IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLUMBIA

United States of America, *et al.*,

Plaintiffs,

v.

Google LLC,

Defendant.

Case No. 1:20-cv-03010-APM

HON. AMIT P. MEHTA

[redacted]

State of Colorado, *et al.*,

Plaintiffs,

v.

Google LLC,

Defendant.

Case No. 1:20-cv-03715-APM

HON. AMIT P. MEHTA

[redacted]

DEFENDANT'S PROPOSED FINDINGS OF FACT

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I. EARLY HISTORY OF GOOGLE

A. Google's Creation

1. Google's mission is "[t]o organize the world's information and make it universally accessible and useful." Tr. 7643:9-13 (Pichai (Google)).

2. Google was founded as a search engine in 1998 by Stanford University Ph.D. students Larry Page and Sergey Brin. Tr. 7812:1-22 (Fox (Google Expert)).

3. Larry Page and Sergey Brin conceived the idea of the Google search engine while at Stanford. Tr. 7292:21-7293:1 (Raghavan (Google)) ("Well, in the computer science department at Stanford, I would frequently run into these two graduate students who had an idea for a search engine . . . Larry Page and Sergey Brin. And we would discuss link analysis for search engine ranking at that time.").

4. Google recruited computer science engineers from the top universities and computer research labs from across the world to work on its search engine. *See, e.g.*, Tr. 8017:3-10 (Gomes (Google)) ("We recruited from universities, a couple of professors who joined . . . we also recruited from other companies, in particular from some of the research labs. Key people came from Bell Labs and from DEC.").

5. Google recruited leaders in the field of information retrieval; for example, current SVP of Knowledge and Information Products (which includes Search and Ads), Prabhakar Raghavan, and VP of Search Quality, Dr. Pandu Nayak, taught graduate-level computer science courses at Stanford University in information retrieval for many years. Tr. 6298:15-6299:9 (Nayak (Google)); Tr. 7292:5-12 (Raghavan).

6. Google opened offices all over the world in order to attract the best talent; key innovations came from places like Zurich, Brazil, and Israel; Local Search, for example, was

built in New York. Tr. 8017:11-24 (Gomes). Key pieces of Google Search came from talent around the world. Tr. 1841:20-1843:1 (Lehman (Google)).

7. As noted in a 2005 "Google Competitive Update" slide deck, Google's strategy was premised on the notion that it "must continue to win the talent war in hiring," and "grow and invest internationally at a rapid clip." DX2046 at .007.

8. By 2008, Google Search had three times the headcount relative to Microsoft Search. Tr. 3555:10-3556:12 (Nadella (Microsoft)); DX0423 at .002.

9. Early computer science engineers were drawn to Google's novel approach to solving the problem of search. Tr. 8009:24-8010:13 (Gomes) ("The problem was really interesting, because search is an interesting combination of -- an interesting technical problem in terms of how do you do it quickly, but also an interesting problem in terms of how does a user interact with information. So it spans a very interesting spectrum, both from complex algorithms for performance all the way to the frontiers of like how do you understand language and what does a user really want to know.").

10. Among other innovations, Google developed a new way of looking at the problem of search with the "idea of distributed computing" across many very inexpensive machines, which "led to the pathway that Google took in the future, because with this they had a lot more computation[al capacity] than anybody else had." Tr. 8011:9-8013:11 (Gomes).

11. As former SVP of Search Dr. Ben Gomes explained: "[H]aving lots of cheap machines allowed us to have more computation ability as a software that actually changed the industry, I believe, in the long run." Tr. 8011:9-8013:11 (Gomes).

12. Dr. Gomes explained that this was "a new way of looking at the problem," which later became the "standard way used across the industry" after Google published the process. Tr. 8011:9-8013:11 (Gomes).

13. Dr. Gomes further explained that "the thread of using a lot of computation continued all the way through [at Google] because search is fundamentally a hard computational problem, and so if you can marshal more computational resources to do it, you can do a better job." Tr. 8014:5-20 (Gomes).

14. The concept of distributed computing would later underpin Google's innovations in machine learning. Tr. 8014:5-20 (Gomes).

15. Google's many early innovations are discussed in greater depth *infra* in Section III.

B. Google Surpassed Larger Rivals Such as AltaVista and Yahoo Through Innovations That Did Not Depend on Scale

16. In Google's first years, the competitive landscape of search engines included AltaVista, Ask Jeeves, Dogpile, Northern Lights, Yahoo, and Microsoft. Tr. 8020:13-19 (Gomes).

17. At that time, the most used search engine in the United States was AltaVista. Tr. 10389:23-25 (Oard (DOJ Expert)).

18. Previously, AltaVista had displaced Lycos, and Lycos had, prior, displaced WebCrawler. Tr. 10394:22-10395:8 (Oard).

19. Each time displacement occurred, the newcomer did so without having more user-side data than the incumbent. Tr. 10395:9-21 (Oard) ("Q. And in each of these instances we've talked about -- Google displacing AltaVista, AltaVista displacing Lycos and Lycos displacing WebCrawler, the smaller search engine with less user data supplanted one that had more user

data, more queries? A. It's certainly the case that new search engines always have less -- fewer queries. As I said, in this period of the web, I don't believe that any search engine, including Google, was making use of the click data in the way that search engines use it today. But the queries were certainly available and were being analyzed, and having access to more queries would itself be valuable. And queries are, of course, user-side data.").

20. Likewise, Google became more popular than AltaVista with less user-side data than AltaVista. Tr. 10390:10-14 (Oard) ("Q. Google became more popular than AltaVista, correct? A. It did. Q. And it didn't do that by somehow magically getting additional user-side data than AltaVista, correct? A. Yes, that's correct.").

21. "Google displaced AltaVista as the preeminent web search engine[] because Google included several capabilities that AltaVista did not offer at the time." Tr. 10392:2-10393:3 (Oard) ("Q. And this is an article that you wrote entitled Studying the Use of Interactive Multilingual Information Retrieval in 2006, correct? A. Yes, I'm the second author on this three-author paper. Q. Okay. And this is an article that is included in your CV? A. It is. It was a workshop paper published at a SIGIR conference. Q. If you'd turn to the second page of your 2006 article, and we'll go down to the second full paragraph. There, you and your coauthors write: "Google displaced AltaVista as the preeminent web search engine, because Google included several capabilities that AltaVista did not offer at the time." Did you write that in 2006 with your coauthors, sir? . . . A. Yes, I see that. And I did write this at the time, yes.").

22. Yahoo was another strong player in the search engine field at the time of Google's 1998 founding. That year, Fortune Magazine reported that "Yahoo! has won the search-engine wars and is poised for much bigger things." DXD-15.011.

23. Fortune Magazine reported that "[m]ore people go to Yahoo! than to Netscape or AOL. More people search at Yahoo! than watch MTV, Nickelodeon, or Showtime in any given week. More people check out Yahoo! than read the typical issue of Time, Newsweek, or Life." DXD-15.011.

24. At the time of Google's entry, Yahoo had "a seemingly insurmountable lead in the race for capturing the search market." Tr. 7304:10-13 (Raghavan); Tr. 5933:4-5934:17 (Whinston (DOJ Expert)).

25. Google disrupted the industry by differentiating itself from other search engines through key innovations such as "PageRank and Keywords in Context" that "nobody else was doing because they're really expensive to do computationally." Tr. 8020:20-8021:15 (Gomes); Tr. 7304:16-7305:14 (Raghavan) ("Q. How did Google disrupt the industry? A. At the very beginning, it was through a completely different way of looking at search ranking, which is the favored [PageRank] algorithm."); Tr. 5933:4-5934:17 (Whinston) ("And then Google came along with its innovation. Now, its innovation, as I just described, was this way of using hyperlinks to figure out what were important websites for a given topic.").

26. Google's approach to search using the PageRank algorithm was "revolutionary." Tr. 5932:14-23 (Whinston) ("Q. From day one, they had better search quality, no scale? A. I don't have the measurement. But, you know, from day one, you know, this web -- you know, you can -- forgetting the -- was it Into the Google Plex? There's a great book about the early days of Google and, you know, it describes how they were -- had some small office and they were trying -- you know, cobbling together computers to be able to do this, to, you know, do their algorithm that used these -- the hyperlinks. So I don't know whether on day 1, you know, or it was day 2 or day 5, but it was revolutionary.").

27. Google's PageRank innovation had nothing to do with scale. Tr. 8023:5-7 (Gomes) ("Q. And you've talked in PageRank about pages. Do the queries that Google receives influence the PageRank algorithm? A. No, no.").

28. DOJ's expert Professor Oard identified a number of the key Google innovations that he credited with allowing it to surpass larger rivals: (1) "'the PageRank algorithm which yielded better ranked lists'"; (2) a larger index; and (3) "'conjunctive all-terms queries rather than the disjunctive any-term queries that AltaVista and other search engines used at the time.'" Tr. 10393:4-10394:21 (Oard).

29. As Ben Gomes explained, "[t]here were many search engines [in 1999]. Google had taken a pretty unique approach" to Search. For example, Google "look[ed] at signals that other people have not, like how is the web connected" using the PageRank signal, which looks "at the connectivity between all of the pages on the web, and used it as a fundamental signal in ranking pages." Tr. 8010:14-8011:8 (Gomes).

30. DOJ's expert Professor Michael Whinston acknowledged, "[y]ou didn't have to be big to use web link, to use that -- to get that information, you just had to know how to do it, which Google brilliantly figured out." Tr. 5931:2-5932:4 (Whinston).

31. Among other innovations and investments, Google devoted considerable work towards growing its web index. From an initial crawl and index of about "50 to 100 million pages," Google set a goal "in a year's [time] of having the crawl and index be a billion pages." Tr. 8014:21-8015:17 (Gomes).

32. Google achieved this goal through significant effort. Tr. 8014:21-8015:17 (Gomes) ("And so the first was rebuilding the entire crawling and indexing system in that year's time frame. I, in particular, worked on some aspects of indexing on the PageRank system, which

was initially in memory. Then I got it working on disk. I rewrote it twice for better performance, and then it was read-in subsequently as the index grew bigger. PageRank is a computation that requires a huge amount of space, as well as computation. And so it had to be written and read it in multiple times.”).

33. Google continued to set goals around developing a larger, more comprehensive index. DX2046 at .004 (“Executive Summary - Google Strategy in Four Parts #1 - Deliver substantially better search and advertising product . . . [redacted] unit index[;] [c]omprehensiveness through books, video, etc.”).

34. As of 2011, Google had an index that was [redacted] as Microsoft’s index. DX1100; [redacted]

35. Google also differentiated itself because it “wanted to have the biggest index” to “find[] all of the documents” and “have the best results from that index.” Tr. 8020:20-8021:15 (Gomes).

36. As Dr. Gomes testified, “some [of the other search engines] might have paid attention to some aspect of this, but they didn’t seem to care about the problem in quite the same way [Google] did.” Tr. 8020:20-8021:15 (Gomes).

C. Google Fostered a Culture of Innovation from the Very Beginning

37. Google’s culture was directed towards “always thinking about innovation.” Tr. 8015:18-8017:2 (Gomes).

38. Google’s culture was “modeled around the culture” that founders “Larry and Serge[y] . . . had at Stanford” because “they wanted to create a sense of thinking about new ideas all the time.” Tr. 8015:18-8017:2 (Gomes).

39. Pandu Nayak explained that what drew him to Google was “the people” and “their capabilities, [and] their creativity”; “Google’s mission to organize the world’s information

and make it accessible and useful"; and that "Google is a technology company, and they really value, say, the skills that I have been trained to and I possess." Tr. 6299:18-6300:15 (Nayak).

40. Dr. Gomes described the "notion of 20 percent time, where any engineer or actually any employee could take 20 percent of their time to work on a new idea that was theirs that other people might not agree with or think was important, but it was their time to work on it." Tr. 8015:18-8017:2 (Gomes). Key innovations that resulted from this "20 percent time" included Google News and various Ads products. Tr. 8015:18-8017:2 (Gomes).

41. The user experience has always been at the forefront of Google's culture. Tr. 8015:18-8017:2 (Gomes) ("And we also paid a lot of attention to queries and the user. The idea was, if you . . . do the right thing for the user, all other things will follow."), 8020:20-8021:15 ("And I think we really cared about the user. And so we cared about having the best results.").

42. The "connection to the user was really important" and served as a "huge amount of motivation just from the technical side." Tr. 8019:11-8020:12 (Gomes).

43. Google had a "tradition" of improving the user experience by "look[ing] at . . . queries and look[ing] at the results and say[ing] how can we be doing better on each of those queries." Tr. 8015:18-8017:2 (Gomes).

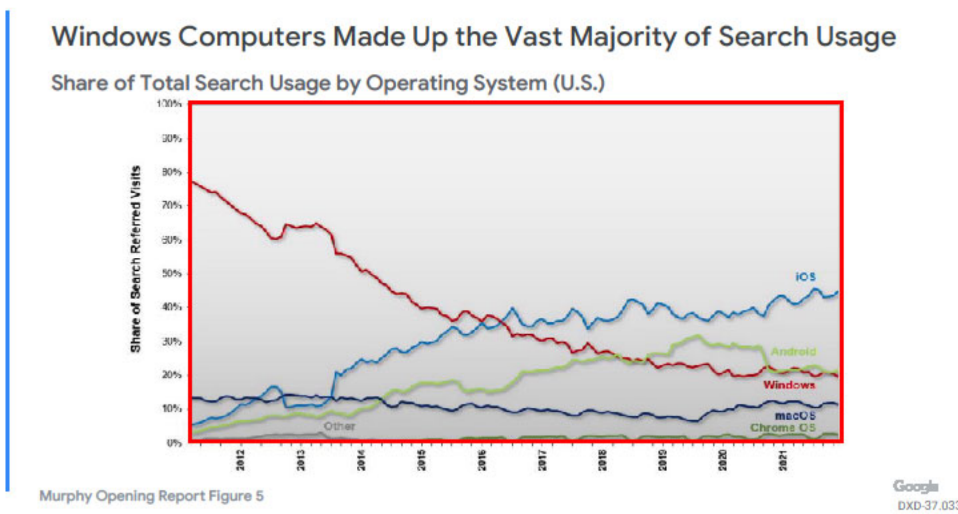
44. Google pushed itself "largely based on the users and what [its] metrics were showing," and where there were "new ideas to push the boundaries." Tr. 8101:20-25 (Gomes).

45. Even as the Google Search component within Google grew to over 7,000 employees, Dr. Gomes explained that while he was leading Search in 2018, he continued "looking for ideas"—that Google was "hiring smart people not just to do the work, but to have the ideas." Tr. 8018:10-8019:10 (Gomes).

46. Continuing to today, Google has "a culture of trying to improve search for [its] users," and it continually sets new goals to improve search quality and the search experience for its users. Tr. 6369:18-6370:4 (Nayak); *see generally infra* § III.

D. Google Search Became the Most Popular General Search Engine by the Mid-2000s with No Distribution Advantages and Without Web Portals Like Yahoo or MSN

47. Prior to 2014, the majority of all general search queries in the U.S. originated from Microsoft Windows PCs.[1] As late as 2011, the figure exceeded 70%. Tr. 9733:15-9734:23 (Murphy (Google Expert)) ("Windows PCs accounted for the vast majority of search if we're looking in that pre-2014 period . . . It gets down, in 2014, to about half."); Tr. 5935:13-17 (Whinston) ("Q. And you know that for many, many, many years Microsoft has had the exclusive contracts during periods where that's where all the searching was done, basically, in the United States, correct? A. That is correct."); DXD-37.033; DX1126.



[1] Plaintiffs' expert does not express any opinions regarding the period prior to 2014. Tr. 5935:6-12 (Whinston) ("Q. And as part of your work in this case, you weren't asked to look at any contracts that predated 2014, correct? A. So I didn't -- you know, I obviously have looked at the history of this market. I've looked at things about the market. I've looked at documents that are about the market, but I was asked to express an opinion about -- from 2014 to 2000 -- to the present, and that's what I did.").

48. From 2006 to present, no more than 20% of Google's queries in any given year on Microsoft Windows PCs came from sources for which Google was the preinstalled default—in many years, it was substantially less. Tr. 9735:6-9736:14 (Murphy); DXD-37.034-.035.

49. That phenomenon did not depend on usage of Google's Chrome browser. During 2006-08, which ended with the 2008 launch of Chrome, 80.5% of queries to Google on Microsoft Windows PCs were the result of users navigating directly to Google.com. Tr. 9735:6-9736:14 (Murphy); DXD-37.034-.035.

50. And for many years after the launch of Chrome, where Chrome had a minority of the usage of Windows PCs, Google's search share on those devices was consistently in the 80% range. Tr. 9735:6-9736:14, 9738:20-9739:19 (Murphy); DXD-037.036-.038.

51. During this same time period (and continuing to today), Microsoft had virtually all preinstalled browser defaults on Windows PCs. Tr. 9737:22-9738:19 (Murphy); DXD-37.035-.036; Tr. 5935:13-17 (Whinston) ("Q. And you know that for many, many, many years Microsoft has had the exclusive contracts on Windows PCs during periods where that's where all the searching was done, basically, in the United States, correct? A. That is correct.").

52. Despite Microsoft's preinstalled browser defaults, Microsoft was "much less successful in getting search usage." Tr. 9737:22-9738:19 (Murphy); DXD-37.037.

II. DIMENSIONS OF SEARCH COMPETITION

53. Search engines compete for users, for advertisers, and for distribution.

A. Search Engines Compete for Users

54. Search engines compete for users on the basis of the quality of search results provided in response to user queries, which encompasses many aspects of the search results page and overall user experience. Tr. 616:13-25 (Rangel (DOJ Expert)) ("When consumers are deciding between products, and the product in this case will be different search engine, these

products have different features. So, for example, when you query a search, there are many features that describe the product. You have the quality of the text, the quality of the advertisements, the quality of the images, the quality of the underlying index that is going to affect the quality of the results, how good it is for the particular type of searches that you tend to do.").

55. The quality of the search results page is the most significant factor in whether users will switch search engines. Tr. 2081:18-2082:8 (Weinberg (DuckDuckGo)) ("Q. . . . This is a document with the heading in the top right corner Adoption Funnel Quantification Study Results - November 2019. . . . There's a question in the middle of page six that reads: 'What would motivate you to use DuckDuckGo for nearly all of your searches?' . . . And of the eight options listed here, your understanding is that the response that received the most responses at 43.3 percent was: 'If the search results were better,' right? A. Yes, that's what this says.") (testifying about DX0633 at .006); Baker (Mozilla) Dep. Tr. 75:4-24 (explaining why Firefox users would switch to Google even though the Firefox search engine default was Yahoo) ("Q. Can you explain the reasons why in your view the search experience that Yahoo! was offering deteriorated? A. . . . And the other piece that I remember is that we had high dropoff of users, and I myself struggled, and as a Firefox user, you know, I myself would do a search and wonder why can't I find what I need, and then realize, oh, and switch to Google, because Firefox makes it easy, so I use the same search query and I go to the UI, I use Google. I find what I wanted. You know, and that happens so many times that finally I gave up. . . ."), 235:25-236:4 ("Q. If Yahoo! had improved the quality of its search engine when it was the Firefox default, do you believe more Firefox users would have stuck with Yahoo! A. Yes.").

56. The topic of search quality was discussed at length at trial. *See infra* §§ III, IV. At a high level, search quality includes factors such as:

a. the search engine's index, because if the document is not indexed, it cannot be found;

b. the quality of its ranking and retrieval algorithms, which surface from the index and rank documents based on relevance and quality;

c. search features, such as spell correction, units with structured information and the like;

d. optimization for the user's device, as the experience on mobile, for example, differs from a desktop; and

e. latency, because users have come to expect fast results.

57. Privacy is another dimension upon which search providers differentiate and compete for users. Tr. 7451:5-10 (Raghavan) ("Q. . . . Search engines -- general search engines, including Google, compete on data privacy, correct? A. As always, it's one of many dimensions. We just spoke of latency, so there are many dimensions. The quality of the output is the most important thing."); Tr. 8996:15-17 (Fitzpatrick (Google)) ("Q. Does Google face competitive pressure in the area of privacy? A. Yes, absolutely."); Tr. 1943:3-7 (Weinberg) ("Q. And does DuckDuckGo try to distinguish its search engine from Google's search engine in any way? A. Yeah. I mean, in a word, it's privacy.").

58. Search engines differentiate and compete on privacy by catering to the preferences of different users. DuckDuckGo competes by minimizing the collection and use of user data at the expense of certain functionality, whereas Google competes by offering a range of privacy controls so users may choose their desired level of privacy. Tr. 1947:2-1948:20

(Weinberg) (testifying that DuckDuckGo's "target market . . . is the care and act on privacy group, so they not only have expressed concern, but they've expressly taken actions that show that concern"); Tr. 2507:4-2508:2 (Cue (Apple)) ("In the case of DuckDuckGo, they were doing some -- you know, trying to be innovative and trying to push privacy. But unfortunately they didn't have the goods on search."); Tr. 9059:6-9060:5 (Fitzpatrick) ("But, what we found is . . . giving people more granular controls was a better way to meet their expectations."); Tr. 7417:1-25 (Raghavan) ("Q. Has Google adopted privacy policies that mirror DuckDuckGo? A. No. Q. Why not? A. Going back to where we began, the right thing to do is look for what our users are seeking and give them those controls. Our user research suggested a few things. One that I just mentioned on ads personalization. Another thing we learned was users sometimes will forget that they set or did not set something. But in the instant, they sometimes will have some activity, and then they say oops, I wish Google would forget my last 15 minutes, whatever I did. And so we give a facility to turn off your last 15 minutes of activity. And those were things that we felt were user-impactful, and we do allow that.").

B. Search Engines Compete for Advertisers; the Quality of Search Ads Impacts Both Advertisers and Users

59. Search engines compete for advertisers on the Return on Investment ("ROI") they provide. *See infra* §§ IX.B, X.D.

60. The quality of search ads impacts that value to advertisers, as well as the user experience with the search engine. Tr. 1288:13-22 (Dischler (Google)) ("Q. Does Google innovate in the ad space? A. Constantly. Q. Okay. And why? A. In order to be market competitive. We want to -- I mean, there are two reasons. We want to offer good value to our users and our advertisers, and the second is, we're not the only game in town.").

61. Search ads quality depends on how relevant ads are to users' search queries. Tr. 1287:25-1288:8 (Dischler) ("The objective of the search ads quality team is to show delightful ads to our users that satisfy their user needs."); Tr. 4020:21-24 (Juda (Google)) ("Q. Would you agree that a high-quality ad is one in which a user finds informative, relevant, and responsive to a search query? A. In general, that sounds like an adequate description.").

62. Google also considers how many ads should be shown on the search results page because it wants "there to be a lot of organic value on the page in order to deliver value for [its] users." Tr. 1294:12-1295:4 (Dischler).

63. The topic of Google's innovation in search advertising was discussed at length at trial. *See infra* § III.E.

64. To analyze search ads quality, Google calculates a quality score for each ad that considers "a collection of quality signals, most notably a prediction of click-through rate, an estimate of the quality of the ad copy with respect to the user's particular search, and an estimate of the quality of the landing page experience to which an ad is pointing with respect to a search." Tr. 4014:13-19 (Juda).

65. Among other things, to provide quality ads, Google determines predicted click through rate ("pCTR") using machine learning models trained on user activity, ensuring that ads are unlikely to appear on the search results page if users are unlikely to click on the ad. Tr. 4198:23-4200:9 (Juda) ("Predict the click-through rate is trying to predict the likelihood of a user to click on ads. And it's -- the machine learning models that try and come up with that prediction are grounded on actual user activity. So it looks like -- it looks at a selection of historical impressions and a collection of historical clicks to try and predict the current click-through rate.

So if users aren't clicking on an ad, I would expect our systems to predict a click-through rate that is extraordinarily low and so then those ads are unlikely to appear at all on the page.").

66. When serving ads in response to a query, Google also factors in usefulness and relevance of the ad copy and landing page. Tr. 4243:3-23 (Juda) (explaining that ad copy that is "more informative for the user" is considered higher quality by Google) ("In addition, advertisements point to the advertiser's website. And so that's also a part of a user's experience, as estimated through the landing page quality signal. And so similarly there, if one constructs a website that is more relevant to a user's search, that's easier to navigate, easier to conduct business on, these are all things that would likely make the landing page more convenient to a user and so ideally be reflected in improvements in our predictions of landing page quality."); DXD-11.009.

67. Maintaining high search ads quality is necessary for a search engine to maintain and increase its user base. Tr. 1287:25-1288:12 (Dischler) ("Q. What role does quality play in Google's search ads products? A. We discussed it a little bit before. The objective of the search ads quality team is to show delightful ads to our users that satisfy their user needs. If we're able to do that, then the users will come back.").

68. A search engine's business model depends on attracting users. Tr. 9153:13-9154:2 (Holden (Google)) (explaining Google's concern that users were going to other search platforms for travel queries and noting that "[i]f these generic queries are going elsewhere, our advertisers would have less reason to come to Google over time, buy advertising, and we would have less relevant leads to deliver to them over time, thereby harming our business as well").

69. Therefore, the quality of a user's search experience, including the relevance of search results and search ads, impacts whether users will go to the search engine and whether

advertisers will pay the search engine for ad placements. Tr. 1293:23-1294:3 (Dischler) ("Q. Okay. And why is it that Google places such an emphasis on user quality in the ad auction? A. Because we want users to come back to Google and search for lots of commercial topics, lots of topics generally, but commercial topics are important, too, so that we can earn the right to show great ads to them in the future.").

70. Google's Senior Vice President of Knowledge and Information Products, Prabakar Raghavan, testified that Google "always want[s] the long-term user experience to survive, because [Google] think[s] that's the best thing for [its] business as well." Tr. 7348:15-7349:6 (explaining Google's research findings that increasing ad load on a search results page "has a detrimental effect on the user experience that makes users go away," which leads to short-term revenue gains but long-term revenues losses).

C. Price Competition Through Distribution Agreements

71. In addition to competing for users and advertisers, search engines also compete on price to win the search defaults on different web browsers and devices. Tr. 9725:13-9727:5 (Murphy (Google Expert)) (explaining that defaults "create that price competition" that is "part of an indication of the competitive process").

72. Although search engines are free to users, price competition occurs when search engines compete to pay browser providers, OEMs, and wireless carriers to win the search default. Tr. 9703:2-9707:1 (Murphy) ("Search engines, because they're free to users, there's really no end-user price competition. . . . But there's competition among the search providers to be the default, and that is price competition.").

73. When search engines make revenue share payments, it is equivalent to lowering the wholesale price of search. Tr. 9713:19-9716:1 (Murphy) ("But if you have the default and the browser provider or the platform has the ability to threaten to switch to the rival, then Google

can still win and probably will still win, but they have to pay for it, just like a firm has to lower price in the face of competition in your regular, everyday marketplace."); DXD-37.015.

74. "[W]eaker rivals can generate competition" even if they do not ultimately win the contract because "the fact that a lot of people follow the default actually allows the partner to create a lot of price competition between Google and its rivals by threatening to switch to the rivals." Tr. 9713:19-9716:1 (Murphy); Tr. 3245:6-3246:18 (Tinter (Microsoft)) ("So very clearly, even though we weren't winning, we were helping Apple get more money, and it was costing Google more money.").

75. This price competition for search defaults lowers barriers to entry or expansion by allowing rivals to "buy" their way into the market. Tr. 9728:21-9730:23 (Murphy) ("Price competition helps cut down the problem by actually allowing me to buy my way in. So I get some success maybe by differentiating, and then I buy my way in through the default and compete for the default through offering a better deal where I'm going to collect on that in the future when I get better. So I would say this price competition actually can facilitate entry.").

76. When web browsers, OEMs and carriers select their search engine defaults, search quality is also an important consideration. Tr. 2574:15-23 (Cue) (confirming that picking a search engine that "provide[s] the best results to customers" was the "most important factor[]" Apple considered when deciding the Safari default between 2015 to 2016); *see, e.g.*, Tr. 2574:15-2575:8 (Cue) (agreeing that the factors Apple considered during the 2016 time period were consistent with Apple's considerations when choosing a default search engine prior to 2016); Baker (Mozilla) Dep. Tr. 100:3-18 (agreeing with Mozilla's statement in DX0547 at .002 that "[a]s shown by the contemporaneous documents provided to the antitrust division, Mozilla Corporation has carefully weighed the quality of the search product and user experience offered

by both Google Search and Microsoft Bing and has determined that Google is the clear winner when it comes to product experience and what users want”); [redacted] Giard (T-Mobile) Dep. Tr. 32:17-33:03 (T-Mobile preloads its Android devices with Google Search because that configuration “provides customers with the best overall device experience.”); Tr. 1091:19-1092:4 (Higgins (Verizon)) (Verizon never found a search engine other than Google “that was compelling enough to explore” preloading on Verizon Android devices); Ezell (AT&T) Dep. Tr. 126:3-127:2 (“[T]he most operative point is . . . Google generates more query volume and monetizes search at higher rates than Bing and Yahoo.”), 195:7-196:2, 312:12-313:21 [redacted]

III. GOOGLE’S CONTINUING INNOVATIONS IN SEARCH

A. Google Has Relentlessly Innovated Over the Past Twenty-Five Years

77. Google’s mission statement—to organize the world’s information, and make it universally accessible and useful—remains relevant, now more than ever, as the amount of information available on the Internet and users’ information needs have grown dramatically. Tr. 7643:14-22 (Pichai) (“Q. And has that mission statement changed in the almost 20 years that you’ve worked at Google? A. In fact, every year at our annual conference I speak about it. I feel the mission, if anything, is more timeless and relevant today than ever before. User’s information needs have literally exploded; they’re inundated with information. And to organize it across everything they do and help them make sense of it, I think the task, as current, is even more important and useful.”).

78. Accomplishing that mission is a "never ending" process and has become more challenging with the growing diversity of users' information needs, the devices they use, and the languages they speak. Tr. 7643:23-7644:11 (Pichai) ("Q. How has accomplishing Google's mission statement become more challenging over the years? A. If you literally think about it, particularly with the people who have multiple devices -- they have computers, they have phones, they use literally hundreds of applications. Their information needs have gotten much more diverse. They want answers right away. It can be multiple formats. It can be text, images, videos. And so they also ask us more complicated queries. In a place like India, almost one in three queries are people just speak[ing] to us and us[ing] voice because they can't always type in English or so on. They ask it in their native languages. So we try to understand over a hundred languages today. So it's never ending, but it's what makes the challenge really inspiring.").

79. This push to consistently improve search quality is intrinsic to Google's core mission. Tr. 6321:25-6322:4 (Nayak).

80. Every time Google improves search, "users ask [Google] harder questions." Tr. 6369:18-6370:4 (Nayak); *see also* Tr. 7295:4-10 (Raghavan) ("Q. Okay. And how does Google use innovation to try to carry out that mission? A. So, in my experience, I've seen two parallel tracks. One is users' expectations and needs constantly evolve. The other track is technology evolves, and what Google has to do is constantly expand the available technology to meet -- rise to meet those needs.").

81. As Google's CEO Sundar Pichai stated, "[T]here's so much left to be done, there's so much innovation to be had"; and Google is "less than 1 percent done" with Search. Tr. 7665:15-7666:2 (Pichai).

82. Google continues to innovate in the face of this unsolved problem, being keenly aware of the history of other rival search engines—when Google surpassed Yahoo, Yahoo had been widely seen as having a seemingly insurmountable lead. Tr. 7305:18-25 (Raghavan) ("Q. And is there a lesson from that event that you are keenly aware of? A. I think, drawing on my own experience, I feel a keen sense not to become the next roadkill. Q. Roadkill. Okay. A. If I may say so, yeah. Q. And is that why Google is so committed to new innovation? A. Absolutely.").

83. Google innovates in response to not only general search engines like Bing, but also many other competitors that respond to user information needs. Tr. 8102:5-17 (Gomes) ("[I]nspiration came from many places. Bing might have been a source, but a lot of our inspiration actually came from ideal query sets and observations of where Google could do better, ideas around where Google could do better."); Tr. 6367:25-6368:14 (Nayak) ("So, for example, recently, we've been doing comparisons with TikTok, where young people particularly are increasingly turning to TikTok for their information needs, and we want to understand what is it that they're doing there, what are they finding useful, what should we do with Google to address that.").

84. As Microsoft CEO Satya Nadella testified, Google is "competing every day to improve search . . . on search, I think the competition is pretty intense." Tr. 3532:22-3533:2 (Nadella); DXD-37.137.

85. The Court heard extensive testimony regarding innovation in Google's Search product from the following Google witnesses who have or had responsibility for Google Search.

86. Dr. Ben Gomes, who was hired in 1999 as one of Google's first 50 employees and worked in the Search organization for over 20 years, culminating in his role as Head of Search from 2018-2020. Tr. 8007:19-8009:23 (Gomes).

87. Dr. Pandu Nayak, who joined Google in 2004, and held various positions over the years, and is now a Vice President of Search leading the Search Quality Team. Tr. 6299:16-6302:13.

88. Ms. Elizabeth Reid, who joined Google in 2003, and held various positions over the years, and is now a Vice President of Search leading the Search Journeys Team. Tr. 8197:16-8198:12 (Reid (Google)).

89. Dr. Eric Lehman, who worked in the Search organization between 2005 and 2022, with a focus in the latter years on the integration of AI and ML into Search. Tr. 1749:2-6, 1802:7-10 (Lehman).

90. Each of these witnesses was credible, expressed a palpable enthusiasm for Google's mission of constantly working to improve search for users, and discussed numerous innovations in Search over the years, continuing to today. Discussed below are some specific examples of that history of those innovations, as well as objective measures of Google's commitment to that innovation.

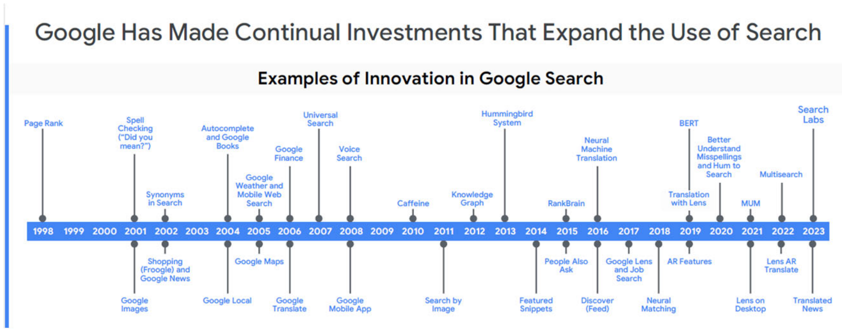
B. Key Search Innovations

1. Google's Early Search Innovations

91. Google provides "[o]ne of the most revolutionary products ever invented." UPX0940 at -481; *see* Tr. 3683:21-24 (Ramaswamy (Neeva)).

92. Google Search is built on thousands of innovations, and is continuously improving. Tr. 9899:19-9900:6 (Murphy (Google Expert)); DXD-37.140 (citing Tr. 1909:25-1911:02, 1912:5-1912:15, 1915:4-1916:9, 1921:21-1922:17, 1923:13-1924:1 (Lehman); Tr.

6346:23-6348:15 (Nayak), 6350:18-6352:13, 6357:1-6358:17) (timeline of Google Search innovation).



93. At trial, there was testimony regarding some of the most important innovations from the early history of Google, which continue to play an important role within Google Search today, including PageRank, Spelling, Synonyms, Autocomplete, Universal Search, and Knowledge Graph. Tr. 8021:19-22 (Gomes); DXD-27.004; *see also supra* §§ I.B, III.B.

94. PageRank was the "key innovation [of] looking at this notion of page importance or page quality." Tr. 8022:6-7 (Gomes).

95. Spelling was another "key innovation" whereby Google took queries and "figure[d] out what's the right spelling according to the web corpus." Tr. 8023:8-8025:2 (Gomes), 8025:3-5, 8025:9-14.

96. The Spelling innovation "improv[ed] the results for the user and shorten[ed] the time it took to get to the results." Tr. 8026:1-14 (Gomes).

97. Synonyms is an innovation whereby Google "broaden[ed] the words in the query to get [the user] the right documents" that may not have necessarily matched exactly the words in the query, but were still relevant. Tr. 8026:15-8027:22 (Gomes); *see* DXD-27.005.

98. It took Google "many years" to launch Synonyms because as you expand the meanings of words in a query, you risk bringing in irrelevant documents and doing more harm than good. Tr. 8026:15-8027:22 (Gomes).

99. Autocomplete is another innovation that helps users "complet[e] the query with other useful suggestions that are likely to be what you might have wanted to complete in that -- type in that query. And so it helps a user formulate that query faster by saving them typing time." Tr. 8028:4-14 (Gomes); DXD-27.007.

100. Universal Search is an innovation Google launched in 2007, which is a way of presenting the search results page to display unstructured information like the ten blue weblinks together with structured information in the form of search features. Tr. 8029:4-8030:15 (Gomes); DXD-27.009-.010. The launch of Universal Search enabled Google to serve user information needs by "find[ing] the best results across [] different types of content" such as video search, news search, image search, and the like. Tr. 8029:5-17 (Gomes); DXD-27.010.

101. As Dr. Gomes testified, "the problem is hard because the signals you're using for different types of content are different . . . if you're going to try and bring them together, one big problem is how do you rank them all together. It's not -- it's apples and oranges in some ways, the scores you're getting from different places." Tr. 8029:4-8030:13 (Gomes).

102. Dr. Gomes also explained the difficulty of developing Universal Search because "now you have to do queries in all of these different corp[o]ra, which is expensive to do, because you were doing one query before, and you now have to do four or five queries. So you have to find ways of doing that efficiently." Tr. 8029:18:8030:13 (Gomes).

103. The Knowledge Graph is an innovation launched in 2012 that made connections between different entities by "actually understanding the meanings of the[] words [Google's] dealing with." Tr. 8031:17-8032:12 (Gomes).

104. The idea behind the Knowledge Graph "was to actually build that network of relationships between people, places, and things and then try to understand [Google's] queries in

terms of the simple entities and what might the user be talking about and which documents or what information can [Google] respond with." Tr. 8031:17-8032:12 (Gomes); DXD-27.012.

105. Building the Knowledge Graph required Google to "combin[e] data sources" such as Wikipedia and the CIA Factbook and "bring that all together into the Knowledge Graph." Tr. 8033:6-18 (Gomes).

106. To build the Knowledge Graph, Google "had to figure out" how to "extract[] information from these data sources," "the algorithms that would normalize across the different data sources," how to "keep up" with changing data sources, how to "reconcile . . . mistakes." Tr. 8033:24-8034:12 (Gomes); *see also* Tr. 8033:24-8034:12 (Gomes) ("So there's a lot of work that had to be done on the algorithms to combine these different data sources.").

107. As discussed in the following paragraphs, the innovations described earlier in this Section depend little on user interaction data.

108. User interaction data does not play a role in PageRank; Tr. 8023:5-7 (Gomes) ("Q. And you've talked in PageRank about pages. Do the queries that Google receives influence the PageRank algorithm? A. No, no.").

109. Likewise, the Spelling algorithm is trained primarily on a web corpus. Tr. 8023:8-8025:2 (Gomes), 8088:12:18 ("Spelling's -- yes, they do use user queries, but spelling in particular relies a lot -- more on the documents, because it's trying to get the correct spelling from the documents."). As Gomes explained, the key insight was that the word is more likely to be spelled correctly in the document on the web than as typed by the user, including because the user may be searching for a topic with which she is unfamiliar. Tr. 8023:8-8025:25 (Gomes) ("[I]n the web corpus you actually have more correct spellings than you have . . . in the queries .

. . [Y]ou're more likely to find the right spellings on the web. And so therefore, you look to analyze those spellings on the web in order to figure out what the right mapping is.").

110. The Knowledge Graph is "driven by the pages of the web and by ways of getting that information from them" along with content licenses. Tr. 8033:19-23 (Gomes); *see also* Tr. 8031:6-16 (Gomes) ("Q. And with those features that you were working on, what was the role of Google having a collection of user queries? How important, if at all, was that to that process? A. It played a role in some features, but not in all. For instance, if you're changing the snippets, the user query doesn't necessarily play any significant role. You can be -- we got sites to do various kind of markup. We were working with the ecosystem in various ways.").

111. To be sure, there were some innovations for which user interaction data "could play a role, like in autocomplete, but it didn't play a role in many of the kinds of changes [Google] did." Tr. 8031:6-16 (Gomes). And even where user interaction data is used in Google's systems, the systems are the result of hundreds of engineers working over multiple years to develop and tweak algorithms to best utilize that data. *See* Tr. 1841:20-1843:1 (Lehman) ("So I guess no, it isn't like somebody just plugged in this query and we just easily memorized this part number. In order to get that part number into this table, it was a multi-year engineering effort with multiple innovations by teams on three continents.").

2. Google's Innovations in Artificial Intelligence and Machine Learning

112. In the past decade or so, Google's innovations in artificial intelligence and machine learning have revolutionized Search. Tr. 7665:15-7666:2 (Pichai) ("[W]ith artificial intelligence, I think we are again in the early stages of completely rethinking what's possible for our users.").

113. "Artificial intelligence is the science and engineering of enabling machines, typically computer programs, to exhibit intelligent behavior." Tr. 6339:15-20 (Nayak).

114. Machine learning is a branch of computer science that involves teaching computers how to learn from data to carry out tasks rather than programming computers to carry out tasks directly. Tr. 2212:24-2213:6 (Giannandrea (Apple)).

115. "[I]n the 21st century, particularly with the rise of deep learning as a very powerful machine-learning approach, AI has essentially moved to the business of machine learning." Studies in the field of AI have increasingly shifted to focus on machine learning. Tr. 6340:17-6341:14 (Nayak).

116. Before the mid-2010s, Google did not rely significantly on machine learning in search based on a "philosophical position" that it was very important for human engineers to be able to understand every aspect of how the search systems worked. Tr. 6341:15-6342:11 (Nayak); *see* Tr. 2213:7-12 (Giannandrea), 2213:25-2214:13 (testifying that Google did not previously use machine learning very much because "machine learning is kind of hard to explain why it works" and Google "didn't want [the Google search algorithm] to be a black box").

117. By 2015, with the advances that had been made in the field, Google moved to using machine learning more extensively in its search algorithms. Tr. 6341:15-6342:11 (Nayak); *see also* Tr. 2213:25-2214:13 (Giannandrea) ("[O]ver time, it became obvious that machine learning was so good at language understanding that it was going to be critical to the future of search.").

118. Google has developed increasingly advanced machine learning systems, eventually with the capacity to understand and generate human language. As applied to Search, these advancements mean that machine learning systems now "could learn from text alone." Tr. 1909:20-1912:3 (Lehman). This led to record quality gains in Google Search results and, with

respect to the most recent models, the need for little or no use interaction data for their training. *See infra* § IV.B.

119. Google Brain, developed and launched in 2011, is the first large-scale machine learning system that Google built. Tr. 6343:5-21 (Nayak); DXD-17.005. It was developed to investigate the possibility of training massive neural networks—which cannot fit on one machine—on a distributed platform with a large number of computers. Tr. 6343:3-21 (Nayak) ("And so the idea in Google Brain was to see if you could train massive neural networks on a distributed platform with lots of computers, because with these very large networks of neural net, they won't fit on one machine. So you need a distributed setup with many different computers talking to each other.").

120. The success of Google Brain set off an "explosion of interest" in "large-scale machine learning" that continues to this day. Tr. 6343:3-21 (Nayak).

121. In 2015, Google developed RankBrain, which was the first application to search of the systems developed with Google Brain. Tr. 6346:23-6347:6 (Nayak); DXD-17.007.

122. The launch of RankBrain was a very significant improvement to Google's search quality. Tr. 6348:9-15 (Nayak) ("Q. Did the launch of RankBrain have an impact on search quality at Google? A. Yeah. RankBrain was the . . . biggest search launch that we've had in improving search quality since I can remember, at any rate. Maybe before that there were bigger ones, but certainly, it was a very significant improvement.").

123. The field continued to evolve rapidly and in 2017 scientists at Google Research published the seminal paper "Attention Is All You Need" on a particular architecture for these new models, called "transformers." Tr. 6348:16-20 (Nayak); DXD-17.007.

124. That paper was an innovative effort to understand a search query or any other sequence of words by understanding the words in their sequence, rather than as a bag of individual words. Tr. 6348:21-6350:8 (Nayak) ("So this is a really, really interesting series of ideas. The first thing to note is that language and the meanings of words is incredibly context-dependent. All right? There's this famous linguist from the 1950s, John Rupert Firth, and he had this beautiful line, which was, 'You shall know a word by the company it keeps.' And the observation being that words derive their meaning from the context in which they're used. Right? So that is sort of one key point . . . So 'Attention is All You Need' was an attempt at understanding words in sequence, not as bags of words as was done in Google Brain or in RankBrain, but as in this sequence manner."); DXD-17.007; *see also* Tr. 2768:5-23 (Parakhin (Microsoft)) (explaining that the "Attention is All You Need" paper was "very seminal, very famous and one of the most highly cited papers" in the field).

