers simplify their decision-making, receive better matches, and increase revenue. Moreover, despite its name, Unified Pricing Rules did not stop publishers from setting higher price floors for third-party exchanges than for AdX. See Tr. Sept. 10 AM 60:7–14 (Layser (News Corp)); Tr. Sept. 18 AM 149:1–8 (Wheatland (Daily Mail)); Tr. Sept. 23 AM 157:8–158:20 (Korula (Google)). Unified Pricing Rules was thus targeted at enhancing AdX's control over DFP publishers' revenue streams, as opposed to simplifying publishers' decision-making. That is why Google's publisher

customers concluded that Unified Pricing Rules was not in their best interest and challenged its implementation. See PTX751 at -120–24; PTX1854 at 25:1–11, 55:1–13; Tr. Sept. 10 AM 50:17–52:7 (Layser (News Corp)).

In addition to proffering procompetitive justifications for individual product and policy changes, Google makes the overarching argument that all of these changes are shielded from antitrust liability because they involved product design choices. See Allied Orthopedic Appliances Inc. v. Tyco Health Care Grp. LP, 592 F.3d 991, 998–99 (9th Cir. 2010) ("Design change that improves a product by providing a new benefit to consumers does not violate Section 2 absent some associated anticompetitive conduct."); Microsoft, 253 F.3d at 65 ("As a general rule, courts are properly very skeptical about claims that competition has been harmed by a dominant firm's product design changes."). Google's decade-long campaign of exclusionary conduct, however, is not properly characterized as a series of product design choices. As the Fourth Circuit made clear in Duke Energy, courts must avoid unduly divvying up a "complex or atypical exclusionary campaign" into "manufactured subcategories" and justify the actions using "specific conduct tests." 111 F.4th at 354–55; see also Alston, 594 U.S. at 101 (stating a defendant is not permitted to "relabel a restraint [on trade] as a product feature and declare it immune from" antitrust scrutiny). It would not be accurate to classify the tying of two separate products, or the subsequent decisions that Google made to manipulate auction rules and restrict customer choice in markets in which the firm had monopoly power, as mere choices of product design. What is more, "[j]udicial deference to product innovation . . . does not mean that a monopolist's product design decisions are per se lawful." Microsoft, 253 F.3d at 65. Indeed, "product redesign is anticompetitive when it coerces consumers and impedes competition," which Google's actions did here. Actavis, 787 F.3d at 652; accord Allied Orthopedic Appliances,

592 F.3d at 998. The AdX-DFP tie, for example, "ha[d] the effect of significantly reducing usage of rivals' products" (i.e., publisher ad servers) by "discouraging," "deterring," and "preventing" publisher customers from using alternatives to DFP. Microsoft, 253 F.3d at 65–66; see also In re Keurig Green Mountain Single-Serve Coffee Antitrust Litig., 383 F. Supp. 3d 187, 230 (S.D.N.Y. 2019) (holding that product design combined with "associated conduct," including "tying agreements" and "product disparagement," can be exclusionary because its "overall effect" is "to coerce consumers to purchase [the defendant's product] over [competitors' products], rather than to compete on the merits").

In sum, Plaintiffs have shown that Google engaged in "willful acquisition or maintenance of [its monopoly] power as distinguished from growth or development as a consequence of a superior product, business acumen, or historic accident" by tying DFP to AdX and committing a series of exclusionary and anticompetitive acts to entrench its monopoly power in two adjacent product markets. Kodak, 504 U.S. at 481 (quoting Grinnell, 384 U.S. at 570–71). The procompetitive justifications that Google proffers for its anticompetitive conduct are both invalid and insufficient, and any procompetitive benefits of this conduct were far outweighed by its anticompetitive effects. Therefore, Google cannot evade liability under Sections 1 and 2 of the Sherman Act.

VII. Plaintiffs' Request for Sanctions

Plaintiffs have alleged that Google should be sanctioned under Federal Rule of Civil Procedure 37(e) because it failed to take reasonable steps to preserve internal communications, resulting in the systemic spoilation of potentially relevant evidence. Specifically, Plaintiffs ask the Court to infer that deleted internal communications were unfavorable to Google on factual issues that were in dispute in this litigation, including market definition, monopoly power,

Google's intent, the anticompetitive nature of Google's conduct, and the harm Google's conduct caused to its competitors and customers. See Fed. R. Civ. P. 37(e)(2)(A) (stating that, in certain circumstances, a court may presume that electronically stored information lost by a party was unfavorable to that party).