125. This paper paved the way for building large language models using transformers; for example, in ChatGPT, the "'T' stands for "transformers." Tr. 6350:9-17 (Nayak).

126. Building on the work published in "Attention is All You Need," in 2018, researchers in Google Research created the BERT model and, again, published its code. Tr. 6350:18-6351:2 (Nayak) (describing "BERT: Pre-training of Deep Bidirectional Transformers for Language Understanding."); DXD-17.007.

127. BERT is a deep network made up of a set of layers, each consisting of a set of transformers that enable the model to develop advanced contextual understanding of words in the sequence, which is of groundbreaking importance to natural language problems and question answering. Tr. 6351:4-6352:13 (Nayak); DXD-17.008.

128. For example, in the sentence "the animal didn't cross the road because it was tired," before BERT, Google's systems might have understood "it" to refer to "the road." BERT, however, understands based on the context that "it" refers to "the animal." Tr. 6351:4-6352:13 (Nayak); DXD-17.008; Tr. 1846:6-22 (Lehman) ("Because the BERT technology is so well adapted to working with language -- actually, the inventor of BERT made rank BERT. It was transformational. Once it appeared, so many variants appeared all across the tech industry because it was just so far ahead of everything else.").

129. When BERT was applied to Google Search, it "beat all of [Google's] existing system[s] combined by a large margin. It just made everything else irrelevant." Tr. 1909:18-1912:3 (Lehman).

130. BERT made significant strides in understanding human language. As measured by the GLUE benchmark, a standardized way to measure progress on computers' ability to understand language, "BERT came along and just demolished everything. So everything on that leader board became variants of BERT. And the performance of BERT was so strong that for those tasks, it was performing above human level." Tr. 1914:6-1915:20 (Lehman).

131. BERT's development was the result of close collaboration between Google's researchers and Google's WebAnswers sub-team within the search quality team. Tr. 6353:5-22 (Nayak) ("Yeah, so we described what BERT was, this pretty remarkable landmark publication. It didn't just come out of nowhere. The researchers, Jacob Devlin and others who worked on it worked very closely with our web answers team. This is a part of our search quality team."); Tr. 1909:18-1912:3 (Lehman) ("[S]o BERT was developed in connection with something called WebAnswers. So, you know, when you do a search, sometimes Google will try to guess the

answer to your search and put it at the very top. That's WebAnswer. So that's a case where there's just a short passage instead of a full web page involved.").

132. Google's breakthrough in developing BERT was "not a lucky coincidence"; rather, it reflects Google's massive, long-term investment in machine learning expertise and hardware and the close relationships between Google's Research and Search teams over the years. DX0134 at .030; Tr. 6353:23-6354:18 (Nayak); Tr. 1922:22-1923:12 (Lehman); UPX0197.

133. Google "made a lot of investments in machine learning hardware," including "TPUs, Tensor Processing Units," and "enable[ed] researchers and product teams like ours to use these TPUs in various ways," which was a key element that allowed us to develop BERT at all. Tr. 6353:23-6354:18 (Nayak); UPX0197.

134. BERT was applied to Google's Search product in a number of ways, including a system called DeepRank that Google launched in its core ranking product in 2019. Tr. 6354:20-6355:4 (Nayak); DXD-17.009.

135. DeepRank uses the technology of BERT to "significantly improve language understanding," and represents the "largest single . . . improvement [Google] made to Search since RankBrain." Tr. 6354:20-6355:4 (Nayak); DXD-17.009. RankBrain and DeepRank perform similar functions, but DeepRank relies on newer BERT technology. Tr. 1844:21-1845:6 (Lehman) ("Q. And in terms of the functionality they provide within the Google search engine, how do rank brain and deep rank fit together or not? A. They're kind of -- they both sort of perform similar functions in that once all the other ranking systems have done -- have gone, or almost all, they look at the top [redacted] search results, something like that, and adjust the scores based on the sort of -- their neural networks. So they're kind of a pair. The difference is one

relies on this older fee[d] forward networks, which is [RankBrain], and [DeepRank] relies on sort of newer BERT technology.").

136. With BERT, DeepRank enables Google Search to better understand the nuance in longer, more complex queries. Tr. 6355:6-24 (Nayak); DXD-17.010; Tr. 1844:10-20 (Lehman) ("[DeepRank] came later. It was built on a sort of second generation language understanding -- second generation sort of deep learning model incorporating something called BERT. BERT was a breakthrough done by researchers at Google that radically increased the ability of deep learning systems to understand language.").

137. For example, prior to DeepRank, for the query "can you get medicine for someone pharmacy," Google's systems would surface results about filling prescriptions at the pharmacy, but they "miss[ed] the nuance that it's not just about filling prescriptions[,] [the user] want[s] to know if someone else can pick up your prescription at the pharmacy." Tr. 6355:6-24 (Nayak); DXD-17.010.

138. In 2020, Google launched RankEmbedBERT—another innovation derived from BERT. Tr. 6355:25-6356:2 (Nayak); DXD-17.011. RankEmbedBERT improves Google Search's retrieval process by embedding queries and documents into the high-dimensional space created by Word2vec, and allowing the model to identify documents that are semantically proximate to search queries. Tr. 6356:3-20 (Nayak) ("RankEmbed BERT is essentially the idea you were talking about earlier. Remember we had this notion of embeddings for words. This thing takes it one step further. It says why don't we embed queries into that space, and why don't we embed documents into that space, and let's do it in a way that if a document is close to a query, then the document is relevant to that query, so let's create the same mapping in a manner similar to what we had done before."); DXD-17.011.

139. The frequency of user queries follow a distribution curve, with those seen less frequently referred to in the industry as "tail" or "longtail" queries. Tr. 1811:4-25 (Lehman). By definition, there is less historical data associated with such queries. As a consequence, language understanding of queries and potentially relevant pages becomes much more important. RankEmbedBERT's language understanding abilities thus had a very strong impact on the quality of Google's results for longtail queries where language understanding is particularly important. Tr. 6356:21-25 (Nayak) ("Q. You mentioned long-tail queries. Overall, what has been the impact of RankEmbed BERT on search? A. RankEmbed BERT was again one of those very strong impact things, and it particularly helped with long-tail queries where language understanding is that much more important.").

140. In 2021, Google launched the Multitask Unified Model ("MUM"), one of the "first generation . . . of large language models that [Google] developed particularly for search." Tr. 6357:1-7 (Nayak); DXD-17.011.

141. A "large language model" is a "computational system that tries to . . . capture patterns in language." Tr. 1912:20-1913:23 (Lehman). As large language models become even larger, their ability to recognize patterns in language "appears [to] mimic[] the cognitive process of the people who created that language." Tr. 1912:20-1913:23 (Lehman).

142. MUM grew out of a 2020 paper published by researchers at Google and introduced the T5 neural network architecture. Tr. 6357:8-13 (Nayak); DXD-17.011.

143. Google found MUM to be even more powerful than BERT. Tr. 6357:15-6358:1 (Nayak); DXD-17.012; DX0241 at .004 (MUM "1000x more powerful than BERT"); Tr. 1918:3-16 (Lehman) ("[T]he amount of computation per unit of text is about a thousand times

greater in MUM than BERT, and the consequence is that it should be able to understand language more deeply, perform reasoning more effectively.”).

144. MUM achieved “essentially human-level performance” on the industry-wide SuperGLUE benchmark for reading comprehension. Tr. 1914:6-1915:20 (Lehman); Tr. 6358:2-17 (Nayak); DXD-17.012; DX0241 at .004.

145. MUM’s SuperGLUE score represented a significant improvement over BERT. DX0237 at .003 (“This builds atop the work done with BERT, but takes advantage of significant progress in language understanding that has since leapfrogged BERT. These models are significantly more powerful than [BERT], demonstrating large improvement on SuperGlue benchmarks (60 for [BERT], vs. 90+ for TP and MUM) and reaching human-level performance for many tasks.”).

146. MUM marked a major “milestone” in that it “could learn simply from text.” Tr. 1909:18-1912:3 (Lehman).

147. MUM exhibits “zero shot” to “few shot” learning capabilities, meaning that the original model, which was trained for general language understanding, can be employed for specific tasks using very few specific examples, in some cases without any at all. DX0237 at .003; DX0241 at .004.

148. MUM “proved to be incredibly valuable” for “many different aspects of search.” Tr. 6357:1-7 (Nayak); DXD-17.013; DX0237 at .003 (“[Google has] built this model for Search, and [is] making it widely accessible to various Search products & teams -- both big and small.”).

149. Google has used MUM to power approximately 90 search innovation launches in the past year, including projects relating to ranking, features, and WebAnswers. Tr. 6358:21-6359:15, 6360:12-22 (Nayak); DXD-17.013.

150. For example, Google used MUM to better help users in crisis (*e.g.*, providing help lines to users with suicidal thoughts) by more accurately detecting whether such users were in crisis based on their queries. Tr. 6362:12-6363:18 (Nayak); DXD-17.014.

151. MUM has directly led to improvements in Google's quality, as measured by its top-line metric, Information Satisfaction ("IS"). Tr. 6359:16-23 (Nayak) ("We used MUM on some of our systems that improved IS and RankEmbed in particular, and it led to very significant improvements for all the reasons that we've described. It was just a more powerful way of understanding language."); DXD-17.013 ("Improvements in IS").

152. Like applications of BERT before it, MUM was particularly impactful in improving results for long tail, complex queries. Tr. 6359:24-6360:11 (Nayak); DXD-17.013.

153. Google continues to launch still more large language models, such as LaMDA (2021), PaLM (2022) and PaLM2 (2023). Tr. 6363:19-6364:3 (Nayak); DXD-17.015.

154. Google launched its Search Generative Experience ("SGE") in 2023, which is an experimental experience Google built to apply its expertise in generative AI to enhance its search results. Tr. 6364:4-8 (Nayak); Tr. 8216:16-8217:5 (Reid).

155. SGE uses generative AI to provide an overview of information from across webpages in response to a user's query to give the user "an overall sense," followed by a set of web results for a user to further explore. Tr. 8217:15-8218:17 (Reid); DXD-28.006-.007.

156. SGE uses generative AI to create a summary of information from across the web in response to a user's query. Tr. 7407:10-7407:18 (Raghavan) ("[N]ow we're giving that synthesized abstract of here's the search results page that you're about to see[.]").

157. Instead of having to visit multiple sites or enter multiple queries to satisfy an information need, generative AI "allow[s] you to join information across the web." Tr. 8219:6-24 (Reid).

158. SGE enables users to enter more complex, descriptive queries and receive relevant responses. DX0334 at .001 ("With this powerful new technology, we can unlock entirely new types of questions you never thought Search could answer, and transform the way information is organized, to help you sort through and make sense of what's out there."); Tr. 8217:15-8218:17 (Reid) ("And, so, I think it allows a person to express more of their real need. Right? Without something like SGE, you would have probably tried your first query, decided it didn't work. And so then you would be, like, Bryce Canyon dog friendly, Arches kid friendly, Arches dog friendly, just Arches in general, and you would have issued all of these queries and looked at lots of web pages, even just to get started."); DXD-28.006-.007.

159. SGE also enables users to search more efficiently and accelerates their ability to meet their information needs. DX0334 at .002 ("With new generative AI capabilities in Search, [Google is] now taking more of the work out of searching, so you'll be able to understand a topic faster, uncover new viewpoints and insights, and get things done more easily."); Tr. 8217:15-8218:17 (Reid) ("And, so, this accelerates your search. At a minimum, it connects you with the most relevant pages, even if the information is scattered across the web."); DXD-28.006-.007.

160. Generative AI models "predict, based on input, what they think users would like to see"—"[t]hey try and guess what you would like them to generate and then do so." Tr. 8218:18-8219:5 (Reid).

161. SGE takes as training inputs for its prediction "large data sources" including "the web and a set of licensed data sources." Tr. 8218:18-8219:5 (Reid).

162. As discussed in greater detail in Section IV.B.3, *supra*, SGE is not trained on user interaction data. Tr. 8218:18-8219:5 (Reid); DXD-17.016.

163. Google has launched other generative AI experiences, including a buying guide in shopping and a feature that uses generative AI to help users searching for clothing virtually try on clothes. Tr. 8220:17-23 (Reid) ("There's -- a couple of examples would be in shopping. So, one, we created a buying guide for you to get some sense. Another one that you're putting up here is on using generative AI to help you understand if clothing is the right clothing for you."); DXD-28.008.

164. Google's accelerating innovations in AI are fundamentally altering Search. Tr. 1909:18-1912:3 (Lehman) (describing advancements in AI as applied to Search) ("So I think at that point, it started to become clear that we were looking at a change [BERT] that would kind of knock all the pieces off the board of search probably at some point within the next few years. And then things began to pick up speed, so I -- it felt like at first maybe there would be a breakthrough every four years, and then it got to be like, Hey, wow, every year there's a breakthrough. And then it's just like every few months. And it's just accelerated and accelerated."); *see also* Tr. 1909:18-1912:3 (Lehman) ("So I think one of the big surprises to me is --was that -- and I still don't have my head wrapped around it, is that these systems could learn from text alone.").

3. Google Lens

165. Another of Google's key search innovations is its application of AI technology to develop Google Lens. Tr. 8216:5-15 (Reid) ("Q. All right. What's the relationship between Google Lens and AI in machine learning? A. Sure. So there's a few different ways that comes. So, the first is just to understand what is that image, uses AI. That image is about a hydrangea. It's about this type of cat. Not to get distracted by the rest of the stuff around, if you're taking a

picture. The second part is then having that image understanding. We need to find relevant search results that are about that image. And then that uses sort of underlying search ranking technology which makes heavy use of ML and AI.").

166. Google Lens "enables a user to search via an image or via an image plus text, rather than just having to type into a text box." Tr. 8210:25-8211:3 (Reid); DXD-28.002-.005.

167. Google launched Google Lens in 2017. Tr. 8211:4-5 (Reid).

168. Google has continuously improved Google Lens since its launch, including enhancing the quality of image understanding, expanding the capabilities of Google Lens, and enabling multi-modal search. Tr. 8211:6-16 (Reid).

169. Users can use Google Lens to identify objects in the real-world; to translate images of text into different languages, including languages with different characters; and to search across modalities. DXD-28.003-.005; Tr. 8211:17-8212:15 (Reid), 8213:24-8214:21.

170. Google Lens has grown in usage to ten billion queries per month. Tr. 8215:12-8216:4 (Reid); *see also* Tr. 7304:14-7305:14 (Raghavan) ("And then I mentioned earlier the lens example. The fastest growing segment of queries is people, especially young people, using their cameras to point to things. But my wife uses it to point to a plant that seems to have a disease and say, How do I fix this?").

C. Google's Investment in Mobile Search

1. Google Made the Strategic Decision to Invest in Mobile Search When It Had Relatively Little Traffic on Mobile

171. Mobile search did not exist when Google was founded in 1998. *See* Tr. 8038:5-7 (Gomes).

172. Google began to pay particular attention to mobile search with the launch of the iPhone (2007) and Android (2008). Tr. 8038:9-15 (Gomes) ("Q. . . . When did mobile search

start to be a thing that Google was paying attention to? A. I think it was -- we began to pay attention to it shortly after the launch of the iPhone and Android, maybe a year or so after that launch. We began to have teams begin to experiment with what mobile search could be. But it was -- we began to experiment with it then, and that progressed from that point.").

173. Google made a strategic decision to commit resources to innovating in mobile search early in this process, at a time when only a small percentage of its search traffic was on mobile devices. Tr. 8040:2-8041:4 (Gomes); DXD-27.013.

174. Google focused on mobile search because it recognized the growth of search on mobile devices. Tr. 8040:2-12 (Gomes) ("And then at some point, we realized that no, this is actually really important. Even though it was a small percentage of our traffic, we could see that it was growing, and we made a big switch to move to mobile."); DXD-27.013; *see also* Tr. 9893:15-9894:22 (Murphy) ("Google's . . . most of the investment in this period is really focused on mobile. Why? Because that's where the growth opportunity was.").

175. The mandate to invest and innovate in mobile search came from Larry Page, one of the co-founders of Google and its then-CEO. Tr. 8040:13-22 (Gomes).

176. The intensity of the pivot to mobile is captured by Larry Page's direction to the Search team "to not just be mobile first but mobile only." Tr. 8040:13-22 (Gomes).

177. Dr. Gomes explained the risk this change had entailed: "It was a tricky call at the time because most of our traffic was desktop traffic. And saying that we're going to focus on mobile rather than desktop was somewhat challenging." Tr. 8040:23-8041:4 (Gomes).

178. Along with its search engine investments and innovation related to mobile, Google invested billions of dollars into a search-friendly mobile operating system that it open-sourced, Android. *See infra* § VIII.E.

179. Mobile brought not only opportunity to Google, but additional forms of competition. The rise of mobile apps provided users with a new set of alternatives to Google to satisfy their information needs. Tr. 8080:14-8081:11 (Gomes) ("[T]here's also a whole slew of other apps you could go to to satisfy the same information needs. So if you think about it, our goal is to satisfy your information need. There are lots of places you can go. Facebook was providing information about -- it had forums on every topic. There were places like Amazon. There were places -- there were places for ordering food. There were places -- there were places for every different kind of thing -- information need you might have. And sometimes we could satisfy it in more depth than we could with a dedicated app. So we had to compete with that whole ecosystem of apps. And the slogan at the time was: 'There's an app for that.'").

180. Google's decision to invest in mobile search was a success. Tr. 8080:9-13 (Gomes) ("Q. How would you, from the standpoint of today, view Google's pivot to mobile, was it a success? A. I believe so. I believe so. I think we put a lot of effort into it, and I think it worked. It was not obvious at the time, but it worked.").

2. Google Innovates to Optimize Search for the Mobile Device

181. The user mobile search experience differs significantly from the desktop search experience. Tr. 8066:10-8067:16 Gomes ("Q. What was different about the mobile experience as compared to desktop? A. You know, almost everything was different about the experience, the phone in terms of how you interacted with it."); *see also* Tr. 8230:13-8231:14 (Reid) ("Q. . . . [H]ow did the rise of mobile search impact the local vertical? A. So, a few things changed with it. One was just there was an increased need for local on mobile relative to desktop, but, mostly, people's expectations of what they should be able to get changed. So, they no longer -- you know, if you saw the 2004 one, it said 1 miles, 5 miles, 15 miles as options of your distance. Now, if I'm on the go and I'm searching for an ATM, I want the closest ATM, which is -- might

be .1 miles away. Right? So how you thought about distance suddenly changed. Things like hours changed because you were going to go, you were on the go, and so you wanted to know not just which places exist in an abstract sense, but which places are relevant for you right now, and so can you actually go visit. People started to do more late planning. . . . So people believe that they can do much more on the fly with mobile, and so their expectations have really risen across.").

182. Google optimized for the differences in mobile search in order to create a better user experience on mobile devices. Tr. 8066:10-8067:16 (Gomes), 8070:14-8071:5 ("First of all, you typed in your query, and there's a lot of waiting. And you'd get the result page, and then when you tapped on the result, quite often you'd go to a page that was not formatted for the mobile screen. So it was a huge -- a large page, and you had to double tap or expand it out -- and sometimes you expanded it too much. So it was really quite difficult to get the information you wanted."); Tr. 8231:15-8232:10 (Reid) ("Q. How did Google go about optimizing its local search for mobile? A. So, one, you know, at its most basic, the page layout has to be different. Right? You have a big screen. Now you've got a much smaller screen. But, a big thing was just realizing that we needed to meet new needs, so we needed to go collect all this additional data. People really expected on mobile that you would see photos, you would see reviews, you would see menus. Right? So we had to gather that. We had to think about how we formatted that question. We had to improve the ranking, especially in how we weighted distance. To my previous point about ATMs, you now needed to really sort them by distance, but you had to understand that how you did it for ATMs is different than restaurants. ATMs, people care about basically nothing other than is it open, is it my bank, and what's the closest? That's all they care about. In restaurants, you're willing to go a little bit further to get a better restaurant. Right? And

so you had to think about distance, but you think about distance in a nuanced way."); DXD-27.014.

183. One key difference between desktop and mobile is that a mobile phone is "a small device where it was hard to type. So unlike on a laptop you didn't have a keyboard, so input was difficult." Tr. 8066:10-8067:16 (Gomes).

184. Accordingly, Google implemented changes to make the input easier for users such as "increasing the amount of coverage" for "autocomplete algorithms," bringing "spelling correction into autocomplete so that you can get a spelling correction as you're typing, not just after you've typed," and "put[ting] a lot of energy into voice search." Tr. 8066:10-8067:16 (Gomes) ("We also began to put a lot of energy into voice search which connected to all of the research that we were doing on machine learning. And voice search was improving over time, but this -- it got a lot better at this point. You know, when I first started using voice search, there was one person on the team who could use it who had the perfect Midwestern accent. And I have this mixture of a British and Indian and whatnot accents, and I could never do the demos. But by the end of it, I was once in a cab where a person with a much heavier accent than I did was using the phone. And he said -- I said: 'It understands you?' He said: 'Yes.' He said: 'People don't understand me, but Google does.' And so we made a huge amount of progress there, but that's what we figured was necessary in order for people to actually be able to enter queries or they wouldn't do that on a phone, they could tap on other apps to get to -- as an alternative."); DXD-27.014.

185. As part of autocomplete on mobile, Google implemented a system called "tail suggest," which enabled users to "enter in queries that had never been typed before" and thus

cover "parts of the query stream that [Google] didn't have before." Tr. 8067:17-8068:18 (Gomes).

186. Google "also had to come up with keyboards" for different languages. Tr. 8067:17-8068:18 (Gomes) ("We also had to come up with keyboards. So I studied Hindi in school for 10 years. And people are coming onto phones for the first time, and I don't know how to type Hindi, even though I studied it in school. People didn't have access to keyboards before that, because the phone was the first time they'd come across an interface they could use. So we came up with new keyboards even for these other languages.").

187. A second key difference between desktop and mobile is that the mobile "screen is very small, and the pages are slow to load[,] [s]o people have a small amount of real estate . . . [to] consume what they want." Tr. 8068:19-8070:13 (Gomes); DXD-27.014; Tr. 6310:23-6311:16 (Nayak) ("The mobile device has very limited real estate. There's just sort of one column of information. Whereas, the desktop device, of course, has a lot of real estate to provide your search experience.").

188. Dr. Gomes described the mobile experience in 2007: "First of all, you typed in your query, and there's a lot of waiting. And you'd get the result page, and then when you tapped on the result, quite often you'd go to a page that was not formatted for the mobile screen. So it was a huge -- a large page, and you had to double tap or expand it out -- and sometimes you expanded it too much. So it was really quite difficult to get the information you wanted." Tr. 8070:14-8071:5 (Gomes); DXD-27.014.

189. Accordingly, Google worked to "figure out how [to] evolve the search product to make it really usable on mobile, to actually serve that information need that users had," Tr.

8070:14-8071:5 (Gomes), and "make sure that the user could get as much information as they needed as quickly as possible," Tr. 8068:19-8070:13 (Gomes).

190. For example, Google optimized the way it served features to fit the mobile screen. Tr. 6312:4-20 (Nayak) ("Q. And how do search features relate to differences between mobile and desktop, if they do? A. So again, the first implication is that of real estate. So to give you sort of a concrete example, when we first put out knowledge panels, it was done on the desktop, and the knowledge panel was in the right-hand column, and the main web results were down the center column. But of course, when we brought it to mobile, there was no right-hand column to put the knowledge panel in. And so the knowledge panel had to be bordered onto the center panel, and then there was a question of how you rank the knowledge panel against all of the other results. So a number of technical challenges had to be solved in that regard."); Tr. 8231:15-8232:10 (Reid) ("Q. How did Google go about optimizing its local search for mobile? A. So, one, you know, at its most basic, the page layout has to be different. Right? You have a big screen. Now you've got a much smaller screen. . . .").

191. Google also developed WebAnswers, a system that would display the section of a webpage that "that is very close to an answer to what [] your query was" directly on the SERP. Tr. 8071:18-8072:21 (Gomes).

192. WebAnswers was "really important" to the mobile experience because webpages were slow to load, thus "it was really important for [a user] to get as much information as [they] could right up front." Tr. 8072:3-21 (Gomes).

193. Google also developed "all kinds of other features within the results page" to "make sure that the user could get as much information as they needed as quickly as possible." Tr. 8068:19-8070:13 (Gomes) ("We brought in images into the results. We brought in structured

snippets which would tell you things like star ratings and other things just within the snippet itself .”); DXD-27.014.

194. Search features “became a lot more important in mobile, because people were expecting sometimes more visual results in terms of images and videos.” Tr. 8071:6-17 (Gomes); DXD-27.014.

195. Similarly, the Knowledge Graph is very important on mobile because it enables Google to display the answers to knowledge-seeking queries directly on the SERP. *See supra* § III.B.1; Tr. 8068:19-8070:13 (Gomes) (“Also using the knowledge graph, we could begin to answer queries, like what is the capital of France, from the knowledge graph. Because, you know, France is a country, it has a capital, the capital is Paris. And we can even begin to do follow-up queries around that, because we could use the knowledge graph with its billions of facts to answer a whole range of queries.”); DXD-27.014.

196. A third key difference between desktop and mobile is that a mobile phone “[is] with you everywhere.” Tr. 8073:14-8074:11 (Gomes); DXD-27.014. As a result, “there are many ways in which local information begins to really matter” on mobile. Tr. 8073:14-8074:11 (Gomes); Tr. 8229:5-12 (Reid) (“Q. When [Google’s local vertical] was launched, in 2004, was there any meaningful mobile search? A. No. I don’t believe there was even any work on mobile search then. Q. . . . But, over time, local became important to mobile, I take it? A. It did.”).

197. Accordingly, Google “invested [] even more in getting a comprehensive catalog of local businesses that [it] could surface in these cases, and making sure that they ranked appropriately in these cases[,] [and] [e]ven within ranking, making sure that you’re getting localized information.” Tr. 8073:14-8074:11 (Gomes); DXD-27.014; Tr. 8229:18-8230:12 (Reid) (“Q. . . . If you look at Google’s investment in local and the other pieces of [G]eo that

you've talked about, what's the scale of that investment? A. So, it's quite substantial. I would say, over the years, we've spent billions of dollars trying to have really accurate data. We have quite a variety of different techniques. We have to license satellite data. We have sent street view cars around. We've sent people in India door to door because there were no directories of many of the businesses around. We have a large number of vendors that we work with that will do things like call up businesses and either collect information or confirm, if we've got a user report. We had to license data from many different sources from what's the underlying map structure, all the way up through what is the business data. And then we've invested in efforts to collect data from users directly with programs like local guides doing outreach to allow. So, both, you know, thousands -- hundreds, if not thousands of engineers, as well as a lot of money to really have an accurate model of the world.").

198. A fourth key difference between desktop and mobile search is that "[m]any users are mobile-centric," meaning that many people who come online for the first time do so on mobile devices, and thus are "not used to necessarily thinking about the web, they're thinking about the apps they have on their phone." Tr. 8074:21-8075:18 (Gomes) (discussing DXD-27.014).

199. Younger users, in particular, "grew up on an app ecosystem[;] [t]hese users didn't actually grow up first using a desktop browser for a long time[;] [t]hey grew up with their first experience on the phone with a bunch of apps that could be on their home screen so that it was easy for them to go say, I'm going to use this app for this, or this app for this, or this app, as opposed to going to the same starting place, and that changed how [Google] comp -- apps also have a set of features that are different than browsers that the younger users were used to expecting." Tr. 8208:12-8209:12 (Reid); DX0241 at .011.

200. Google took steps to appeal to these mobile-centric user needs, including by making content more visual, translating webpages for better presentation on mobile devices, and designing more scrollable/swipeable content. Tr. 8074:21-8075:18 (Gomes); DXD-27.014.

201. Google designed its interface to include more visual search results, but this was "challeng[ing]" in terms of how to "pick the right image from a page" and how to "make sure that it's relevant." Tr. 8075:19-8077:4 (Gomes); DXD-27.014.

202. Google further developed its translation software, including through the use of machine learning, "to [translate] English language content" to people coming online in different languages. Tr. 8075:19-8077:4 (Gomes); DXD-27.014.

203. A fifth key difference between desktop and mobile is that users interact differently with the mobile interface—"it's easy to scroll, so you can go through many pages of text there, but there's not much screen real estate sideways unless you swipe"—so Google constructed the SERP to take "advantage of the scrollability and the swipeability" of the mobile device. Tr. 8077:5-8078:1 (Gomes); DXD-27.014. For example, Google made its carousels "swipeable for images, for videos, for lots of things" Google was displaying in search results through carousels. Tr. 8077:5-8078:1 (Gomes); DXD-27.014.

204. Finally, many webpages were designed for desktop and thus were slow to load or otherwise were not optimized for mobile; thus, the web ecosystem needed to evolve to meet mobile user needs. Tr. 8078:2-8079:2 (Gomes); DXD-27.014.

205. Google was "paying attention to [the mobile friendliness of the web] far before anybody else"; many websites had not yet optimized for mobile because it was "not a big fraction of [their] traffic," so Google had to "evangelize the fact that this is . . . where the future's heading." Tr. 8078:2-8079:2 (Gomes); DXD-27.014.

206. Google therefore encouraged webmasters to create mobile-friendly and fast-loading pages by giving them a slight ranking boost if they optimized for mobile. Tr. 8078:2-8079:2 (Gomes); DXD-27.014.

207. Google's successful improvements to mobile search had little to do with the volume of Google's user interaction data. Tr. 8079:14-8080:8 (Gomes) ("Q. And with respect to these important differences in the mobile experience in Google's reactions, how significant, if at all, was a large volume of mobile queries to causing these innovations? A. I mean, this was happening at a time when our traffic was -- the mobile traffic was a small fraction of our web traffic. So this was largely driven by our ideas about what we wanted to do."); Tr. 8232:11-8233:7 (Reid) ("Q. And as Google was exploring and thinking about distance in mobile, did it rely on click and query data to any serious extent in doing that? A. No. I mean, it was a signal, for sure, but it was not the dominant one. We really needed to understand what was the user's location of the phone. We also used raters to understand how far people would want to go for this query. So, that would be used as the primary signal, the location, and what we got from raters. We did use user query and click-on data to refine the distance. You understood ATMs are closer than restaurants, and we would sort of reinforce. But it was a smaller signal on top. Q. How much data do you need to figure out that people are tolerant of going a certain distance to an ATM versus to a restaurant? A. Not a huge amount, in my mind. Right? That you can figure out some of those things pretty quickly. You do, you know, over time learn things like, okay, your tolerance of distance is different in the rural areas versus the more dense areas. But you can start to understand these extrapolations more broadly.").

208. "Some of these ideas [relating to mobile search] may have used some amount of click data or query data, but [for] many of them, like local search, it was a matter of collecting all

that information from places around the world." Tr. 8079:14-8080:8 (Gomes); *see also* Tr. 8232:11-8234:8 (Reid).

209. "Localization of ranking [on mobile] was a matter of using the ranking -- the local signal coming from the phone, and figuring out what does that mean for your results"; "[t]he knowledge graph is a matter of bringing all the data from all these sites together"; and "voice search is, again, a matter of . . . doing the machine learning improvements in order to make those -- make voice search work; and likewise with translation." Tr. 8079:14-8080:8 (Gomes).

210. Google learned about users' expectations on mobile via "a lot of user studies" in labs whereby Google tried to "understand exactly how users are interacting with the device." Tr. 8072:22-8073:11 (Gomes); Tr. 8246:13-8249:22 (Reid) (testifying about DX0062A at .027-.028).

211. Google optimized for mobile because "that's what [it] figured was necessary in order for people to actually be able to enter queries or they wouldn't do that on a phone, they could tap on other apps to get to -- [] an alternative." Tr. 8066:10-8067:16 (Gomes), 8068:19-8070:13 ("And there was a lot of movement towards, well, the solution is apps, and everyone's going to tap on an app and they're going to get their answer right there. So that is what we had to compete against.").

3. There is Substantial Overlap Between the Mobile and Desktop Query Streams

212. Although the experience on mobile and desktop differs, there is substantial overlap in the queries seen on each. Tr. 6315:24-6317:16 (Nayak) ("So we observed two types of differences between mobile and desktop. But before I get to the differences, we also observed that there was a lot of similarity also. . . . But what was interesting was, a very large fraction of the queries were really the same on both sides."); Tr. 1772:2-7 (Lehman) ("Q. Desktop queries

and mobile queries, they're search intents differ often; right? A. I don't think the search intents for desktop and mobile queries differ often. . . .").

213. In 2014, Google conducted a study to determine, of the queries that occur both on mobile and desktop, whether certain types of queries occurred more frequently on mobile or on desktop. UPX1087 at -718; Tr. 6417:25-6418:15 (Nayak) ("The way to think about this is these are queries that occur both on desktop and mobile, because most queries occur both on desktop and mobile. But these are queries where the number of -- the relative amount of queries on -- the distribution on mobile is higher for these queries, for the mobile-dominant queries, than on desktop; that is, the fraction of occurrence of these queries on desktop is lower.").

214. Google observed that [redacted] of queries were "desktop-dominant," [redacted] were "mobile-dominant," and [redacted] were "mixture queries," meaning that [redacted] of queries that occurred on both desktop and mobile did so at similar frequency. UPX1087 at -721; Tr. 6417:25-6418:15 (Nayak).

215. Of the queries that occur more frequently on mobile, those queries tend to be location-specific queries, while the distribution on desktop is skewed more toward research-oriented queries. Tr. 6315:24-6317:16 (Nayak).

216. But each type of query—location-specific and research-specific—occurs both on desktop and mobile. Tr. 6315:24-6317:16 (Nayak) ("Those same queries did occur on desktop. So it wasn't like they didn't occur at all on desktop. They just occurred less frequently. So the distribution was sort of skewed towards a little bit more local queries. Similarly, on desktop, you found more queries which were more research-oriented, because, you know, maybe people like to do research with -- more realistic like this. That doesn't mean those queries didn't occur on mobile. It's just that the distribution was such.").

217. Where the same type of query occurs on both mobile and desktop, "in some cases, the intents on mobile were slightly different." Tr. 6315:24-6317:16 (Nayak) ("[L]et's say you issued the query 'Bank of America' for your bank. Then on desktop, chances are you want to go to the online home page of Bank of America to do online banking. Whereas, on mobile, chances are you were looking for the locations of the ATMs for the bank, Bank of America.").

218. For most queries, it does not make a difference whether the query is issued from a desktop or a mobile device in terms of the search results returned by Google's search algorithms. Tr. 6317:17-6318:6 (Nayak) ("Q. How does Google Search handle a situation like that where there are potential multiple intents for a query, whether it's on desktop or mobile? A. So one of the signals that does go into Google Search is, you know, is it a desktop query or is it a mobile query. In most cases, that signal doesn't make a difference, but in some cases, you might recognize the difference in intent. And for like that Bank of America query, the result might be that on mobile you might promote the local block that shows the map where the ATMs are and make the home page of Bank of America be the second result. Whereas, on desktop, those two would be switched. The home page would be the first, because maybe that's the primary intent, and the map with the locations near you would be the second result.").

219. Where a query has potential multiple intents (as may be the case for queries where the dominant intent may differ between those issued on desktop versus mobile), if Google has failed to optimize for the correct user intent, often the only difference is that Google ranks the result that best satisfies the intent in the second position instead of in the first position. Tr. 6419:1-22 (Nayak) ("From an overall user perspective, it's not that big a loss. You scroll a little bit and you get the map that you're looking for.").

220. For a large fraction of queries, user interactions for desktop queries are the same as user interactions for mobile queries in that they have the same intent. Tr. 6318:7-15 (Nayak) ("Q. Are the interactions -- the user interactions on desktop have any relevance to how Google presents results on mobile? A. So I think I gave you some examples where queries are different. But in a large fraction of queries, they're really the same. The intents are the same. And so the user interactions on desktop are really no different from the user interactions on mobile. In that subset of cases where there's a difference, you will see the difference in user interactions.").

D. Google Consistently Invests in and Strives to Improve Around Its Industry-Leading Search Quality

221. Google has since its beginning consistently invested to maintain its industry-leading search quality and to support the innovations described in the paragraphs above. DX0227 at .011-.013; Tr. 6319:9-6320:12 (Nayak), 6321:16-24; *see generally supra* § I.

222. Google has consistently increased its investment in research and development for Google Search. Tr. 7297:12-17 (Raghavan) ("Q. Now, we can obviously see an upward trend in these expenditures, correct? A. Correct. Q. And since the chart ends in 2021, has -- based on your knowledge, has that upward trajectory of R&D spend continued? A. Yes, it has."); DXD-21.002 ($[redacted]B in 2018, $[redacted]B in 2019, $[redacted]B in 2020, $[redacted]B in 2021); *see also* Tr. 9900:13-9902:9 (Murphy) ("Professor Whinston has argued that Google has not significantly invested in R&D when compared to other software and computer companies. Do you agree with his analysis? A. I don't. One of the things we already talked about is when they were competing back in 2011 with Bing on -- largely on Windows at the time, they were out-investing Bing significantly. Remember, they're competing -- you know, users lost by Bing or, basically, users gained by -- by Google, and vice versa at that time, because there's not that much growth in the

platform, right? This is not a period where desktops were really growing like mobile does later.”).

223. In addition to the research and development investment spent specifically in the Search organization referenced above, much of Google’s overall research and development supports innovation in Search. For example, as Pandu Nayak explained, the AI innovations in Search build on work done by Google Research. Tr. 6342:18-6343:2 (Nayak) (“Q. And what is the relationship or the significance of some items being on top of the line and some items being below the line? A. So the items on the top of the line is work, either systems or papers, done by members of the Google research team. So these are all various research advances that our research teams did. The items below the line are applications of this research [to Search].”); DXD-17.005.

224. Google invests significantly in research and development because “[i]t’s the best way of keeping up with the very best technology we can bring to our users so we can run the best product that we can put in front of users.” Tr. 7297:18-21 (Raghavan), 7297:22-7298:5 (“I think the space of information in the media is exploding with so many players, each of whom brings a special secret sauce, that it would be foolish of us to not put our best foot forward in terms of investment and technology.”).

225. Google also continues to invest in Search through headcount: Today, Google employs approximately 8,000 engineers and product managers to work in Google Search, with roughly 1,000 of those employees focused on search quality. Tr. 7298:6-12 (Raghavan). That is ten times the number of engineers working on search at Microsoft. Tr. 2753:14-2754:4 (Parakhin); *see infra* § V.A.3.

226. Today, Google employs over 15,000 Ph.D.s. Tr. 7298:14-17 (Raghavan).

227. Google does not rest on its laurels. Instead, it constantly tracks its search quality. Tr. 6322:8-14 (Nayak) ("Q. And why does it do that? A. Well, there's a saying which is sometimes attributed to Lord Kelvin, maybe misattributed. It says you can't improve what you don't measure. And even if the attribution isn't accurate, it makes an important point. If we are seeking to improve search quality, then we better have a way of measuring whether it actually is making improvements or not."); *see* Tr. 1781:8-12 (Lehman) ("[T]he goal of the metrics is not to measure user behavior. The goal of the metrics is to measure quality of search results.").

228. As part of Google's "culture of trying to improve [S]earch," Google regularly conducts comparisons of itself to Bing and other search engines on quality metrics. Tr. 6367:16-6368:14 (Nayak), 6369:6-6370:4; *see supra* §§ I.C, III.A.

229. Google sets itself goals every year for improving its quality scores. Tr. 6321:16-24 (Nayak) ("Q. Now, this document we just reviewed was for 2021. Are there similar documents and goals for other years at Google? A. Yeah. This is a part of our annual planning. Every year, we set ourselves goals that -- OKRs, you may have heard of those, objectives and key results. And we set up objectives along these lines. In search quality, we always have an objective like this one here to improve search quality according to the metrics that we measure here. And we do this every year, yes."); DX0227 at .011-.013.

230. Google's "top-level" metric is "information satisfaction" or "IS." Tr. 6320:2-6321:5 (Nayak), 6322:5-14 ("Q. Does Google conduct any measurements of its quality in the ordinary course of its search engine? A. Yes, we do."), 6322:15-6323:3 ("Q. What metrics does Google use to measure its search quality? A. So we use a number of different things of course, but there is one measure that is sort of, I think, the most important, and that is the information satisfaction measure that we touched upon briefly."); Tr. 1779:13-20 (Lehman) ("So currently, at

least when I left Google, the primary measure of search quality is a metric called IS4, information satisfaction version 4, the metric, and maybe it's a higher number now. That captures many of these aspects of search quality, but it can't get quite all of them. And so sometimes we use other methods to compl[e]ment IS4.").

231. Human raters determine IS score by evaluating their satisfaction level with a search result, meaning how well the result meets their information needs. Tr. 1779:21-1780:1 (Lehman) ("Q. Okay. So the IS metric, information satisfaction metric, that's human rater-based evaluation; right? A. That's right, yep. Q. So it's basically paying people to evaluate search results? A. Yes[.]").

232. Google utilizes over 16,000 human raters to evaluate its search results and generate an IS score. Tr. 6323:19-6324:24 (Nayak) ("Q. And how does Google go about scoring -- or generating the data to create these IS scores? A. So we have a whole system of evaluation to produce these IS scores. The core of it is we have a whole lot of raters. These are people that are hired from all over the world. We have about 16,000 or more of them around the world. And we essentially ask them to take a look at a sample of queries and the results for them and to provide judgments, ratings for how well the results match the queries . . . . So they give those judgments on these queries, query result pairs. We aggregate those judgments up to the query level and then aggregate it up to the query set level. And so we get an overall metric for how we're doing for that particular sample of queries that represents our query stream.").

233. Google developed a 160-page set of search rater guidelines from which the human raters are instructed to evaluate Google's search results. Tr. 6323:19-6324:24 (Nayak); DX0298.

234. The guidelines detail criteria on what makes search results relevant and reliable. Tr. 6323:19-6324:24 (Nayak) ("And the document itself, as I mentioned, what search wants to be

is to produce relevant results from reliable sources whenever possible. And so this document goes into a lot of detail on what does it mean to be relevant, what does it mean to be reliable. Right? And so that gives raters guidance on making those judgments.").

235. Google publishes its rater guidelines to be transparent about Google's vision of its search product. Tr. 6325:4-15 (Nayak).

236. Google regularly tests its search quality with both human rater tests and live experiment tests. Tr. 6325:17-23 (Nayak); DXD-17.003.

237. Google sets specific goals for increasing its search quality in various international markets, in addition to its goals for the U.S. market. Tr. 6321:6-15 (Nayak); *see also* DX0227 at .012 (discussing search quality goals for i18n (top eighteen international countries) and NBU (next billion user) international countries).

238. Google invests significantly in research and development, and search quality worldwide. UPX8085 at -873 ("We continue to invest heavily and develop localized versions of our products and advertising programs relevant to our users in these [international] markets"); Tr. 8155:13-19 (Gomes) (Google is "making investments in Europe all the time" because "[t]he European market is extremely important to [Google], and so [Google] invest[s] in all those countries in a very big way.").

239. Google provides higher-quality search results than Bing. Tr. 8100:15-18 (Gomes) ("Q. Let's focus on Bing for a few minutes. You believe that Google provides better search results than Bing, correct? A. I -- definitely.").

240. Google has consistently outscored Bing on the IS metric both in English and internationally. Tr. 6369:6-12 (Nayak) ("Q. And over those 19 years in which Google's been doing those comparisons to Microsoft's search product and other search engines of the same ilk,

what has Google seen in terms of the quality differences? A. I think we've seen a fairly meaningful difference in quality. I would guess in the range of three to four points of IS at various points is the gap we've seen."); Tr. 8100:19-21 (Gomes) ("Q. And in your time at search, the IS4 rankings between Google and Bing, Google always had a higher ranking, correct? A. Yes."); UPX0268 at -123 ("Internationally, [Google] also outperform[s] Bing from [redacted] points (German/Portuguese) to [redacted] points (Arabic).").

241. The DOJ Plaintiffs' expert, Professor Whinston, acknowledges that Google has been consistently better than Bing. UPXD104 at 50; Tr. 5795:4-5796:15 (Whinston (DOJ Expert)) (conceding that Bing's quality is lower than Google's for both head and tail queries).

E. Google Has Innovated in Search Ads Quality

242. Google has continuously innovated in search ads. Tr. 7349:7-15 (Raghavan) ("Q. Are you familiar, sir, with various innovations that have been made to Google's search ads functions over the years? A. Some of them, I would say. Q. Okay. And is innovation something that is going on with great frequency? A. I would say it's a fairly constant activity, and it's the reason why hundreds of engineers work on this problem all the time."); *see also* Tr. 1288:13-17 (Dischler) ("Q. . . . Does Google innovate in the ad space? A. Constantly."); [redacted] Tr. 7349:16-7366:20 (Raghavan) (discussing DXD-21.007-.012); DXD-21.007-.012 (examples of Google Search Ads Innovations).

243. When Google launched AdWords in 2000, "AdWords dramatically simplified the buying experience of advertising on search engines." Tr. 7350:24-7351:19 (Raghavan) ("Q. . . .

Now, you just reminded us that you were not at Google when AdWords was launched in 2000. Were you aware of the launch of AdWords in 2000? A. Very much so. Q. How so? A. For the left half of this slide, which is roughly the period I was not at Google, I think I'd say I was in grudging admiration for what Google was doing. AdWords dramatically simplified the buying experience of advertising on search engines. . . ."); DXD-21.007.

244. Google has continued to improve its search text ads over the years: the current version of text ads has "much richer image-heavy content" and has ad extensions, which "are features within an advertisement that . . . allow a user to navigate directly to some point with[in] an advertiser's website." Tr. 7353:6-7354:3 (Raghavan), 7354:4-18 ("Q. Okay. And was that an innovation that Google introduced into this -- A. I believe it was Google that first came up with this. Q. These types of innovations, these . . . new features where you can click on dining, for example, is that a benefit to users? A. I would hope so, because for users, they want to continue their journey as efficiently as possible. This is a means to not have to go first to a home page, and then click their way down. It's also a case where an advertiser indicates what it is about their site might be of the greatest interest to users issuing this query. And this advertiser, for instance, says -- felt that dining at the hotel or viewing guest rooms would be especially useful in continuing the journey of a user directly."); DXD-21.009 (showing text ads appearing in response to the query "drake hotel, chicago" in 2000 and 2023).

245. Google also innovated by introducing various ad types over time. *See* Tr. 1346:14-23 (Dischler) ("Q. . . . Can you briefly tell us some of the different -- some of the types of ad formats that Google offers on search? A. We have text ads and the text ads can have one or more or zero or more extensions. We have product listing ads. We have local ads that show up in the local results. We have local services ads which are a specialized format for service providers.

We have hotel ads as well and other smaller travel formats. . . ."), 1347:11-23 (explaining Google Discovery ads); Tr. 9195:8-9196:3 (Holden) ("Businesses in the travel space can use Google search ads, the text ads, they can buy those. And they can also buy hotel ads, which are another form of search advertising. . . . [T]here's different places where the hotel ads will appear. They appear in the booking module that we referred to before in the immersive, as well as on the search results page in the knowledge panel. They could also appear in promoted hotels, which is the list at the top of hotels in the immersive experience. . . . [T]hese products are designed just like our general search ad products are, to help our advertising partners connect with consumers who are interested in their products or services, and our goal is to make that as ROI positive for our partners as possible."); *see also* DXD-21.007 (showing introduction of Dynamic Search Ads (2012), Local Services Ads (2017), and Responsive Search Ads (2018)).

246. Google has invested in and improved its ad auctions platform "[b]ecause advertisers who are focused on return on ad spend have other places to take their budgets." Tr. 7385:24-7386:5 (Raghavan); *see also* Tr. 1361:19-23 (Dischler) (testifying that one of the reasons Google has "so many launches" is because "we want to stay competitive").

247. Google's innovative focus on long-term value ("LTV") in its search ads auction reflects its competition with other sellers of digital advertising and has delivered a higher quality experience for both advertisers and users. Tr. 7355:5-7356:24 (Raghavan) ("Q. What was innovative about the LTV function that got introduced that still is there? A. I would say a couple things. To my knowledge, it was the first formal quantification of user impact. And that's an incredibly hard thing to do, because you have look at an event that's happening billions of times a day, and each single time come up with this value assessment. And then the second piece of it was to actually reduce the revenue upside so that we would have to consider the user impact, and

make sure the user got value -- enough value to come back. And establishing that connection is hard, but that's what the LTV function has been after. Q. How, if at all, did this innovation distinguish Google from competitors like your former employer, Yahoo!? A. Back when I was at Yahoo! and Yahoo! had a search engine, there wasn't as clear a quantification of long-term value. It's a hard problem, but we were not able to get quite the same quantification.").

248. Through continuous innovation, Google has improved its ability to predict which ads will be most relevant and useful to users in response to their queries, which benefits advertisers (who want to reach the users that are more interested in their product or service) and users (who prefer to see ads that are attractive and relevant). Tr. 8554:20-8555:20 (Israel (Google Expert)) ("So the way I've tried to measure quality . . . is basically the click-through rate. If ads are higher quality, if they're a better match, then more people are going to click on them. So the sort of goal of targeted advertising is to match it to the right user . . . . So you see in 2011 . . . about 10 percent of the time that a query had an ad, it was clicked. By 2021, that's over 30 percent. So the ads that are being put are matching to users better in the sense that they're being clicked on more regularly."); Tr. 4265:1-16 (Juda) ("Q. Okay. . . . just on average, how many launches a year do you have in ads quality? A. So it's not a number that I've been tracking lately. When last I was looking at such things, it was usually a few hundred launches a quarter. So probably either several hundred to low thousands over the course of a year. . . . Q. Okay. Explain. How is advertiser value created by ads, ads quality launches? A. So there's certainly a variety of launches that can end up providing advertisers with more traffic than what they had previously received. More traffic means more opportunities for an advertiser to sell their good[s] and service[s] . . . .").

249. Google has also made improvements to its product listing ads (PLAs) over time based on user research, including changing the vertical ordering of ads to a carousel, and adding content including reviews and shipping information that helps a user decide what to buy. Tr. 7370:2-14 (Raghavan) (Google has made certain changes to its PLA product "[b]ased on [its] user research": Google has "gone from the vertical ordering of these ads to a carousel, a horizontal carousel. . . . Second, the badging is changed. The final thing . . . is this auxiliary content that helps the user decide what product to buy, such as reviews, free shipping and so on."); DXD-21.015 (showing PLAs appearing in response to the query "double jogging stroller" in 2009 and 2023).

250. Google "look[s] at competing platforms to see what type of ad formats they have," and "do[es] competitive intelligence to see what's working on other platforms." Tr. 1349:2-9 (Dischler) ("Q. How about looking at competing platforms to see what type of ad formats they have, is that something that Google routinely does? A. Yes. Q. Why do you do that? A. Because there's no monopoly on good ideas. We do competitive intelligence to see what's working on other platforms.").

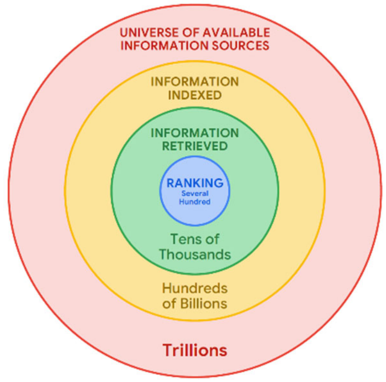
251. For example, Google looks to see what Facebook, Instagram, Amazon, and Tiktok are doing with their ad platforms. Tr. 1349:10-20 (Dischler) ("Q. And what are some of the other platforms that your team will look to see what other competing platforms are doing? A. we'll look at Meta's properties, Facebook and Instagram. At Amazon, we'll look at the various video ad platforms. We'll look at short-form video like TikTok. Really, a whole host of platforms. And then . . . in addition to online ads, we'll also look at offline ads as well, what's going on on TV, in print, outdoor, et cetera, lead gen of various sorts.").

252. Google has launched innovations in response to competitive pressure to simplify its ad products. Tr. 1369:13-16 (Dischler) ("Q. . . . Has Google launched any innovations in response to competitive pressure to simplify [] ad products? A. Yes."); *see also* DXD-21.007 (timeline of examples of Google search ads innovations); Tr. 7349:16-7350:1 (Raghavan), 7304:10-7305:25 (agreeing that Google surpassed Yahoo by launching "new and innovative technologies"). For example, Google has "developed a number of different automated systems in order to try to be more competitive with . . . Facebook advertising," which had "much simpler targeting criteria." Tr. 1369:14-1370:1 (Dischler) ("Q. Has Google launched any innovations in response to competitive pressure to simplify to ad products? A. Yes. Q. Describe. A. So if you advertise on a Facebook, for example, they have much simpler targeting criteria. And so Google find that small and medium advertisers are -- even some large advertiser[s] would go to Facebook first before going to Google in order to meet the same business objective because it's easier to set up. They don't have the notion of keywords. And so we've developed a number of different automated systems in order to try to be more competitive with this aspect of Facebook advertising.").

IV. THE EVIDENCE OF THE CONTRIBUTION OF SCALE OF USER INTERACTION DATA TO SEARCH QUALITY

A. Google's Search Quality is Determined by Many Factors, with the Usage of User Interaction Data Being Only One

253. Search quality refers to the ability of search engines to "give results that are helpful for people." DX0298 at .006. As depicted in the visual below, providing results that are helpful for people demands designing algorithms to carefully winnow the relevant, useful, high-quality content in response to a user query from the trillions of potential results on the web. DXD-17.002.



254. User interaction data is the compilation of observations about the user's engagement—such as clicks, swipes, and other events—with search results. Tr. 1752:9-21 (Lehman).

255. Historical user interaction data may, in certain instances, affect how results are ranked in response to a particular query. Tr. 1759:2-7 (Lehman) ("Q. Okay. So user data can improve specific search results, correct, with respect to a specific query? A. So for each specific query, there's a scoring process for all the results, and then results are ranked by decreasing [score]. And the user data may affect the scoring of those individual results and so affect how they're ranked, yes.").

256. While the volume and availability of user interaction data is one factor that can affect search quality, there are an enormous number of other factors that do so as well. Tr. 6330:19-24 (Nayak) ("There's actually a lot that goes into the quality of search results at Google. User interaction is one piece of it, but by no means the only piece. There's many, many other important pieces in there."), 6335:25-6336:16 ("[Y]ou have to do a lot more."); *see also* Tr. 10395:22-10396:4 (Oard (DOJ Expert)) ("Q. Professor Oard, you agree that there are an enormous number of other factors that influence or affect search quality other than user-side data? A. It's certainly true that there are quite a large number of factors, an enormous number of

factors, that in addition to user-side data affect search quality. Some of them are used without user-side data at all, and others make use of user-side data and other signals.”).

257. As described in Sections III, VI.B, and VI.E, Google has constantly innovated to improve its search engine over the past twenty-five years, resulting in tremendous quality gains. Many of these innovations depend little on user interaction data.

1. Indexing/Culling Process

258. The size and quality of a search index is a crucial part of search quality for the simple reason that a search engine cannot serve a webpage (or document) unless it exists in the index. Tr. 6303:18-25 (Nayak) (“Q. What is the implication for search of a document being either in the index or not in the index? A. It has a very significant implication, which is if it’s not in the index, we can’t serve it to users. It’s as simple as that. So making sure that when users come to us with queries, we want to make sure that we’ve indexed enough of the web so we can serve those queries. And so that’s why the index is such a crucial piece of the puzzle.”).

259. Creating a search index is no small matter. From the trillions of documents on the web that represent the universe of available information sources, Google crawls and indexes a fraction, amounting to hundreds of billions of documents. In response to specific queries, Google retrieves from its index tens of thousands of documents, and ranks several hundred among the information retrieved. Tr. 6330:25-6332:11 (Nayak); DXD-17.004.

260. Thus, well before user interaction data can even exist, the document in question must be crawled, indexed, retrieved, and ranked for a user to potentially click on a link. Tr. 6332:4-11 (Nayak); DXD-17.004.

261. Increasing the size of an index is fundamentally an engineering problem rather than one that depends on the volume of user interaction data. Tr. 10422:6-14 (Oard) (“Q. And when Microsoft increased the size of its index, did it need to have additional user-side data in

order to do that? A. I think clearly not. When Microsoft increased the size of its index, I think it simply made a decision to make an engineering investment in a larger index. User-side data can be useful in making the index of higher quality. But to make the index larger, the fundamental problems are engineering problems, not user-side data problems.").

262. There is a considerable amount of work required to create a good index. One must combat problems like spam. One must make decisions on matters of freshness. The web changes all the time and one must make decisions about what pages are changing quickly, which pages are changing slowly, and the like. Tr. 6304:1-21 (Nayak); *see also* 6304:22-6305:3 ("Q. Is there a cost associated with creating an index of this size? A. Oh, there's a very significant cost associated with it, because you need machines to create the index. You need the network bandwidth to go out and fetch the documents. You need the storage to create the index. So there is a fairly big investment that goes into creating this index, yes.").

263. For example, when Microsoft recently increased the size of its index by [redacted], it did not need to have additional user-side data. Tr. 10422:6-14 (Oard); Tr. 2756:3-2757:1 (Parakhin (Microsoft)) ("Q And there, you describe a project to dramatically increase index scale? A Correct. Q And Microsoft then proceeded to do that, correct? A Yes, one of our big successes. Q And it was a big success because it improved Microsoft's relevance metric, correct? A Among other things, but not only relevance, yes. Q And it improved search quality in other ways, as well, correct? A Yes. Q And Microsoft didn't need additional user scale to complete that project, did it? A That is correct, it did not need additional user scale to complete that project."); DX0538 at .003.

2. Retrieval and Ranking

264. In response to a query, Google must retrieve documents that match the query from the documents included in its index. Tr. 6330:25-6332:11 (Nayak); DXD-17.004.

265. "A typical query might have millions of documents on the web that match it, but there's no way that in the fraction of a second that . . . [Google] can look at a million or millions of documents and retrieve them." Google instead developed a retrieval process that selects on the order of tens of thousands of documents from the index that Google can actually look at. Tr. 6330:25-6332:11 (Nayak); DXD-17.004.

266. The retrieval step is "crucial" to search quality, and Google must do a "good job" of deciding which documents to retrieve, because if it does not retrieve relevant documents then search quality will be poor. Tr. 6330:25-6332:11 (Nayak); DXD-17.004.

267. And even then, Google does further work to "score[]" the queries "to get down to several hundred documents." Tr. 6330:25-6332:11 (Nayak); DXD-17.004. Once Google narrows the set of documents, it then employs a ranking system it has developed. Tr. 6330:25-6332:11 (Nayak); DXD-17.004.

268. Accordingly, Google has developed "a variety of signals" to determine which documents to surface—to retrieve and rank—in the first place. Tr. 6332:19-6333:11 (Nayak) ("Q. At a high level, how has Google gone about developing its systems to surface documents in the first instance? A. I mean, we use a variety of signals . . . ."); DXD-17.004.

269. Google uses "several hundred signals" that "work together to give [Google Search] the experience that is search today." Tr. 6332:19-6333:11 (Nayak); *see* Tr. 2214:22-2215:2 (Giannandrea) (testifying that Google used "maybe 200 signals" in retrieval and ranking when he was at Google).

270. Some of the signals that Google uses in the retrieval and ranking process include core topicality signals, page rank signals, localization signals, reliability signals, and more. Tr. 6400:1-7 (Nayak), 6407:23-6408:4, 6472:1-14. Some of these signals do not use any user

interaction data; other signals use user interaction data only in part. *See* Tr. 1765:5-20 (Lehman) ("The word 'signal' in the sense that I used it while working on search at Google was fairly broad. Maybe examples would help. They're not all related to user interactions. So for example, a signal might be how many links on the web are there that point to this web page or what is our estimate of the sort of authoritativeness of this page."), 1833:22-1834:6, 1836:19-1837:21; Tr. 6332:19-6333:11 (Nayak), 6335:7-6336:16.

271. "The most basic and in some ways the most important signal[]" is the words on a webpage and where they occur. Tr. 6332:19-6333:11 (Nayak) ("The signals vary on a number of different dimensions. It starts with the most basic and in some ways the most important signal, which is just the words on the page. The words on the page are actually kind of crucial, and that's where the index comes in. Where the words occur, is it in the title or is it in some metadata or is it in the body, these kind[s] of signals are very important.").

272. "Another very important signal is the [hyper]links between pages," also known as "[a]nchors," which provide a "very valuable clue in deciding what the target page is relevant to." Tr. 6332:19-6333:23 (Nayak), 6335:20-24.

273. Clicks are not used in generating an anchor signal. Tr. 1833:22-1834:6 (Lehman) ("Q. In order to evaluate anchors, is click user interaction data used? . . . A. . . . To generate the anchor signal, that's just from links between web pages, and it doesn't involve clicks.").

274. Freshness is another signal that is "important as a notion of relevance" for queries seeking current content, such as a search for the recent scores of a user's favorite sports team or a search for a new laptop. Tr. 6334:1-6335:6 (Nayak) ("For example, if you wanted to find out something about your favorite sports team, you want the pages that were published maybe this morning or yesterday, not the ones that were published a year ago, even though they might be

relevant in that sense, but they're not really relevant because they're not the information you're seeking. Similarly, if you're looking for a new laptop, maybe you don't want the page that was published today, but you want laptop reviews from 2023, because those are the laptops you will be looking at, not the laptop reviews in 2022. On the other hand, if you're planning your Thanksgiving meal and you want a turkey recipe, then maybe the recipe from ten years ago is actually better than the recipes from today."); *see also* Tr. 2369:8-20 (Giannandrea) ("Q. . . . [T]hey're important in training these elements, helped make sure that they gave fresh rankings, that the responses were correct, right? A. Yes. Freshness is about latency, not quantity. Q. Freshness, . . . let me put it this way: Part of the challenge of freshness is making sure that whatever gets surfaced to the top of the -- in the ranking algorithm is consistent with what people right now are interested in, right? A. I mean, generally true. A great example of freshness would be somebody famous dies, you kind of need to know that within seconds."); Tr. 1899:22-1901:12 (Lehman) ("There is a special sort of freshness component that tries to look at things like, often news articles will have by-line dates so you can say, well, how old is this article versus this one. This is about Taylor Swift's relationship two years ago, this is one two weeks ago. And so it can sort of boost the more recent ones more aggressively.").

275. "[T]he notion of freshness and deciding whether to use it or not is a crucial element" of search quality. Tr. 6333:12-6335:6 (Nayak).

276. Search results that have received the most clicks typically are not the most relevant results for queries that require fresh results because older, potentially stale pages tend to have more clicks than fresh pages. Tr. 6335:7-19 (Nayak) ("Q. You made reference in your answer to freshness. How do the existence of a collection of clicks in the logs interact with this concept of freshness? A. The challenge with freshness and clicks is that clicks accrete over time,

which means older pages, potentially stale pages, tend to have more clicks than fresh pages which may start out with no clicks at all, but even if they start acquiring clicks still will have fewer clicks than sort of the pages that have been around for a while. And so if you want to have a good fresh set of results, you really have to take into account the fact that clicks tend to create staleness, and you need to compensate for that in some way.”).

277. The location of the device is an important signal for certain queries, such as a search for pizza restaurants near the user. Tr. 6333:12-6335:6 (Nayak).

278. Many signals relate to language understanding, which is a “crucial element” in the quality of search results because the search engine “need[s] to understand the language of queries, the language of documents, and the match between them.” Tr. 6333:12-6335:16 (Nayak). These signals, especially those stemming from recent advances in machine learning, do not rely primarily or even at all on user interaction data. *See infra* § IV.B.3.

279. Another group of signals, referred to as page quality signals, are “tremendously important” because Google wants to surface authoritative, reliable search results for its users. Tr. 6335:25-6336:16 (Nayak); Tr. 1836:19-1837:21 (Lehman) (“Our goal is to show -- when someone issues a query, to give them information that’s relevant and from authoritative, reputable sources.”).

280. A large number of clicks on a link does not necessarily mean that the page is of high quality. Tr. 1836:19-1837:21 (Lehman) (“Q. Dr. Lehman, at the top, the slide reads ‘some known live traffic eval shortcomings.’ . . . [H]ow does that relate to the question of user data or user interaction data? A. So the chart is a little bit complex, but what it’s illustrating is one of the problems with using click data in connection with ranking search results. It’s a very strong observation that people tend to click on lower-quality, less-authoritative content than we would

like to show on our search engine. Our goal is to show -- when someone issues a query, to give them information that's relevant and from authoritative, reputable sources. People tend not to click on those so much. So if we're guided too much by clicks, our results would be of a lower quality than we're targeting.") (discussing UPX0204 at -231).

281. In fact, page quality is *anti*-correlated with user clicks. Tr. 6326:17-6327:8 (Nayak) ("Q. And you mentioned page quality. What is the relationship between page quality on the one hand and clicks? A. . . . [W]hen looked sort of at an aggregate level, what Google ha[s] noticed is that page quality is a little anticorrelated with clicks. Q. When you say 'anticorrelated,' what do you mean by that? A. It means that in cases where we improve page quality on the margins, not sort of at the -- at the big level, I think page quality is a good thing in the long term. But on the margins, whenever we improve page quality, what we've noticed is that our live experiments come out not so great. So they move in sort of opposite directions. And I think part of it is things that I mentioned around things like click bait and variations thereof. If we demote the click bait, users may still seek it out, and that looks like a loss on the live experiment when really it's actually a good thing to do that."); Tr. 1836:8-10 (Lehman) (noting that clicks present "many challenges" as a signal in ranking).

282. Of the signals that rely on user interaction data, Google must "do a lot more" than just "mine the clicks and create a table and serve results"—"there's a lot of work that goes on in all these different areas." Tr. 6335:25-6336:16 (Nayak).

283. Navboost, which does make use of user interaction data and was the signal on which Plaintiffs focused, is not the most important signal in Google's document retrieval and ranking process. Tr. 6472:15-6473:3 (Nayak); Tr. 1808:21-25 (Lehman) ("Q. Navboost and

QBST are the two most effective ranking systems in figuring out language nuances; right? . . . A. Not even close.”).

3. Search Features and Device Optimization

284. Search features are tremendously important to search quality as well. The “term ‘search features’ was used to refer to all of the different changes [Google] made into the interface of search. Even things like universal search would be considered a search feature.” Tr. 8071:6-17 (Gomes). Some examples of search features about which the Court heard testimony include Universal Search, *see supra* § III.B.1, the Knowledge Graph, *see supra id.*

285. Search features are particularly important to search quality on mobile where the device is such that a user has a smaller screen and it is more difficult to navigate to different webpages. *See supra* § III.C.2.

286. As former Head of Search Ben Gomes explained, Google “began to make all kinds of other features within the result page, because the nature in which people were getting information today was changing.” Tr. 8068:19-8070:13 (Gomes). And, as discussed earlier in Section III.B.1, Google began to rank and display different features together along with the ten blue links in order to offer users the best results across different types of content. *See supra* § III.B.1; Tr. 8029:4-8030:13 (Gomes); DXD-27.010.

287. User interaction data plays a role in some features, to be sure, but certainly not all. Tr. 8031:6-16 (Gomes) (“Q. And with those features that you were working on, what was the role of Google having a collection of user queries? How important, if at all, was that to that process? A. It played a role in some features, but not in all. For instance, if you’re changing the snippets, the user query doesn’t necessarily play any significant role. You can be -- we got sites to do various kind of markup. We were working with the ecosystem in various ways. So there

were some things they could play a role, like in auto-complete, but it didn't play a role in many of the kinds of changes we did.").

288. Further, Google's effort to acquire the information and content necessary to build out these search features had little to do with user interaction data. *See, e.g.*, Tr. 8232:11-8233:7 (Reid) (describing developing the Local unit); *infra* § VI.B, E.

289. There was some discussion at trial of latency, meaning the time lapse between a user issuing a query and the search engine returning actionable results visible to the user on his/her device. Tr. 7301:2-5 (Raghavan). Latency is certainly a factor in user perception of search quality. Tr. 7301:6-8 (Raghavan) ("Q. Is that a[n] important consideration at Google? A. Extremely. Because the founders enshrined it as one of the principles for building successful products."). The degree of latency is impacted by, among many other factors, the index, the richness of the search results page in terms of features and images, the use of machine learning models to retrieve and rank results, the strategy for constructing the SERP and rendering it to users; thus, addressing latency fundamentally involves making tradeoffs. Tr. 6469:9-6470:5 (Nayak), 6470:18-6471:10.

B. The Limits on the Utility of User Interaction Data

1. The Incremental Benefit to Search Quality from Increased User Interaction Data is Subject to the Law of Diminishing Returns to Scale

290. The scientific principle of the law of diminishing returns applies to search engines' use of user interaction data. Tr. 6337:6-9 (Nayak); Tr. 2252:23 (Giannandrea); Tr. 1897:13-15 (Lehman).

291. Each incremental query's value is further reduced by the money- and time-related costs of processing that query. Tr. 6337:17-6338:6 (Nayak).

292. Because of the trade-off between the diminishing returns of the data and the cost of processing the data, there is a "sweet spot" where the diminished value fails to catch up with the increased cost. Tr. 6337:17-6338:6 (Nayak).

293. For example, Google's Navboost ranking algorithm is a click data memorization system. Tr. 1895:14-1896:19 (Lehman) ("I think yesterday we talked about the difference between memorization systems and generalization systems. So now [Navboost] would be an example of a memorization system. It remembers for a particular search query and a particular web page user did or did not click.").

294. In 2017, Google investigated the effect of a one-third decrease on the amount of Navboost training data. Tr. 6338:16-6339:1 (Nayak); DX0108 at .003 ("This launch lowers the Navboost mode duration from 18 months to 13 months, in an effort to save cost to time."). Google found "no meaningful change in search quality" with this decrease and thus approved and implemented the reduction. Tr. 6339:2-10 (Nayak). Now, Navboost is trained on 13 months of data instead of the former 18 months. Tr. 6339:2-10 (Nayak) ("Q. And what did Google find when it made the determination to reduce the Navboost data in the respect that's shown in DX108? A. I mean, what we found was that there was no meaningful change in search quality with this decrease, which was really great, because we could then process the data more quickly because there was a third less data to process. THE COURT: Did Google implement that change? THE WITNESS: Oh, yes. This was approved, and we moved ahead with this, yes."); DX0108 at .001 ("It seems that the KE team has signed off and the follow up evals look[] good. Let's go ahead and launch.").

295. Other search engines can compete successfully with Google using a fraction of the queries that Google currently receives. Tr. 3778:9-3779:25 (Ramaswamy (Neeva)) ("Q. And

I appreciate that 2.5 sounds more specific than perhaps you were thinking about it, but at roughly that scale, you believe Neeva could compete successfully with Google, correct? A. Yes.”).

296. Notwithstanding the prominence of its scale allegations in its case, Tr. 6:3-15 (DOJ Opening Statement), neither DOJ expert economist Professor Whinston nor DOJ expert computer scientist Professor Oard offered an opinion on the quantity of user interaction data that a search engine would need to build a competitive search business, whether from the perspective of search quality or as a seller of advertising. Tr. 5924:18-5925:6 (Whinston (DOJ Expert)) (“Q. You haven’t offered an opinion in this case that a general search engine needs to achieve some specific degree of scale in order to compete effectively in a market? A. So, no, I haven’t. . . . Q. You haven’t offered an opinion in this case about how much scale a search engine needs in order to build a competitive search advertising business, correct? A. My answer, I think, would be the same.”); Tr. 10379:8-13 (Oard) (“Q. It is correct that you don’t have an opinion on whether any search engine needs to have a specific amount of user-side data in order to compete with Google on search quality? A. That’s correct, sir, I have no opinions on competition.”).

2. User Interaction Data Has Little Impact on the Quality of Search Results for Longtail Queries

297. Plaintiffs have suggested that user interaction data is more important for longtail queries. *See, e.g.*, Tr. 5785:5-5790:24 (Whinston) (discussing UPXD104.44). The trial testimony from computer science engineers was to the contrary.

298. Longtail queries, by their very nature, occur infrequently, and have very few, if any, associated clicks. They also tend to be longer. Tr. 1811:4-25 (Lehman) (“You can imagine tiers [in the query stream] until at some point you get down to . . . tiers of queries that are individually extremely rare, but there’s just enormous numbers of them, like eight-word queries or something like that.”); Tr. 6336:17-6337:5 (Nayak) (“So long-tail queries, by their very

nature, occur infrequently. That's almost by definition is what happens. And as a result, they have few, if any, clicks for them."); Tr. 2274:9-22 (Giannandrea) ("[A]s you go further down the tail, there's just not enough queries.").

299. When clicks on a query are scarce, those clicks tend to be noisy rather than useful. Tr. 6336:17-6337:5 (Nayak) ("And even the clicks that they do have, again by the nature of being clicks, can be noisy. And when there's few of them, the noise becomes meaningful. When there's a lot of them, then you can say that the noise can be modulated.").

300. Although a search engine with data on a longtail query may have "a marginal advantage" over a search engine with no data on the longtail query, more important is the size of the index as a search engine cannot return a result that is not in its index, regardless of how many times its users have submitted a longtail query. Tr. 2253:3-14 (Giannandrea) ("Q. But for a search engine with more data, even if they have only seen this thing in the tail once or twice, they would have an advantage over a search engine that has never seen the query before? A. There would be a marginal advantage, yes. The most important thing for the tail is to have a much bigger index, which is a function of resources. Q. And I want to get a confirmation. If you don't have as many queries, you will do worse in the tail; is that right, sir? A. Queries will help you prioritize the tail, but if you don't have the document, the query is not going to help you."); Tr. 6308:18-6309:1 (Nayak) ("The thing with long-tail queries is that this is where you really need to have a more comprehensive index, because the user is asking for something very specific. It's not a very common document. And if you don't have that document in the index, you can't serve that long-tail intent that the user came to you with. So it's the index -- comprehensiveness of the index is crucial to being able to serve long-tail queries like this.").

301. For example, Google indexes more of the open web than Bing, meaning that most Bing results are within Google's index, but that fewer Google results are in Bing's index. Tr. 6306:16-6307:17 (Nayak) ("We started with a large sample of queries that were representative of the query stream. And for those queries, we looked at what results Bing returned for those queries. And then we looked to see what fraction of those results were in our index. All right? So that's the blue line. And you can see over time most of the results that were in the Bing results were in the Google index. You can ignore that little sharp line that goes down. That's just a data error at that point, and that can be ignored. But you can see that the blue line suggests that most of the results that were in the Bing results were in the Google index. The red line is the opposite of that. So we looked at all the results that were showing up for Google, and we asked ourselves which of these results were in the Bing index. And as you can see, there's sort of a meaningful gap in the index coverage there.") (discussing UPX0268 at -141).

302. The coverage gap between Google's index and Bing's index is larger in longtail queries than more popular queries. Tr. 6307:24-6308:11 (Nayak) ("Q. Let's turn to the next page, 034, which is also redacted. What are we seeing here? A. Here, we have two charts that are created in the same way as that -- the top-level chart that we talked about in the past. The top chart here is on a subset of queries that are identified as long-tail queries. So these are queries that occur quite infrequently in the query stream. And you can see that the gap between the Google line and the Bing line is actually larger here. The bottom line is on popular queries. These are more common queries that occur more frequently, and you can see that the gap is smaller here. So this suggests that the index coverage is poorer, or the index coverage gap is larger in long-tail queries.") (discussing UPX0268 at -142).

303. Accordingly, a larger index gap on longtail queries translates to a larger quality gap between Bing and Google because if a specific document is not in the index, a search engine cannot serve that result, thus lowering search quality. Tr. 6308:12-6309:1 (Nayak); UPX0268 at -141-142.

304. When it comes to ranking longtail queries, language understanding, not clicks, is the crucial element. Tr. 6336:17-6337:5 (Nayak); *see also* Tr. 2274:9-22 (Giannandrea) (for tail queries, search engines "analyz[e] the documents and the meaning of the documents much more so" than they do for head or torso queries).

3. The AI Revolution Has Diminished the Competitive Significance of User Interaction Data

305. As described in Section III.B.2, Google has launched significant innovations in machine learning and the wider field of artificial intelligence ("AI") in the past decade.

306. Google has used a variety of machine learning systems in search, which rely on a variety of training data, but increasingly use little to no user interaction data. Tr. 1786:4-10 (Lehman) ("Q. Are you saying that the machine learning systems learn better from search logs, if I'm understanding? A. That's a complicated question. It's evolved over time. So Google has used a variety of machine learning systems in search. Many of them -- I don't know how to generalize, actually. They're all over the board. Some use IS data. Some use click data. Some use both. Some use neither.").

307. Advances in machine learning technology make click-and-query data increasingly less important in building a high-quality search engine. Tr. 2361:24-2362:2 (Giannandrea); Tr. 1760:10-22 (Lehman) ("Q . . . The more user queries that Google has, the more inferences it can make from those queries; right? A. It's changing pretty fast. So in one direction, it's better to have more user data. At the same time, with technology improvements, later systems in some

cases require much, much less user data. So it's a little bit of a complicated picture. Q. All right. But the later systems still do require some user data; right? A. Some later systems require user data, and some do not."), 1789:12-22 ("Q. So both older Google ranking systems and new machine learning systems leverage user data; right? A. This is as of, I guess, some time around 2020 that was true. Subsequently, some -- an important machine learning system did not use any user data."), 1895:14-1896:19 ("Some of the -- those older versions of systems themselves need quite a bit of data train, but the new ones require far less.").

308. The "primary effort involved in the use of clicks over the last 10 or 15 years" has not been on rote memorization of prior matches, but instead to build "generalization systems." Tr. 1895:14-1896:19 (Lehman). The goal of generalization systems is to fill in holes in the data by generalizing from situations where data exists to situations where there is no data. Tr. 1895:14-1896:19 (Lehman) ("There, the goal is to generalize from situations where we have data to situations where we don't. So these are kind of like filling in the holes where we don't have data. So I think in terms of how these systems respond to different quantities of available data, a factor to keep in mind is that even though we're adding more systems, many of these are generalization systems. They're systems that are designed to fill in holes in data.").

309. For example, in 2016, before BERT, described *supra* in Section III.B.2, Google's systems could not understand documents based on their content alone—they "read by proxy" by generalizing across user interaction patterns. Tr. 1907:18-1909:16 (Lehman) ("So with this fundamental problem of determining whether a web page is relevant to a query, as of this presentation, after just the first wave of deep learning systems, we really couldn't read documents. . . . [O]ur ability was minimal. So we played this game of read by proxy. Show the text to people, we observe their reactions and we adopt them as our own . . . I was starting to

contemplate the possibility that rather than this whole mechanism of read by proxy, have people read for us and try to learn from Clicks, that we might . . . maybe someday, we might get to a point where -- with a computer we'd be able to understand a document, like a web page or a passage, there are just a few sentences instead of a web page, based just on the content alone. That is, we wouldn't need humans to interpret it for us. We could get computers to directly understand a document or a passage just based on the words."); UPX0203 at -905, -919.

310. As Dr. Lehman described it, the idea that Google "could get computers to directly understand a document or a passage just based on the words" seemed like "a little bit of a crazy idea at the time." Tr. 1908:16-1909:16 (Lehman).

311. Dr. Lehman testified that Google's innovations in machine learning allowed its systems to better understand language and generalize, not memorize, results. Tr. 1846:6-22 (Lehman) ("So these [BERT models] are examples of systems that are really good at understanding the complexity of language, grammatical structure, things like that. So they do a lot of computation. They may not be so good at memorizing facts, but they're really good at understanding language.").

312. Because machine learning models are powerful at generalizing, they need less and less click-and-query data. Tr. 6366:5-10 (Nayak). For example, Google Research's work on transformers, which led to the publication of the seminal paper "Attention Is All You Need," *see supra* § III.B.2, did not make use of user interaction data.

313. As another example, Google's deep learning ranking and retrieval models that were applied to search (RankBrain (2015), DeepRank (2019), RankEmbedBERT (2020), *see supra* § III.B.2, have evolved such that significantly less user data is necessary for training. Tr. 1843:20-1846:22 (Lehman); UPX0255 at .010-.011.

314. DeepRank used [redacted] of the training data necessary for RankBrain. Tr. 1845:7-21 (Lehman) ("How does [RankBrain], which was 2014-2015, compare to [DeepRank] in the 2018-2019 time period? A. To clarify, [redacted] means order of or roughly [redacted] training examples for [RankBrain]. And for [DeepRank], the number of training examples was about [redacted]."); UPX0255 at .010-.011.

315. RankBrain uses two sources of data: [redacted] days of search logs data including click-and-query data and IS scores generated by human raters commissioned by Google, whereas DeepRank uses only [redacted] days of search logs data and IS scores. Tr. 6364:23-6365:15 (Nayak); DXD-17.016.

316. However, RankBrain and DeepRank "provid[ed] comparable improvements to search quality." Tr. 1845:7-21 (Lehman) ("And I think this shows -- improvements in deep learning have just vastly accelerated, but I think we're seeing here the early ages of sort of the AI or deep learning revolution where you have two systems doing similar things. They're providing comparable improvements to search quality. And yet, as the sort of technologies moved forward, only [redacted] of the training examples are required.").

317. As AI technologies move forward, a newer system can provide similar function and quality on a fraction of an older system's user interaction data. Tr. 1845:7-21 (Lehman).

318. For example, RankEmbed version 2, later renamed RankEmbedBERT, was "significantly higher performing" than RankEmbed version 1 despite using [redacted] of version 1's training data. Tr. 1845:22-1846:22 (Lehman).

319. RankEmbedBERT currently uses two sources of data: [redacted] of [redacted] days of search logs including click-and-query data, and IS scores generated by human raters commissioned by Google. Tr. 6364:23-6365:15 (Nayak); DXD-17.016.

320. RankEmbedBERT provided "significantly larger contributions to search quality with [redacted] the training data[b]ecause BERT technology is so well adapted to working with language[.]" Tr. 1846:6-22 (Lehman) ("It was transformational. Once it appeared, so many variants appeared all across the tech industry because it was just so far ahead of everything else.").

321. Later machine learning technologies are not trained on user interaction data at all. Google's MUM, *supra* § III.B.2, is "trained on a high-quality subset of the web corpus" and does not use user interaction data. Tr. 6358:18-20, 6365:17-6366:2 (Nayak); Tr. 1918:17-1919:2 (Lehman) ("Was MUM trained on click-and-query data that Google had? A. No, and as I mentioned, it was a shock to me that that's possible, but no, there was -- there are no -- no user data."); DXD-17.016; DX0241 at .004.

322. Google Research's work that led to LaMDA, PaLM, and PaLM2, *supra* § III.B.2, did not make use of user interaction data. Tr. 6363:19-6364:22 (Nayak); DXD-17.011, .016.

323. Google's latest machine learning development in generative AI—SGE—is not trained on any user interaction data. Tr. 8218:19-8219:5 (Reid); *see supra* § III.B.2; *see also* DXD-17.016.

324. Advances in machine learning technology have made it easier for a rival search engine to compete with Google and achieve scale without Google's amount of user interaction data. Tr. 2361:12-23 (Giannandrea); Tr. 1924:18-1925:22 (Lehman) ("THE COURT: So, Dr. Lehman, could I ask you to project out five years, ten years from now, what would you guess to be the relationship between these deep ML systems and user data in terms of search? THE WITNESS: So my guess, and it's really hard to guess . . . is that search engines will shift largely from a reliance on user data and all these other tricks we built up over the years to systems that

draw upon these deep learning systems largely. I think there will still be a role for user data but I think it will be much diminished, but I think user data does still bring some things. Maybe the clearest thing would be popularity. . . So I think there will still be a role for user data but, you know, trying to get a high resolution picture of the world from user data requires a vast amount, trying to figure out which is the most popular toothpaste and a bunch of things like that I think will require much, much less user data. So generally I think a lot of the function of user data will be replaced but probably not all of it. But it's a guess.").

325. Deep learning systems can be and have been developed outside Google and thus do not rely on Google user interaction data. Tr. 1922:22-1923:12 (Lehman) ("A. 'One consideration is that such a deep ML system could well be developed outside of Google - at Microsoft, Baidu, Yandex, Amazon, Apple, or even a startup. My impression is that the [T]ranslate team experienced this. Deep ML reset the translation game; past advantages were sort of wiped out.'") (discussing UPX0197 at -211), 1923:13-1924:1 ("Q. And you wrote this at the end of 2018 with BERT. By November of 2022, with the introduction of MUM and further advances in ML, what's your view? A. I think by 2021, with the arrival of MUM, it seems like this is the path we're going down. And I think, MUM was a big deal in 2021 but now these large language models are everywhere. You can download them from the web and run on a large PC. So I think indeed we have seen such deep ML systems developed outside of Google at pretty much, I think, almost every major tech company in the U.S. and many abroad, and a notable startup like OpenAI. So, yeah, I think this is largely come to pass and it's a story that's still unfolding, but I think it seems like this is a road we're still on.").

326. Members of Microsoft's search team were "shocked" by how powerful transformer models were. Tr. 2738:17-19 (Parakhin) ("Q. And the team was shocked by how

good the results were from using this type of model in 2019, correct? A. Uh-huh."); DX0725 at .004 ("Just to give you an example, like, let's say the Search team was about a hundred people and they're working on various parts of search all the time so what we did is take about ten folks and said, okay, I want you guys to look at these large transformer networks and see what kind of impact could you have. So in just, like, a few months they were able to ship an improvement so large that it was larger than all the other, like, ninety folks, all the work they did, combined. So we were just, like, shocked how important and how impactful this kind of work was.").

327. Later, when Microsoft applied OpenAI's model to Bing's core search ranking algorithm, Microsoft saw the largest jump in relevance in two decades. *See infra* § V.A.6; Tr. 3600:10-21 (Nadella) ("Q. And in the summer of 2022, OpenAI shared its most up to date GPT model with Microsoft, right? A. That's correct. Q. And Microsoft applied the AI model to Microsoft's core searching ranking engine for Bing, right? A. That's correct. Q. And as a result of that, Microsoft saw the largest jump in relevance in two decades for Bing? A. That's correct. Q. OpenAI's GPT technology has led Bing's search quality to reach an all time high, correct? A. That's correct."); Tr. 2742:19-25 (Parakhin) ("Q. Okay. And if you go down to the third bullet point, you say, 'We've also applied the AI model to our core Bing search ranking engine, which led to the largest jump in relevance in two decades.' A. Correct. Q. And that's an accurate statement? A. Very much."); DX0302 at .006 (2023 Microsoft announcement that "[w]e applied the AI model to our core search ranking engine, and we saw the largest jump in relevance in two decades").

328. OpenAI's GPT model is trained on publicly available data and does not rely on user interaction data. Tr. 3600:22-3601:2 (Nadella).

329. In developing its own search engine, Neeva did not have access to the user interaction data that Google or Bing had. Tr. 3783:24-3784:9 (Ramaswamy).

330. Rather, Neeva was able to develop its own search engine with "small datasets" that cost "single-digit millions" to license every year. Tr. 3783:24-3784:23 (Ramaswamy).

331. Using AI models and large language models, Neeva provided succinct answers to the questions that users are asking. Tr. 3785:5-3787:10 (Ramaswamy); *see* DX0299 at .002 ("We use AI to process the information on the most relevant pages and turn that information into clear and digestible summaries.").

332. Using natural language processing and understanding, Neeva was able to successfully improve its search quality and search experience, including in understanding the queries and the pages, suggesting related queries, and correcting misspellings. Tr. 3781:23-3783:20 (Ramaswamy). Neeva's search engine was also able to "understand [a page's] contents, incoming links, and other authority signals that tell us whether the page is important and useful." DX0299 at .002; *see* Tr. 3788:2-18 (Ramaswamy).

C. Microsoft's and Yahoo's Failure to Convert Scale into Quality Improvements

333. In 2009, Microsoft entered into an agreement with Yahoo under which Microsoft would provide search results to Yahoo. Tr. 3520:17-25 (Nadella) ("Q. And what is Microsoft providing to Yahoo! in terms of search? A. Again, it's very similar to what we do with DuckDuckGo, what have you. We provide them all of our search, essentially white labeled, so that it's Yahoo!'s search for people who go to Yahoo! Q. And how long has that relationship existed? A. It's existed now for a long time, and I think we renewed it even recently again. So it's 10 plus years."); DX0271 at .002 ("In simple terms, Microsoft will now power Yahoo!

search while Yahoo! will become the exclusive worldwide relationship sales force for both companies' premium search advertisers.").

334. The effect of the Yahoo agreement was to, in one fell swoop, more than double Microsoft's scale in search. DXD-37.124; Tr. 3643:10-19 (Nadella) ("Q. At the time -- do you remember -- and I know this is unfair asking these memory tests going way back in time. Do you remember roughly what the market share that Bing had and Yahoo! had at the time of the deal in -- A. I don't recall, but I'm assuming they had more -- maybe 20 percent, and we were 10 percent perhaps. Q. Okay. So as a result of that deal, Bing from a scale perspective was in roughly 30 percent plus or minus in terms of market share? A. That's right.").

335. At the time of the Yahoo agreement, Microsoft CEO Steve Ballmer proclaimed that the "agreement with Yahoo! w[ould] provide the scale we need to deliver even more rapid advances in relevancy and usefulness." DX0271 at .002.