Google's internal messaging application deleted records of chats between employees unless an employee explicitly turned on "chat history," and the application's user interface made it difficult for employees to turn on chat history for every conversation they had. See Tr. Sept. 11 AM 33:1–12, 88:13–89:17 (Bender (Google)); Tr. Sept. 13 AM 121:23–124:3 (LaSala (Google)). Chat deletions occurred when employees discussed substantive topics at issue in this litigation and continued after the federal government began an antitrust investigation into Google's conduct. See, e.g., Tr. Sept. 17 AM 103:11–20 (Jayaram (Google)). Cf. Gerlich v. U.S. Dep't of Justice, 711 F.3d 161, 171 (D.C. Cir. 2013) (holding that the "duty of preservation" was "triggered . . . by a reasonably foreseeable Department [of Justice] investigation"). Some employees who received litigation holds failed to turn on their chat history despite being instructed to, resulting in their communications being deleted. See Tr. Sept. 13 AM 131:24–133:19 (LaSala (Google)) (discussing PTX992, in which a Google executive under a litigation hold agreed with his subordinate that a topic was "too sensitive for email" and thus should be discussed via auto-deleted chats). Indeed, Google employees regularly used this "off the record" chat functionality, PTX1777 at 14, for discussions of "legally sensitive" topics that they did not want to be preserved, PTX1033 at -656. See also PTX851 at -549; Tr. Sept. 11 AM 33:1–12, 88:13–89:17 (Bender (Google)).

Google employees and executives also misused the attorney-client privilege. For example, Kent Walker, an attorney who served as Google's President of Global Affairs and

oversaw the company's legal team, marked an email in which he asked his colleagues for reactions to a New York Times article as "privileged." PTX864 at -424; see Tr. Sept. 13 AM 76:23–77:16 (LaSala (Google)). Other Google executives and employees routinely labeled emails as attorney-client privileged even though the emails clearly did not involve privileged communications. See, e.g., PTX864 at -422–25; PTX884 at -249; PTX997 at -389; Tr. Sept. 12 AM 151:2–152:16 (Srinivasan (Google)); Tr. Sept. 13 AM 71:18–72:2, 76:23–78:13 (LaSala (Google)); Tr. Sept. 19 AM 128:10–129:7, 129:17–130:22 (Bellack (Google)) (discussing PTX719 and PTX1507).

Google's systemic disregard of the evidentiary rules regarding spoliation of evidence and its misuse of the attorney-client privilege may well be sanctionable. But because the Court has found Google liable under Sections 1 and 2 of the Sherman Act based on trial testimony and admitted evidence, including those Google documents that were preserved, it need not adopt an adverse inference or otherwise sanction Google for spoilation at this juncture. As in Google Search, the Court's decision not to sanction "should not be understood as condoning Google's failure to preserve chat evidence." 2024 WL 3647498, at *134.

VIII. Conclusion

Plaintiffs have proven that Google has willfully engaged in a series of anticompetitive acts to acquire and maintain monopoly power in the publisher ad server and ad exchange markets for open-web display advertising. For over a decade, Google has tied its publisher ad server and ad exchange together through contractual policies and technological integration, which enabled the company to establish and protect its monopoly power in these two markets. Google further entrenched its monopoly power by imposing anticompetitive policies on its customers and eliminating desirable product features. In addition to depriving rivals of the ability to compete,

this exclusionary conduct substantially harmed Google's publisher customers, the competitive process, and, ultimately, consumers of information on the open web. Accordingly, Google is liable under Sections 1 and 2 of the Sherman Act.

For the foregoing reasons, by an Order to be issued with this Memorandum Opinion, Count III (monopolization of the advertiser ad network market) will be dismissed, and the parties will be ordered to submit a joint proposed schedule for briefing and arguing their positions as to the remedies that should be imposed in light of Google have been found liable for monopolization of the publisher ad server market (Count I), monopolization of the ad exchange market (Count II), and unlawful tying of AdX and DFP (Count IV).

Entered this 17th day of April, 2025.

Alexandria, Virginia

/s/

Leonie M. Brinkema
United States District Judge