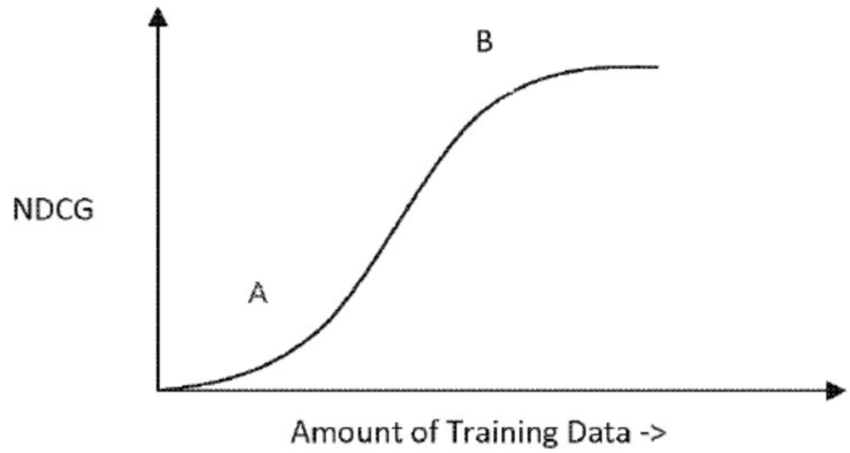
336. In December 2010, Microsoft began to use Yahoo's search data. Tr. 3642:13-24 (Nadella) ("Q. Again, so 2009 up until today, Bing has enjoyed getting all of the search queries that people enter into Yahoo! search, right? A. That's correct. Q. And you've enjoyed all of that additional scale as -- A. That's correct. Q. -- part of Bing's development efforts? A. That's correct. Q. You get to see every Yahoo! search query, right? A. The dynamic data, yeah. Q. You get to see every click? A. That's correct."); Tr. 9881:25-9883:1 (Murphy (Google Expert)) ("The data comes in in December 2010. That is, that's when they actually added the scale."); DX0442 at .001 [redacted]

337. Microsoft's use of Yahoo's search data did not lead to a material increase in Bing search quality. Tr. 9881:25-9883:1 (Murphy) ("Q. Did you find evidence that Microsoft's gains

in scale due to the Yahoo! agreement led to a material impact or increase in Bing's search quality relative to Google's search quality? A. No."); DXD-37.124 ("Microsoft's Syndication Deal Doubled Its Scale in December 2010, But This Did Not Lead to a Material Improvement in Bing's Relative Quality").

338. [redacted] *Compare* DX0441 at .001 [redacted], *with* DX0442 at .001 [redacted]

339. The minimal quality gains associated with the doubling of Microsoft's scale seen above are consistent with the expectations Microsoft's own engineers had in June 2009. An email to Harry Shum, then head of search at Microsoft, reported two pieces of evidence. First, is an analysis done by Dr. Rich Caruana, a Microsoft-affiliated researcher and former Cornell University computer science professor, who conducted experiments for Microsoft's search systems and found that those models were very close to [redacted] Tr. 10412:4-10412:23 (Oard); *see also* Tr. 7819:22-7820:6 (Fox (Google Expert)); UPX0892 at -489-490 [redacted]



UPX0892 at -490.

340. Second, that same email reported that Microsoft's experience in the month prior had been that when Microsoft increased its training data by [redacted], it "did not see any additional gains from [doing so.]" UPX0892 at -490 ("For the May net, we increased our training data by [redacted]. However, we did not see any additional gains from this.").

341. Microsoft's use of Yahoo's search data also did not lead to a subsequent increase in market share for the combined Bing and Yahoo. Tr. 3644:3-6 (Nadella) ("Q. In other words, if you look at the combined share of Bing and Yahoo! in '09, and the combined share of Bing and Yahoo! today, today's number is lower? A. That's right."); Tr. 9883:17-9884:18 (Murphy) ("Q. Did you also take a look at the question of whether the Microsoft Yahoo! agreement resulted in gains in search share by either Yahoo! or Microsoft? . . . It really stayed about the same at that point in time. Really, no evidence that it led to any -- the improvement."); DXD-37.124 ("Despite Microsoft doubling its scale through the Bing Yahoo! syndication in December 2010 (and having most preinstallation), Bing's and Yahoo!'s combined share of desktop was essentially unchanged after 2010.").

342. Similarly, Yahoo becoming the Firefox default in 2014 did not result in any lasting gains in Yahoo's market share. In December 2014, Yahoo experienced an initial increase in share, increasing from under 8% of Windows PC search queries in the United States to roughly 10%. Tr. 9892:3-15 (Murphy); DXD-37.126.

343. However, Yahoo's share steeply declined during the term of the agreement. In just two years, by late 2016, Yahoo's share of Windows PC search queries dropped below Yahoo's share prior to becoming the default. Tr. 9892:3-15 (Murphy); DXD-37.126.

D. Data Reduction Experiment

1. Overview

344. For years, Google's search quality has been roughly four IS4@5 points higher than Bing's search quality. Tr. 7845:21-7846:19 (Fox).

345. Four IS4@5 points is "quite a large difference" that "would certainly be noticeable to users and would make a difference to users." Tr. 10270:8-14 (Oard) ("THE COURT: And just, you would agree that -- let me ask you: Do you agree that this IS difference is a significant difference? Leaving aside whether it's correct or not, that delta is a large -- THE WITNESS: Oh, indeed, that's quite a large difference, would certainly be noticeable to users and would make a difference to users.").

346. Professor Edward Fox is an expert in the fields of computer science and information retrieval whose experience includes (1) over 40 years as a professor at Virginia Tech's Departments of Computer Science and Electrical and Computer Engineering; (2) over 140 research grants, many relating to search engines in particular; (3) publishing roughly 500 peer-reviewed articles and co-authoring nineteen books with a total of 21,000 citations in Google Scholar; and (4) being a Fellow of the Association for Computer Machinery, where he served as the chairman of its Special Interest Group on Information Retrieval. Tr. 7808:5-7811:25 (Fox).

347. Professor Fox's assignment was to determine the extent to which the large Google-Bing search quality gap can be attributed to their respective volumes of user interaction data. Tr. 7818:22-7819:2 (Fox).

348. To do so, Professor Fox ran a controlled data reduction experiment ("DRE") on Google's search engine. Tr. 7822:14-7823:4 (Fox) ("Q. At a high level, how did you go about measuring the effect of the volume of user interaction data on Google's search quality? A. By running an experiment -- a controlled experiment. . . . Q. Did this experiment have any particular type of name or any particular type of experiment? A. Yes. . . . It's called a data reduction experiment.").

349. As explained below, Professor Fox's DRE showed that 2.9% of the quality gap between Google and Bing is attributable to their respective volumes of user interaction data. Tr. 7848:17-7850:8 (Fox) ("So, if you -- if you take Google's system and you shrink the amount of data it has -- user interaction data down to the level that Bing has, then you get -- 2.9 percent of the gap between the two is explained by that change, that amount of user interaction data. THE COURT: I'm sorry. The 2.9 percent, in your view, is -- it's -- that 3 percent is what explains the overall quality gap. In your view, there's 97 percent of some other variables that explain the rest of the quality? THE WITNESS: Right. So, we're controlling the experiment. I want to see what's the effect of user direction data, and this says 3 percent is affected by user interaction data. The rest must be by something else."); DXD-26.010.

350. The results of Professor Fox's DRE show that both Google and Bing are at the point of diminishing returns with respect to the utility of user interaction data for search result quality. Tr. 7860:18-7861:21 (Fox) ("This was the chart we looked at before from the Microsoft document, UPX892. Professor Fox, did you attempt to take this information that you did in your

experiment and relate it to this general concept of diminishing returns? A. Right. Because we're not getting much difference, it was clear to me that we're in a situation of diminishing returns, and this is sort of a hypothetical, one way to look at that kind of curve. Q. Did you plot the points from your experiment? A. I did . . . So, I really don't know what the left side of the curve is because I don't know the whole history of Google, and, you know, what would happen if I had, you know, ten clicks or a million clicks. Now, we're up in the level of a trillion queries, and, so, these numbers are very, very big. So, all I know is far out on the curve -- way out on the curve there we have these three points, which are the ones that I did in my experiment. And clearly, from the stuff we saw before, and if we kind of look at this, eyeballing, as well, the low mobile, the high mobile, and the Google traffic 100 percent situation, there's really not much difference. THE COURT: They're all on the very flat part of the curve? THE WITNESS: Right. And to put this in perspective, I mean, let's just kind of ballpark it. If you have a trillion queries, 4.86 is 48 billion, that's a lot of data, so going from there on up doesn't make much difference."); DXD-26.018; UPX0892 at -489-490; *infra* § IV.D.2.

2. The Experiment and Its Results

351. Google's search engine is a large system containing many components, some of which utilize user interaction data. Tr. 7828:11-25 (Fox).

352. Professor Fox selected the six components whose behavior was most influenced by the volume of available user interaction data. Tr. 7828:11-25 (Fox).

353. He then "retrained" these six components—NavBoost, Term Weighting, QBST, RankBrain, DeepRank, and RankEmbedBERT—by training them using different amounts of data (the Low Mobile and High Mobile samples described below). Tr. 7840:24-7841:14 (Fox); DXD-26.004.

354. The DRE measured the quality of Google's search engine at three different volumes of user interaction data: 100%, Low Mobile, and High Mobile. Tr. 7826:12-7827:11 (Fox); DXD-26.007.

355. The first sample, 100%, contained all of the data available to Google's search engine and served as a baseline against which to compare the performance of the Low and High Mobile samples. Tr. 7826:12-7827:11 (Fox) ("We have to have a system, and controlled experiments typically have a baseline, something that you're going to compare against. This one had a baseline, had two other versions that we were going to compare against baseline. Later, I'm sure we'll talk about the low mobile and the high mobile were the two ones. The baseline we called 100 percent because that was sort of everything.").

356. The 100% sample was a "froze[n]" or static snapshot of Google's search engine. Tr. 7842:6-22 (Fox). This ensured that the DRE's comparisons were done on the same version of Google's search engine, meaning that the only variable was the volume of user interaction data. Tr. 7842:6-22 (Fox) ("Q. When you did the comparison, did you do the comparison to the live Google system or something else? A. So, when you run experiments, you want to control everything you can, so that was very careful. I didn't want to test anything else. I didn't want any other confounding variables. I just wanted to have the amount of web traffic as the variable that I was considering to see what the effects would be. So, we took the Google system, and then they set it aside, they froze it, and they created a separate system that wouldn't change during the course of our experiment. Because we had to do these retrainings, and they take a while to do, and you don't want to keep changing the code and changing the data and so forth. So, it's like they took Google's current system and stuck it off in a corner, ran their production things separately from this so we could just do this experiment.").

357. The second sample, Low Mobile, represented the volume of mobile and desktop user interaction data available to Bing and its syndication partners. Tr. 7841:15-7842:4 (Fox), 7843:25-7845:11; DXD-26.007.

358. The Low Mobile sample was the equivalent of 4.86% of Google's total traffic. Tr. 7844:15-7845:11 (Fox); DXD-26.007.

359. The third sample, High Mobile, doubled the amount of mobile data as compared to the Low Mobile sample. Tr. 7840:16-23 (Fox); DXD-26.007.

360. High Mobile was the equivalent of 6.43% of Google's total traffic. Tr. 7844:15-7845:11 (Fox); DXD-26.007.

361. In other words, Professor Fox's experiment decreased the amount of user interaction data available to the six components to simulate their performance at (1) Bing's quantity of user interaction data and (2) double Bing's quantity of mobile user interaction data. Tr. 7840:24-7841:14 (Fox); DXD-26.004, .007.

362. These models can be "trained anew" by initializing them with zeroes or random values and feeding them new data, with the one exception of RankBrain which is never retrained entirely from scratch as it uses a technique called "distillation." Professor Fox examined whether distillation made a difference (as compared to retraining entirely anew) and concluded, based on a correlation study, that it did not. Tr. 7842:23-7843:22 (Fox).

363. The DRE thus isolated the effect of differing volumes of user interaction data—as opposed to some other variable—on the performance of these six components. Tr. 7842:6-7843:22 (Fox).

364. To test how much of Google's system was covered by the experiment, Professor Fox measured each signal that has at least a 0.01% impact on Google's ranking of search results.

Tr. 7837:9-7838:3 (Fox); DXD-26.005 (listing signals in descending order of impact on ranking). Together, those 59 signals account for 97.6% of the impact on ranking. DXD-26.006.

365. Professor Fox determined whether each signal was (1) in any way affected by user interaction data or (2) retrained. DXD-26.005-.006; Tr. 7832:18-7839:23 (Fox).

366. As described earlier in this Section, some signals do not rely on user interaction data. Axiomatically, the quality impact of these signals was not altered at all by reducing the volume of user interaction data. Tr. 7833:11-7834:9 (Fox) (explaining that the signals on the chart in white are those that make no use of user interaction data); DXD-26.006 (noting that the DRE accounted for the "white" signals without needing to retrain them). Those signals accounted for 28.02% of the impact on ranking. DXD-26.005-.006.

367. The other signals utilize user interaction data in some manner. Tr. 7833:11-7834:9 (Fox); DXD-26.006.

368. Most of them rely on one or more inputs *other* than user interaction data. Tr. 7834:10-21 (Fox) ("Q. And when you say that any of these signals that are blue or purple use user interaction data, does that mean that user interaction data is the only thing they use, or something else? A. No. Most of them use at least one or two other things, sometimes even more. Some of them only have a small affect from the amount of user interaction data. When people do clicks on web pages, various things like that, there's a lot of noise. You get a clickbait, you get all kinds of other things, [spam]ing and situations. And people go off and get coffee in the middle of something, so we don't really have a lot of reliability with regard to that. So, it's noisy -- that user interaction data is rather noisy."); § IV.B.2.

369. Professor Fox concluded that the signals that use (at least in part) user interaction data that were not retrained in the DRE (the "purple" signals) were unlikely to impact ranking

within the experiment. Tr. 7833:11-7834:12 (Fox) ("The purple ones are the ones that we didn't change. They could have some small [e]ffect coming out of the user interaction data, but, for various reasons, like the second one there, the second purple one, the way we built the experiment, it's unlikely that would make any difference because that one is affected by a timing kind of thing, and our experiment had different timing than what you see normally. So, the purple ones are the ones that there could be some small affect from the amount of user interaction data, and they were not changed.").

370. Together, the signals that either were retrained or do not use user interaction data account for 82.33% of impact on ranking. Tr. 7838:7-7839:8 (Fox); DXD-26.006.

371. Professor Fox measured the quality of search results produced by the Low Mobile and High Mobile retrained systems and compared those quality scores to that of the frozen 100% system. Tr. 7845:21-7848:12 (Fox); DXD-26.008-.010, .013-.015.

372. Across all comparisons of Low Mobile and High Mobile results to 100% results, diminutions in quality were minor.

373. To obtain his results, the three different "querysets"—samples of search queries—were run across the models. Tr. 7847:10-7848:6 (Fox), 7851:1-7852:11; DXD-26.011. Professor Fox used three querysets to check the robustness of his experiment's results. Tr. 7853:18-7854:9 (Fox). All three querysets are used by Google in its ordinary course of business. Tr. 7851:1-7852:11 (Fox) ("So, Google has three kinds of query sets that it uses for [its] normal business practices.").

374. The covert set is a random sample of 5,000 queries that Google uses to compare its quality to Bing's quality on a weekly basis. It contains 25% longtail queries. Tr. 7851:1-7852:11 (Fox); DXD-26.012.

375. The launch set is also a random sample of 5,000 queries (and therefore also contains 25% longtail). Tr. 7851:1-7852:11 (Fox); DXD-26.012. The launch set is used to test changes that Google may implement. Tr. 7851:1-7852:11 (Fox); DXD-26.012.

376. The training set contains 15,000 queries and oversamples longtails so that 50% of its queries are longtail queries. Tr. 7851:1-7852:11 (Fox), 7836:21-7837:4; DXD-26.012.

377. The results from running each queryset through the variously trained models were scored by human raters. Tr. 7854:22-25 (Fox); DXD-26.011.

378. Professor Fox chose to use human raters, as opposed to deriving live traffic metrics, in order to minimize the effect of bias in the quality scores. Tr. 7855:1-23 (Fox) ("Q. And why did you use human raters as opposed to, say, live traffic for that? A. So, this is the same procedure we do in much of science. We get judges, multiple people to make an assessment. And then just like in sports or other things, you want to get multiple judges to score something for the Olympics or some other things. You would be more confident that it's not one person who has some sort of bias or some other things going on. The fact that I used raters as opposed to the particular person who issued the query is actually really important, because there's more confidence that that's actually the right value to use. When Google is trying to return a page to someone, they're not just wanting to give what somebody might want. They want to give them something good that they should see, right? So part of what goes on with this IS4@5 score is the judges say: How high is the quality of this? So, they look at two things: Does it meet the needs of the question, does it answer the question, and is it of high quality? So, they combine those two things. You wouldn't get a high-quality rating if you had just a user giving you values. So I like this kind of study better, and it makes it much easier to do comparisons.").

379. Human raters scored the SERPs using four metrics: IS4@1, IS4@5, DCG, and NDCG. Tr. 7855:24-7856:14 (Fox).

380. Diminutions in quality were consistently minor regardless of the metric employed. Tr. 7856:15-22 (Fox) ("Q. And when you chose different methods to aggregate the quality scores, did you see any significant difference between the amount of the difference caused by the different data sizes as compared to the Google versus Bing difference? A. So, Appendix A of my report, which is 34 pages and 24 tables, has all kinds of details and examples and I had all these different numbers and I looked at them and they were, essentially, all consistent.").

381. Professor Fox opined that there was no reason to believe that using a different methodology, such as side-by-side comparisons or live traffic, would lead to different results. Tr. 8003:25-8004:18 (Fox).

382. Using the covert set scored on IS4@5 as an example, the quality gap between Google and Bing is 3.924 points. DXD-26.008-.009; Tr. 7845:21-7848:12 (Fox).

383. The quality decrease going from Google's quantity of user interaction data (the 100% sample) to Bing's quantity of user interaction data (the Low Mobile sample) is 0.113 points. Tr. 7847:10-7848:12 (Fox) ("THE COURT: This delta, .113 and the .203, that is a reduction from the 3.924? THE WITNESS: When you go from the 100 percent score to the score that you get for the low mobile case, for IS4, that's how much decrease you get. So, it doesn't go down much, basically.")

384. The 0.113 point difference is not statistically significant; in other words, at a 95% confidence interval, one cannot determine whether the difference is other than zero. Tr. 7847:4-7848:12 (Fox) ("So, if you look at the first -- the middle column, when we went down to the low

mobile sample, the decrease we saw with the covert set was, as you can see, .113, plus or minus .117. Statistically insignificant. Looking at 95 percent, you can't tell it's not zero. So, it could be no effect, right?").

385. Professor Fox also assessed the effect of reduced user interaction data on the performance of each of the six components. Tr. 7859:11-7860:4 (Fox); DXD-26.016-.017.

386. Consistent with the overall scores for the six components, Professor Fox found only minor score decreases for the individual components running on Low Mobile and High Mobile data volumes. Tr. 7859:11-7860:4 (Fox); DXD-26.016.

387. These results show that both Google and Bing are at the point of diminishing returns to the utility of user interaction data in search result quality. Tr. 7860:18-7861:21 (Fox); DXD-26.018; UPX0892 at -489-490.

388. Finally, the diminutions in quality were consistently minor when the subset of longtail queries were considered. Tr. 7857:2-7859:1 (Fox); DXD-26.013-.015.

3. Trial Testimony Confirms That the DRE Was Reliable and Methodologically Sound[2]

389. Professor Fox spent over 200 hours designing the DRE. Tr. 7825:19-23 (Fox) ("Q. Okay. And how much time did you spend on the design of the experiment? A. So, up through the beginning part of April, I spent over 200 hours, and probably 600 hours through November on the reporting and the deposition and all that stuff.").

[2] Consistent with the Court's instructions as to other issues raised pre-trial, Google will not repeat in full here the facts set forth in its Opposition to Plaintiffs' Motion to Exclude the Expert Testimony of Edward A. Fox [ECF No. 475], which it incorporates by reference. Tr. 9652:5-21 ("THE COURT: . . . What I can formally say is that whatever was submitted in connection with those [Chats] exhibits, I will consider as part of the overall record. Whatever has been admitted at trial, I consider to be a supplement of the record that was made in writing.").

390. Professor Fox made the decision that conducting a data reduction experiment was the best way to measure the effect of user interaction data at the scale of a search engine such as Google or Microsoft. Tr. 7822:14-7823:4 (Fox) ("At a high level, how did you go about measuring the effect of the volume of user interaction data on Google's search quality? A. By running an experiment -- a controlled experiment. I like running experiments. You never know what is going to happen until you actually run an experiment. . . . So, because I was in the privileged position of having a lot of data to work with, and I was interested to see what happened when you have less of that. It's called a data reduction experiment. So we're reducing the amount of data in the experiment to see what happens. Do you get any change? How much change do you get?").

391. Data reduction experiments are a type of scalability study, which are commonly used to determine the amount of data needed to accomplish a task. Tr. 7823:5-17 (Fox) ("Q. Are experiments in which the amount of data is changed or altered common in the computer industry? A. They're fairly common when you're in a situation where you have a lot of data to start with. But, they're in a broad family, which is really very common, which I would call a scaleability study. You want to see how things scale up as you go along. And most of the time I've run scaleability studies -- in the roughly 100 masters and doctoral students I work with, about a third of them have been experimental scaleability studies.").

392. Professor Fox implemented a "tried and true" approach that dates back to the Cranfield experiments in the 1960s and is the most efficient way to make comparisons between many different data situations. Tr. 7825:24-7826:11 (Fox) ("So first of all, the approach that I used is a tried and true method that goes back to the 1960s of doing these kinds of studies. It's been published in hundreds of studies. I've used it for years. It's used by Google and other

companies in large numbers to do testing. It's the most efficient way to be able to make comparisons between many different situations that we have."), 8002:25-8004:18.

393. Hundreds of published studies, as well as large companies, have used this approach to conduct studies. Tr. 7825:24-7826:11 (Fox), 8002:25-8004:18.

394. Professor Fox has worked on scalability studies for large companies such as the Internet Archive. Tr. 7823:18-7824:6 (Fox) ("Q. Are you aware of evidence in this case of companies that have commercial search engines doing scaleability studies or data reduction experiments or the like? A. Yeah. I work with a number of big companies. I work with the internet archive, which is much bigger than Google in terms of the amount of data that they have, because they're trying to, through the Wayback Machine and other things, give you answers of what happened in 1998 on some web page that's no longer there. They have petabytes of information. So it's expensive to store a lot of information, and if you can get by with less storage and less processing, then you can make economies of scale that are good for your business. And if you get the same results, then why bother doing all that extra?").

395. He has also worked on scalability studies with his masters and doctoral students, and some of the resulting papers have been published. Tr. 7824:7-18 (Fox) ("Q. Have you done any recent work with information retrieval systems that have addressed this concept of scaleability or data reduction? A. We do the scaleability studies all the time. In the last month, I've had a couple papers published. One of the students is working on a National Institutes of Health-funded study about obesity and diabetes, and we've gotten about 3,000 assessments of quality of text that have to do with inspiring people to change their behavior to reduce obesity and diabetes issues. And then she tried with some of the newer language models and managed to get about the same results with 30 examples rather than 3,000. So, that was quite impressive.").

396. When working with Google's engineers to implement the DRE, Professor Fox followed the same procedure that he has used both in his own research and when advising masters and doctoral for 40 years over 500 studies: finding a competent and knowledgeable group; discussing the experimental design, plan, research questions, measurement, and other technicalities; and allowing the group to implement the experiment as designed. Tr. 7827:12-7828:1 (Fox) ("Q. And in terms of physically touching the machines -- if one physically touches machines anymore -- what was your role as compared to the role of others in terms of implementing each of the steps in the experiment? A. Well, just as I've done as a faculty member for 40 years, running maybe 500 different studies, supervising student teams or doctoral or master students, I find a good group who can do the specific details and I supervise them and I help them with the design and the plan and identify the research questions and the hypotheses, how to measure things, all those things. So, in this case, I did the same thing I've been doing for many, many years with my own research and with many others. I had probably one of the best teams in the world to work with, and, so, I supervised them and designed this experiment to test what I wanted to test."), 7865:1-10 ("Q. . . . Google's engineers worked on the study; is that right? A. I directed and ran the study and they implemented the different problems, yes, and did the calculations for the evaluations, yes. Q. Okay. And… A. Just like happens with my graduate students. Q. I'm sorry? A. Just like happens with my graduate students."); *see also* Tr. 7938:6-9 (Fox) ("Q. And Google had a large team of engineers design the DRE; right? A. I designed the DRE. They worked with me so that it would be able to be implemented in their system.").

397. Professor Fox consulted Google engineers when working on the experiment write-up. Tr. 8006:5-13 (Fox) ("Q. And there are a number of other places, I'm not going to go through all of them, where you had a footnote in which you indicated an interview with either

Dr. Lehman or Dr. Haahr. Do those footnotes indicate the first time you learned that fact in each instance? A. No. They were to confirm my understanding and allow me to give due credit to the right person who could confirm this and had sufficient stature in the company to be representative and perhaps having to be deposed or whatever else.").

398. Prior to filing his reports, Professor Fox conducted a number of interviews to properly credit Google engineers for their work on the DRE, provide a specific citation for information he had previously learned in the course of the experiment, and to formally confirm his understanding of Google's ordinary business practices. *See, e.g.*, Tr. 7963:9-7964:21 (Fox), 8005:4-8006:13.

399. Professor Fox's experimental design utilized procedures and processes that Google already uses in its ordinary course of business to improve its search quality. *See, e.g.*, Tr. 7851:1-7852:11 (Fox).

400. Professor Fox also made changes to Google's practices when he thought it would better fit the needs of his experiment. *See, e.g.*, Tr. 7851:1-7852:11 (Fox), 7855:24-7856:14.

401. For example, the covert set is not generally available to Google's engineers. Tr. 7851:1-7852:11 (Fox). But because Google uses the covert set in its weekly quality comparisons against Bing, Professor Fox knew that the covert set was an important comparison point and therefore ensured that it was used in his DRE. Tr. 7851:1-7852:11 (Fox) ("Q. Where did you get the queries from, Dr. Fox? A. So, Google has three kinds of query sets that it uses for [its] normal business practices. I mentioned already the first one, the covert set. This is the one that it uses for comparing its behavior with Bing and potentially others. It's a 5,000 query set. It's randomly sampled from the total traffic that Google sees in terms of queries. So, all the queries that Google gets, it's a random sample of size 5,000. It's not something that's available to the

engineers, generally. However, I said I want to use this for my comparison because I want to have a gap that I can consider. So, I said, you got to use this. So, they changed their procedures to run the experiment with the covert set.”).

402. Similarly, Google does not usually assess its quality on the NDCG metric, but Professor Fox ensured that his experiment also included NDCG scores as that is the measure that Microsoft has used. Tr. 7855:24-7856:14 (Fox).

403. Professor Fox has published roughly 500 peer-reviewed articles and is confident that the DRE meets the scientific rigor to pass peer review. Tr. 7810:20-21 (Fox) (“Q. Have you published any peer-reviewed articles? A. Roughly 500.”), 7997:9-13 (“Q. And your experiment was not peer reviewed, or the approach that you did -- I mean, you said no one has ever done it before. This one hasn’t been peer reviewed; right? A. I would love to have it peer reviewed, if the judge would let it happen.”).

404. DOJ’s expert, Professor Oard, admitted that peer review does not require getting access to the underlying systems and data used in a study as “practice varies in the field” and further that where, for example, “when the code base is proprietary, . . . it might not be possible to release the code base.” Tr. 10263:10-10265:11 (Oard).[3]

405. Professor Oard further observed that peer review does not require a study to be capable of being “reproduced exactly” so long as it could be replicated in “some way.” Tr. 10263:10-10266:18 (Oard).

[3] Notably, Professor Oard did not offer a declaration in support of Plaintiffs’ Motion to Exclude the Expert Testimony of Edward A. Fox [ECF No. 425, ECF No. 521] and Professor Oard did not express an opinion at trial contending that Professor Fox’s DRE would not satisfy the requirements of peer review or was otherwise methodologically unsound.

406. It is noteworthy that Professor Oard himself offered opinions that relied on Professor Fox's DRE, Tr. 10339:22-10346:19 (Oard), and acknowledged that the DRE constituted "the best information we have" regarding the likely effect of additional data on Microsoft's ranking algorithms, Tr. 10401:24-10402:16 (Oard) ("Q. With regard to this first factor affecting search quality, you don't know whether additional user-side data would have a substantial effect, as you use that term, on Microsoft's search quality through improvements in Microsoft's ranking algorithms, do you? A. I think there's evidence in the case on that from Professor Fox's report that I showed on direct. It was in a redacted slide, but it showed that on long-tail queries, there were substantial and statistically significant differences. Q. And your opinion is that that tells one what the effect of that additional data would be if Microsoft had it; is that correct? A. It's the best information we have. I think it's understated, and it is tied to the specific architecture that Google used. So I doubt that it is a perfect model of Bing. But all models are wrong, and the question is whether this model is useful for drawing conclusions.").

V. RIVAL GENERAL SEARCH ENGINE OVERVIEW

A. Microsoft Has Long Trailed Google in Search Quality and Missed the Rise of Search on Mobile

1. Microsoft Squanders Its Advantages on Desktop

407. Microsoft first offered a search engine in 1998. Tr. 3545:19-21 (Nadella). At the time, Microsoft was one of the wealthiest companies in the world, and Windows was the leading operating system in the United States. Tr. 3546:1-12 (Nadella).

408. Despite its resources, at the time Microsoft entered search in 1998, it relied on third parties to provide the technology needed to deliver its algorithmic and search advertising results, rather than invest in search and search advertising technology itself. Tr. 3546:25-3547:6 (Nadella); [redacted]

[redacted]

409. It was not until 2005 that Microsoft launched a search engine built on Microsoft technology. Tr. 3547:3-6 (Nadella); [redacted]

410. It was not until 2006 that Microsoft launched a search advertising service built on Microsoft technology. Tr. 3547:10-18 (Nadella).

411. Over its first decade, Microsoft's search engine was rebranded several times, as MSN Search, Windows Live Search, Live Search, and finally as Bing. Tr. 3545:19-21 (Nadella), 3547:23-3548:3.

412. Throughout Microsoft's first decade in search, continuing up through today, Microsoft has been one of the most recognizable and widely known companies to market software for desktop computers.

413. Microsoft owned the MSN web portal, which had been used by a majority of internet users twenty years ago (2004). Tr. 333:12-13 (Barton (Google)); [redacted]

414. Microsoft also offered a desktop computer web browser, Internet Explorer, which was for many years the most widely used browser on Windows PCs. [redacted] *see also* Tr. 3584:14-22 (Nadella) ("Q. Now, Microsoft's Internet Explorer had once been far and away the most popular browser

on Windows PCs, right? A. That's right. Q. It once accounted for the overwhelming majority of browser usage share in the United States? A. That's correct.").

415. Internet Explorer was a major referral source for Microsoft's search engine. [redacted] *see also* DX0424 at .004 (2007 email from Satya Nadella noting that "[t]he majority of our share is driven from passive browser defaults and searches originated out of MSN - this results in a dramatically lower engagement and usage relative to our competitors").

416. Since at least 2007, Microsoft has had agreements with PC OEMs to preinstall Internet Explorer and Microsoft Search. *E.g.*, DX0954 (Windows Live Agreement between Microsoft and Lenovo (Feb. 1, 2007)); DX0955 (License and Distribution Agreement between Microsoft and Hewlett-Packard (May 22, 2008)); DX0956 (Portal Services and Licensing Agreement between Microsoft and Dell (Oct. 31, 2008)).

417. Starting in approximately 2009, Microsoft began shifting its individually negotiated desktop distribution agreements with PC OEMs to the Microsoft Advantage Program. [redacted]

418. The Microsoft Advantage Program required PC OEMs to [redacted]

419. In approximately 2012, Microsoft transitioned its search promotion terms from its Microsoft Advantage program to a broader OEM Jumpstart Program. *E.g.*, DX0968 (Microsoft OEM Products Incentive Program Terms Document 2012 (PTD) between Microsoft and Dell (Aug. 1, 2011)); DX0971 (Microsoft OEM Products Incentive Program Terms Document 2013 (PTD) between Microsoft and Hewlett-Packard (Aug. 1, 2012) ("2012 HP Jumpstart Agreement")).

420. Similar to its predecessor programs, under the Jumpstart program, Microsoft pays OEMs to ship Windows devices with Microsoft's browser as the default browser. *E.g.*, [redacted]

[redacted]

421. Microsoft likewise pays OEMs to ship Windows devices with Bing as the exclusive, default search engine. [redacted]

422. Microsoft has maintained substantively the same terms requiring browser defaults and Bing as the exclusive search engine in subsequent years of the Jumpstart program. *See, e.g.*, [redacted]

423. These agreements also make Microsoft's search engine the exclusive search engine on PCs out of the box. *E.g.*, DX0954 at .004; DX0955 at .008-.009; Tr. 3331:10-20 (Tinter (Microsoft)) ("[M]ost of the PC OEMs in the United States participate in [these programs]. Those co-marketing programs have multiple elements. One of the elements of the co-marketing programs is Edge is the default browser and Bing is the default in Edge.").

424. These agreements cover essentially all of the major PC OEMs in the United States. Tr. 3580:19-21 (Nadella) ("Q. The overwhelming majority of PCs sold in the world are covered by the Jumpstart program, right? A. That's correct."); Tr. 3331:21-25 (Tinter) ("Q. I

take it you can't think of any major OEM in the U.S. that doesn't ship exclusively Windows PC with Edge as the default . . . and Bing as the default in the browser; correct? A. Off the top of my head, I cannot think of one.").

425. Microsoft charges a license fee to PC OEMs for all standard commercial licenses for Windows. Tr. 3332:11-13 (Tinter), 3333:18-20.

426. The payment that Microsoft makes under its search distribution agreements significantly offsets the cost PC OEMs would otherwise incur to license the Windows operating system. Tr. 3332:18-24 (Tinter) ("Q. The money that you give Windows PC OEMs to, among other things, set the default to your browser and your search engine, that helps defray or offset some of the money they have to pay you for a license to Windows; correct? A. Yes, there [are] two transaction[s], a transaction where money flows to us and a transaction that money flows to them, and they net against each other.").

427. Microsoft uses the opportunity to defray the Windows license cost as a "carrot" to incentivize PC OEMs to preload Microsoft Edge as the exclusive, default browser, and Microsoft Bing as the exclusive, default search engine within that browser. Tr. 3332:1-10 (Tinter) ("Q. Okay. Those deals are deals in which you give money to the OEMs, and they set it as -- they set Microsoft's products as the default; correct? A. As I said, they -- we give them money, and they have a whole series of requirements what they can do. The Bing defaults and the Edge defaults are some of it. If I remember correctly, there's system configuration requirements they have to do. There's branding requirements. There's the whole thing is about an experience, the PC search and browser being a part of them."); Tr. 3522:16-3523:2 (Nadella) ("Q. And are you familiar with something called the 'jump-start program' on desktop? A. Yes, I am. Q. What is that? A. So it's our OEM incentive program. Essentially we give discounts on Windows pricing

for OEMs who carry our defaults. And in that sort of analogy of carrots, this is our carrot to have OEMs carry our defaults. Of course, they're free to take money from others and at that time our incentive goes away and our Windows price becomes whole so to speak. But that's essentially the problem.").

428. Through these agreements, Microsoft has been able to maintain exclusive defaults on Windows PCs in the United States for many years. Tr. 5935:13-17 (Whinston (DOJ Expert)) ("Q. And you know that for many, many, many years Microsoft has had the exclusive contracts on Windows PCs during periods where that's where all the searching was done, basically, in the United States, correct? A. That is correct.").

429. The Jumpstart program has been wildly successful for Microsoft. Tr. 3580:15-18 (Nadella) ("Q. It's been wildly successful for Microsoft, correct? A. Yeah, it's our best way to incent people on our defaults."); Tr. 9889:24-9891:10 (Murphy (Google Expert)) ("Bing was pre-installed on just about -- on a large fraction of Windows PCs, so Windows had pre-installation access."); Tr. 3564:15-20 (Nadella) ("Q. Now, you testified earlier this morning about Bing's distribution and the efforts Microsoft has made to get distribution. And I take it you're not suggesting that Microsoft doesn't have adequate distribution on desktop computers in the United States; is that right? A. That's correct."); Tr. 9733:15-9734:23 (Murphy) ("Windows PCs accounted for the vast majority of search if we're looking in that pre-2014 period. . . . It gets down, in 2014, to about half."); DXD-37.035 ("Microsoft Had Virtually All Preinstallation on Windows" in 2011), [redacted] .033 ("Windows Computers Made Up the Vast Majority of Search Usage").

430. Rather than compete on quality, Microsoft was able to win default agreements on Windows PCs by leveraging the economics of its Windows operating system license. Tr. 3579:23-3580:1 (Nadella) ("Q. Microsoft has been able to win distribution on PCs by using the economics of its Windows license with OEMs, correct? A. That's correct."); Tr. 10644:17-10645:4 (Whinston) ("Q. So, Professor, Microsoft has won a lot of default agreements on Windows PCs, even though it is inferior to Google, correct? A. Microsoft has agreements on Windows PCs. It's obviously also the operating system in Windows. But the facts, just stating a fact, Microsoft has agreements to be defaults on Windows PCs, Google does not. Q. They have been able to win those contracts even though they are not at par with Google on quality or consumer demand, right? A. I think they are not on par with Google in search, as I've said multiple, many, many times. And I've also just said that they've won those agreements.").

431. In 2008, Google first released its Chrome browser. Tr. 7646:5-7 (Pichai) ("Q. And when was Chrome launched, if you recall? A. 2006, I think -- sorry, we started working on it in 2006, and launched it in 2008.").

432. When Chrome launched in 2008, Microsoft had all of the search defaults on Windows PCs. Tr. 3587:1-3 (Nadella) ("Q. Sir, in -- when Chrome launched in 2008, Microsoft had all of the search defaults on PCs, right? A. Yeah.").

433. Chrome was a high-quality, fast browser with performance advantages over Internet Explorer. Tr. 3343:22-3344:3 (Tinter) ("Q. Chrome was considered, when it first shipped, to be a fast browser that loaded websites in a good way; correct? A. Yes. Q. Google's Chrome open-source platform gave Google some advantages in how they built a high-quality sort of performance browser; correct? A. Yes."). DOJ's expert acknowledges Chrome was superior to Microsoft's Internet Explorer. Tr. 5935:18-5936:1 (Whinston).

434. In browsers, Google was innovating faster than Microsoft, which was putting fewer resources into Internet Explorer. Tr. 3343:15-21 (Tinter) ("Q. So, sir, you testified there was a period of time where Microsoft was putting less resources into Internet Explorer, and therefore, Chrome was innovating on features faster than Microsoft was; correct? A. I did say that, yes. Q. And that was true when you testified to it; correct? A. Yes.");

435. [redacted]

436. Microsoft failed to recognize that having a superior browser was critical to users' experience on search. Tr. 3585:20-23 (Nadella) ("Q. Microsoft failed to understand that having a really, really good browser could affect users' experience on search, right? A. That's absolutely right.").

437. Google invested heavily in its Chrome browser. *See infra* § VIII.F.

438. Even though Chrome was not preloaded on Windows PCs or Windows Phones, those users steadily sought out and downloaded Chrome such that came to be more widely used on Windows than Internet Explorer. Tr. 3586:13-16 (Nadella) ("Q. People, just like they went and downloaded Google Search onto those PCs, they went and they downloaded Chrome, too, right? A. That's correct."), 3587:8-15 ("Q. And Microsoft failed to innovate with Internet Explorer, and Chrome beat it in the market, correct? A. I mean, Chrome did beat us in browser share on Windows desktop, yes. Q. And Google did that by getting people to download Chrome onto the desktop because Chrome wasn't preloaded anywhere on Windows. A. That's correct.").

439. Microsoft ultimately decided to retire Internet Explorer, replacing it in 2015 with a new browser, Edge. Tr. 3587:20-22 (Nadella).

440. By 2020, Microsoft had reworked Edge so that it was built on Chromium, a free and open-source browser project released by Google. Tr. 3345:9-14 (Tinter) ("Q. Now, as of 2020, Microsoft Edge browser is based on Chromium; is that correct? A. Yes. Q. Chromium is a free and open-source browser project initially released by Google; correct? A. That's correct.").

441. The adoption of Chromium has improved the Edge browser. Tr. 3346:5-9 (Tinter).

442. Today, all Windows PCs ship in the United States with Microsoft's Edge browser as the default browser. Tr. 3341:15-19 (Tinter) ("Q. . . . [Y]ou're not aware of any Windows PC that ships today in the United States without Microsoft's Edge browser as the default browser; correct? A. Correct.").

443. Despite that out-of-the-box default setting, approximately 75% of Windows PC users browse with Chrome rather than Microsoft's Edge browser. Tr. 3341:15-3342:4 (Tinter); *see also* Tr. 3584:11-13 (Nadella) ("Q. Now, Chrome is the most popular browser on Windows today, correct? A. That is correct.").

444. Users are still selecting Google for the overwhelming majority of search queries on Windows PCs today because users are actively either navigating to Google or downloading Google Chrome. Tr. 3583:4-9 (Nadella) ("Q. So just to be clear, Google is getting the overwhelming majority of search queries on Windows PCs because users are actively going and downloading either Google Search or Google Chrome onto their Windows PC, correct? A. That's correct.").

2. Microsoft Squanders Its Initial Mobile Operating System Advantages

445. Microsoft was one of the first companies to develop an operating system for mobile devices. Tr. 3595:24-3596:1 (Nadella).

446. In 2003, Microsoft released a mobile operating system called Windows Mobile, later renamed Windows Phone. Tr. 3596:11-13 (Nadella), 3571:11-16.

447. Microsoft's Windows mobile phones incorporated Microsoft's search engine as the sole preinstalled search engine. Tr. 3571:17-20 (Nadella).

448. In the 2000s, Microsoft had a "high share" of mobile search. Tr. 3663:19-25 (Nadella) ("Q. And did Microsoft or Bing have any more mobile scale back then than it does today? A. Back then, in the way the market was -- it's kind of like taking a very small market at that time, and yes, we had high share of a very small market called mobile at one point. And it's when the mobile market became the dominant one we had very low share or zero share.").

449. Prior to the release of the iPhone in 2007 and the release of Android in 2008, Windows Mobile enjoyed success. Tr. 3596:15-19 (Nadella).

450. Microsoft's then-CEO, Steve Ballmer, told the press that there was "no chance that the iPhone [was] going to get any significant market share." Tr. 3596:25-3597:10 (Nadella) ("Q. And do you recall Mr. Ballmer making the following statement in a public interview: 'There's no chance that the iPhone is going to get any significant market share. No chance. It's a $500 subsidized item. They may make a lot of money, but if you actually take a look at the 1.3 billion phones that get sold, I prefer to have our software in 60 percent or 70 percent or 80 percent of them than I would to have 2 or 3 percent which is what Apple might get.' Do you recall he made that statement in an interview with *USA Today* in 2007? A. Yeah, I'll take your word for it.").

451. In reality, the iPhone and Android "changed the game." Tr. 3597:16-20 (Nadella) ("Q. The iPhone changed the game for everybody, didn't it? A That's right. Q. And Android changed the game, too, didn't it? A. Absolutely.").

452. At first, Microsoft's mobile operating system continued to have more users than Android. Tr. 3574:2-14 (Nadella) ("And what you notice here is that RIM, who we just talked about that Microsoft had a deal with, RIM is actually bigger than the iPhone, right, in terms of users? A. Yep. Q. And Windows Mobile we just talked about, at this time, it's bigger than Android, right? A. Yes."); *see* DX0440 at .011 (Microsoft-commissioned study showing that in the U.S. in 2010, Windows Mobile had an installed base of "11 M Users" compared to "9 M Users" for Android).

453. As a result of competition from the iPhone and Android, Windows Phone eventually lost many users. Tr. 3597:21-24 (Nadella) ("Q. As a result of the competition from Apple and Google involving iPhone and Android, Windows Phone lost lots of customers, didn't it? A. That's correct."). The Windows Phone ultimately proved to be a failure. Tr. 3329:1-3 (Tinter) ("Q. And Microsoft didn't execute well on the Windows phone; right? A. We ended up shutting down the business."); [redacted]

454. In light of the poor performance of Windows Phone in competing against the iPhone and Android phones, Microsoft's then-CEO, Steve Ballmer, announced in 2013 that Microsoft would acquire phone manufacturer Nokia for $7 billion. Tr. 3598:4-20 (Nadella) ("Q. Six years after the launch of the iPhone, Mr. Ballmer decided to spend $7 billion to acquire Nokia, right? A. That's right. Q. This was how Microsoft was going to solve its mobile problem, right? It was going to build Microsoft search and other Microsoft software applications onto

Nokia's smartphone hardware, right? A. Yeah, at that point, we sort of said, we knew [we] were grounded in the fact that we were number three, but we wanted to compete and that was about Mr. Ballmer's attempt to get into the hardware business as a way to sort of solidify our number three position. Q. And that acquisition, I believe it was announced in 2013 but closed in early 2014. Does that sound right? A. That's correct. That's right.").

455. The Nokia acquisition proved to be a failure. Tr. 3559:7-9 (Nadella) ("Q. And the Nokia acquisition proved to be a failure, correct? A. That's correct.").

456. Less than a year after the deal closed, Mr. Nadella—in one of his first acts as Microsoft's new CEO—wrote off the entire $7 billion acquisition. Tr. 3598:23-3599:3 (Nadella) ("Q. One of the first things you did upon becoming CEO was to scrap the entire Nokia investment, right? A. I mean, in the first year, yes. Q. In 2014, you wrote off the entire 7-billion-dollar acquisition of Nokia, right? A. That's correct.").

3. Microsoft's Failure to Invest and Innovate in Search Leads to Persistent Quality Shortcomings

457. Developing a high-quality search engine requires investment. For years, Microsoft has refrained from making investments—particularly on mobile—that could improve its search quality. Tr. 2750:25-2751:11 (Parakhin (Microsoft)) ("Q. Mr. Parakhin, it is the case that Microsoft told Apple that it could invest more in mobile search but it would not do so unless Apple gave it further distribution in mobile? A. It is uneconomical for Microsoft right now to invest more in mobile because even -- any -- like, it's our belief that no amount of investment without securing some way to do distribution in mobile will result in any share gain. And so Microsoft, unless -- it is correct that unless Microsoft gets a more significant or a more firmer guarantee of distribution, then it makes it uneconomical for Microsoft to invest in mobile quality and in mobile search mode."); Tr. 6140:25-6141:2 (Whinston) ("Q. And Microsoft's position

was if you give us the contract, we'll make the investment; right? A. Well, that was certainly one of the, you know -- yes. Q. And Microsoft was making the claim that if you give us the contract, we'll make the investment, and we'll improve our search quality; correct? A. That's what they were arguing, yes.").

458. For decades, Microsoft has had substantially fewer engineers in search than Google. For example, in fiscal year 2007, Microsoft estimated that Google had more than double Microsoft's search head count. Tr. 3554:3-7 (Nadella) ("Q. In fiscal year 2007, Microsoft estimated that Google had more than double Microsoft's search head count, correct? A. Yeah, I'm assuming there's a document to that effect."); DX0423 at .002 (in fiscal year 2007, Microsoft's search headcount was 880, while Google's was reportedly 2,040).

459. Microsoft forecast that its headcount gap with Google would grow from two-to-one to three-to-one in fiscal year 2008. Tr. 3555:17-23 (Nadella) ("Q. And in fiscal year 2007, the numbers indicate Google's got more than twice as many -- twice as much headcount on search than Microsoft, right? A. Yeah. Q. And you were forecasting for fiscal year 2008, it's going to go up to 3 to 1, right? A. Yep."); DX0423 at .002 (Microsoft's search headcount in fiscal year 2008 was projected to be 1043, while Google's was projected to be 3,090).

460. By 2018, Microsoft estimated that the Google Search engineering team was five times bigger than Bing's. Tr. 3556:13-15 (Nadella) ("Q. By 2018, did Microsoft estimate the Google Search engineering team was five times bigger than Bing's? A. I'll take your word for it."); [redacted]

461. In 2021, Mr. Parakhin estimated that Microsoft's search team was roughly one-tenth the size of Google's. Tr. 2753:14-2754:4 (Parakhin); DX0688 at .001.

462. Microsoft has not subsequently closed its headcount gap with Google. Tr. 3559:1-8 (Nadella).

463. Microsoft also significantly under-invested in hardware for providing quality search results. Tr. 3559:20-25 (Nadella) ("Q. . . . During the time that you were in charge of search, Microsoft also was significantly under-invested in hardware, correct? A. In hardware, you said? Q. Yes. A. Okay."); DX0421 at .003.

464. Over the years, Microsoft's capital investments in Bing have been consistently a small fraction of the capital expenditures that Google has made on search. Microsoft personnel maintained a spreadsheet showing Google's capital expenditures versus Microsoft's for Bing during the period of 2005 to 2015. Tr. 3563:2-10 (Nadella) ("Q. . . . [T]his document here purports to estimate Google's capital expenditures versus Microsoft's during the period 2005 to 2015 with respect to Bing, correct? A. Uh-huh, yes."); [redacted]

465. It showed that Bing's capital expenditures consistently trailed Google's by a wide margin:

[redacted]

DX0500A at .004.

466. Consistent with its years of underinvestment, Microsoft has long recognized that it trailed Google in quality. [redacted] Two years later, Satya Nadella, then head of Microsoft's search unit, wrote that Microsoft was "at least 3 to 5 years behind" to be competitive in search. DX0424 at .005.

467. Given the problems with quality and branding during this era, Microsoft's search engine was likewise far behind Google's in terms of the frequency with which users would engage with the search engine. DX0424 at .004 (November 2007 email from Satya Nadella noting that "[t]he majority of our share is driven from passive browser defaults and searches originated out of MSN - this results in a dramatically lower engagement and usage relative to our competitors").

468. In 2009, Microsoft rebranded its search engine as Bing. Tr. 3548:4-5 (Nadella).

469. In the years following Bing's launch, senior Microsoft personnel continued to recognize their search engine's quality issues, particularly on mobile devices. For example, in 2010, an analysis delivered to Microsoft personnel working on search warned that "[m].bing.com requires significant product improvement" and that "[t]here is no reason for a user to switch from G[oogle] to Bing (and they're not switching)." DX0440 at .002.

470. While Microsoft—publicly—attempted to suggest the quality gap was attributable to scale, internally, its engineers recognized that more data was not the answer. *See supra* § IV.C.

471. Among the most important factors impacting search quality is the search engine's index. *See supra* § IV.A.1. Microsoft's index had been too small for too long, as acknowledged

by its senior search leadership. Tr. 2754:5-9 (Parakhin) ("Q. When you returned to Microsoft in 2019, you saw that one of the factors that was holding back Microsoft was the size of its index, correct? A. That was one of the priorities identified that we need to increase index size, yes."); [redacted]

472. As Microsoft was aware, index size is important because if the right document is not in the web index, it cannot be displayed to the user. Tr. 2754:10-13 (Parakhin) ("Q. And the reason you need to do that is because if a document is not in the index, no matter how good everything else is, you can't provide it to the user? A. That is correct.").

473. [redacted]

474. It was not until 2021 that Microsoft undertook to significantly invest in the size of its index. Tr. 2756:12-14 (Parakhin); DX0538.

475. Importantly, Microsoft's recent expansion of its search index did not depend on Microsoft's access to user interaction data. Tr. 10422:6-14 (Oard (DOJ Expert)) ("Q. And when Microsoft increased the size of its index, did it need to have additional user-side data in order to do that? A. I think clearly not. When Microsoft increased the size of its index, I think it simply made a decision to make an engineering investment in a larger index. User-side data can be useful in making the index of higher quality. But to make the index larger, the fundamental problems are engineering problems, not user-side data problems.")

476. When (in 2021) Microsoft finally invested in a larger index, it proved to be a "big success," improving Bing's search quality (relevance) scores. Tr. 2756:15-19 (Parakhin) ("Q. And Microsoft then proceeded to do that, correct? A. Yes, one of our big successes. Q. And it was a big success because it improved Microsoft's relevance metric, correct? A. Among other things, but not only relevance, yes.").

477. As discussed in § III.C.2, there are differences between the search experience on desktop and mobile. Bing was particularly uncompetitive in mobile search as its executives recognized. Tr. 3592:16-3593:1 (Nadella) ("Q. And if you jump down to the next paragraph, the third sentence, 'We have to act fast to get Bing's mobile search quality up to be competitive.' A. Yep. Q. And that's consistent with all the documents we've been looking at, right -- A. That's correct. Q. -- that in this time period, Bing was not competitive -- certainly wasn't competitive in mobile search? A. That's correct."); DX0451 at .002.

478. In 2012, Microsoft personnel acknowledged that the company had made "minimal" investment in mobile search. Tr. 3591:13-24 (Nadella) ("Q. And if you look at the second paragraph there, 'Bing has invested in mobile search, although in the past, the focus has been on clients in U.S. Bing client is available for iPhone, Windows Phone and Android. Users can also access Bing on browser at M.Bing.com. Due to historical reasons, the investment on mobile relevance has been minimal.' Do you see that? A. Yes. Q. And you have no reason to disagree with that statement? A. Yeah, I don't."); DX0451 at .002.

479. In 2012, the system Microsoft used to respond to mobile queries relied on the desktop system with "some mobile unique aspects [not] taken into consideration as it should be." *See* DX0451 at .002; *see also* Tr. 3591:25-3592:8 (Nadella). As a consequence, Microsoft's

mobile search's relevance (a quality metric) was suffering. DX0451 at .002; *see also* Tr. 3592:9-15 (Nadella).

480. A year later, in 2013, a presentation among Bing's most senior executives reported, "[o]ur mobile story sucks. We need to beat Google at mobile relevance. The gap to achieve this is absurdly large, and nobody is talking about solving it." DX0456 at .007; Tr. 3594:16-3595:4 (Nadella) ("Q. . . . So the slide here that was presented and circulated amongst the senior executives involved in Bing in July '13 reads, 'Our mobile story sucks. We need to beat Google at mobile relevance. The gap to achieve this is absurdly large, and nobody is talking about solving it.' Do you see that? A. I see that. Q. You don't have any reason to disagree with statements that were sent to Mr. Ribas in July 2013, do you? A. I don't.").

481. As of 2014, the same search quality problems for Bing remained; Microsoft executives recognized that the company should have invested more earlier in mobile search. Tr. 3589:17-3590:1 (Nadella) ("Q. By the time you became CEO in 2014, Microsoft had not invested nearly enough to compete in mobile search, correct? A. Yeah, I mean, in fact, I started by saying when it comes to search, to prioritize, if anything, good quality desktop search, and then get back -- having learned all the hard lessons that you pointed to on all of our distribution deals on mobile, get back to a place where we can start competing begin with the product and -- and an approach that will allow us to gain mobile share.").

482. That same year (2014),[4] Microsoft personnel continued to express concerns that most features in Bing were designed with mobile search as an afterthought, resulting in a "sloppy" search user experience. DX0469 at .010 ("Most features in Bing are designed with

[4] By 2014, approximately 40% of search usage in the United States occurred on mobile. DXD-37.033 (the combination of searches on mobile operating systems iOS and Android) (chart is discussed at Tr. 9733:15–9734:23 (Murphy)).

mobile as an afterthought, resulting in sloppy search UX.”). For example, Microsoft personnel noted that Google had more mobile search features than Bing did. DX0469 at .010 (“Google has over 15 features Bing doesn’t have.”). [redacted]

483. Microsoft’s focus on its desktop operating system business had led it to miss the rise in mobile technology. Tr. 3588:21-3589:3 (Nadella) (“Q. I mean, you -- you publicly stated that, ‘As a company, we’d been very publicly missing the mobile revolution,’ correct? A. Uh-huh, that’s correct.”); [redacted]

484. Accordingly, Mr. Nadella’s very first email as CEO emphasized that the company needed to adopt a “mobile first, cloud first” perspective. Tr. 3588:25-3589:6 (Nadella) (“Q. So when you became CEO in 2014, you announced that you wanted Microsoft, as a company, to be mobile first and cloud first; is that right? A. That’s correct. Q. You made that point in the very first email when you were CEO, right? A. That’s right.”).

485. Despite that professed goal, it was not until 2017, for example, that Microsoft made a version of its mobile browser available on the iPhone and Android mobile devices. Tr. 3588:1-10 (Nadella).

486. Ultimately, Microsoft decided it would not make the necessary investments to improve Bing’s search quality unless and until it had a commitment from a company like Apple

to deliver traffic to Bing. Tr. 2750:25-2751:11 (Parakhin) ("Q. Mr. Parakhin, it is the case that Microsoft told Apple that it could invest more in mobile search but it would not do so unless Apple gave it further distribution in mobile? A. It is uneconomical for Microsoft right now to invest more in mobile because even -- any -- like, it's our belief that no amount of investment without securing some way to do distribution in mobile will result in any share gain. And so Microsoft, unless -- it is correct that unless Microsoft gets a more significant or a more firmer guarantee of distribution, then it makes it uneconomical for Microsoft to invest in mobile quality and in mobile search mode.").

4. Microsoft's Efforts to Obtain Distribution Deals, Including on Apple and Mozilla

487. Microsoft has sought to enter, and succeeded in entering, many deals over the years for search distribution. Tr. 3319:4-8 (Tinter) ("Q. When you launched Bing in 2009, Microsoft was buying literally any search distribution deal it could get its hands on? A. We were investing very aggressively into search distribution deals at that point in time."). The most significant of these were discussed at trial and summarized below.

488. Despite Microsoft's preinstallation advantages on Windows PCs discussed in § V.A.1, above, Google—which received little to virtually no preinstallation on Windows PCs—received the overwhelming majority of search queries on Windows PCs. Tr. 9735:6-9738:19 (Murphy); DXD-37.034, .036.

489. Microsoft also entered into numerous search distribution agreements that covered mobile devices.

490. For example, in 2008, Microsoft entered into a five-year agreement with Verizon that provided that Bing would be the exclusive search engine preloaded on Verizon devices that were covered by the deal. Tr. 3565:11-14 (Nadella) ("Q. And it was a five-year mobile deal that

provided that Bing would be the exclusive search engine preloaded on devices that were covered by that deal, right? A. That's correct."); DX0957 at .039.

491. Rather than invest in improving mobile search quality to improve Bing's performance given its search distribution deal with Verizon, Microsoft [redacted]

492. As part of its agreement with Microsoft, Verizon was forbidden from providing or promoting non-Microsoft search services on any of the devices if the service primarily returned general searches or web results. Tr. 3565:15-19 (Nadella); DX0957 at .039.

493. To take another example, in 2011, Microsoft entered into a distribution deal with Nokia, then one of the world's largest smartphone manufacturers. Tr. 3570:21-3571:3 (Nadella); DX0967 (April 21, 2011 Microsoft-Nokia Search, Advertising, Mapping and Local Commerce Services Agreement).

494. Similarly, in 2011, Microsoft announced a default distribution agreement with Research in Motion ("RIM"), the company behind the then-popular BlackBerry mobile devices. Tr. 3568:24-3569:13 (Nadella); DX0445 (email attaching Microsoft-RIM Bing for Mobile Search OEM Distribution Agreement).

495. Microsoft also licensed its own mobile operating system to third parties—Windows Mobile (later called Windows Phone). On both Windows Mobile devices and Windows Phone devices, Microsoft's search engine was always preinstalled as the exclusive

search engine on these devices. *See supra* § V.A.2; Tr. 3571:7-20 (Nadella) ("Q. And on top of all that, Microsoft had its own phones during the 2007 to 2011 time period when you were in charge of search, right? A. Yes, we did. Q. Microsoft had a mobile operating system that was called Windows Mobile; am I right? A. That's correct. Q. And was that later changed to be called Windows Phone? A. That's correct. Q. And Bing was the default search engine that came exclusively preloaded on Windows Mobile and Windows Phone devices, correct? A. That's correct.").

496. Just as on desktop, despite Bing's preinstallation, Google achieved a high share of search queries made on these devices because users churned off of Bing. Tr. 3571:24-3572:7 (Nadella) ("Q. Well, you knew that, you were in charge of the product at the time? A. Yeah. I mean -- yeah, Google -- you don't have to keep repeating to me that Google has high share. Yes, Google has high share and all through that period and today too."), 3572:8-16 ("Q. All of these mobile distribution agreements that Microsoft entered into in this 2009, '10, '11, '12 time period, they all failed to get Bing's scale because users preferred Google, and the large majority of users of these devices searched on Google instead of Bing, right? A. Users do switch. Q. They churned off of Bing. That's an industry term, right? A. Yep."), 3578:22-3579:2 ("Q. . . . Another problem that Bing was experiencing, and has experienced over time, is people churning the product very early on when it gets exposure, right? A. Yep."); DX0440 at .002 (Microsoft email noting that "[w]e can't hold onto new users"), .003 (Microsoft email noting that "[w]e have a massive user retention problem" and that "[r]apid churn (<1 week of use) is killing us"); Tr. 3571:4-6 (Nadella) ("Q. And Bing wasn't any more popular on Nokia's phones than it was on the Verizon and on the RIM phones, was it? A. Probably not."), 3595:8-15 ("Q. This is the reason why Microsoft, all of those mobile deals we looked at, were losers for Microsoft, right? A. Yeah. I

mean, none of them helped us gain enough ground and prioritize economically these. And that's why I think in 2014, which comes the year after these type of emails, where I doubled-down on just desktop search."); DX0440 at .022 (Keystone analysis noting that "60% of new users churn within 1 week" when using Bing Mobile on the iPhone or BlackBerry devices").

497. As Microsoft CEO Satya Nadella admitted, "[u]sers do switch," and users in particular switched away from Bing and to Google when Bing was set as the default search engine. Tr. 3572:8-13 (Nadella), 3574:21-3575:4 ("Q. It says, 'Bing and Yahoo! share is about 10 percent despite default deals; Google is super dominant in 90 percent.' So this is -- this document is sort of reflecting a little bit of what we've been talking about, which is Google is getting the overwhelming majority of search queries even though Bing and Yahoo! are the defaults on various of these devices, right? A. That's correct."); DX0440 at .011 (describing mobile query distribution in 2010 as "Bing + Yahoo is about 10% despite default deals").

498. To take another example, on BlackBerry devices' browsers where Bing was the default, Bing received about 8% of the queries while Google received 91%. Tr. 3577:7-15 (Nadella) ("Q. For that device, even though Bing is the default, Google gets 91 percent of the queries, right? A. Yep. Q. Bing only gets 8 percent? A. Yeah, which is 8 percent more than any other device, yeah. Q. Without the default, Bing would have no share, right? A. That's correct."); Tr. 680:9-681:6 (Rangel (DOJ Expert)) ("But based on the numbers that are plotted, the advantage in the default for Bing, in this specific time of devices at this specific time -- and let me remind you these were very different interfaces generally, I don't know this is the bias but generally in the market -- the default looks small or bounded or not of a very large magnitude."); DX0440 at .013 ("In April 2010, default generates 7.5% of Bing RIM Browse queries on Verizon; Without default, Bing would have no share.").

499. Bing's preinstallation on these early mobile devices generated "a lot" of "bad[ ]press" and "turbulence" for the product. Tr. 3566:22-3567:18 (Nadella) ("Q. . . . You were aware at this time -- you were overseeing Bing search. You were aware that these Verizon devices that came with Bing as the exclusive preloaded search engine were encountering bad tech reviews like this, weren't you? A. Yeah, we saw -- saw a lot of this. In fact, a lot of this even informed a lot of my conversation even subsequently with even Apple. Knowing that, look, I think you need to have a good product, and more importantly, you need to be able to get through this bad-press period and turbulence and to get to the other side, because in some sense, you have to persist to change. And you sort of mentioned it very well, when Google's such a user habit that is well ingrained, that there will be a little bit of, both from the intelligentsia to the users, a lot of change, management that you have to persist through.").

500. Microsoft could not retain users at the rate it needed to in order to make its search distribution deals consistently profitable. Tr. 3568:3-9 (Nadella) ("Q. But the problem you found was that users of these Verizon devices, they didn't search with Bing, they searched with Google even when Bing was preloaded as the default, right? A. I mean, it happens even today, and so, therefore, the question is, Can you build a product that retains more each day."), 3568:17-22 ("Q. It was a disaster for Microsoft because Microsoft made certain guarantees to Verizon that turned out to be economically bad because people didn't use Bing, they used Google, right? A. Yeah, because we couldn't retain the users at the rate at which we needed to."), 3569:21-3570:3 ("And you're right in saying that its onus is on us to build a product that retains more, and we'll keep trying until we sort of break through on it.").

501. Microsoft continued to bid for distribution, although it routinely faced concerns from prospective counterparties around Bing's quality and user retention. Tr. 2505:3-16 (Cue)

("Bing certainly wasn't anywhere near as good as Google."), 2588:16-21 ("Q. In any of these meetings with Microsoft, did you or anyone else from Apple indicate that you believed that switching from Google to Bing would be a better user experience for Apple customers? A. No. It's not true, so we wouldn't -- we're not going to lie to them."); Tr. 3579:11-19 (Nadella) ("Q. Over half of new iPhone and RIM users, across clients and browse, only try the Bing mobile product for one day before churning. One day. And that's something you've experienced over the years, people churn off of Bing very quickly, right? A. Yep. Q. And this is one of the concerns Apple had about switching from Bing -- or from Google to Bing, correct? A. That's correct.").

502. On multiple occasions, Microsoft tried to persuade Apple to adopt Bing as the default search engine for the Safari browser. Tr. 3655:17-23 (Nadella) ("Q. And even though there's been no appreciable demand for Bing on Apple devices, Microsoft has tried to engage Apple on a number of occasions to persuade Apple to change the default on Safari from Google to Bing? A.Yeah. And, as I said, we also had some modicum of success with these alternative entry points like Siri and Spotlight.").

503. In its negotiation with Microsoft, Apple consistently expressly concerns about Bing's search quality. Tr. 3655:24-3656:11 (Nadella) ("Q. And one topic that arose frequently during these conversations with Apple has been Bing's search quality, right? A. That's right. Q. And Apple executives have raised concerns about Bing's search quality, right? A. That's correct. Q. And they've raised concerns about Bing's brand with consumers, right? A. That's correct. Q. And I take it Microsoft has never been able to persuade Apple to switch the default on Safari from Google to Bing? A. That's correct."); *see also infra* § XI.A.5.

504. Apple also consistently expressed concerns to Microsoft about Bing's ability to retain users. Tr. 3579:11-19 (Nadella).

505. For example, as early as 2013, Microsoft understood that concerns over "product quality" would prevent Apple from selecting Bing as the Safari default search engine when Apple's deal with Google expired. Tr. 3290:10-3291:21 (Tinter) ("Q. And that's because Apple had been very clear with Microsoft at this point in time that even if their deal with Google expired, they were not prepared to move to Bing; correct? A. Correct. . . . Q. You agree at this point in time that the issue with Apple was mostly one of product quality; right? A. That was my reflection of the conversations with them in 2013.").

506. Likewise, in 2021, Apple conducted an evaluation of Bing's quality and found that the evaluation did not support recent claims from Microsoft that its search quality had improved. Tr. 2349:5-2350:2 (Giannandrea) ("Q. Did your evaluation support the claims that Microsoft was making? A. When we finally did the evaluation and looked at it, it definitely did not."). The evaluation found that Bing's quality was [redacted]

507. Microsoft also sought to become the default search engine on Mozilla. Tr. 3335:20-3336:5 (Tinter).

508. Driven in part by concerns about retaining search volume if Firefox were preset to Bing, Mozilla would not agree to set Bing as the default without a guarantee as to some minimum amount of revenue that would be paid irrespective of search volume. Tr. 3336:6-3337:9 (Tinter).

509. Mozilla also conducted experiments to determine the effect of setting Bing as the default search engine for the Firefox browser on search volume. For instance, in 2016, Mozilla

found that, at day [redacted] of the experiment, Bing kept just [redacted] of its volume, before eventually dropping to the low to mid-[redacted] Tr. 3296:13-18 (Tinter) ("Q. Thank you. He also related that Mozilla had run a funnel test? A. Yes. Q. And that test showed that with the default switch to Bing, the search volume eventually dropped to the low to mid[redacted]? A. It also says that they had a bug in the test."); [redacted]

510. In 2017, Mozilla conducted an experiment where it switched the default search engine to Bing for certain users. By day 14, Bing's search volume retention dropped by nearly [redacted] Tr. 3295:21-3296:12 (Tinter) ("Q. Thank you for the clarification. So in the past tense, in that two-week period, they lost half their search volume; correct? A. They lost [redacted] their search volume."); [redacted]

511. Mozilla carefully weighed the quality of the search product and user experience offered by both Google Search and Bing and determined that Google was the clear winner when it comes to product experience and what users wanted. [redacted] DX0547 at .002 (September 30, 2020 letter from Mozilla to DOJ).

512. Mozilla found that Bing, when compared to Google Search, has poor user retention, lower follow-on search volume, and lower monetization rates. [redacted] DX0547 at .002 (September 30, 2020 letter from Mozilla to DOJ).

513. Microsoft has also entered into syndication deals to supply results to other search engines, including Yahoo, Neeva, DuckDuckGo, Qwant, and Ecosia. Tr. 3520:17-25 (Nadella); Tr. 1938:16-1939:23 (Weinberg); Tr. 3739:14-16 (Ramaswamy (Neeva)) (at the outset, when Neeva launched, it used Bing to provide its search results); DX0989 (Microsoft-Ecosia agreement); DX0992 (Microsoft-Qwant agreement).

514. Microsoft's syndication partners shared many of the same concerns about Bing (including Bing's search quality); for example, Sridhar Ramaswamy, Neeva's co-founder and CEO, found that when Neeva was using Bing's search results in 2019 and 2020, Bing's search quality did not match Google's. Tr. 3739:20-3740:2 (Ramaswamy) ("Q. And in 2020, when Neeva was using Bing's search results, it's correct that you believed that Bing's search quality did not match Google's? A. That is correct. There was that, and the fact that we felt that we could not innovate as much as we wanted to on top of an API were major factors in us deciding to essentially to build our scale search ourselves. And that effort started in late 2019."); [redacted]

[redacted]

5. Microsoft's Tactic of Making It Difficult or Impossible to Change Defaults Within Its Operating System and Browser

515. Microsoft has historically taken steps to make it more difficult for end users to use its competitors' software within Microsoft's operating system and browsers.

516. In the 1990s, Microsoft's Windows operating system was the dominant personal computing operating system in the United States. Tr. 3546:9-12 (Nadella). During this time, Microsoft grew concerned that its operating system dominance could be jeopardized by Netscape's Navigator browser, a middleware application that had the potential to erode the applications barrier to entry that protected Windows from effective competition. Tr. 5851:5-5852:5 (Whinston) ("[Netscape] was a threat to Windows."), 6146:14-20 (Whinston) ("Q. . . . In the *U.S. v. Microsoft* case, Microsoft's contracts that excluded Netscape Navigator, the reason why that was deemed harm to competition was because Netscape Navigator offered the prospect of reducing the application's barrier to entry that other competing operating systems faced when trying to compete with Windows; correct? A. Correct. . . .").

517. The District Court entered a judgment that Microsoft violated Section 2 of the Sherman Act by employing anticompetitive means to maintain a monopoly in the PC operating system market, and the U.S. Court of Appeals for the D.C. Circuit affirmed. *United States v. Microsoft Corp.*, 253 F.3d 34, 46 (D.C. Cir. 2001) (en banc).

518. Despite the resolution of *U.S. v. Microsoft*, companies continued to express concern about Microsoft's conduct on Windows PCs. For example, Microsoft undertook a series of actions to make it more difficult to switch search defaults to Google on Windows desktop computers. Tr. 2352:1-6 (Giannandrea) ("Q. And did you have an understanding as to whether

or not Microsoft had engaged in a series of actions to actually make it difficult for users to switch defaults to Google on the Windows desktop? A. That would have been my opinion at the time. We did a lot of things to try and combat that behavior.”).

519. To take another example, as recently as 2020, [redacted]

520. [redacted]

521. [redacted]

522. Consistent with its awareness that end users will often opt for Google Search, Microsoft often makes it difficult or impossible to change the default to another search engine. For example, end users cannot change the default search engine in Windows 10S. Tr. 3349:3-7

(Tinter) ("Q. It's impossible to change the default search engine in Windows 10S? A. Correct. Q. It's permanently set to Bing; correct? A. That's what it says."); DX2014 at .003

523. Similarly, changing the default search engine in Windows 10 takes twice as many clicks as it does on Android and 50% more clicks than it does on iOS. Tr. 3348:5-17 (Tinter) ("Q. So in Windows 10, you can change the default search engine; correct? A. Yes. Q. And it takes six clicks once you're in settings; correct? A. At this point in time, it did. Q. Okay. At this point in time being 2018; correct? A. Yes. Q. Okay. The answer for Android is three clicks in settings; correct? A. Yes. Q. And the answer for iOS, which is what runs on the iPhone, is four clicks in settings; correct? A. Yes."); DX2014 at .003.

6. Microsoft's Efforts in AI/ML

524. Microsoft has also historically underinvested relative to Google in artificial intelligence and search innovation. For example, in June 2019, Microsoft's Chief Technology Officer Kevin Scott believed that it was critical that Microsoft not fall further behind Google in AI technology. Tr. 3640:23-3641:1 (Nadella) ("Q. So, again, this is Mr. Scott confirming that, in 2019, it was critical that Microsoft make sure that it not fall further behind in AI technology to Google? A. That's correct."); DX0680.

525. At the time of Dr. Scott's email, Microsoft had recently begun to incorporate transformer- and BERT-based techniques into Bing's search technology. Tr. 2736:9-15 (Parakhin); DX0275 at .002.

526. As Microsoft began to use these large pretrained models, its search team was "shocked" by how good their results were. Tr. 2738:17-19 (Parakhin) ("Q. And the team was shocked by how good the results were from using this type of model in 2019, correct? A. Uh-huh.").

527. Members of Microsoft's search team who worked with transformer models delivered quality improvements far larger than did their other colleagues. Tr. 2739:5-16 (Parakhin); DX0725 at .004.

528. [redacted]

529. [redacted]

530. [redacted]

531. [redacted]

532. [redacted]

533. In 2019, Microsoft entered into its partnership with OpenAI and invested roughly $1 billion into the company. Tr. 3599:10-17 (Nadella) ("Q. Now, Microsoft and OpenAI entered into a partnership in the summer of 2019; is that right? A. Sounds accurate. Q. Microsoft made a significant investment in 2019 in OpenAI, right? A. That's correct. Q. Was that roughly a billion dollars? A. Yeah, that's correct.").

534. [redacted]

535. OpenAI's model does not rely on click-and-query data. Tr. 3600:22-3601:2 (Nadella) ("Q. And ChatGPT is trained on publicly available data, correct? A. That's correct. Q. ChatGPT does not rely on user click-and-query data, correct? A. That's correct.")

536. In the summer of 2022, Microsoft applied OpenAI's model to Microsoft's core search ranking algorithm for Bing. Tr. 3600:10-15 (Nadella) ("Q. And in the summer of 2022, OpenAI shared its most up to date GPT model with Microsoft, right? A. That's correct. Q. And Microsoft applied the AI model to Microsoft's core searching ranking engine for Bing, right? A. That's correct.").

537. As a result, Microsoft saw the largest jump in relevance (a quality metric) in two decades. Tr. 3600:16-21 (Nadella) ("Q. And as a result of that, Microsoft saw the largest jump in relevance in two decades for Bing? A. That's correct. Q. OpenAI's GPT technology has led Bing's search quality to reach an all time high, correct? A. That's correct."); Tr. 2742:19-25 (Parakhin) ("Q. Okay. And if you go down to the third bullet point, you say, 'We've also applied the AI model to our core Bing search ranking engine, which led to the largest jump in relevance

in two decades.' A. Correct. Q. And that's an accurate statement? A. Very much."); DX0302 at .006 (2022 Microsoft announcement that "[w]e applied the AI model to our core search ranking engine, and we saw the largest jump in relevance in two decades.").

538. Microsoft and its partners expect that AI will continue to fundamentally change the nature of search. Tr. 3529:10-24 (Nadella) ("[T]he search category by itself will fundamentally change, because there's a new way to think about answering questions using LLMs versus sort of just giving you the 10 blue links."); DX0301 at .001 ("AI will fundamentally change every software category, starting with the largest category of all—search."); Tr. 2741:7-2742:2 (Parakhin) (similar); Tr. 3671:2-3672:5 (Ramaswamy) ("[T]he power of generative AI models could really create a much, much better search experience . . . ."), 3672:21-3674:15 ("[F]or us AI was a real breakthrough. And I continue to think that generative AI is going to be a big game changer for search. . . . [I]n many ways, AI search was the culmination of our vision to truly create a better search experience for our users.").

539. In sum, despite its many advantages, Microsoft has failed to produce a search product of the same quality as Google. It thus comes as no surprise that for those who find themselves on Bing, their most queried word is "Google." Tr. 3582:21-23 (Nadella) ("Q. . . . And is Google still the most commonly queried word on Bing? A. Yeah.").

B. DuckDuckGo Has Chosen Not to Invest in Attempting to Become a Quality Search Engine

1. DuckDuckGo Launched a General Search Engine and Achieved Consistent Profitability with Minimal Up-Front and Ongoing Investment

540. DuckDuckGo is a privately held company founded by Gabriel Weinberg, who remains the company's CEO. Tr. 1937:2-3 (Weinberg), 2057:5-12.

541. DuckDuckGo has operated a general search engine in the U.S. since shortly after its founding in 2008, and since 2010 DuckDuckGo has positioned itself as a "privacy focused" search engine. Tr. 1949:19-1950:9 (Weinberg).

542. Mr. Weinberg invested approximately [redacted]

543. DuckDuckGo did not raise any capital from external sources until 2011, when it received approximately $3 million from outside investors. Tr. 2057:17-22 (Weinberg).

544. DuckDuckGo became profitable in 2014 and has remained profitable on a cash-flow basis ever since. Tr. 2057:23-2058:4 (Weinberg).

545. Since 2014, DuckDuckGo's business model has entailed (1) serving organic search results (*i.e.*, the list of web links displayed in response to search queries) delivered by business partners such as Yahoo or Microsoft, and (2) serving search ads from those partners in return for a portion of the revenue generated. Tr. 1938:16-1940:1 (Weinberg), 2146:15-2147:17, 2145:18-21.

546. Search advertising is currently DuckDuckGo's sole source of operating revenue, and today all of the search ads displayed by DuckDuckGo to users in the U.S. are provided by Microsoft. Tr. 2060:21-23 (Weinberg), 2146:15-2147:2.

547. DuckDuckGo's current arrangement with Microsoft to display Microsoft's organic search results and search ads to DuckDuckGo users has been in place since 2020 and has been profitable for DuckDuckGo in the U.S. Tr. 2062:16-19 (Weinberg).

2. Although DuckDuckGo Has Been Able to Access Significant Amounts of Capital, It Has Not Invested in Building a Competitive Search Engine

548. In 2018, its first capital raise since 2011, DuckDuckGo raised approximately $10 million from outside investors, but the majority of that money was distributed to DuckDuckGo's

shareholders rather than used by the company to improve DuckDuckGo's search engine. Tr. 2057:23-25 (Weinberg), 2058:5-11.

549. In 2020, DuckDuckGo raised approximately $100 million dollars from outside investors, but approximately [redacted] of that money was distributed to DuckDuckGo's shareholders rather than used by the company to improve DuckDuckGo's search engine. Tr. 2058:25-2059:8 (Weinberg).

550. DuckDuckGo was valued at approximately [redacted] at the time of its 2020 capital raise. Tr. 2059:9-11 (Weinberg).

551. In 2021, DuckDuckGo shareholders sold approximately [redacted] in DuckDuckGo stock to a consortium of venture capital firms, but none of that [redacted] was used by the company to improve DuckDuckGo's search engine. Tr. 2059:12-14 (Weinberg), 2060:1-3.

552. There was no evidence presented at trial that Mr. Weinberg (or any other DuckDuckGo officer or director) sought to deploy the [redacted] available to the company between 2018 and 2021 to improve the quality of DuckDuckGo's search engine, expand the company's marketing efforts, develop complementary products that would increase the use of DuckDuckGo's search engine, or otherwise compete to attract and retain users. *See* Tr. 2057:1-2060:9 (Weinberg).

553. The number of employees DuckDuckGo has hired is modest by any standard. As of 2018, Mr. Weinberg estimated that fewer than 20 employees were working on improving DuckDuckGo's search engine. [redacted] Tr. 2058:21-24 (Weinberg) ("Q. So on the order of a third of DuckDuckGo's 50 employees as of 2018 were

working on improving the search engine; is that right? A. That sounds about right."); DX0628 at .005 [redacted]

554. Even though it has been profitable for almost a decade, DuckDuckGo has not built its own comprehensive web index for serving organic web results, which has long been regarded as a core component of providing an innovative and high-quality experience to users. Tr. 1938:11-1940:1 (Weinberg), 2147:14-20; *see* Tr. 6303:2-25 (Nayak); Tr. 2754:5-13 (Parakhin).

555. In 2020 and 2021, Google implemented a search engine choice screen on Android devices sold in many European countries in response to determinations by the European Commission. There is no evidence that DuckDuckGo increased its investments in search quality, marketing, or any other aspect of its business in Europe in response to the implementation of the choice screen. Tr. 10609:15-10610:3 (Whinston).

3. DuckDuckGo Is Not a High-Quality Search Engine

556. The quality of DuckDuckGo's search engine has never approached the quality of Google Search according to any metric, including metrics used in the ordinary course of business by companies such as Google and Microsoft.

557. None of Plaintiffs' experts opined that DuckDuckGo is a higher-quality search engine than Google. *See* Tr. 5938:25-5939:7 (Whinston).

558. Apple executives did not view DuckDuckGo as a superior search engine to Google. Tr. 2353:9-14 (Giannandrea) ("Q. Do you view DuckDuckGo as a superior search engine to Google? A. I do not, no. Q. Are you aware of anybody with [] Apple who believes that

DuckDuckGo offers a superior search engine than Google? A. It's a subjective question. Objectively, no.").

559. Apple executives believed that, given DuckDuckGo's inferior search quality, it was not preferred by a majority of Apple's customers. Tr. 2507:4-2508:2 (Cue) ("Q. And did you consider DuckDuckGo as an option to be set as the default in the Safari browser in 2016? A. No, we did not. Again, that is not a good choice for customers. We do have DuckDuckGo as a choice so they can switch if they'd like, but, again, the quality of the search results of DuckDuckGo are not up to par. And so one of the things we've been very clear on from an Apple point of view is, privacy is of utmost importance, but you can't do privacy by providing an inferior product.")

560. DuckDuckGo does not measure quality for its search results pages in the ordinary course of its business, and to the extent that DuckDuckGo's search quality has improved at all over time, there is no evidence of the magnitude of the improvement or how it compares to the rate at which Google's search quality has improved. Tr. 2073:5-22 (Weinberg).

561. DuckDuckGo employees have acknowledged that apart from the company's privacy narrative, there is no feature or aspect of DuckDuckGo's search engine that would convince users to prefer it to Google. For example, in response to an August 2017 proposal from a colleague "to tell the story head on that we're better than Google in x, y and z ways, and that we are the leaders in privacy," Mr. Weinberg observed that an "issue is that it isn't true we're better on x, y or z feature." DX0624 at .004-.005 ("That is, can anyone here name x, y or z? I cannot. If there was a compelling story, it should be easy to spell out the basics of that narrative and test it right now without much effort."); Tr. 2074:20-2076:2 (Weinberg); DX0623 at .005

[redacted]

[redacted]

562. DuckDuckGo employees have also acknowledged that they do not perceive DuckDuckGo to be a source of innovation in the search industry. For example, a periodic survey of DuckDuckGo employees conducted in September 2018 addressed 16 categories ranging from "Company Leadership" to "Learning & Development." The category with the lowest scores from DuckDuckGo employees was "Innovation," where the company ranked 24 points below the survey's benchmark. DX0629 at .011-.016, .019 (indicating that DuckDuckGo scored 39 percent in response to the prompt, "At DuckDuckGo we act on promising new or innovative ideas," which was 29 points below the benchmark); Tr. 2078:10-2079:24 (Weinberg).

4. Although a Significant Number of People Try DuckDuckGo's Search Engine, It Has Failed to Retain Users Because It Does Not Offer a High-Quality Search Experience

563. Although DuckDuckGo does not know exactly how many individuals use its search engine, it has estimated that as of 2021 approximately 100 million people worldwide used DuckDuckGo. Tr. 2080:17-2081:5 (Weinberg).

564. Mr. Weinberg believes that a significant number of DuckDuckGo users use DuckDuckGo for some but not all of their general search queries. For example, DuckDuckGo has estimated that on the order of 10% of people in the U.S. currently identify as DuckDuckGo users, but it has also estimated that DuckDuckGo receives only about 2.5% of general search queries conducted in the U.S. Tr. 2081:6-14 (Weinberg), 1942:22-24.

565. DuckDuckGo employees have acknowledged that search quality issues, particularly with regard to queries with local intent, have dissuaded users from continuing to use DuckDuckGo. For example, in a July 2018 exchange, Mr. Weinberg described "signals that local is a problem in terms of retention," including "[u]ser feedback complaints." DX0627 at

.003 [redacted] Tr. 2087:6-10 (Weinberg) ("Q. So as of July 2018 when this was written, your understanding, based on the materials you received as CEO of the company, was that local results were a problem in terms of retaining users; is that right? A. Yes.").

566. According to a November 2019 survey produced by DuckDuckGo, a group of current DuckDuckGo users were asked: "What would motivate you to use DuckDuckGo for nearly all of your searches?" Of the eight possible responses identified, the most frequent response was: "If the search results were better." The same survey indicates that the least frequent response of the eight listed was: "If I knew how to change the default search option in my browser." DX0633 at .006; Tr. 2081:23-2082:8 (Weinberg), 2084:20-2085:3.

567. There is no evidence that a significant number of people who have tried DuckDuckGo would become more frequent users if their browser or device did not come with a default or preinstalled search engine. Tr. 6045:12-6046:19 (Whinston) ("Q. Have you attempted to estimate what percentage of U.S. search consumers prefer Bing or Yahoo! or DuckDuckGo to Google? A. Not -- in some sense, the analysis I did of the EU choice screen and then projecting what that would imply had the same choice screen been in the U.S. was seeking to do that. . . . Q. And your choice screen analysis demonstrated that over 90 percent of U.S. consumers would select Google if presented with the choice screen, right? A. Yeah, I think it was 90.55, but yes.").

5. When Presented with a Choice, Users Do Not Select DuckDuckGo as Their Default Search Engine

568. In response to determinations by the European Commission, Google has implemented a search engine choice screen on Android devices sold in most European countries. Since September 2021, DuckDuckGo has been included on the search engine choice screen at no

cost in all European countries where it is used, including the U.K., Germany, France, Spain, and Italy. Tr. 2137:12-19 (Weinberg); Tr. 10609:15-22 (Whinston); Tr. 9832:7-9834:11 (Murphy).

569. With the exception of a small number of European countries where DuckDuckGo is not among the five most widely used search engines, DuckDuckGo is always among the first five options listed on the Android choice screen, and the order of the search engines is randomized, such that DuckDuckGo is equally likely to appear above or below Google on the list. Tr. 2137:20-2138:9 (Weinberg).

570. DuckDuckGo received only [redacted] of all choice screen selections during the first several months that the current search engine choice screen was in place on Android devices in Europe (specifically, from September to December 2021). Tr. 10615:5-10618:3 (Whinston); DXD-41.021.

571. There is no evidence that DuckDuckGo's share of general search queries has increased meaningfully in Europe since the introduction of the current choice screen on Android devices in Europe in September 2021, even though Android devices are more widely used in Europe than in the U.S. (such that a more significant fraction of all smartphones sold in Europe ship with a search engine choice screen). Tr. 10617:22-10619:11 (Whinston); DXD-41.021; Tr. 654:1-19 (Rangel (DOJ Expert)); Tr. 9834:12-9385:23 (Murphy); DXD-37.079-.080.

572. According to commercially available data from StatCounter, DuckDuckGo received only 0.6% of general search queries on mobile devices in Europe in August 2023—nearly two years after the introduction of the current Android choice screen on which DuckDuckGo is included at no cost. Usage, in other words, is 50% lower than choice screen selections. Tr. 10615:5-10618:3 (Whinston); DXD-41.021.

573. According to Mr. Weinberg, DuckDuckGo's total share of general search queries in European countries as of the second quarter of 2023 ranged from approximately 0.5% to 2.5% depending upon the country. By comparison, Mr. Weinberg estimated that during the same period using the same methodology, DuckDuckGo's usage share in the U.S. was 2.5%, even though search engine choice screens are not used in the U.S. Tr. 1942:22-24 (Weinberg), 2136:6-2137:2.

6. DuckDuckGo's Low-Cost Approach to Search Has Made the Company Less Attractive to Partners Who Are Concerned with Quality and Reliability

574. While DuckDuckGo has appealed to a niche audience, and been profitable for its owners, its approach to search has rendered it ill-suited for selection as a default search engine in mainstream web browsers or preinstallation on mainstream devices. Tr. 2506:25-2507:3 (Cue) ("Q. Would you consider DuckDuckGo as an option to be set as the default in the Safari browser? A. No, I would not. That would not be a good thing for our customers."); Giard (T-Mobile) Dep. Tr. 263:11-264:06 ("Q. In connection with or leading up to the negotiations of the 2017 RSA, did T-Mobile explore a relationship with DuckDuckGo? A. I think we probably looked into it but dismissed it pretty early on. Q. Why is that? A. I think it didn't have as robust a user experience as either of the alternative search options, nor did they have the same business model behind them.").

575. DuckDuckGo's lack of investment in its own search infrastructure and reliance on business partners such as Microsoft and Yahoo to supply organic search results and search ads has affected Apple's views on whether its customers' experience with the Safari browser would improve if DuckDuckGo were the default search engine in Safari. Tr. 2352:21-2353:25 (Giannandrea) ("Q. To your knowledge, has Apple considered using DuckDuckGo as the default search engine on the Safari browser? A. Not to my knowledge, no. Q. Why not? A. Because

DuckDuckGo is, I would describe, a veneer on top of other search engines, specifically Yahoo! and Bing. Q. What do you mean by 'a veneer on top of'? A. Well, in order to be a functional search engine, they have to get most of the results from a much larger search engine."); Tr. 2505:3-16 (Cue) ("One thing that is a problem with DuckDuckGo and one of the other reasons, again, we were trying to be helpful, is DuckDuckGo's [backend] basically searches Bing, so it doesn't have its own search engine. And so they're dependent on Bing. Bing certainly wasn't anywhere near as good as Google. And so we wanted to help DuckDuckGo get better."); DX0377 at .001 (February 2019 email from John Giannandrea of Apple to Darin Adler of Apple) (explaining that a proposal for recommending DuckDuckGo to Safari users who turn on private browsing for the first time is "probably a bad idea," n[redacted] Tr. 2358:16-2354:11 (Giannandrea).

7. There is No Evidence of Material Demand for DuckDuckGo

576. There is no evidence that any particular percentage of U.S. consumers, let alone a significant percentage, prefer the privacy-related attributes offered by DuckDuckGo to those offered by Google or any other search engine. Tr. 5938:12-15 (Whinston) ("Q. And you're not offering any particular opinion in this case that any particular feature of DuckDuckGo is demanded by a particular percentage of consumers in the United States? A. No.").

577. Although Mr. Weinberg testified about surveys DuckDuckGo has conducted regarding consumers' general views on digital privacy, neither the testimony nor the referenced surveys addressed the range of features actually offered by Google and DuckDuckGo, identified user preferences for any particular attribute, or assessed the trade-offs involved in implementing a privacy-related setting. Tr. 1946:5-1948:20 (Weinberg).

578. With respect to user preferences for the range of features offered by DuckDuckGo and other search engines, Mr. Weinberg acknowledged that if DuckDuckGo became the default search engine in private browsing mode in Apple's Safari browser, he had "no idea" "how many users might keep DuckDuckGo as the default in private browsing mode in Safari rather than switching the default to another search engine." Tr. 2098:14-18 (Weinberg).

579. The approach to privacy employed by DuckDuckGo involves significant trade-offs to search quality, including through the elimination of features that other search engines have found popular with users and techniques that are used to counteract malicious behavior that degrades search quality. For example:

a. By not using search sessions, DuckDuckGo fails to utilize prior queries that can provide context for later ones. *Compare* Tr. 2050:24-2051:7 (Weinberg) ("[W]e don't have any user sessions so that we can't say it's the same user doing different actions."), *with* Tr. 9035:14-9036:1 (Fitzpatrick) ("Q. Is it Google's view that using the in-session customization provides a user with a better search experience? A. Yes. . . . [T]he features that -- you know, that we choose to include beyond the experiment phase are the ones that we believe are, like I said, measurably beneficial to the user experience, including things like this in-session use of context to improve results.") *and* Tr. 9025:22-9027:14 (Fitzpatrick) ("So we don't have any way to tie . . . signed out usage back to individual humans. What we do in the signed-out state is we will use very short time windows to group together queries based on those temporary IDs so that you can use an initial search to influence the results in a subsequent one.

So, an example here might be, if I type in travel and then I type in Alaska and then my next search is cruises, you could get a suggested auto-complete to cruises for Alaska based on the fact that three minutes ago, you just told us you were interested in Alaska . . . .”).

b. By not offering users a signed-in experience, DuckDuckGo’s users lack the ability to customize their interaction with the site across visits based on their individual preferences. *Compare* Tr. 1943:3-1944:25 (Weinberg) (“A way to think about it is every time you search on DuckDuckGo, it’s like it’s your first time.”), *with* Tr. 9016:6-19 (Fitzpatrick) (“So, to give you a simple example, if you have visited a website before, Google will show the link in a different color than a website you haven’t visited. . . . The ability to show you that tailored information within the context of your search experience is something that we would pull from your account history, but, you, as a user, have the ability to turn that personalization off if, for whatever reason, you don’t want it.”) *and* Tr. 3737:5-19 (Ramaswamy) (“Q. And you also spoke about personalization. Did you believe that personalization improved the quality of the search experience for users? A. Absolutely. So to give you concrete examples, we had a feature called preferred providers by which people could pick their news sources. . . . And the user feedback that we got was definitely that users like features like that.”).

c. By not logging IP addresses, DuckDuckGo eliminates a tool that full-fledged search engines use to combat malicious behavior that can negatively affect the ranking of search results or usability of the site. *Compare* Tr. 2085:19-2086:7 (Weinberg) ("And we use the location we get via the IP address, and then we throw it away after the search is done."), *with* Tr. 7413:25-7414:10 (Raghavan) ("Analysis of logs with IP addresses can indicate to us that a fraudulent attack is underway.") *and* Tr. 9032:5-12 (Fitzpatrick) ("To the best of our understanding, and at least the way that they explained it, DuckDuckGo does not log IP addresses, whereas, as we've discussed, Google does for many reasons, including that it's an important fraud and abuse signal for us.").

580. The approach to privacy that DuckDuckGo has employed involves significant trade-offs to the quality and integrity of search ads, including through the prevalence of "click fraud" (*i.e.*, ad clicks by bots or humans for the purpose of imposing a cost on the advertiser, as opposed to clicks by humans who are legitimately interested in the advertiser's product or service). For example, in a 2017 email addressing a DuckDuckGo proposal relating to not providing users' IP addresses, Microsoft stated, among other things, that while it "understand[s] the commitment you make to your end users and concerns about government subpoenas . . . [it] need[s] to ensure Bing collects the signals [it] need[s] to protect our advertiser customers." [redacted] DX0621 at .001; Tr. 2068:23-2069:5 (Weinberg), 2070:21-2070:24.

581. [redacted]

[redacted] DX0375 at .001; Tr. 2355:2-17 (Giannandrea) ("[I]n the conversations we'd had in late 2018 with Bing, the subject of DuckDuckGo had come up because I knew there were some people at Apple who were excited about the privacy claims that they were making, specifically, that when they sent search to Bing, they hid the [IP] addresses of the original browser. [redacted] DX0377 at .001 (February 2019 email from John Giannandrea of Apple to Darin Adler of Apple) [redacted] Tr. 2358:16-2359:17 (Giannandrea).

8. There is No Evidence That Shifting Search Queries from Google to DuckDuckGo Would Improve Its Search Quality or Output

582. Plaintiffs' case is predicated in part on their assertions regarding the purported effect of additional user interaction data (*i.e.*, click-and-query data) on search quality. DOJ Pls.' Am. Compl. ¶¶ 36, 95, 113.

583. DuckDuckGo chooses as a matter of policy not to retain the kinds of user interaction data that Plaintiffs contend would be useful to improving the quality of a full-fledged general search engine. Tr. 2063:15-2064:10 (Weinberg) ("We have a running anonymous database, I would say, of user interaction data that runs I think for the last 28 days. . . . I don't think all clicks are logged."), 2064:15-18 ("Q. And I think you indicated earlier that these queries

and clicks are not stitched together into sessions, they're each individualized; is that accurate? A. Yes."), 2085:19-2086:7 ("And we use the location that we get via the IP address, and then we throw it away after the search is done.").

584. There is no evidence that the approach DuckDuckGo takes to using data is conducive to developing a search engine with results that are of higher quality than Google search results. Tr. 2066:24-2067:19 (Weinberg) ("Q. So you're not familiar with the extent to which Microsoft uses user interaction data generated by Bing users to develop search results? A. No. Q. And you're not really familiar with Bing's privacy policies, as a general matter? A. I mean, as a general matter, roughly maybe, but not in any detailed way, no. Q. And you don't know the extent to which the quality of the search results that Microsoft delivers to DuckDuckGo depends upon using the types of user interaction data that DuckDuckGo says it doesn't retain, correct? A. I don't know how they're developing their algorithms exactly, no.").

585. There also is no evidence that the approach DuckDuckGo takes to using data is conducive to developing a high-quality ads auction. Tr. 2068:2-22 (Weinberg) ("Q. On the sort of Microsoft ads side of the house, do you know which kinds of user and advertiser data Microsoft uses to sort of optimize its ads auction infrastructure? A. I mean, generally I know that they're looking at conversion data and things like that, but I don't know specifically exactly how their algorithm works or what they're using . . . . Q. I mean have you ever studied or analyzed whether it's feasible to replicate the search ads network that Microsoft runs and syndicates to you using only the data that DuckDuckGo collects? A. I mean, a bit. I mean, we've thought about before making our own ad feed, and kind of given up at a different point before that, which is just the sales effort required was going to be too distracting for us.").

C. Yahoo's Failure to Innovate and Successfully Compete

1. Yahoo Competed Heavily for Search Distribution in the 2000s, But Failed to Convert Users

586. During the 2000s, Yahoo competed with Google and Microsoft to be the preloaded search provider on browsers, devices, and portals in the United States. *See infra* § XI.A.2; Tr. 3577:16-3578:5 (Nadella).

587. For instance, Yahoo competed with Google to be the default provider on Apple's Safari Browser. Apple selected Google due to its superior quality, but entered into agreements with Yahoo for alternative promotion. *Infra* § XI.A.2; Tr. 9752:21-9753:12 (Murphy); DXD-37.048 [redacted] Tr. 2622:19-2623:10 (Cue) ("[A]t the time we thought Google was the best search engine, Yahoo! was still a close second and was popular. So we -- as we've done since then, we built it in so that customers could easily switch. And so we wanted to make sure that people knew that if they bought an iPhone and they were using Safari, they could also use Yahoo!.").

588. Yahoo also competed for and won search distribution deals with wireless carriers. Tr. 356:19-25 (Barton) ("Q. You were shown some documents earlier today about -- that made reference to deals that Verizon did with Bing and AT&T did with Yahoo! . . . Had you tried to get deals with Verizon and AT&T at the time those deals actually were entered into with rival search engines? A. Yes, definitely, yeah."); UPX0134 at -865 (Email from Chris Barton "AT&T shipped Yahoo on Android phones. Verizon shipped Bing. America Movil shipped Yahoo. . . . You can bet that Microsoft and Yahoo will enter contracts for search on Android through carrier deals if we do not.").

589. [redacted] DX0935 at .075.

590. Even on devices in which Yahoo was set as the default, Google received the vast majority of search traffic. For instance, an analysis commissioned by Microsoft found that Google received 87% of queries on AT&T RIM devices and 88% of queries on T-Mobile RIM devices, compared to 13% and 11% for Yahoo respectively, despite Yahoo being the default search engine on both. Tr. 9766:17-9767:14 (Murphy) ("[I]ndeed, on the devices that had either Bing or Yahoo! as the default, the vast majority of people searched away from that default, probably in these days mostly by going to google.com because that's where a lot of people went."); DX0440 at .013.

591. By 2010, Google accounted for approximately 80% of general search engine usage in the U.S. compared to just 9.2% for Yahoo. Tr. 9881:13-9884:18 (Murphy); DXD-37.123, .125.

2. Yahoo Eventually Stopped Crawling the Web and Providing Its Own Algorithmic Search to Focus on Other Products

592. In the late 2000s, Yahoo decided to shift its business model from crawling the web and providing its own algorithmic search results to instead syndicating search results from another search provider. In 2008, Yahoo first attempted to get its search results from Google, but the Department of Justice blocked that deal. Ramalingam (Yahoo) Dep. Tr. 331:18-332:24.

593. In 2009, Yahoo entered a [redacted] agreement with Microsoft under which Yahoo would receive algorithmic search and paid search (*i.e.*, search advertising) results exclusively from Microsoft [redacted] Yahoo thereafter stopped crawling the Web. Ramalingam (Yahoo) Dep. Tr. 305:3-9, 332:25-334:06; Tr. 3641:5-3642:1 (Nadella); DX0960 at -364-377, -468-475 (§§ 2.1, 2.2, 19).

594. Yahoo abandoned algorithmic search in order to lower its investment in Yahoo Search and instead focus on other, more popular Yahoo products. Tr. 3641:5-3642:1 (Nadella) ("Q. Because Yahoo -- in 2009, as part of that deal, Yahoo! stopped crawling the web, right? A. That's correct. Q. Yahoo! stopped investing in search technologies, correct? A. That's correct."); Ramalingam (Yahoo) Dep. Tr. 297:03-17, 311:18-314:06; DX0271 at .001 (Press release for Microsoft/ Yahoo deal: "Under this agreement, Yahoo! will focus on its core business of providing consumers with great experiences with the world's favorite online destinations and Web products. . . . [T]his deal will help us increase our investments in priority areas in winning audience properties, display advertising capabilities and mobile experiences.").

595. In addition to Yahoo Search, Yahoo owned and operated a number of products including Yahoo Finance, Yahoo Sports, Yahoo Mail, and Yahoo News. These products are more popular than Yahoo Search in the United States. Tr. 1092:25-1093:24 (Higgins (Verizon)); Ramalingam (Yahoo) Dep. Tr. 313:16-314:06.

596. By abandoning algorithmic search, Yahoo's search quality came to depend on Microsoft's search and search ads quality. [redacted]

[redacted].

597. [redacted]

598. [redacted]

599. [redacted]

600. [redacted]

601. [redacted]

[redacted]

3. Mozilla Replaced Yahoo Due to Its Poor Search Quality

602. In December 2014, Yahoo won an agreement with Mozilla to be the preloaded default search engine on Mozilla's Firefox browser. *Infra* § XI.B.2

603. In order to assuage Mozilla's concerns about Yahoo's search quality, Yahoo promised to implement specific innovations to improve the quality of its search product. Baker (Mozilla) Dep. Tr. 71:02-05, 71:06-07, 71:09-72:13 ("Q. At the time that you selected Yahoo, did you consider Yahoo to be on par with Google in terms of search quality? A. We did not . . . . We expected to be able to work with Yahoo! to innovate, and we expected them to invest in a set of specific things about search results or search experience that I think were outlined in the contract."); [redacted]

604. Yahoo, however, failed to invest sufficiently in its product quality, resulting in Mozilla terminating the agreement in 2017. *Infra* § XI.B.2.

D. Neeva's Business Model of Charging for a Traditionally Free Product Failed

1. Neeva's Founders and Investors Had Extensive Experience in the Search Engine Industry

605. Neeva was a start-up founded by former Google employees, including Sridhar Ramaswamy. Mr. Ramsawamy had worked at Google from 2003 to 2018, including in very senior posts where he reported to the CEO and managed Google's ads, commerce, search infrastructure, and privacy teams. Tr. 3667:3-3668:15 (Ramaswamy).

606. Neeva began developing an enterprise search service in 2019 before deciding in late 2019 to focus on building a consumer search engine. Tr. 3732:20-3734:4 (Ramaswamy).

607. Sequoia Capital and Greylock Ventures—which are among the most sophisticated venture capital firms in Silicon Valley—invested in Neeva. Tr. 3672:6-13 (Ramaswamy), 3732:7-14. Mr. Ramaswamy also invested his own money and time in Neeva. Tr. 3732:15-13 (Ramaswamy).

608. Neeva, whose leadership came from Google, entered the consumer search engine business with full awareness of the agreements challenged by Plaintiffs in this case. Tr. 3691:10-17 (Ramaswamy).

609. Neeva's leadership was also keenly familiar with the question of whether having user data on the scale of Google was necessary to deliver quality search results and believed that it was not an impediment using modern machine learning systems. Tr. 3781:23-3783:20 (Ramaswamy) ("Q. And what were you communicating would be different about Neeva's approach to search ranking in that slide? A. See, we spoke yesterday about the part of scale and how scale was important to develop a search engine which uses things like query [click data] in order to figure out the most popular domains in order to figure out the best pages for search queries. Investors understand that. And so one of the questions that they always have is how an upstart -- how a startup, which definitely has no users to start with, is able to create a search experience that can compare with both the years of software expertise that, say, a Google or a Bing has put in but also needs like the data from users and usage.").

610. Mr. Ramaswamy concluded that Neeva could compete successfully on search quality with Google in the U.S. and certain other countries with approximately 2.5% of general search users in those countries. Tr. 3778:9-3779:25 (Ramaswamy) ("Q. And I appreciate that 2.5

sounds more specific than perhaps you were thinking about it, but at roughly that scale, you believe Neeva could compete successfully with Google, correct? A. Yes.”).

2. Neeva Believed It Could Build a General Search Engine from the Ground Up and Did So in Short Order

611. Neeva launched its consumer search engine in June 2020. Tr. 3734:5-7 (Ramaswamy).

612. At first, Neeva primarily delivered search results generated by Microsoft Bing to Neeva users, but Neeva simultaneously worked on developing its own search infrastructure for the purpose of gradually reducing its reliance on Bing. Tr. 3739:14-16 (Ramaswamy) (“Q. Now, at the outset, when Neeva launched, it used Bing to provide its search results; is that right? A. Yes, sir.”), 3775:9-14 (“Q. There came a time when Neeva developed its own search engine as opposed to relying on the Bing API; is that right? A. That’s correct. The efforts started late 2019. And we were gradually replacing Bing with the results of our own search engine.”).

613. When Neeva decided to develop a consumer search engine in late 2019, Mr. Ramaswamy determined that Neeva could build a web index that would allow it to compete with Google in the U.S., and Neeva accomplished that task over the course of the next two years. Tr. 3775:15-3776:10 (Ramaswamy) (“Q. And part of doing that was developing a system to crawl and index the web; is that right? A. That’s correct. Q. And you believed that Neeva could build a web index that allowed it to compete with Google; is that right? A. Yes, I definitely did believe that in 2019, and over the space of the next two years we went about doing exactly that. . . . Q. And at least with respect to the United States, Neeva accomplished building such an index that would allow it to compete with a search engine like Google? A. That is correct.”).

614. Neeva independently developed techniques for ranking web results in response to its users' queries, and by 2022 it was in position to use its own index and ranking infrastructure to respond to the vast majority of user queries it received. Tr. 3776:14-3777:6 (Ramaswamy).

615. Mr. Ramaswamy concluded that in the few short years of its existence, Neeva's search quality was "better than that of Bing and very comparable to Google" in various verticals (*i.e.*, substantive categories of user queries). Tr. 3777:7-3778:6 (Ramaswamy).

3. Neeva Used Modern Machine Learning and Commercially Available Data to Build Its Own Search Infrastructure

616. When Neeva decided to develop a general search engine from the ground up in late 2019, Mr. Ramaswamy determined that Neeva could use modern machine learning techniques, including natural language processing, to deliver quality search results without having access to the volume of historical user interaction data available to search engines such as Google and Bing. DX0690 at .015 ("The Tech Vision" / "A ranking system built from ground up for signed-in users using modern ML" / "Re-imagine search ranking <u>using modern ML</u>" / "Use learn-to-rank and deep learning in lieu of traditional information retrieval (IR)" / "Use deep learning NLP for content understanding and personal language models."); Tr. 3781:23-3783:20 (Ramaswamy).

617. Neeva proved many of the technical hypotheses that it initially laid out in late 2019 by successfully using modern machine learning techniques to provide quality search results. Tr. 3781:23-3783:20 (Ramaswamy) ("And so that was the rough idea. And as I said, in a number of cases, for example, when it comes to figuring out concepts for a query, related queries, or correcting misspellings that people often have when they type in or speak queries, we were able to very, very successfully do that. We were also able to use content understanding, which is roughly to understand what the main intent of a pretty long page is. . . . So we've used a

number of these techniques to -- in order to make the quality of the search experience better. So like many of the technical hypotheses up here were things that we proved over the course of the following three years after this presentation."); DX0690 at .015.

618. Even though Neeva did not have access to the volume of historical user data available to established search engines such as Google and Bing, Neeva believed it was able to use modern machine learning techniques to provide quality search results through the efforts of its own employees and access to commercially available data that it licensed to train its models. Tr. 3783:24-3784:9 (Ramaswamy) ("Q. And in growing those models, Neeva didn't have access to the click-and-query data that, say, a Google had or a Bing had; is that right? A. So we were able to license some anonymous information that served as basically a bootstrap for some of these models. And so -- but this is widely accessible, certainly, to, you know, to Google and Bing. And in that sense, these were small datasets, these were not special. And definitely much of the software, the rating systems that we use, the data that we got from raters, these were all things that we invested in ourselves.").

619. In early 2023, Neeva launched a feature called Neeva AI, which used generative artificial intelligence models to display answers to a subset of user queries directly on the search results page, in addition to providing links to external webpages. Tr. 3671:2-3672:5 (Ramaswamy) ("But our sort of big breakthrough realization came in early 2022 where we realized that the power of generative AI models could really create a much, much better search experience where instead of providing a set of links, we could provide concise and useful answers to many queries that users could put in. And that's what we worked through through last year. So Neeva transformed itself from being an ads-free private search engine -- we kept all of it

-- to being more of an answer engine powered by AI working on top of the search infrastructure that we had built in the early years of Neeva.”).

620. Neeva’s generative AI models built upon the search ranking techniques that Neeva had developed and were capable of understanding the contents of the webpages that Neeva had indexed. DX0299 at .001-.003; Tr. 3788:2-18 (Ramaswamy) (“Q. . . . And you write, ‘Thanks to Neeva’s independent search stack as we look at a page, we understand its contents, incoming links, and other authority signals that tell us whether the page is important and useful.’ Do you see that? A. Yes, sir. Q. And there, you’re referring to the documents that have been stored in Neeva’s index; is that right? A. That’s right. Q. And you are using these large language models to understand the contents of those documents, correct? A. That’s right.”).

4. Although Neeva Quickly Attracted a Substantial Number of Users, Very Few Paid to Subscribe to a Service That Competitors Offered to Users for Free

621. Unlike other general search engines such as Google and Bing that are free for users and generate revenue through advertising, Neeva’s business plan was to generate revenue by charging users a monthly or annual subscription fee. Tr. 3734:8-11 (Ramaswamy).

622. By relying on a subscription model, Neeva’s viability depended upon overcoming the “power of zero”—an axiom that consumers exhibit a strong preference for free products or services. Tr. 3735:11-17 (Ramaswamy) (“Q. Now, the Neeva business model depended on overcoming something you’ve described as the power of zero; is that right? A. That is correct. That is a phrase popularized by Dan Ariely who is a behavioral economist. Q. And the power of zero refers to the fact that people like stuff that’s free? A. Yes.”).

623. Even though Neeva’s consumer search engine was available to the public for less than three years, at its peak Neeva succeeded in attracting several million unique users per month. Tr. 3734:12-3735:10 (Ramaswamy).

624. Despite attracting millions of monthly users, Neeva was unable to overcome the "power of zero" and convert a significant number of those users into paid subscribers. By 2023, Neeva's revenue from user subscriptions was still "less than a million dollars." Tr. 3676:1-3677:10 (Ramaswamy).

625. The challenge of convincing enough users to pay for a new product to create a sustainable business is ubiquitous among start-ups across industries, and it was apparent to Mr. Ramaswamy and Neeva's other sophisticated investors from the outset. Tr. 3699:13-3701:12 (Ramaswamy) ("The problems that we would face were predictable four years ago, meaning that acquiring users, getting them into a habit is something that is tricky. Every startup founder has sort of dealt -- has dealt with this. And there is always a race to create a better product fast enough that you get enough users before your employees tire or your money runs out.").

5. Neeva Was Not Competing with Google for Any of the Promotional Opportunities at Issue in This Case

626. There is no evidence that Neeva sought to replace Google as the default search engine in a third-party browser such as Safari, or that Neeva sought to replace Google as the preinstalled or default search engine on any access point on any Android device.

627. Neeva asked Apple to be added to the list of search engines that are integrated into the Safari browser. In the U.S., that list presently includes Google, Yahoo, Bing, DuckDuckGo, and Ecosia. Tr. 3788:25-3789:12 (Ramaswamy) ("Q. Understood. Let's put up, we have a demonstrative we used before, DXD6. And, Dr. Ramaswamy, this is a collection of screenshots from an iOS device. Do you recognize that? A. Yes, I do. Q. And I want to focus on the right-most screenshot. A. Yes, sir. Q. And make sure I understand your testimony. Your request of Apple was that Neeva be listed along with the other five search engines that are currently listed on that screenshot; is that correct? A. That's correct."); DXD-06.001.

628. Google's Information Services Agreement with Apple does not restrict Apple's ability to add search engines to the list of options in Safari's settings menu, and there is no evidence that the agreement affected any decision by Apple not to add Neeva to the list. JX0033; JX0097.

629. There is no evidence that any company that is party to an agreement challenged by Plaintiffs in this case (*i.e.*, any browser developer, Android OEM, or wireless carrier) determined that it would be in the best interest of the company or its customers to distribute or promote Neeva in any manner that was prohibited by an agreement with Google, or that any such company refrained from promoting Neeva because of an agreement with Google.

6. As Macroeconomic Conditions for Technology Start-Ups Deteriorated in 2023, Neeva Sold Itself for More Than Twice the Amount Raised from Its Investors

630. In March 2023, Neeva's founders began discussing a potential sale of the company in light of significant changes in the availability of venture capital funding. Those changes reflected shifts in the macroeconomic environment, such as rising interest rates, and involved a reassessment of the valuation of start-ups like Neeva in relation to the revenue they were generating. Tr. 3674:16-3675:6 (Ramaswamy) ("Q. And is Neeva still available to the public? A. No. We launched AI-powered search earlier this year, and we are -- as I said, we were venture funded, we had raised a substantial amount of money. But Neeva also struggled with user growth. And with the changes in just the macro environment of things like interest rates, venture funding has changed pretty substantially in the past year. My co-founder, Vivek, and I came to the reluctant conclusion that we would not be able to build up a business fast enough to be able to continue raising capital to support the growth of the product and the team. So earlier this year, in May -- we actually started potential acquisition conversations in March. But earlier this year, in May, we shut down the consumer search engine, refunded the money that customers

had paid us, and got acquired by Snowflake, which is an enterprise data company.”), 3676:1-3677:10 (“And then in terms of the actual numbers, we were at a pretty modest place when it came to subscription revenue. It was actually less than a million dollars earlier this year. It was growing robustly, but it was quite small. That was all a part of our calculus for where we needed to get to in a world that had gone back to pricing companies as a small two digit multiple of their revenue.”).

631. In May 2023, Neeva was acquired by Snowflake, Inc.—a publicly traded company that provides a cloud-based data platform to thousands of enterprises—for total preliminary consideration of approximately $185.4 million in cash. Tr. 3792:12-23 (Ramaswamy). The amount Snowflake paid to acquire Neeva in 2023 was more than double the amount that had been invested in Neeva. Tr. 3794:9-13 (Ramaswamy).

VI. VERTICAL/SPECIALIZED SEARCH ENGINES

A. Google Monetizes a Small Percentage of Search Queries

632. Google strives to provide a quality response to every query for information, whether it’s commercial or non-commercial in nature. Tr. 1337:20-1338:13 (Dischler (Google)); Tr. 7314:14-25 (Raghavan (Google)).

633. A commercial query is one with business or commercial intent, such as seeking a product or service. Tr. 1328:14-1329:2 (Dischler) (“[W]hen people search on Google and are looking for commercial information, they’re looking for a variety of products and services.”).

634. In general, Google only serves ads in response to, and therefore only monetizes commercial queries. *See* Tr. 1443:4-9 (Dischler). These are a minority of the queries that it receives. Tr. 1443:1-3 (Dischler); Tr. 8396:16-8398:17 (Israel (Google Expert)) (Google “sell[s] ads on about 20 percent of their queries.”).

635. In those verticals where Google is likely to serve an ad, it faces intense competition from Specialized Vertical Providers ("SVPs") such as Amazon, Expedia, Booking, and Yelp. *See infra* §§ VI.C, D.

B. Google Has Created "Vertical" Search Experiences to Meet User Information Needs

636. A search "vertical" refers to a "class of information needs." Tr. 8221:11-25, 8228:4-12 (Reid (Google)); Tr. 9139:5-24 (Holden (Google)).

637. Over the past twenty years, Google has created features for many different search verticals in both commercial and non-commercial segments, such as News, Dictionary, Local, Weather, Sports, Movies, Books, Travel (Flights and Hotels), Shopping, Local Services, Stocks, Images, Sports Scores, Movies, and Health, among many others. *See* Tr. 8223:10-8224:1 (Reid); DX0115 at .012.

638. In various of these verticals, Google recognized that users were often searching for information that was not readily available on a webpage, and thus Google's crawlers would not be able to surface it to users. *See* Tr. 8224:2-8225:6 (Reid) ("And there's lots of time where that information just isn't on any web page, and so we didn't think users should be hampered just based on whether it's on a web page.").

639. Google's founders Larry Page and Sergey Brin "really, really had the desire that [a user] could come here and get any question answered," and did not think "users should be hampered" by whether the information they sought was available "on a web page." Tr. 8224:2-17 (Reid).

640. Thus, Google determined that it should "try and gather the data, whatever is necessary, [to] answer [a user's query]." Tr. 8224:2-17 (Reid).

641. Accordingly, Google introduced various verticals or "different search features or different layouts of the page to answer the question," and those features often include "structured information or highly fresh information that's different" from what the user can get on the web. Tr. 8222:3-19 (Reid).

642. Google acquires the content for its vertical features through data feeds, license agreements, directly from businesses and merchants, and from users in the world. Tr. 8224:18-8225:6 (Reid) ("But much of the information is not even on the web. So, we have feeds that we get, we have license data in various cases. In some cases, users give us data. In some cases, merchants across shopping and local give us data. We have, in the case of geo, actually sent people out into the real world to gather the data, or we have people call up businesses to gather data so that we can really build that up."); *see infra* § VI.E.1.b.

643. Google's Travel vertical team's mission is "buil[t] off of" the "overall Google mission, to organize the world's information, make it accessible and useful," and focuses on "utility, helping a user find what they need quickly and easily," "comprehensiveness," and trust—"[t]he user should be able to trust that they can come to Google and find all the information they're looking for objectively presented to them, as well as advertising information." Tr. 9143:6-18 (Holden).

644. Today, Google has a wide variety of verticals, including News, Weather, Sports, Movies, People, Books, Local, Flights, and Hotels. Tr. 8223:10-8224:1 (Reid).

645. Google's Hotels, Flights, Local Search, and Shopping verticals were the subjects of testimony and evidence presented during trial.

646. Google's Hotels vertical provides specialized travel results "primarily around hotel search capabilities, helping a user find information about a hotel and connect with a partner." Tr. 9142:15-9143:5 (Holden).

647. Google's Flights vertical provides specialized results focused on "helping consumers find information about flights, pricing, availability, et cetera and then connect with partners." Tr. 9142:15-9143:5 (Holden).

648. Google's Local vertical provides specialized results focused on "trying to help people find information about places." Tr. 8198:16-18 (Reid) ("Q. When you say 'local,' what do you mean by that? A. So, we're working on local search and really trying to help people find information about places.").

649. Google's Shopping vertical provides specialized shopping results to "[h]elp users understand their shopping options, so they can get the best for them." DX3249 at .036.

650. Google's Local Services vertical provides specialized results so that users can "find, compare and book trusted service providers." DX0144 at .002.

651. Other general search engines ("GSEs"), like Bing, also recognized the importance of verticals and have also launched vertical experiences. *See, e.g.*, Connell (Microsoft) Dep. Tr., 342:13-343:17; Tr. 6218:10-14, 6219:14-6221:4 Barrett-Bowen (Microsoft)) (testifying about DX0292A). Neeva and DuckDuckGo similarly recognized the importance of providing a vertical experience. Tr. 3688:9-25 (Ramaswamy (Neeva)); Tr. 1938:16-1939:23, 1966:9-1967:10 (Weinberg (DuckDuckGo)).

C. SVPs Offer Search Services for Specific Vertical(s)

652. A "specialized vertical provider" refers to a search engine where a user can go to search within a particular search vertical or verticals.[5] *See, e.g.*, Tr. 2168:23-2169:6 (Giannandrea) ("[V]ertical search engines . . . like Amazon or kayak.com or anyone that searches a very narrow set of content."); Tr. 8221:11-25 (Reid) (explaining that a vertical is "a class of information needs" for which a search provider will provide "different information" or "organiz[e] the information in a different way.").

653. Much like GSEs, vertical search engines provide advertisers with spaces for advertising. Tr. 3649:7-9 (Nadella (Microsoft)) ("Q. And each of these vertical search engines also has advertising on them, correct? A. That is correct."); Tr. 6572:15-6573:12 (Hurst (Expedia)) ("Q. . . . you were asked a few questions earlier this morning about the ads that Expedia Group sells on its platforms . . . [o]ne of those forms of ads is called Expedia travel ads? A. Yes.").

654. SVPs primarily operate in commercial verticals. *See* Tr. 8437:24-8439:2 (Israel) ("To me, what the lesson of commercial verticals has told us is that where there's money to be made, SVPs pop up and they compete for advertising. So, if there were some potential to make money, to actually monetize any of the noncommercial verticals, I think the lesson tells us SVPs would compete for that.").

655. Google competes for users and advertisers with, among others, travel SVPs, local SVPs, and shopping SVPs. *See infra* §§ IX.A, B.

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[5] SVPs are also sometimes referred to as a "vertical search engine," a "vertical search provider," or a "special purpose search engine."

656. Travel SVPs such as Booking monetize all results on their search pages. Tr. 5302:7-18 (Dijk (Booking)) ("Q. And Booking is charging that money and accepting that money so that the advertiser can feature its ad higher up than what you described as an organic result; is that also fair? A. In our business, there is no such thing as an organic result, because hotels or partners will always pay a commission. That's a difference.").

657. In Travel, SVPs include both online travel agents ("OTAs") and metasearch engines. Tr. 9143:19-9144:3 (Holden).

658. Online travel agents are "places where consumers can go to look for information about flights or hotels or car rental or things to do," such as "pricing and availability information," "review information," and "other information about the products," and "then ultimately, they can reserve a room or a hotel through that online travel agent and enter a consumer relationship with that company." Tr. 9144:19-9145:4 (Holden).

659. Metasearch engines operate at a further level of aggregation and gather information related to travel across the web to present to consumers in one place offerings from many different companies, including OTAs and suppliers (*e.g.*, hotels and hotel chains). Tr. 9144:4-12 (Holden).

660. Large metasearch SVPs include, for example, TripAdvisor and Kayak. Tr. 9144:13-18 (Holden) ("Q. And can you provide some examples of those types of companies [metasearch providers]? A. Yeah. Large, good examples of that are Tripadvisor, Kayak was primarily in flights in the past but hotels also. Those are examples of that. There are others as well, too.").

661. Large OTA SVPs include, for example, Expedia Group and various of its subsidiaries and Booking Holdings and various of its subsidiaries. Tr. 9145:5-13 (Holden) ("Q.

And can you provide some examples of large companies . . . that . . . are online travel agents? A. Sure. There are a couple of large ones. One's the Expedia group, which owns a set of online travel agencies underneath that umbrella organization. And then there's Booking Holdings, which also owns a whole suite of online travel agents as well."); DX0308 (Expedia Group 2022 Form 10-K) at .040, .073; DX3114 (Booking Holdings 2022 Form 10-K) at .003.

662. Expedia Group owns a number of SVP subsidiaries across both the metasearch and OTA space: Expedia, Hotels.com, Vrbo, Trivago, Orbitz, Travelocity, Hotwire, WotIF, eBookers, CheapTickets, CarRentals.com, and Expedia Cruises. *See* DX0308 at .040, .073.

663. Booking Holdings owns a number of SVP subsidiaries across both the metasearch and OTA space: Booking.com, Priceline, Agoda, Rentalcars.com, Kayak, and OpenTable. *See* DX3114 at .003.

664. Other SVPs in the Travel vertical include, among others, Hopper, which focuses on flights and hotels; and Airbnb, which focuses on vacation rentals and lodging. Tr. 9199:16-21 (Holden) ("Q. What is Hopper? A. Hopper is a provider of -- was typically in the past, flight search capabilities. I think they might have hotel search capability as well now too. But it's another place that consumers can go to to look for travel information."), 9203:25-9204:23 ("Well, Airbnb has come out with a great offering the consumers engage with highly. They have a wonderful native app that people enjoy using. And when people often think of vacation rental content, they think Airbnb.").

665. In Local, large SVPs include, among others, online review platforms such as Yelp, OpenTable, and TripAdvisor; local services aggregators such as Angi, Thumbtack, Handy, and TaskRabbit; and mobile apps focused on a specific local subvertical such as DoorDash (food delivery) and Rover (pet services). Tr. 8201:22-8203:7 (Reid) (discussing local SVPs

DoorDash, OpenTable, Yelp, and Tripadvisor), 8252:19-8253:13 (describing mobile apps focused on local subverticals); Tr. 8395:13-8396:5 (Israel) (testifying about DXD-29 at .017), 8975:20-8977:2 (testifying about DX0085 at .003, .006, which lists Thumbtack, Porch, Match, Handy, Yelp, Angie's List, and TaskRabbit, among others); *see also* DX0124 at .031 (discussing Rover and Wag); *see infra* § IX.A.1.

666. In Shopping, large SVPs include, among others, Amazon, Walmart, eBay, The Home Depot, Etsy, Overstock, and Wayfair. Tr. 8395:13-8396:5 (Israel) (testifying about DXD-29 at .017), 8425:15-8426:17 (testifying about DXD-29 at .028, which lists Target, eBay, Walmart, and Amazon, among others), 8978:17-8979:18 (testifying about DX0225 at .006 ("Amazon and Walmart continue to rank 1st and 2nd across [brand health] metrics[.]")); Tr. 7312:1-3 (Raghavan) (testifying about DXD-21 at .006); *see also* DX3249 at .048.

667. As discussed in the paragraphs below, SVPs have grown significantly over time. DX0253 at .001.

668. SVPs in the Travel vertical have experienced significant growth over the past decade. Tr. 6536:1-14 (Hurst) (testifying about DX0273 at .010) ("Q. Okay. So this is one of those presentations. And if you look at slide 9 of this presentation, this shows certain metrics for the Expedia Group as a whole, including revenue and gross bookings. Do you see that? A. I do. Q. And so for revenue, Expedia Group's revenue doubled from 2014 to 2018? A. Yes. Q. And so did Expedia Group's gross bookings? A. Yes. It's a little bit [wind aided]. So from '15 to '16, we would have added Vrbo to the group. So that's why it kind of pops more in that year, because there's an acquisition. But yes."), 6536:23-25 ("Q. And it's true that Expedia's revenues were also higher in 2019 than they were in 2018? A. Yes."); *see also* Tr. 5310:11-17, 5356:16-5357:11 (Dijk) (testifying about DXD-13 at .0042); DX0253 at .001.

669. Whether measured by revenue, gross bookings, or company stock price, Booking and its parent, Booking Holdings, have seen tremendous growth and success from 2006 to present. Tr. 5356:22-5359:14 (Dijk) (testifying about DXD-13.0042-.0045).

670. SVPs in the Travel vertical continue to grow. DX0310 at .005 (TripAdvisor 2022 Form 10-K) ("OTAs are the fastest growing channel in the travel experience market and are expected to undergo significant growth going forward, with the OTA channel expected to experience a compounded annual growth rate ('CAGR') of 62% from 2020 to 2025[.]").

671. For example, Expedia Group reported that 2022 was a "record" year in terms of bookings, revenues, and profits. Tr. 6545:23-6546:18 (Hurst) (testifying about DX0590 at .002).

672. A substantial portion of SVP traffic is "direct," *i.e.*, traffic that comes to the SVP website or app without navigating via a search engine. Tr. 6513:25-6514:3 (Hurst) (explaining that direct traffic is "anyone who goes directly to [Expedia's] URL, so types it in or opens the app[]"), 6553:1-6555:20 (testifying about DX2026 at .004, Expedia's earnings call transcript, and explaining that globally, nearly two-thirds of Expedia's gross bookings come from direct traffic); Tr. 5310:11-14 (Dijk) (testifying that Booking's "direct [traffic] channel has continued to grow" and discussing PSX00094A at .011, showing that Booking "increased its direct channel" from 2019 to 2023, with direct traffic making up [redacted] of its bookings); Soo (OpenTable) Dep. Tr. 108:17-109:12 [redacted]

673. As discussed in the paragraphs below, SVPs in the Local vertical have grown significantly as well.

674. In 2021, Yelp had "record annual adjusted EBITDA margin." Stoppelman (Yelp) Dep. Tr. 55:12-18 (testifying about DX0588 at .025); *see also* Stoppelman Dep. Tr. 56:25-57:6;

DX0313 (Yelp 2022 Form 10-K) at .006 ("Our performance in 2022 . . . included record annual revenue and profitable growth[.]"), .049 (reporting $1.19 billion in annual revenue in 2022).

675. OpenTable "has the large[st] diner network" in the United States amongst restaurant reservation sites. Soo Dep. Tr. 117:12-17 [redacted]

676. Angi's revenue increased 15% to $1.7 billion from 2021 to 2022. DX0315 (IAC 2022 Form 10-K) at .047; *see also* Stein (IAC) Dep. Tr. 45:24-46:9 [redacted]

677. Thumbtack is valued at [redacted] and its CEO expects it to [redacted] Daniels (Thumbtack) Dep. Tr. 172:16-25 [redacted]

678. And in the shopping vertical, Amazon, for example, has experienced [redacted] compounded annual revenue growth from 2011 to 2021. DX0253 at .001; Tr. 5871:22-5872:3 (Whinston (DOJ Expert)) ("Q. Would you agree that Amazon has been successful in providing a high quality online shopping experience that customers look to first without going to a general search engine? A. Yes. I think Amazon has been, out of various SVPs, you know, the one that kind of stands out in terms of its success in that way.").

679. In 2021, Amazon had a market capitalization of approximately $1.7 trillion. DX1195 at .001.

D. Google Faces Intense Competition from SVPs and Innovates to Meet That Competition

680. Google launched the Local vertical to help users who needed information that was not on the web in 2004, such as local business information that might otherwise only exist in the White Pages. Tr. 8227:21-8288:12 (Reid) ("Q. And this is circa 2004. Why did Google launch this local vertical? A. So . . . there's a set of information needs that people wanted for which the information isn't available in the web. There's still a huge number of businesses today, even in a country like U.S., that . . . do not have their information posted on a web page. This was even more true in 2004. But, it's a very real need. People wanted to know what was the phone number of the business. Where do they navigate? They wanted to find a plumber. And you might have the White Pages book, but, first of all, that might be 11 months old. . . .").

681. At the time, users could get local information from the White Pages, from friends, or from other GSEs, with local review sites like Yelp soon launching and competing with Google. Tr. 8228:13-8229:4 (Reid).

682. Since then the competition in the Local vertical has "dramatically increased" and includes niche local players that capitalize on the app ecosystem as well as other entrants like Apple Maps, social media platforms, and food delivery and restaurant reservation sites. Tr. 8252:19-8253:13 (Reid) ("Q. In the United States, how would you describe the trend in the level of competition in the local vertical? A. I think it has, honestly, dramatically increased. There's just a lot more players in the space. They're answering a lot of different ways. Social media was not something we had all thought about 20 years ago as a competitor. I think Apple Maps has also increased in the space compared to five years ago or ten years ago. . . . there's a lot more

players that just focus on particular angles because people can access them via apps. So they can build those relationships and they can switch between the different apps for their uses."), 8251:19-8252:18 ("[W]ith younger users they are increasingly using Instagram and TikTok for discovering things like restaurants. . . . I would actually say food delivery sites and restaurant reservations . . . . [Y]ou go directly to DoorDash to decide where to go eat because you're only going to pick the places that will deliver from DoorDash, and so you don't need to go to Google.").

683. Google has invested significantly in the Local vertical, launching new features on a "constant basis" to better serve its users. Tr. 8242:7-25 (Reid).

684. Google monitored and reacted to the competitive landscape in Local. Tr. 8246:4-12 (Reid) ("Q. And why did Google look at the competitive landscape in the local area? A. So, you know, in general, whether it's Search or local or maps, we think we can always learn from other people, learn from competitors about what are they doing well? What does it teach us about what are user expectations, how to better help users? So, we always look at that question, about what are they doing well, what should we improve on, how do we better serve our users.").

685. Over a decade ago, Google began to "observe a decline in generic queries across a number of verticals" as other companies were entering various vertical markets. Tr. 9155:12-9156:7 (Holden) ("There were a number of companies that are then [e]merging from 2008, 2009 that, in essence, were sort of cherry-picking some of these most interesting commercial verticals, and we were seeing declines in queries in each one of these segments.").

686. Google feared that "potentially consumers were starting to go elsewhere to get their questions answered." Tr. 9145:17-9146:6 (Holden).

687. In the Travel vertical, there was "strong [navigational] query growth" for both online travel agents and metasearch providers, while generic queries like "Hotels in Washington, D.C." were declining. Tr. 9152:19-9153:12 (Holden); DX0046 at .007.

688. Google was "most worried about . . . [the] actual decline in queries, not slower growth but actual declining queries on generic queries; again, the categorical queries, the ones like 'Hotels in Washington, D.C.'" Tr. 9152:19-9153:12 (Holden); DX0046 at .007.

689. Richard Holden, former Vice President of Product Management for Google Flights and Hotels, explained that Google's query analysis signaled that "[consumers] were going elsewhere to get their answers related to travel queries," meaning that Google was not fully addressing users' information needs and, secondarily, "[i]f these generic queries are going elsewhere, our advertisers would have less reason to come to Google over time, buy advertising, and we would have less relevant leads to deliver to them over time, thereby harming our business as well." Tr. 9153:13-9154:2 (Holden). Mr. Holden further explained that Google's query analysis signaled that Google was "losing relevance with consumers," who "were going elsewhere to get their answers related to travel queries." Tr. 9153:13-9154:2 (Holden).

690. Google faced "very strong competition" in the Hotels vertical, where it competed against large online travel agents such as Expedia and Booking and metasearch providers like TripAdvisor, Kayak, and Trivago. Tr. 9151:16-9152:1 (Holden); DX0046 at .007.

691. Mr. Holden testified that these competitors were "strong competitors in the sense that they had lots of resources focused on this set of queries from users that were very focused on travel in particular, and they had invested years and many, many resources in building what we thought at the time was a superior user experience" while Google was "falling behind as a result." Tr. 9152:10-18 (Holden); DX0046 at .007.

692. There were likewise strong competitors to Google in the Flights vertical, including Expedia, Priceline, and regional players that later grew larger like Skyscanner. Tr. 9154:9-24 (Holden); DX0046 at .015.

693. To better compete with those rivals, Google increased its investment in the Travel vertical. Tr. 9155:12-9156:7 (Holden) ("And from that point forward, we started to invest in a number of verticals. Travel was one of them."), 9160:15-9161:16 (explaining that Google invested in the travel vertical to out-compete travel SVPs) ("Q. And if we turn to Slide 16, can you summarize what was the plan for the flight search at that time? A. Similar to the one in hotel search in the sense that the number one theme for the 2014, going into it was we wanted to build the best in-house flight search. . . ."); DX0046 at .016.

694. Today, Google continues to face competition within the Travel vertical. Tr. 9189:10-13 (Holden) ("Q. So today, how would you describe the overall trend in competition in the travel vertical in the last ten years? A. I'd say it's been very competitive and gets increasingly competitive over time."). Google views its key competitors in the travel space as Booking.com, Expedia, TripAdvisor, Kayak, Trivago, and Airbnb, with increasing competition from social platforms like Facebook and TikTok. Tr. 9189:10-23 (Holden).

E. Examples of Google's Vertical Search Innovations

695. Product and feature innovation in the Local, Flights, and Hotels verticals in particular have been the subject of trial testimony as witnesses described how Google developed features to display relevant and useful search results for these verticals. *See, e.g.*, Tr. 8242:18-25 (Reid); Tr. 9139:5-17, 9160:15-9161:16 (Holden).

1. Local

a. Local SERP Design

696. Beginning around 2004, users could reach an early version of Local by clicking on a tab or link from the main web results, and Google would provide information akin to the White Pages, such as business name, address, and phone. Tr. 8226:21-8227:20 (Reid) ("We didn't know things like opening hours. We didn't really have reviews or photos, and just the amount of information we got was, you know, sort of basically as if you had scanned the White Pages on, and then attached some of the relevant ones."); DXD-28.010.

697. Today, for example, a local search for "vegan Mexican food San Diego" will return a map and list of restaurants on the SERP, and each restaurant listing will display the address, opening hours, price range, user reviews, and photos. DXD-28.009.

698. For restaurant searches, the Local vertical also allows users to filter restaurants by tapping on categories at the top of the map, such as "delivery" or "open now." DXD-28.009.

699. If a user selects a particular business, they can also book a reservation or appointment seamlessly without leaving Google's interface. DX0101 at .021.

700. Google's SERP will also show relevant web results from review sites like Yelp. And if users are still scrolling because they did not find what they wanted, Google may also provide suggestions for other related searches and surface results for a broader but related query, like "healthy restaurants." Tr. 8225:22-8226:20 (Reid); DXD-28.009.

b. Local Data

701. Google's "[M]aps and [L]ocal product lives or dies based on the quality of the data." Tr. 8237:9-18 (Reid).

702. Acquiring comprehensive local data is challenging because much local business information is not on the web and, even when it is on the web, the information is not structured

for ingestion into a database. Tr. 8224:18-8225:6 (Reid) ("So, generally, if you crawl a web page, it may contain some of this information, but it's not structured. . . . I mean, it's structured in a web page format, not in sort of a database key value pair. But much of the information is not even on the web.").

703. Google relies on multiple sources for its local data—it licenses data feeds, asks users and merchants for data, and even sends people out into the real world to gather the data. Tr. 8224:18-8225:6 (Reid).

704. After gathering local data, Google needs to perform quality control because there is a risk of inaccuracy due to spam or simply because businesses open, close, and move frequently. Tr. 8233:8-8234:8 (Reid) ("And so it's a lot of work to both gather the data, but then to ensure the data stays up to date, to ensure that you can filter out [spam]."), 8234:9-24 ("We will get user reports that says the hours are wrong or this business is closed, and then the vendors will call up the business and say, Do you still exist? Are you open? Are you temporary closing? Or, are your hours correct? So, we're doing that. Then, we will also go look at data that we think is suspicious and say, Do they think it's a [spamm]ing business or not?").

c. Google Maps

705. Google Maps provides some of the underlying data behind the Local vertical, and Google has invested billions of dollars to create a model of the world based on accurate data. Tr. 8229:13-8230:12 (Reid) ("Q. I want to switch to the topic of investments. If you look at Google's investment in local and the other pieces of geo that you've talked about, what's the scale of that investment? A. So, it's quite substantial. I would say, over the years, we've spent billions of dollars trying to have really accurate data. . . ."), 8245:2-22 ("[W]e're really invested in building a great underlying model of the world.").

706. Today, Google Maps is "the primar[y] place people give [Google] user-generated content," which is critical to the Local vertical. Tr. 8245:2-22 (Reid) ("Q. And how important is having this Maps product to the local vertical? A. . . . Google Maps has also been really critical. It's the primaril[y] place people give user-generated content, more than Google Search, and so without that, that would have fundamentally changed it.").

d. User Generated Content

707. User Generated Content ("UGC") is any information provided by users, including but not limited to business openings and closings, opening hours, photos, and reviews. Tr. 8234:25-8237:3 (Reid).

708. Google realized early on that UGC would be important to keep local data fresh, and began cultivating UGC as early as 2005 to 2007, with increased efforts in the mid-2010s. Tr. 8236:21-8237:3 (Reid).

709. To encourage more users to submit UGC, Google made it easier and more intuitive to submit information ranging from photos to opening hours. Tr. 8236:9-20 (Reid) ("Q. What was your involvement in that effort? A. So, I was the engineering lead on a number of the projects for it over the years, really thinking about, like, how do we build out? If we're going to send emails, then we have to figure out who do we send emails to build out that feature, improve the flows, how do you make it easy for people to contribute in a way that's natural. Relatively easy to think about how you upload photos. A little harder to upload opening hours. They're highly structured. People make mistakes. How do you do a great job for that? You can then take an image and do OCR to understand the hours. So, all different efforts to make it easier.").

710. Google also created the Local Guides program, which awards badges to users for sharing their experiences and emphasizes the impact of each guide's contribution. Tr. 8235:12-8236:8 ("The local guides program has levels, it has badges, it has some perks. It's not really a

paid program. We really get the data from people who are eager to share about their experiences to improve their neighborhood. We have places in Brazil that were more off the standard map that Brazil would have, and they could go and they drew the map and they felt like they made their neighborhood be seen, and it was deeply empowering for them. So, a lot of effort to really make it feel exciting for users. We send emails to them that say, Did you know, thanks to your review, 1,000 people have benefited or a million people have benefited, so they understand the value [of] what they're doing.").

711. Ms. Reid testified that by 2019, half of the new places that Google discovered came from UGC. Tr. 8238:2-8239:14 (Reid).

712. As of 2019, Google had three billion user submitted photos in its corpus, and one billion of those photos were contributed in 2019 alone. That year, users also submitted 590 million reviews and there were 135 million unique Local Guides. Tr. 8238:2-8239:14 (Reid); DX0208 at .001.

e. Google My Business

713. Around 2006, Google created tools for businesses to contribute information about themselves in a program now called Google Business Center. Tr. 8240:25-8241:4 (Reid).

714. Ms. Reid explained that information from the merchant is crucial for comprehensive data, because UGC skews toward certain content types. Tr. 8239:20-8240:10 (Reid).

715. Merchants can submit information through the Google My Business site or edit information directly on Google Maps; for large chains like Starbucks, Google offers API access to update data like opening hours at scale. Tr. 8240:11-24 (Reid).

716. Google sets certain goals for supporting small businesses, and often launches product improvements in Google My Business that can make data uploads easier or give

businesses insight into how users are interacting with their place pages. Tr. 8242:7-17 (Reid); DX0101 at .012.

717. For instance, in June 2017 alone, Google planned to launch "Click to Chat expansion" allowing users to chat directly with businesses; "Local Posts" for merchants to post business updates and "highlight real-time content"; a "bookings tab"; and a host of other product changes. DX0101 at .012-.013, .015, .021.

718. Google "ship[s] lots of changes on a constant basis, some of them bigger, some of them smaller. But, [Google is] really trying to improve the experience. And [Google] tr[ies] [to] get changes out as quickly as [it] can for users so they can benefit." Tr. 8242:18-25 (Reid).

2. Flights

719. Google's Flights vertical helps "consumers find information about flights, pricing, availability," and connects the user with partners. Tr. 9142:15-9143:5 (Holden).

720. Mr. Holden testified that around 2014, Google realized that its Flights offering had a number of gaps compared to its competitors, so Google began to invest in creating "the best in-house flight search" by "acquiring pricing, availability information and doing it globally." Tr. 9158:17-9159:4 (Holden) ("Q. And what was the conclusion relating to the flights features? A. Well, this one we also indicated that [it] had gaps relative to some of the parties. . . ."), 9160:15-9161:17.

a. Flights SERP Design

721. Today, when a user enters a flights query like "Chicago to New York flights," Google will trigger a Flights unit on the SERP that will "tell the user in as condensed a space as possible what their options might look like," allowing the user to edit departure and arrival dates, choose economy versus business class, and select round trip versus one or two stop itineraries,

with the results instantly updating as the user edits the flight criteria. Tr. 9180:24-9181:25 (Holden); DXD-30.012.

722. The Flights unit also includes a Price Graph, where the user can roll over any date and instantly see how the price changes for particular departure or arrival dates. Tr. 9182:2-25 (Holden) ("Yeah, the user can roll over any particular date, and it will show, for a two-day stay or a three-day stay or a four-day stay, depending on what's been chosen above on dates what the price for those days are. They can also use their cursor and drag across it and the prices will re-render and the bar charts will change immediately for them as well."); DXD-30.013.

723. Beneath the Price Graph, Google displays airlines that fly the selected route and the associated pricing. Tr. 9182:2-25 (Holden); DXD-30.013.

724. If the user is not looking to purchase a future flight, but is instead checking on a current flight, the user can toggle to the "Flight Status" button or the "Airports" button to get that information. Tr. 9182:2-25 (Holden); DXD-30.013.

b. Flights Immersive

725. When a user clicks on the "Show flights" button of the unit, they are brought to the Flights immersive, which displays a more comprehensive list of flight options. Tr. 9183:6-19 (Holden) ("Yes, this is when a user has said, I'm interested in, you know, the X number of flights, clicked on that button on the search results page, they would end up in the immersive experience because we think that they're now truly interested in shopping."); Christensen (United Airlines) Dep. Tr. 14:16-16:3 [redacted]

726. Once a user clicks on a price, their browser connects them to the website of an airline or an OTA to book the flight, and Google does not charge for any part of that transaction because the Flights unit is not monetized. Tr. 9174:6-20 (Holden) ("There is no monetization in the flights unit so when consumers go to the airlines or the OTAs, there's no charge.").

727. The immersive also has a link to a more comprehensive Price Graph, where the user can edit the length of the trip and get a sense of how dramatically pricing may change. Tr. 9184:12-9185:7 (Holden); DXD-30.015.

728. There is also a link to the Date Grid, a matrix where the user can view a departure date on the horizontal axis and a return date on the vertical axis, and hover over the grid or drag the cursor up and down to see price volatility instantly. Tr. 9185:8-9186:8 (Holden); DXD-30.016.

c. Caching

729. For the flight prices on the Price Graph and Date Grid to populate immediately, Google created "probably the world's largest cache." Tr. 9186:19-9187:18 (Holden).

730. Holden explained that "[i]n the flight space in particular, when you think about the combination of every origin, destination, plus every flight option, plus nonstop or one stay, and across every departure date and a return date, the combination of that combinatorially is massive." Tr. 9185:8-9186:8 (Holden).

731. Google developed a method to store all this pricing and availability data, and refresh the cache constantly in case a user searches for it. Tr. 9185:8-9186:8, 9186:19-9187:18 (Holden).

732. Vast amounts of computing infrastructure allow Google to deliver pricing information that is "100 percent or nearly 100 percent accurate to that user instantaneously," even as the user changes dates or destinations quickly. Tr. 9187:19-9188:10 (Holden).

733. As a result, Google is "usually looked at as the leading flight search product in the market" due to the flight unit's speed and comprehensiveness. Tr. 9188:15-25 (Holden).

3. Hotels

734. Google's Hotels vertical helps a user "find information about a hotel and connect with a partner." Tr. 9142:15-9143:5 (Holden).

a. Hotels SERP Design

735. Initially, a user searching Google for a navigational query for a hotel would get traditional organic links, also known as the "10 Blue Links." Tr. 9147:3-11 (Holden); DXD-30.003.

736. Later, Google created Hotel Finder, a commercial unit, which started to gather hotel pricing and availability data, as well as reviews, and present the information to the user in a more structured manner. Tr. 9147:12-9148:9 (Holden); DXD-30.004.

737. Today, the Hotels unit on the SERP includes hotel listings on the left-hand side and a map of the hotel options with pricing information on the right. Tr. 9165:3-9166:7 (Holden); DXD-30.006.

738. The hotel listings include price, large photos, information on the number of reviews and the resultant star rating, a brief description of the hotel, and information on the hotel's amenities. Tr. 9165:3-9166:7 (Holden); DXD-30.006.

739. And the unit offers pivots across the top so that users can filter hotels by budget options or luxury stays. Tr. 9165:3-9166:7 (Holden); DXD-30.006.

740. On the map, a desktop user can roll over the hotel and additional information will pop up, so users can "get[] a general sense of the market" and figure out where hotels are located in relation to places they want to visit. Tr. 9166:8-20 (Holden); DXD-30.007.

741. The Hotels unit is organic, meaning hotel suppliers do not pay to appear—as such, Google's "organic search ranking algorithms control where the unit appears on the [SERP] [a]nd so it may show up in a variety of places on the page." Tr. 9167:14-9167:20 (Holden).

742. And within the Hotels unit, the hotel listings are organically ranked based on relevancy and attributes of engagement over time. Tr. 9170:1-20 (Holden).

743. Google acquires content for the Hotels unit from a number of different places: data feeds from OTAs such as Expedia and Booking; data feeds from metasearch engines like Tripadvisor, Kayak, and others; hotels themselves; industry consolidators; and other players. Tr. 9168:17-9169:25 (Holden) ("THE COURT: . . . In terms of the structured data that Google obtains, the pricing information and vacancy information, is that something that comes from hotel companies, information aggregators, all of the above? THE WITNESS: Yeah, it's a good question because it can be confusing at times. It does come from all of the above. We gather that data through working with online travel agents and setting up data feeds with them to gather the data. And we also go to hotels themselves, the suppliers, and gather that data. There's a whole bunch of other players in the industry often called bed banks or consolidators, and we gather data from them. . . .").

744. Google "work[s] across any of the parties in the industry, competitors or not, because [it is] seeking comprehensive information, all the information." Tr. 9169:11-25 (Holden).

b. Hotels Immersive

745. If a user clicks on the Hotels unit, that user is directed to the Hotels immersive. Tr. 9168:9-15 (Holden).

746. The immersive includes pivots at the top so the user can filter on different criteria, such as whether the hotel has parking or whether the hotel has four or five stars. Tr. 9170:22-9171:19 (Holden); DXD-30.008.

747. There are also options for the user to edit dates and locations. Tr. 9170:22-9171:19 (Holden); DXD-30.008.

748. Hotel listings on the left may show ads at the top, labeled "sponsored," and a full set of organic hotel listings underneath. Tr. 9170:22-9171:19 (Holden); DXD-30.008.

749. Each listing includes "star rating, reviews, number of reviews, amenities for the hotel, [and] pricing information for that particular date of arrival and departure." Tr. 9170:22-9171:19 (Holden); DXD-30.008.

c. Hotel Unpaid Booking Links

750. If a user clicks on a hotel in the immersive, a more detailed listing for that hotel will appear in the middle of the screen with information such as address, rating information, website link, and pricing and booking options from both OTAs and directly from hotel suppliers in the booking module. Tr. 9171:20-9172:16 (Holden); DXD-30.009.

751. The booking module includes both advertisements and organic results, and if the user clicks on "more options," the user will be shown an expanded list of organic results. Tr. 9173:1-17 (Holden) ("[O]ur goal is to have all offers, all pricing information for a consumer, and so we have both a paid section of the booking module, as well as an organic section."), 9174:23-9175:18; DXD-30.009-.010.

752. Google's partners, including hotel suppliers, OTAs, and metasearch providers, can choose whether to share pricing data with Google for the booking module, which generates leads for the partner. Tr. 9176:3-11 (Holden).

753. Any partner that does not want to buy advertising will still show up in the organic listings of the booking module, offering partners opportunities for unpaid leads. Tr. 9176:12-24 (Holden); Osmond (TripTease) Dep. Tr. 68:18-69:6 [redacted]

754. Internally, Google refers to these organic listings as hotel unpaid booking links. Tr. 9176:25-9177:3 (Holden).

755. Google introduced hotel unpaid booking links to ensure that the Hotels immersive could display the most comprehensive hotel pricing data. Tr. 9177:4-20 (Holden) (Google "want[s], at the end of the day, in the consumer mind to think, Google has all prices. . . . I can go to Google and trust that I'm not going to be missing out on something elsewhere."); *see also* Osmond (TripTease) Dep. Tr. 69:7-70:8 [redacted]

756. While OTAs also offer users the ability to book hotel rooms, OTAs typically have less comprehensive pricing data. Osmond (TripTease) Dep. Tr. 84:13-19 [redacted]).

d. Hotel Knowledge Panel

757. If a user searches for a particular hotel, which is a navigational query, Google will display a search results page with organic listings and advertisements related to the query rather than triggering the Hotels unit. Tr. 9178:7-9179:9 (Holden); DXD-30.011.

758. The right side of the SERP will include a Knowledge Panel on the hotel, which includes structured data from Google's Knowledge Graph. Tr. 9178:7-9179:9 (Holden) ("This is -- comes out of the work that we've done across Google, not specific to travel, but where we've invested a tremendous amount of resources over the last decade-plus in building out what we call the knowledge graph, which is a knowledge -- or a structuring data around the world around all entities that exist in the world. We do it for restaurants, we do [it] for a variety of things. And so we've worked with our teams across Google to use the knowledge panel capability or the knowledge graph capability to provide a comprehensive listing for a hotel as well."); DXD-30.011.

759. In case the user just wants to know more about the hotel, the Knowledge Panel includes imagery of the hotel, a link to a map and directions, a link to the hotel's website, as well as the hotel's address and phone number. Tr. 9179:10-9180:1 (Holden); DXD-30.011.

760. And if the user wants to book the hotel, the Knowledge Panel includes booking options that are both sponsored (labeled "Sponsored Featured Options") and organic (under "All Options") from hotel suppliers, OTAs, and metasearch providers. Tr. 9179:10-9180:9 (Holden); DXD-30.011.

VII. ECONOMICS BEHIND SEARCH ENGINE DISTRIBUTION AGREEMENTS

A. Search Engine Distribution Agreements Provide Incremental Search Volume

761. Search distribution agreements in which payments are exchanged for promotion of a search service, including with browsers, carriers, or OEMs to preset that search engine as the

default, generate incremental users and output-expanding incremental search volume in multiple ways.

762. *First*, some number of users will use a preloaded search default if it meets their needs. Tr. 9767:15-9768:22 (Murphy (Google Expert)) ("Number one, they got incremental users, that's what we've talked about up until now. When you win the default, you're getting -- those users who would move back and forth, move to you. So winning the agreement gave Google volume by shifting users to Google.").

763. One reason for this is that search defaults provide an implicit search engine recommendation to the user, and some users accept that recommendation. Tr. 742:18-743:5 (Rangel (DOJ Expert)) ("[D]efaults are interpreted by decision makers, by consumers as an implicit recommendation of what is the right product to use."); Tr. 9698:19-9699:23 (Murphy) ("So you can call it a recommendation, you can call it reliance, whatever you want to call it. You know, relying on the browser maker, in this case, to choose a good search engine is part of the game.").

764. How many people use the recommended default depends on a number of factors including, *inter alia*, (1) the quality of the recommended default search provider; (2) the identity of the recommender; (3) the availability and quality of alternative providers; and (4) the ease with which a user can change the default or download or otherwise employ an alternative. *See infra* ¶¶ 765-770, 1483; Tr. 9707:6-9709:15 (Murphy) ("I think it's clear[] that the defaults have an impact. In some cases, a significant impact, you know, in terms of people's choices. . . . But what we also find is when people are incentivized to switch, that is, when they like the alternative better than the one they have, we see a lot more switching. . . . [T]he willingness to use the default is somewhat driven by cost of switching, but it's also driven by some of those

other forces . . . ."); Tr. 758:18-759:6 (Rangel) ("[W]hen we talk about sources of choice friction, there are these three top stages that has to do with realizing that there is a default: thinking about the space, considering options, and only the final thing is the clicks.").

765. Thus, one must use care when comparing one default arrangement to another. For example, when Apple replaced Google Maps with its own maps product on iOS devices, customers used Apple Maps in high numbers due to the design of the default and the unavailability of alternatives. Tr. 9783:21-9785:15 (Murphy).

766. As to the design, unlike Apple's implementation of the Search default on Safari, which can be changed within Safari by users in four taps and otherwise offers users alternative providers within Safari, the default maps provider on iOS (that is, the maps provider that opens when an address is clicked) cannot be changed to Google Maps or any other map provider. *See infra* § XI.A.3 (discussing Apple's implementation of alternative search providers on Safari); Tr. 9783:21-9785:15 (Murphy) ("Apple Maps wasn't really a default, because you can't change. When they switched to Apple Maps, Apple Maps is the default map app, you can't change that back to Google, okay? And so that-it's not a default, it's hard-wired[.]"); Tr. 684:15-686:14 (Rangel) ("[I]f there is not a way of explicitly, especially at the time, switching the default, that would be what behavioral economists would consider, Your Honor, an example of extreme choice friction, I mean, it's almost like extreme. . . . [A]n imposed force. You cannot change it, so you can think about it -- I hope I'm not being too prophezoric, but like an infinite level of choice friction."); DXD-37.066.

767. As to availability of alternatives, unlike with the Safari search default where users have the option to download alternative search providers (on search apps or browsers) from the Apple App Store, for the first several months after Apple Maps launched, Google did not have a

Google Maps App available for download from the Apple App Store. Tr. 9783:21-9785:15 (Murphy) ("[T]here was no Google Maps app available on Apple devices. It took time for that to come around. So that really made it difficult for people to switch right back to Google on an app basis because they didn't have the app, right, they would have had to do something through the browser instead.").

768. By contrast, in situations where Google has not been the default but has been easily accessible (either through an easily changed default or an alternative browser), users have switched from the default to Google in very large numbers. *See infra* § VII.C.

769. For instance, Mozilla designed Firefox so that users can easily change the default search engine. From December 2014 to October 2017, when Mozilla set Yahoo as the default search provider, only 23% of Firefox searches occurred on Yahoo, compared to 69% of Firefox searches occurring on Google. And this does not account for those users that switched browsers altogether (*e.g.*, by downloading Chrome) to use Google. Baker (Mozilla) Dep. Tr. 46:24-48:01; Tr. 9761:23-9764:1 (Murphy); DXD-37.055; *infra* § VII.C.

770. And on Windows PCs, although Microsoft has made it more difficult than rivals to change the default search engine on its Edge browser that is exclusively preloaded on all Windows PCs, many users have downloaded Google's Chrome browser. From 2013 to 2021, 78% of searches on Windows PCs went to Google, compared to only 14% for Bing (the default). Tr. 711:14-712:10 (Rangel) (testifying that "the choice friction in Bing is substantial" and requires more effort than in Safari); Tr. 9761:23-9764:1 (Murphy); DXD-37.055.

771. *Second*, revenue share agreements to preset a default also incentivize partners to promote search engine usage on their products, generating output-expanding incremental search volume. Tr. 9767:15-9768:22 (Murphy) ("[B]ecause you're getting a rev share payment, like we

talked about before, that incentivizes the carrier or whoever to do -- generate more search, sell devices that get more search, encourage their customers to do more search, improve their devices all kinds of ways, because it increases their incentive to get more search volume because more search volume means more dollars for them.").

772. The same is true of other forms of payments for incremental promotion, such as prominent placement or preinstallation exclusivity. Tr. 9751:21-9752:20 (Murphy) (bookmarks), 9856:24-9858:13 (placement and preinstallation exclusivity); DXD-37.047, .089.

B. Convenience and Placement Increase Search Output

773. Search distribution agreements—whether to preset a search service as a default, to provide incremental promotion in the form of preinstallation exclusivity, or to provide other forms of prominent placement for that service—also increase search usage by giving users convenient, prominently placed search access points. Tr. 7674:9-16 (Pichai) (Google)) ("I would say increasing usage of search, you know, was a lot of what we were thinking about. And some of it would be because we gain market share. Some of it is because you're taking existing users, and by giving them more convenient access points, you're making them search more. So both of them could be contributing to it.").

774. The seamless integration of setting a search service as the browser's default leads to increased search usage. Tr. 7649:6-7650:2 (Pichai) ("THE COURT: . . . . Mr. Pichai, to what do you attribute the dramatic increase in search as a result of the adoption of Chrome? I mean, what was it about Chrome that encouraged people to search more? THE WITNESS: That's a great question. A few things. One is it was just much faster to use, so you could consume a lot more of web -- and it was designed to do that . . . . We also integrated -- one of the unique designs was we combined the URL box and the search box so that, as a user, you could type. If you were trying to navigate, we would help you navigate to the website you were looking for. If

you were looking for -- to search, we made it seamless. So that seamless integration, I think, people really enjoyed it, people valued it, and people used the web more and searched more. That's what we found.").

775. Similarly, prominent placement of other search access points increases use of search. For instance, placement of a search widget on the default home screen of mobile devices increases search usage on those devices. Tr. 9421:14-9423:1 (Rosenberg (Google)) ("Q. And how, if at all, do these [widgets] make access to Search easier for users? A. Well, instead of finding the application somewhere on the device and opening it up, each of these widgets, even though they have slightly different designs, each of these widgets allow for the initiation of a search directly from the home screen."); Ezell (AT&T) Dep. Tr. 64:08-65:18 ("But it also makes sense for us in the sense that if our participation on revenue on search is a function of people doing more searches, it's in our interest both from the consumer experience with respect to making something that people always do on the phone easily accessible, but it also makes sense for us to make that convenient. And putting it on the home screen is very convenient."); UPX0076 at -199 (Google document reporting that "[d]evices without [widget] have [redacted]); UPX0651 at -845, -052 (Google studies showing deletion of widget [redacted]).

776. And providing a default search engine for a browser out of the box enables consumers to begin searching the Internet immediately, without additional decision-making, increasing use of the product for search. By contrast, product designs with additional decisional steps for consumers to take can cause users to abandon use of the product. Tr. 9698:19-9699:23 (Murphy) ("I get my browser, I can use it day one. . . . Having that out-of-the-box experience is

going to be very valuable to the customer, which then, of course, makes it valuable to both the search provider and the browser provider."); Tr. 736:10-16 (Rangel) ("Q. Okay. Would you agree that if the choice architecture that a company decides is to present a choice screen, that there are cognitive costs for a consumer for trying to evaluate and make a selection with a choice screen? A. Every mental operation, every consumption of information, every decision, Your Honor, of everyone involves some mental cost; some more than others.").

C. Users Switch/Avoid Default or Prominently Placed Services in Large Numbers if the Default Does Not Meet Their Needs

777. Users regularly switch away from default settings when the default service does not meet their needs. Tr. 9707:24-9709:15 (Murphy) ("[W]hen people are incentivized to switch, that is, when they like the alternative better than the one they have, we see a lot more switching."); DXD-37.057 ("Users commonly switch from preinstalled services on mobile devices by downloading apps; Users rarely switch away from a Google default, but frequently switch away from rivals on mobile devices."); Tr. 3571:11-3572:16 (Nadella (Microsoft)) ("Users do switch"); Tr. 547:16-549:3 (Rangel) ("[Y]ou start thinking about switching more if the experience is unsatisfactory.").

778. On Windows PCs, Microsoft's Edge browser is the exclusive preinstalled and default browser, yet Google Chrome is overwhelmingly the most-used browser on Windows devices due to users switching away from the Edge browser. Tr. 9788:18-9789:7 (Murphy) ("[T]he vast majority of [Windows] users are switching away from Edge . . . they're moving to Chrome."); Tr. 5928:10-25 (Whinston (DOJ Expert)) (agreeing that Chrome has, for years, been the most popular browser used on Windows despite Internet Explorer (later Edge) being preloaded on every Windows PC); Tr. 3587:8-15 (Nadella) (Chrome succeeded on Windows "by

getting people to download Chrome onto the desktop because Chrome wasn't preloaded anywhere on Windows").

779. More generally, Google Search receives very little distribution on Windows PCs, where Bing is the default search engine, yet Google receives the overwhelming majority of search queries due to users switching away from the Windows default search engine. Tr. 6137:17-19 (Whinston) (agreeing that "the overall search engine share on Windows PCs is predominantly Google"); Tr. 3582:10-12 (Nadella) (agreeing "Google gets the large majority of search queries from users of Windows PCs"); Tr. 10032:17-10033:4 (Murphy) ("Google has, for the last 10 plus years, held about an 80 percent share on . . . Windows Desktop, even though they don't have preinstallation."); Tr. 671:25-672:5 (Rangel) (agreeing that "people switched in droves from Bing on . . . Windows device[s] to Google."); *see supra* §§ V.A.1, VII.A.

780. This switching behavior by users is not a recent phenomenon; in 2007, when consumers were less technically savvy than today, Google received the majority of search traffic on browsers that had home pages set to a search engine other than Google due to users going around the default settings. UPX0123 at -483 (56% of search activity on browsers with homepage set to MSN went through Google), -485 ("Google still preferred even if hp is not Google.").

781. On Windows Mobile, on which Microsoft set its own search product as the out of the box default, over 90% of search activity occurred on Google as the vast majority of users switched search engines. DXD-37.058; DX0439 at .008 ("Bing + Yahoo Share is about 10% despite default deals; Google is super-dominant at ~90%."); DX0440 at .011; *supra* § V.A.4.

782. Similarly, on various BlackBerry RIM devices with Bing or Yahoo set as the default search engine pursuant to distribution agreements, Google still received 90% of the search queries. DXD-37.059; DX0439 at .008; *supra* § V.A.4.

783. In 2014, Mozilla switched the default search engine in the Firefox browser from Google to Yahoo and immediately experienced a "high dropoff" in "the number of Firefox users who use the default search functionality." Baker (Mozilla) Dep. Tr. 75:4-76:4; *see* UPX0074 at -760 (documenting how Google's total queries on Firefox before the default switched to Yahoo was approximately "[redacted] per day," and after the switch Google's daily queries on Firefox "fell to [redacted]," but after 5 weeks had risen to "[redacted]" daily queries); Tr. 6079:24-6080:10 (Whinston) (agreeing that "many users switched back to Google after Firefox switched to Yahoo" and that "after Mozilla had made that switch, the large majority of search queries were sent to Google, even though Google was not the default on Firefox."); *supra* §§ VII.A, XI.B.2.

784. Mozilla "found [its] users trying all sorts of different ways to get back to Google and . . . experienced lots of people leaving Firefox." Baker (Mozilla) Dep. Tr. 52:22-53:3, 75:25-76:23, 77:18-78:2, 78:9-12.

785. Mozilla Corporation CEO Mitchell Baker attributed the loss of Firefox's browser share, and Chrome's increased browser share at the same time, to "a good portion of [Firefox users] just went to Chrome where Google Search is built in." Baker (Mozilla) Dep. Tr. 76:5-23.

786. Baker testified that even she herself "couldn't use the product experience [Mozilla was] shipping as [its] default" and that she "switch[ed] to Google." Baker (Mozilla) Dep. Tr. 75:4-24.

787. [redacted]

[redacted]

788. AT&T Vice President for Strategy and Business Development Jeffrey Ezell testified that part of the reason AT&T chose to set Google as the default search engine on its Android mobile devices was that if it set a different search engine as the default, "consumers would simply go around it and download Google Search." Ezell Dep. Tr. 301:20-302:17; DX0386 at .003-.004 ("[I]f we refused to distribute Google search on our Android devices . . . then Google would just make Google search available for download from Android Market and a large number of Android users would use it instead of the default search service we might provide from Yahoo.").

D. Revenue Share Agreements Are Commonplace

789. Revenue share payments in exchange for specific promotional requirements are the predominant form of promotional arrangement for search engines. *See* Tr. 9725:13-9727:5 (Murphy) (this structure is "basically ubiquitous" in the industry over time), 9795:9-9796:9 ("[W]hen you have specific things, like, I want you to give me a default, I want you to give me a bookmark, I want you to do this, that -- I even want you to put me on a trade, whatever it is, specifying it just makes a whole lot of sense, because, again, it's not like the wholesale retail

world where you say, Oh, I'll give you a discount. Even if you don't give me any promotion, that's going to give sales because customers are going to get a lower price, they're going to buy more. Here, you're really contracting for specific elements of promotion. And to me, it just makes a lot of sense to say, the efficient contract in that world is to put that in the contract.").

790. Search promotion arrangements which provide exclusive default to one search provider have been commonplace since the early days of search. *E.g.*, DX0935 [redacted]; *see infra* § VIII.

791. Microsoft has competed for and entered into exclusive promotional arrangements for its search engine on both Windows PC desktops and a wide variety of mobile devices. *See supra* § V.A.1-2, 4.

792. Yahoo's 2014 agreement with Mozilla included a revenue share payment in exchange for the exclusive default in the United States. DX1012 [redacted] DXD-37.072.

E. No Precedent for Unconditional Revenue Share or Choice Screen

793. To assess the competitive effects, if any, of a particular agreement or set of agreements, sound economic analysis compares the world under the agreements at issue to a but-for world absent the challenged agreements. Tr. 5774:14-18 (Whinston) ("Q. And then do you

recall writing in your rebuttal report: ‘The likely competitive effects of Google’s behavior locking up search access points through the challenged agreements is ideally estimated relative to a but-for world’? A. I do.”), 6085:15-19 (“Q. The likely competitive effects of Google’s behavior, locking up search access points through the challenged agreements, is ideally examined relative to a but-for world? A. Yes. Your question asked about competitive effects, and I agree with that.”).

794. Accordingly, foreclosure, if any, attributable to any agreement or set of agreements should be measured against an economically sound but-for world, something that would emerge in competition. Tr. 9689:4-9691:18 (Murphy) (“One, you have to always have some but-for world. You have to think about, are they foreclosed relative to some alternative.”), 9725:13-9727:5 (“So foreclosure is going to compare the actual world we see with an economically sound but-for world. What I mean by economically sound is something that would arise in competition.”); DXD-37.064.

795. Plaintiffs’ experts, however, have not analyzed foreclosure against any but-for world absent the challenged agreements. Tr. 6088:21-6089:19 (Whinston) (“[Q.] But you offer opinions in this case about moving all the defaults from Google to somebody else, and then you also look at a world in which all of the agreements involve a choice screen, correct? A. They’re not worlds . . . . I’m with you except for the use of the word world, which is trying to kind of make things sound like it’s a but-for world, and that that was what I was thinking of when I did competitive effects. It was not.”).

1. Unconditional Revenue Share is Not a Result That Would Occur in Any Economically Valid But-For World

796. There is no precedent in the search industry for an unconditional revenue share agreement, meaning one where a revenue share is provided regardless of promotion. Plaintiffs

put forward no evidence of any company agreeing to unconditional revenue share payments in the search industry, or otherwise. Tr. 9793:5-9795:8 (Murphy) ("THE COURT: You're not going to pay for something that you may or may not get? THE WITNESS: Exactly. That's why I don't like the unconditional. And that's particularly true for somebody like Google, who you're going to make a lot of payments even if he doesn't do anything because you're -- you're -- you've got a lot of customers in you. A lot of people would choose you. . . . [I]f you look at this industry, and this is blanked out, I'm looking at other providers, and they don't have this problem nearly as much as you, Google, does, because they don't have as many organic customers that would have used them anyway. But even they specify what they're going to get. They say, Hey, we'll pay you. We'll pay you to give us promotion, but we're going to get the X, Y, or Z that we're going to get in return."); DXD-37.072.

797. In particular, Professor Whinston failed to identify any search provider agreeing to an unconditional revenue share agreement. Tr. 10621:16-19 (Whinston) ("Q. You've not cited any evidence in your expert reports of any search provider ever agreeing to an unconditional revenue share agreement? A. . . . No, I don't think I did."), 6057:21-25 ("Q. For the devices covered by Microsoft's mobile agreements, you're not aware of any unconditional revenue share, are you? A. I haven't seen those agreements, so no. You know -- anyway.").

798. Professor Whinston also was unable to opine that any search provider would have entered into an unconditional revenue share agreement in any but-for world. Tr. 6087:10-17 (Whinston) ("Q. You've never offered the opinion in your report that in the but-for world, absent the agreements, that anybody would have entered into an unconditional revenue share agreement? A. Oh, I don't know if -- as I said yesterday, I mean, it's very hard to know exactly

what the form -- you know, absent these agreements, it's very hard to know exactly what the agreements would have been, what Google would have done to start with.").

799. An unconditional revenue share is at odds with basic economics. Tr. 9791:20-9793:4 (Murphy) ("Q. Have you considered the economic feasibility of Google agreeing to an unconditional revenue payment? A. Yes. And basically the biggest problem I see with unconditional revenue share payments is really at odds with basic economics, particularly for a firm like Google.").

800. In the marketplace, search providers pay revenue share for incremental users generated by promotion. *See supra* § VII.A; DXD-37.071.

801. Under an unconditional revenue share, a partner would have no obligation to promote the search engine. *See* Tr. 9790:13-9791:7 (Murphy) ("Q. And can you just summarize here what the alternatives that Professor Whinston identified in his trial testimony? A. Yes. . . . One is what [Professor Whinston] calls unconditional revenue share payments, which I don't think he ever fully defined what 'unconditional' means. In the most extreme case, that would be saying -- Google going to somebody and saying, Here, here's the rev share, whatever volume I get, I get, it's completely unconditional on anything, okay? That would be the literal definition of unconditional rev share."); DXD-37.071.

802. An unconditional revenue share arrangement would be irrational for Google because there would not be any reciprocal commitment for the partner to promote Google's search engine in any way. Thus, a search provider could promote a rival and Google would not receive any incremental usage, yet would still have to pay revenue share on the traffic it would receive anyways. Tr. 9791:19-9793:4 (Murphy) ("Because if [Google] make[s] an unconditional rev share offer, Apple could decide or the partner could decide to not give them any promotion,

in which case Google gets the business they would have gotten anyway, right. They didn't get anything for it. They got what -- the business they might have gotten anyway. And if they're not getting -- or then Google is being paid for nothing. They're not going to do that."); *see supra* § VII.A; DXD-37.071.

2. Choice Screen or Other "Parity" is Not a Result That Would Occur in Any Economically Valid But-For World

803. There is no market-driven precedent for a choice screen in the search industry. Tr. 9797:16-9800:25 (Murphy) ("We haven't seen partners saying, Oh, let's have [a] choice screen. I know they discussed it at a few points in time, but it's never really emerged as a marketplace alternative . . . and it's not emerged as an alternative with Google or other search providers, right, it just doesn't show up. And it's even rarely discussed."); DXD-37.075.

804. Google's general search rivals, such as Microsoft, Yahoo, and DuckDuckGo, do not contract for a choice screen. *E.g.*, Tr. 9797:16-9800:25 (Murphy) ("[Choice screens have] not emerged as an alternative with Google or other search providers, right, it just doesn't show up. And it's even rarely discussed. I know there's been some documents that mention choice screen, but it's hardly at all -- unlike the stalking horse, which is an ever present of the marketplace we see, the choice screen is an alternative that just rises very rarely."); DXD-37.075.

805. Microsoft did not implement a choice screen for its Edge browser. It instead sets Bing as the single default, with "substantial" friction to change the default. Tr. 711:14-712:10 (Rangel); DXD-37.075.

806. Similarly, DuckDuckGo's web browser does not include a search engine choice screen. And unlike Chrome, Safari, and Firefox, DuckDuckGo's browser does not include the option to change the default search engine (*i.e.*, the search engine that receives queries entered in the browser's address bar). Tr. 2150:6-18 (Weinberg (DuckDuckGo)), 2151:5-12 ("Q. There's

no sort of radio button or option that a user can select such that every query entered into the address bar going forward will be sent to another search engine instead of DuckDuckGo, correct? A. No, there's nothing like that. Q. And that was a decision DuckDuckGo made about how to design its browser, right? A. Yes.").

807. Google's partners have never implemented a choice screen for users to select a default search engine. A browser default search engine choice screen was not something Apple has ever sought on Apple devices. Tr. 2476:2-2477:4 (Cue (Apple)) ("Q. And the ISA does not permit a choice screen for Apple users to get their default search engine out of the box, correct? A. That's correct, it's not something we've ever wanted. We didn't ask for it in 2002, and it's not something we wanted. We think it's a mistake to ask the customer something like that.").

808. Likewise, Mozilla has chosen not to have a default search engine choice screen implemented on the Firefox browser. *See* Baker (Mozilla) Dep. Tr. 300:2-4, 300:7-21 ("Q. Ms. Baker, has Mozilla ever considered offering a choice screen when they first download the Firefox browser? A. [W]e thought about it from the very early days and decided that the best customer experience was to have the default, the thing that people who don't want to think about search engines expect, and then to make it very easy after that.").

809. The record evidence reflects a single instance in which Apple considered implementing a default search engine choice screen for a version of the Safari browser on Windows devices. Tr. 2633:5-2635:3 (Cue) ("[B]ack in 2007, Apple was developing Safari for Windows, so this would be non Apple devices[,] . . . which actually came to fruition."); *see infra* § XI.A.

810. Apple ultimately decided not to ship Safari for Windows with a choice screen—instead Google was set as the default, with an easy way to change the default from the settings

menu. Tr. 2633:5-2635:3 (Cue) ("So we, at the end of the day, decided to ship Safari for Windows just like the Mac, and so it's shipped with Google as the default, and again, with the choices on the screen.").

811. Safari for Windows was discontinued as of 2012. Tr. 2635:4-6 (Cue) ("Q. Was Safari for Windows effectively discontinued as of roughly 2012? A. That's correct.").

812. Apple has not implemented, or made a request to Google to implement, a default search engine choice screen for the Safari browser on any of its own devices. *E.g.*, Tr. 2476:2-2477:4 (Cue) ("Q. And the ISA does not permit a choice screen for Apple users to set their default search engine out of the box, correct? A. That's correct, it's not something we've ever wanted. We didn't ask for it in 2002, and it's not something we wanted. We think it's a mistake to ask the customer something like that."); *see* § XI.A.

813. The only implementations of choice screens Plaintiffs identified were imposed by regulators, *i.e.*, not market-driven outcomes. *E.g.*, Tr. 10159:17-10160:1 (Murphy) ("Q. Okay. So the existence of a choice screen assigning a search default did not prevent the transfer in these two directions on the EMADA; right? A. Well, it affected other parts of the deals. This is a regulated solution, though. So you've got to be careful. I'm not sure this gives us a very good idea of what the competitive dynamics of that would be. Right? I mean, this was negotiated as part of a regulatory solution. So I'm not sure you can take the pricing change you see here as indicative of that."), 9939:18-9940:6 (choice screen implementation in Europe was "a regulatory change, which obviously is not the equivalent to what would happen if somebody did it in the marketplace"), 9835:24-9837:3 ("Q. Professor Murphy, is the Russian choice screen experience something you found relevant to an analysis of the U.S. market? A. It's not directly relevant because it's so different from the U.S."); DXD-37.075 ("The only examples offered by

Plaintiffs' experts—on Android devices in Europe and in Russia—were imposed pursuant to regulatory proceedings.").

814. Revenue share conditional on a partner implementing a choice screen or other "parity" is not an economically valid but-for alternative. Tr. 9797:16-9800:25 (Murphy) ("Q. Professor Murphy, did you find a choice screen to be an economically valid but-for world? A. No."); DXD-37.073.

815. Google pays for incremental promotion in exchange for a share of revenue generated by Google Search on the device. *See supra* § VII.A.

816. A choice screen, by contrast, would not offer incremental promotion to Google. Tr. 7686:7-15 (Pichai) ("Q. Today, Google's RSAs and the ISA prohibit choice screens for search defaults, correct? A. Sorry, to be very clear, we don't prohibit choice screens. But . . . if you're doing a commercial deal, we are paying for enhanced promotion, right, that's the commercial deal. OEMs have the option not to take the RSA and they can put some other products, so they have choices to do what they want. The RSA has payments associated for enhanced promotion of our services."); Tr. 9797:16-9800:25 (Murphy) ("And if you think about the discussion when a choice screen did come up, what was the answer? It doesn't work for us, we're not getting the incremental sales, right? That was the answer about the choice screen. That's exactly what economics tells us you'd expect the answer to be, right? When they say, well, that's Google, they used their market power to squash choice screen. But these other guys, they don't choose the choice screen either[.]").

817. A choice screen can also be cumbersome for users and undermines the user experience by forcing users to select a service, rather than providing a high-quality search engine out of the box. Tr. 9797:16-9800:25 (Murphy) ("[Search partners] find a choice screen

somewhat cumbersome in terms of setup of the device and the like. You know, because people are making that decision when they just want to start using their phone."), 9797:16-9800:25 ("[T]hey want to be able to recommend to the users what's a good search engine. They want to have the best thing out of the box."); DXD-37.076.

818. The 2018 decision by the European Commission which resulted in Google implementing a search engine choice screen on certain Android devices sold in certain European countries resulted in little boost to rivals, while reducing payments to partners.

819. The EU choice screen did not result in a material increase in search usage for rivals. *See infra* § XI.C.4; Tr. 9834:12-9835:23 (Murphy); DXD-37.080.

820. And there is no evidence that it increased investment incentives for rivals. Professor Whinston could not identify any evidence of increased search investment by rivals as a result of the 2018 European Commission ruling. *E.g.*, Tr. 10609:23-10610:3 (Whinston) ("Q. And have you identified in your expert reports any evidence in the record in this case of Microsoft or Yahoo! or DuckDuckGo increasing their investments to improve search quality in Europe as a result of the choice screen implementation? A. No[.]").

821. At the same time, on devices with a choice screen, revenue share payments by Google to partners decreased significantly. Tr. 9471:12-9472:9 (Rosenberg) ("THE COURT: Let me just . . . go back to the European situation again and the post EU Android settlement. What ended up happening to the rev share in those contracts? Did it drop to zero. Did it -- was it reduced by some percentage? THE WITNESS: . . . So there were a couple things, but I would say generally speaking, the revenue that we were able to pay partners on those devices went way, way down. . . . Q. And to be clear as a general matter, Mr. Rosenberg, in Europe, were you still paying revenue share on the Google Search widget in Europe after the EC Android decision? A.

No."); Tr. 9797:16-9800:25 (Murphy) ("But also economics tells me they're probably going to get less revenue because it's not worth as much to bid to be on a choice screen as it is to be a default, so it's a stronger bidding process to bid. In fact, if you think about somebody like Microsoft, getting on a choice screen isn't worth that much to Microsoft, right? Because they get next to -- next to Google, they're not going to get many choices. The thing that's really worth something to Microsoft is to get on a device where Google is not there. Right? The choice screen is not such a great idea for them."); UPX0786 at -295 (Summary of 2020 Samsung MIA) [redacted]

822. Lower revenue share payments diminish OEMs' incentives to expand search and to sell more Android devices—thereby decreasing competition. Tr. 9876:6-9877:2 (Murphy) ("OEMs would get less, and if they get less, that's less incentive to expand search and less incentive to sell more Android devices. Both would hinder Android's ability to compete with Apple[.]").

823. Such decrease in competition reduces search output by slowing the growth of mobile platforms. Tr. 9877:3-9 (Murphy) ("Q. And would that decrease in competition have a spillover [e]ffect on search? A. It would. And, if you remember, if we go back, how search grew on mobile is a lot of it is growing the ecosystem; getting more devices, more use of those devices. So things that slow down the growth of the mobile platforms is going to slow down search."); DXD-37.073.

VIII. SEARCH DISTRIBUTION/DEFAULT DEAL HISTORY

A. History of Exclusive Distribution on Desktop: Google Has Limited Success in Getting Distribution on Windows PCs

824. For many years, Microsoft has had contracts that make (1) Bing the exclusive default search engine on Windows PCs and (2) its browser (Internet Explorer; later Edge) the default on Windows PCs. *See supra* § V.A.1.

825. To obtain those default positions, Microsoft has made significant payments to Windows PC OEMs, in the form of rebates on licenses for the Windows operating system, in exchange for this exclusive search and browser preload distribution on Windows PCs. *See supra* § V.A.1.

826. Compared to Microsoft's preload distribution of its browser and search engine on Windows PCs, Google historically had very little preload distribution. Tr. 3581:14-17 (Nadella) (agreeing that Google Search is not preinstalled on any Windows PCs in the United States); Tr. 9701:25-9703:1 (Murphy (Google Expert)) ("Bing is the only search engine that comes pre-installed on Windows."); DXD-37.032 ("[M]ost pre-2014 search took place on Windows PCs" and during this time "most Google users navigated directly to Google.com[.]"); DXD-37.034 (80.5% of Google Search Queries on Windows PCs in 2006-08 came from direct navigation to Google.com); [redacted]

827. In the last decade, Google's preinstallation deals on Windows PCs have tailed off to virtually zero. DXD-37.036. As Professor Whinston states: "Microsoft has agreements to be defaults on Windows PCs, Google does not." Tr. 10644:17-23 (Whinston (DOJ Expert)).

828. Microsoft has engaged in efforts dating back to 2005 to make switching default browsers and search engines on Windows PCs more difficult. *See supra* § V.A.5.

829. The Google Chrome browser is not currently preloaded on any Windows PCs and never had more than a minor share of preinstallation on that platform. Tr. 5745:25-5476:10 (Whinston) ("[O]n Windows PCs the pre-installed browser is Edge with a Bing default."); Tr. 3581:14-17 (Nadella) (agreeing that Google Chrome is not preinstalled on any Windows PCs in the United States); DXD-37.036 (zero preinstallation of browsers with Google set as default on Windows PCs since 2015).

830. Notwithstanding Google's lack of distribution on Windows PCs, Google is the most used general search engine on Windows PCs. Tr. 6137:17-19 (Whinston) (agreeing that "the overall search engine share on Windows PCs is predominantly Google"); UPXD0104 at 30 (Google's search share on Windows PCs in the United States was 76% in 2021); Tr. 3582:10-12 (Nadella) (Google gets the large majority of search queries from users of Windows PCs), 3582:21-23 ("Google" is the most commonly queried word on Bing), 3587:1-3 (when Chrome launched in 2008, Microsoft had all the search defaults on PCs); Tr. 10032:17-10033:4 (Murphy) ("Google has, for the last 10 plus years, held about an 80 percent share on . . . Windows Desktop, even though they don't have preinstallation.").

831. And despite the lack of distribution for Google Chrome on Windows PCs, it is the most used web browser on Windows PCs. Tr. 5928:12-25 (Whinston) (agreeing that Chrome has, for years, been the most popular browser used on Windows despite Internet Explorer being preloaded on every Windows PC); Tr. 3584:11-13 (Nadella) (Chrome is the most popular browser on Windows PCs), 3587:12-15 (Chrome succeeded on Windows "by getting people to download Chrome onto the desktop because Chrome wasn't preloaded anywhere on Windows"); Tr. 7651:20-25 (Pichai) (Chrome is the most popular browser on Windows PCs today).

B. Portal/Homepage Default Deals

832. During the 2000s, in the period before Plaintiffs claim anticompetitive conduct or effects, branded Internet portals and browser home pages were significant access points for search activity. [redacted] UPX0960 at -518 (same).

833. Microsoft and Yahoo obtained substantial distribution of their search products at this time through [redacted] UPX0960 at -513 ("Y! & MSN lead in home page share, Google far behind."), -518 (in 2007, 72% of Yahoo's search traffic and 71% of MSN's search traffic came through users who had those search engines set as their home page); Tr. 3730:19-3732:6 (Ramaswamy (Neeva)) (in 2007, Yahoo and MSN were relying on default home page settings for the majority of the traffic that they received); *see, e.g.*, [redacted]

[redacted]

834. Google obtained considerably less distribution through such agreements. Tr. 7674:17-7675:5 (Pichai) (in 2007, "Google didn't have a . . . product" similar to the Yahoo portal); UPX0960 at -513 ("Y! & MSN lead in home page share, Google far behind."), -518 (in 2007, only 24% of Google's search traffic came through users who had Google.com set as their home page); Tr. 3731:14-3732:2 (Ramaswamy) (in 2007, most of Google's traffic "was coming from people typing Google.com into the browser bar"); DXD-37.034 (80.5% of Google Search Queries on Windows PCs in 2006-2008 came from direct navigation to Google.com).

C. History of Exclusive Distribution on Early Mobile Phones

1. Competing for Exclusive Distribution Has Been a Normal Competitive Practice in the Mobile Industry

835. Throughout the 2000s and early 2010s, numerous rival platforms competed in the mobile phone industry. *E.g.*, Tr. 351:22-353:5 (Barton (Google)) ("Q. And describe the competition that was taking place while you were at Google amongst all of those mobile platforms? A. So each -- because, as I mentioned, all these platforms were proprietary, they were -- as you heard, they were basically each controlled -- each platform was controlled by the manufacturer of the mobile devices. And so their goal was -- similar to an iPhone, controlled by Apple, their goal was to sell a lot of devices and then control all the Internet experiences and application experiences on that device, as well as The App Store. So, for example, Qualcomm BREW had its own app store on Verizon, and I think BlackBerry had an early version of an app

store. Many people don't remember these app stores. Palm, I believe, had an app store. So there were very early versions of app stores. And also you could preload apps on these devices. So they were all kind of competing to basically sort of become what we see today with Apple IOS, you know, basically become a big ecosystem of mobile devices and the distribution of all the software and services associated with those mobile devices. Q. And was Microsoft Windows or [M]obile, was that another mobile platform that was competing with Android during this time? A. . . .[I]t was a very significant potential, you know, at the time it was viewed as one of the ones that was likely to become very successful.").

836. In the pre-smartphone years, mobile was a relatively small channel for search distribution. Tr. 317:6-9 (Barton) ("Q. Was mobile a significant channel for search distribution when you first joined Google? A. It was very, very small."); Tr. 3663:10-18 (Nadella) ("Q. Is the mobile industry different today than it was back then? A. Very much so. Q. How so? A. It's evolved to a place where the mobile phone itself, both because of the connectivity, the form factor, it's the main computing device. And in the early sort of 2010s it was still growing into that position, whereas now it is the dominant platform.").

837. Before smartphones became popular, Google competed for preload search engine distribution partnerships for BlackBerry devices, Palm devices, Symbian devices, and feature phones with Java applications, among others. Tr. 350:1-16 (Barton).

838. Pursuing exclusive or default arrangements with mobile OEMs and carriers has been a common competitive practice. Tr. 3577:16-3578:2 (Nadella) ("Q. And it was very common at this time period for Bing and Yahoo! and Google to be slugging it out to try to get that default, right? A. Yep. Yes."); *e.g.*, JX0003 (Directed Traffic Distribution Agreement between Motorola and Google (Dec. 28, 2005)) at -160 (§ 6) ("Exclusivity. During the Services

Term Motorola shall not implement on Covered Motorola Devices any search services, which are the same as or substantially similar to a specific Google Mobile Services, including, without limitation, search of web pages, images, and local information, unless otherwise mutually agreed upon by the parties.”).

839. Chris Barton explained that the mobile ecosystem was “a very complicated space” that involved search providers negotiating search distribution contracts with both the mobile OEMs and carriers. Tr. 312:25-313:2, 349:11-14, 321:18-322:1 (Barton) (“Q. Why did you negotiate search distribution contracts with both carriers and mobile manufacturers? A. Because . . . it’s a very complicated space, the mobile ecosystem.”).

840. In this time period, Google sought to enter into search distribution contracts with both mobile OEMs and carriers because which party would determine whether to preload Google Search was unpredictable. Tr. 321:18-322:18 (Barton) (“[Mobile ecosystem] varies widely and almost unpredictably as to who decides whether Google search goes onto a mobile device. In some cases, it’s the mobile OEM, the device manufacturer. In some cases, it’s the mobile carrier. And in some cases, the two of these can’t even agree who it is. . . . I created my original framework . . . as a way to make sure that you can have contractual relationships with both, but only one of the two parties would receive the revenue share based on whoever actually distributed Google search.”).

841. Certain of these mobile distribution arrangements took several years to negotiate. Tr. 356:13-357:9 (Barton) (“Q And were you always successful in being able to negotiate Android deals with carriers? A. No, some of these deals would take years to put in place. In some cases, even years just to agree to the contract terms.”).

842. Negotiating and entering into distribution agreements with both mobile OEMs and carriers ensured that Google Search would be "discoverable and easily usable by consumers." Tr. 322:6-18 (Barton).

843. In this competitive landscape for mobile search distribution agreements, Google, Bing, and Yahoo each won certain deals. *E.g.*, Tr. 356:22-357:9 (Barton) ("Q. Had you tried to get deals with Verizon and AT&T at the time those deals actually were entered into with rival search engines? A. Yes, definitely, yeah."); Tr. 3577:3-23 (Nadella) ("Q. So depicted here, you see a RIM device sold by Verizon . . . The default there was Bing, correct? A. Uh-huh. . . . Q. And then we look at the AT&T, T-Mobile examples, now those were carriers where -- did Bing try to get the default on those carriers? A. Bing may have tried, but we obviously didn't get them. Q. And Yahoo! was successful in winning those deals, right? A. Yep.").

844. In 2008, for example, Google negotiated a search distribution deal with Sprint. Tr. 329:1-15 (Barton) ("[Q.] Is this an example of the default exclusivity terms that you would negotiate for search distribution contracts? A. Yeah, it is an example, and I'd like to point out there's lots of unique things in certain partnerships, so things like the default carousel and Sprint web tile and EFP device and local search services are all examples of things that were specific to Sprint and not most other carrier partners. But, yeah, this is an example of exclusivity in the sense that they're implementing Google and not other search providers as the default."); UPX5533 (Google Products and Services Agreement between Sprint and Google (May 6, 2008)).

845. Had Google not been successful on the Sprint deal, Sprint made it clear to Google that it would have entered into a deal with another search engine. Tr. 357:14-358:2 (Barton).

846. Google competed for and negotiated similar deals with other major carriers during this period. Tr. 356:6-12 (Barton).

2. Mobile Users Preferred Google Even When Bing or Yahoo was the Preinstalled Default

847. Google has competed successfully on mobile devices where it lacked preinstallation.

848. The competition for users on the Blackberry Research In Motion ("RIM") devices highlights Google's success. Tr. 9766:20-9767:14 (Murphy) ("[R]egardless of who had the default [on RIM devices], Google got the majority of the business.").

849. In 2010, Bing was the preinstalled search provider on Verizon RIM devices. Tr. 3312:20-3313:10 (Tinter (Microsoft)) ("Q. . . . [O]n Blackberry, Microsoft had some search distribution deals on Blackberry; correct? A. . . . We had entered into a partnership where Bing was the search default on Blackberry . . . . [W]e had a direct partnership that we had entered into Blackberry, and then Blackberry was covered through the Verizon partnership.").

850. In 2010, Yahoo was the preinstalled search provider on AT&T and T-Mobile RIM devices. Tr. 3577:16-23 (Nadella) ("Q. And then we look at the AT&T, T-Mobile examples, now those were carriers where -- did Bing try to get the default on those carriers? A. Bing may have tried, but we obviously didn't get them. Q. And Yahoo! was successful in winning those deals, right? A. Yep.").

851. In 2010, Google was the preinstalled provider on Sprint RIM devices. DX2011 at .012.

852. Despite having no preinstallation on three of the four major wireless carriers of Blackberry RIM devices, Google successfully competed for users of all the RIM devices. Tr. 3574:12-3575:4 (Nadella) ("[Q.] Google is getting the overwhelming majority of search

queries even though Bing and Yahoo! are the defaults on various of these devices, right? A. That's correct."); DX0440 at .011 ("Bing + Yahoo Share is about 10% despite default deals; Google is super-dominant at ~90%[.]").

853. As Satya Nadella acknowledged, people were switching from the defaults on these devices and using Google. Tr. 3578:3-8 (Nadella); DX0440 at .013.

854. From the outset of the smartphone industry, then, RIM users overwhelmingly preferred Google, even when Bing or Yahoo was the exclusive preinstalled default search engine. Tr. 9766:20-9767:14 (Murphy) ("And, indeed, on the devices that had either Bing or Yahoo! as the default, the vast majority of people searched away from that default, probably in these days mostly by going to google.com because that's where a lot of people went."); DX0440 at .013 ("Bing Mobile Browse on RIM achieves low penetration to date, while client has almost no uptake; however users do search . . . using Google"); DXD-37.059.

855. Microsoft's CEO further acknowledged that this "churning" of Bing mobile users was a problem Microsoft faced when he oversaw Microsoft's search division from 2007 to 2011. Tr. 3572:8-16 (Nadella) ("Q. All of these mobile distribution agreements that Microsoft entered into in this 2009, '10, '11, '12 time period, they all failed to get Bing's scale because users preferred Google, and the large majority of users of these devices searched on Google instead of Bing, right? A. Users do switch. Q. They churned off of Bing. That's an industry term, right? A. Yep."), 3579:3-10 ("Q. And as this slide says, 'First impression matters. Bing mobile users search very few days before leaving.' Do you see that? A. Yeah, I do. Q. And you recall that was a problem that you had when you were overseeing the search group from 2007 to 2011, correct? A. Yes."); DX2011 at .028 ("57% of New users have only one active day on Bing Mobile before leaving.").

856. By contrast, there is no comparable evidence of users of RIM devices switching away from Google when Google was the preinstalled default search engine. *See* DX2011 at .012.

857. Bing was not any more successful with users of devices sold by Nokia, one of the largest OEMs as of 2011. Tr. 3570:14-16 (Nadella) ("Q. In 2011, Microsoft also struck a deal with Nokia, right? A. Yes.").

858. Under Microsoft's agreement with Nokia, Bing was set as the exclusive preinstalled default search engine to power Nokia's search services across all of Nokia's devices. Tr. 3570:24-3571:3 (Nadella) ("Q. And under that deal, . . . Bing would power Nokia's search services across all of Nokia's devices, correct? A. Yeah, I don't have the details, but I would assume that you're correct."); DX0966 at .003 [redacted]

859. Bing was not any more popular on Nokia's phones than it was on the RIM devices. Tr. 3571:4-6 (Nadella) ("Q. And Bing wasn't any more popular on Nokia's phones than it was on the Verizon and on the RIM phones, was it? A. Probably not.").

D. A Single Preset Browser Default is a Ubiquitous Product Design

860. Since the early 2000s, browser developers have designed their browsers with a single default search engine. Tr. 9693:9-9695:3 (Murphy) ("So my first opinion is that browser defaults reflect partners' design decisions that enhance competition. . . . We're going back to 2000, 2001, 2003. And what you see is the decision to have an integrated search functionality in a browser with a default search provider. . . . And what we'll also see is that it's not only been

around for a long time, it's basically the universal design that people have adopted. . . . And it's also important that no other design really met the market test, right? It's not like we see some people use the defaults and a bunch of other people do something else. Actually throughout this period, defaults, it was the standard, that's what everybody did."); DXD-37.008.

861. In 2000, Netscape made Netscape Search the single preset default search engine for the Netscape 6 browser. Tr. 9695:7-9696:10 (Murphy) ("[I]f you look at the Netscape, Netscape 6, search was integrated into the address bar. That is, you could type your search into the address bar and hit search, and then you would get a Netscape search engine's result."); DXD-37.008.

862. In 2001, Microsoft made MSN Search the single preset default search engine for Internet Explorer 6. Tr. 9695:7-9696:10 (Murphy) ("In the case of MSN, you again would type it in to the address bar, and you could get search there, okay? Or you could use the search button, and then something would pop up for the search button. . . . The point I'm making here is all those search functionalities came with a default provider."); DXD-37.008.

863. In 2003, Apple made Google the single preset default search engine for the Safari browser search box. Tr. 2620:8-2621:19 (Cue) ("[B]efore 2003, the way that you searched the web was you had to go in and type in, you know, Google.com in the URL field-or you could type another search engine, obviously Yahoo.com or anybody at that time. And we had thought of this idea of like, well, this seems like an extra step for the customer. What if we come up with the idea of if you type in something in the search field and it's not a URL, let's just automatically search and provide the results."); DX0267 at .001 (Apple press release of January 7, 2003 announcing the release of Safari: "Safari's innovative features include Google search capabilities integrated directly into the toolbar;" "Safari's features include: Google search capabilities built

into the user interface for convenient and quick searching on the web's most popular search engine"); DXD-37.008; *see infra* § XI.A.1.

864. This industry-wide preset default search engine design persists today across U.S. browsers, regardless of whether the browser's default is set to Google or a different search engine. Baker Dep. Tr. 47:24-49:11 ("Q. Has that structure that you described always been in place on the Firefox browser since it was first introduced? A. Firefox browsers have had a search box for a long time before 1.0. . . .The concept of a default search has always been there."); Tr. 2623:24-2624:9 (Cue) ("When you bring up Safari for the first time and you type something in and you get the search results, it works -- some people would call it magically. Again, we've gotten used to all of this. But at this time, when we're innovating and doing this for the first time, it was incredible."); Tr. 9693:9-9695:3 (Murphy) ("And what we'll also see is that it's not only been around for a long time, it's basically the universal design that people have adopted. . . . [P]eople have agreements not with Google and not just in terms of agreements with Google as the search engine. If you look at Internet Explorer using Bing or Edge using Bing or Brave using Brave search, the Silk browser using Bing. . . . Firefox used Yahoo!. DuckDuckGo uses the DuckDuckGo search platform. The point is, this is a market outcome. This was the product of competition. And how do I know that? Because this happened basically across the board. And it's also important that no other design really met the market test, right? It's not like we see some people use the defaults and a bunch of other people do something else. Actually throughout this period, defaults, it was the standard, that's what everybody did. Whether it was Google or whether it was people other than Google, whether it was when somebody's a small player or a big player."), 9695:7-9696:10 ("So that default design . . . was present way back then and has continued to really be the design choice made throughout the industry."); DXD-37.009;

see also Tr. 1963:3-17 (Weinberg) ("THE COURT: I just want to add, just as a practical question, if I go to an app store and download DuckDuckGo, the DuckDuckGo app is both a browser and search engine or is it just search engine? Can you tell me what gets downloaded? THE WITNESS: Yeah, I mean, I think that it's a browser, but it has the search engine built in. I mean, all the browsers since about 2010 have that address bar where you just type, search right into the address bar.").

865. Browser developers design their browsers to have a single search default because it enables a browser to function seamlessly the first time a user opens it. [redacted] Baker Dep. Tr. 46:24-47:23 ("You want the browser to work when it starts, and so the default -- in Firefox, the default in the search box, the awesome bar in Firefox, is what happens if the user makes no choice. . . . [W]e try to make it easy for people to find other search engines and to use them, and we combine that with the default of what happens if you open a browser, you look at the search box and you just want to type something in and get an answer, and so if you make no other choice, you'll get the default.").

866. Browser developers have determined that users prefer browsers that function out of the box. Tr. 2624:10-2625:10 (Cue) ("[I]t's critical for customers -- with our products, at

least. . . . We like our products to come out-of-the-box and work where it feels like magic. And I think the ability of searching in Safari and doing that with Google, it does feel like magic, it works really well."); [redacted] Baker Dep. Tr. 46:24-47:23 ("[T]he software that we use is complex enough when you get to the computers and devices, that many users want their device or the software -- I'll talk about browsers. You want the browser to work when it starts, and so the default -- in Firefox, the default in the search box, the awesome bar in Firefox, is what happens if the user makes no choice.").

867. The DOJ Plaintiffs' behavioral economics expert, Professor Antonio Rangel, offered no opinion that Apple's or Mozilla's decision to have a single search default for their Safari and Firefox browsers has harmed consumers. Tr. 739:5-18 (Rangel (DOJ Expert)) ("Q. Now, you're not offering an opinion in this matter that a browser developer's decision to select a default search engine rather than employing some other mechanism for a default selection has harmed consumers, correct? A. To be able to do that, I would have to carry a type of analysis that is called a welfare analysis, Your Honor, that quantifies the gains and losses. I have not done that, therefore I'm not offering an opinion. Q. So you're not offering an opinion that Apple's decision to make Google the default search engine on the Safari browser has harmed consumers, correct? A. I am not. Q. And the same would be true for Mozilla, correct? A. Yes.").

868. A browser's default search engine is important to a consumer's view of the quality of that browser. Tr. 6052:6-8 (Whinston) ("Q. You would agree that the default search engine is important to a consumer's view of the quality of a browser? A. I think that's the case, yes."); Tr. 2619:5-11 (Cue) ("[T]he Internet is a huge piece of what customers do. They use Safari every day . . . and part of using that is searching. So it's a critical experience of our devices.").

E. Android Device Distribution History—Early Days

869. Smartphone operating systems have typically been commercialized under two models: (1) as a closed operating system developed by the OEM and used exclusively on that OEM's devices or (2) as a licensable operating system that the operating system developer makes available for OEMs—in the case of Android, any OEM—to license. Tr. 351:25-352:22 (Barton) ("[A]ll these platforms were proprietary, they were -- as you heard, they were basically each controlled -- each platform was controlled by the manufacturer of the mobile devices."); Tr. 9414:19-9415:21 (Rosenberg) ("The prevailing platforms at the time [of Android's initial release] carried license fees"); Tr. 9840:21-9842:19 (Murphy) ("[T]here's two basic, kind of, models you can use in a platform business. You can have a, kind of, a more closed model, like Apple has. . . [o]r you can do a more open structure, like Android tried to do.").

870. Apple's iOS is a closed operating system; Apple developed it for use on its own devices, and no other OEM can license iOS. Tr. 9840:21-9842:19 (Murphy).

871. Many licensable mobile phone operating systems have been released, including Android, Windows Mobile, Symbian, and Qualcomm BREW. Tr. 350:17-353:14 (Barton); Christensen Dep. Tr. 21:2-16; DXD-37.087.

872. Prior to Android, OEMs' implementations of these customizable mobile platforms were typically not compatible with one another such that an application written for one mobile

phone model often would not work on another model running a variation of the same mobile operating system (a phenomenon known as "fragmentation"). Tr. 9413:17-9414:18 (Rosenberg) ("[D]uring [the mid-2000s], the landscape was highly fragmented. . . . [E]very implementation tended to be different, every phone, whether it was because of a carrier or because of a particular manufacturer, because of the underlying platform, every phone had a different set of characteristics, and also a different mechanism for distributing a website or an app to that phone. And so if you were a developer of an app or a publisher of a website, it was enormously challenging to go around to all of these individual entities, work with their respective walled gardens and get distribution for your product[.]").

873. Fragmentation made it more difficult for developers to efficiently distribute their mobile apps and other products. As a result, fragmentation made operating systems less attractive to developers. Tr. 3341:12-14 (Tinter) ("Q. Fragmentation is challenging for an operating system? It makes it harder for developers to develop for it; correct? A. Yes."); Tr. 9413:17-9414:18 (Rosenberg) ("And so if you were a developer of an app or a publisher of a website, it was enormously challenging to go around to all of these individual entities, work with their respective walled gardens and get distribution for your product; and so that put an overhang on innovation, it put an overhang on the capabilities that could come to users. I experienced [fragmentation] firsthand at Danger. We had an amazing product. One of my responsibilities was to run the app store there. And my proposition to developers was, you develop an app for this device, I can get you distribution on this device but nothing else. So we had a couple dozen developers, we had a couple hundred apps, that's as much as we could achieve."); Lagerling (Google) Dep. Tr. 83:18-84:20 ("Fragmentation is something that means that you have a large amount of derivatives of a software environment on different hardware platforms. That means

that app developers have to change, fix, adapt, port their application specifically for each hardware rendition, which makes it very hard for developers to scale—to focus their development in a way that scales.").

874. In addition, some operating systems, such as Windows Mobile and Symbian, charged a positive license fee, which contributed to their failure. Tr. 353:15-23 (Barton) ("[T]hey were charging money per device -- for a per device for devices that were Windows Mobile devices"); Tr. 9414:19-9415:21 (Rosenberg) ("The prevailing platforms at the time [of Android's initial release] carried license fees[.]"); Tr. 9849:17-9851:1 (Murphy) ("Symbian and Windows Mobile charged positive license fees that, at least some people say, made it more difficult for those platforms to succeed."); DXD-37.094 (citing sources showing that "Symbian's license fee 'really held Symbian back'" and "Windows Mobile's license fee a key cause of failure"); Christensen Dep. Tr. 23:02-24:09 (describing Windows Mobile as "fairly expensive to license from Microsoft").

875. By contrast, Google licensed the Android operating system with no license fee to "lower the barrier to adoption" and encourage OEMs to adopt the Android platform. Tr. 7654:2-14 (Pichai); Tr. 9414:19-9415:21 (Rosenberg) ("I also think the fact that there was no license fee for Android helped encourage manufacturers to adopt the platform."); Christensen Dep. Tr. 23:2-24:9 ("Q. And why did . . . Motorola use Android over other operating systems that Motorola had worked with for doing smartphones going forward? A. So there was a number of factors. It wasn't all about Android. It was also about the others. . . . For example . . . [Windows Mobile] was fairly expensive to license from Microsoft. Linux Java was inexpensive from a licensing point of view, but very expensive from a development point of view. Essentially, we had to create the structure and the operating system ourselves using, you know, a fair amount of open

source software. However, it required a significant investment in the overall app, application, ecosystem. And Android solved a lot of those problems.").

876. Google also chose to license Android for free because a free, world-class mobile operating system would further Google's mission of making the world's information universally accessible and useful by increasing access to the internet, and as consumers "use the internet more . . . they also search [on] Google more." Tr. 7652:4-22 (Pichai); *see also* Tr. 7654:2-14 (Pichai) ("[P]eople use Android to build smartphones at prices as low as $30, right. It's what has helped bring hundreds of millions of people online and give them to access to computing, which otherwise wouldn't have been possible. I don't think that could have been done with any other model. So allowing Android to be free to license allows people to just build. I think it lowers the barrier to invest in Android, and so that's partly by design.").

877. Not only did Google license Android for free, it has, since Android's first release, made the operating system available open source, meaning "any person or company can download and use [Android] without having to enter into commercial negotiations with any particular corporate entity, including Google. So they could use it as they see fit and they could even alter it as they see -- if they want. . . . [I]t's a free software so that people can create smartphones." Tr. 354:21-355:7 (Barton); *see* Tr. 7652:23-7653:11 (Pichai) ("Android is an open source operating system, so . . . you can just take the open source project and do whatever you want with it without ever talking to Google.").

878. Google open sourced Android because the open-source model "facilitated both adoption of the product, as well as allowed OEMs to customize and meet the needs of people around the world." Tr. 7652:4-22 (Pichai); Tr. 9844:22-9846:12 (Murphy) ("Who knew if Android was going to turn out to be successful? If it split up and went its separate ways, they

could take advantage of the open source nature, and they wouldn't be out of everything they had worked on in Android."); Tr. 9414:19-9415:21 (Rosenberg) ("Being open source, [Android is] customizable. It [i]s something that someone could take with its underlying capabilities and then build on top of and add capabilities to.").

879. But in making Android available under a free, open-source license, Google needed to solve for potential fragmentation (or incompatibility) problems that had plagued other customizable operating systems in the past. Tr. 9842:20-9844:21 (Murphy) ("There was a lot going on, and these platforms had significant issues . . . and one of the big ones [wa]s compatibility within the platform.").

880. Google thus made promoting compatibility—a consistent baseline implementation of its operating system enabling a single version of an application to run properly across compatible devices—a key goal for Android. *E.g.*, Tr. 9414:19-9415:21 (Rosenberg) ("Q. Now, from the perspective of your time working on Android from 2010 to 2022, how, if at all, has Android helped solve those twin problems that you described of fragmentation and walled gardens? A. Well, Android itself is an open source operating system and so it was developed with a couple of key principles in mind. Being open source, it was customizable. It was something that someone could take with its underlying capabilities and then build on top of and add capabilities to. But it had a set of consistent capabilities that enabled for a strong developer experience, enabled developers to really harness the power of the devices it was running on. Android also enabled customization. And so doing something in a consistent way at the operating system level for a manufacturer didn't necessarily mean they couldn't differentiate themselves for competitors, and so this was the needle that I think was thread very cleverly as to

how to create a consistently strong underlying platform for developers' capabilities but continued to have the opportunity to differentiate.").

881. To combat potential incompatibilities and attract app developers to Android, Google entered into compatibility commitments with partners as early as 2007, prior to Android's open-source release. *E.g.*, DX0804 (Open Handset Alliance Cooperative Marketing Agreement between LG Electronics and Google (Feb. 22, 2007)).

882. Since Android's release in 2008, Google has entered into Anti-Fragmentation Agreements ("AFAs") and later Android Compatibility Commitments ("ACCs") with OEMs, such as Samsung and Motorola. *E.g.*, DX0817 (Anti-Fragmentation Agreement between Samsung and Google (Jan. 1, 2011) ("2011 Samsung AFA")); DX0861 (Android Compatibility Commitment between Motorola and Google (Jan. 5, 2018) ("2018 Motorola ACC")).

883. These agreements promote a baseline level of compatibility across all of a signatory's Android devices, to ensure that application developers need only write one set of code that functions properly across compatible devices. Tr. 9844:22-9846:12 (Murphy) (AFAs/ACCs ensure "a platform that is easy for developers to write to and has similar functionality, no matter who you get the device from"), 9842:20-9844:21 ("If software that runs on some of the platform doesn't run on other parts of the platform, it's not really a good platform, right? The whole idea of a platform is some kind of uniformity. So when you manage a platform, you're trying to combine some ability to expand and do new things, but at the same time, maintain compatibility. And the kind of agreements we have are an effort to do that."); Tr. 9414:19-9415:21 (Rosenberg) (the Android model "ha[s] a set of consistent capabilities that enable[] for a strong developer experience, enable[] developers to really harness the power of the devices [Android is] running on").

884. ACCs and AFAs require signatories to comply with the public Android Compatibility Definition Document ("CDD") for the Android devices that they market, absent exemption. *E.g.*, Lagerling Dep. Tr. 70:6-14 ("Q. Am I correct in understanding that OEMs who had signed the AFA were required to comply with the CDD? A. Yes. If you are building an Android device and you have signed an AFA, the expectation was that you would build a device according to the -- CDD is a technical document -- in accordance with the technical definitions of the CDD."); DX0817 (2011 Samsung AFA) at -027-028 (§§ 1.2, 2.1); DX0861 (2018 Motorola ACC) at -257-258 (§§ 1.2, 2.1).

885. Neither the ACC nor the AFA requires a signatory to install the Google Search application, the Chrome browser, or any proprietary Google Software on any Android device, or to set any Google service as a default, nor do they restrict a signatory from exclusively preinstalling or setting as the default on an Android device a search application, search widget, or browser provided by a search engine other than Google. *E.g.*, DX0817 (2011 Samsung AFA) at -027-028 (§§ 1.2, 2.1); DX0861 (2018 Motorola ACC) at -257-258 (§§ 1.2, 2.1).

886. Google also needed a means of distributing its products and services on Android devices, otherwise Google "would have created an ecosystem that basically would just lead to a bunch of searches on competing services." Tr. 341:5-21 (Barton).

887. Google accordingly created the Mobile Application Distribution Agreement ("MADA"), which distributes and provides out-of-the-box promotion for certain revenue-generating Google services, thereby enabling Google to fund the Android ecosystem without charging a license fee for the Android operating system or for Google's popular proprietary applications. Tr. 9849:17-9851:1 (Murphy) ("Google is giving a royalty-free license to GMS. . . . [T]hat's something that, obviously, an OEM values because he's got a good OS with

users that know how and want to use it, apps developed for the platform. . . . Google says: No license fee for that at all. . . . In exchange, though, we're going to ask for some promotion."); DXD-37.094; Tr. 9425:12-9426:16 (Rosenberg) ("[S]ome of the apps we distribute in MADA do generate[] revenue for us, and that is part of what enables us to continue to invest in the platform and the ecosystem that we cultivate around it."), 9427:16-25 (explaining how MADA placement terms contribute to financial model for Android by making Google services "convenient" to users to access); Tr. 816:20-25 (Kolotouros (Google)) ("[T]he MADAs themselves are the mechanism to fund the ecosystem via the presence of the widget and the Play Store icon on the home screen."); Tr. 7716:1-11 (Pichai) (The MADA "provides a distribution for [Google's] revenue generating services, including Google Search and Google Play. And it also helps [Google] support the business model of -- because [Google] provide[s] Android for free, and [Google] invest[s] tens of thousands of engineers to compete with Apple. It helps provide the business model to support innovation on Android."); *see infra* § XII.A.

888. Google charged no license fee for the MADA to facilitate Android OEMs' abilities to enter and expand, permitting Android OEMs to focus their resources on "innovat[ing] on the hardware [and] innovat[ing] on differentiating their . . . user experience." Tr. 9426:19-9427:7 (Rosenberg).

889. Google also offered a Revenue Share Agreement ("RSA") to certain OEM and carrier partners to provide enhanced promotion of certain Google services, including Google Search, and to encourage partners to invest in quality Android devices to enable Android to better compete against Apple devices. Tr. 9428:4-9429:9 (Rosenberg) ("[W]e think Search is best in class. We think that it's a great experience to promote Google Search to end users on these devices. . . . And we want our partners to have . . . aligned incentives in growing that

business with us and growing Android with us."); Tr. 7656:20-7657:1 (Pichai) ("[R]evenue share agreements are commercial deals where [Google] give[s] a revenue share to [its] partners, both OEM partners and telecom partners, so that they can provide enhanced promotion of [Google's] products and services."); Tr. 817:16-22 (Kolotouros) ("The goals of the RSA, more broadly, are to invest in the OEMs in the ecosystem to help them compete more successfully with iPhone. Part of that is out-of-box search defaults and out-of-box exclusivity for search, among other things that are in the RSAs."); Tr. 9872:21-9873:17 (Murphy) ("The RSA payments encourage search, but, also, at the same time, help the Android OEMs compete."); *see infra* § XII.B.

890. The terms of these Android agreements have changed over the years but this general structure for the Android business model has remained consistent in the United States from Android's first release through today. *See infra* §§ XII.A, B.

891. In the very early days of Android, various OEMs and carriers in the United States in some instances shipped Android devices with search engines other than Google as the exclusive preloaded default search engine. Tr. 357:4-9 (Barton).

892. In 2010, Motorola and AT&T launched the Backflip, an Android phone preloaded exclusively with Yahoo as the default search engine, and, also in 2010, Samsung and Verizon launched the Fascinate, an Android phone preloaded exclusively with Bing as the default search engine. Ezell Dep. Tr. 287:21-288:22 ("[T]he Backflip . . . was our first Android device that we carried . . . and . . . Yahoo was the search on that device."); [redacted] UPX0134 ("Verizon[] and AT&T were . . . examples of large carriers that wanted to ship without Google . . . and did. AT&T shipped Yahoo on Android phones. Verizon shipped Bing.").

893. AT&T's Jeffrey Ezell testified that, due to AT&T's decision to preload Yahoo on the Backflip device instead of Google, AT&T received "complaints by customers" and was "criticized in the . . . media" with "people saying things that would be derogatory about -- you know, this is an Android device, where are the Google services." Ezell Dep. Tr. 287:21-288:22.

894. Ezell also testified that AT&T was "very sensitive" to this criticism and "didn't want to be perceived as having an inferior device lineup to [its] competitors," so it partnered with Google moving forward to avoid "criticism for carrying a device that didn't have the search product the consumers were expecting on the device." Ezell Dep. Tr. 301:20-304:10.

895. AT&T compiled consumer complaints about the Backflip in a document titled "Negative BACKFLIP Feedback on Facebook" that includes comments such as: "Most of us have discovered . . . that the Backflip is very crippled when compared against Android phones on other networks. For starters, AT&T has had the default search engine on the phone changed from Google (the obvious choice) to Yahoo (a baffling and disappointing choice)." DX0384 at .001.

896. Nadella testified that Microsoft "saw a lot of" bad press surrounding the Samsung Fascinate and that Microsoft's agreement with Verizon to preload Bing on Verizon Android devices "was a disaster financially" for Microsoft. Tr. 3566:15-3568:22 (Nadella).

897. Internal Verizon documents show that it compiled a "coverage report" of press articles about the Samsung Fascinate [redacted]

898. These articles include statements such as: "Now, imagine buying an Android phone – a Google phone – only to discover that not only was Google not defaulted to as a search

engine, it's not even an option! For us, this is actually a deal breaker." DX0737 at .024; *see* DXD-41.003.

899. Verizon Chief Customer Experience Officer Brian Higgins testified that Verizon takes product reviews like this "seriously because they provide product insights and [Verizon] know[s] consumers read the reviews." Tr. 1116:18-23 (Higgins (Verizon)).

900. Higgins also testified that he did not recall ever seeing a product review where anyone complained about Google Search being preloaded on a Verizon Android device. Tr. 1116:13-17 (Higgins).

901. Professor Whinston agreed that "from an economic perspective, it would be rational for an Android OEM or an Android carrier to be very sensitive to and care about product reviews like" those that AT&T, Verizon, Motorola, and Samsung received regarding the Backflip and Fascinate "when they go about making decisions about how to configure their devices." Tr. 10585:16-21 (Whinston).

902. He also testified that when Android OEMs and carriers are "confronted with the choice" of whether to preload "Google or a rival" that such product reviews "certainly . . . would matter." Tr. 10585:22-10586:2 (Whinston).

903. Since the Backflip and Fascinate in 2010, Verizon, AT&T, Motorola, and Samsung have not sold Android devices in the United States (1) with search engines other than Google as the exclusive preloaded search engine or (2) with a search engine other than Google set as the default in a default browser. *See infra* §§ XII.C, D.

F. Google's Development of the Chrome Browser

904. Browsers are the primary means by which users navigate and use the Internet. Tr. 7644:22-7646:4 (Pichai) (Google "realized early on browsers are critical to how people are able to navigate and use the web and improve their experience.").

905. Prior to the launch of Chrome, Microsoft had dominated the browser market. Tr. 3584:14-19 (Nadella) (agreeing that Microsoft's Internet Explorer had "once accounted for the overwhelming majority of browser usage share in the United States").

906. As discussed *supra* in paragraphs 434 to 436, after Microsoft gained control of the browser market, it did not innovate or otherwise make significant improvements to Internet Explorer.

907. Better browsers improve users' web experience, leading to increased web usage and more search activity. Tr. 7644:22-7646:4, 7646:18-7647:10 (Pichai) (Google "realized just improving the state of browsers would overall help users use the web more, will increase online activity and increase search usage, including Google's usage. And the correlation was pretty clear to see, and [Google] had seen that.").

908. Google wanted to ensure it was not reliant on third parties that controlled all of the primary access points through which users access the internet. UPX0804 at -670 ("All of Google's business flows through the browser. Google must control its own destiny."); Tr. 3585:13-19 (Nadella) (Google "had all the incentives to [build Chrome] in order to be able to control their own destiny on Windows, given the search property.").

909. Google started developing its Chrome browser in 2006 and launched it publicly in 2008. Tr. 7646:5-7 (Pichai).

910. Chrome was premised on simplicity, speed, and security. Tr. 7651:7-19 (Pichai) ("It was one of the most profound security advances at the time for browsers, and really helped improve[] user security and privacy."), 7649:6-7650:2 (citing Chrome's innovations and features, including that Chrome is "much faster to use," that the design of the border of the

browser "gave people a lot more access to content," that Chrome "combined the URL box and the search box," and more).

911. To provide users access to new features as soon as they are developed, Google releases a new version of Chrome every six weeks, whereas "[b]efore Chrome, Internet Explorer used to release a new version once every one to two years." Tr. 7650:18-7651:6 (Pichai).

912. Upon launch, and since, Chrome has been widely considered to be the best quality browser. Tr. 3343:22-24 (Tinter) (agreeing that "Chrome was considered, when it first shipped, to be a fast browser that loaded websites in a good way"); Tr. 7644:22-7646:4 (Pichai) (Google "improved the execution speed of many of the applications by over 20 times by building Chrome. [Google] also made applications much more secure for users."), 7650:18-7651:6 (At release Google "saw strong adoption. Since then, [Google has] continued to make the product better."); Tr. 3585:24-3586:12 (Nadella) (agreeing that "Microsoft was caught sleeping when Google introduced Chrome, which was a far superior browser to Internet Explorer"); Tr. 5935:18-5936:1 (Whinston) ("Chrome as, you said, came in. It was a much better browser than Internet Explorer, and it managed -- and because of that, people started putting Chrome onto their Windows PCs.").

913. Today, Chrome is the most used browser in the United States as well as the most used browser on Windows devices. Tr. 7651:20-25 (Pichai); Tr. 3584:11-13 (Nadella); Tr. 5928:12-16 (Whinston).

914. Chrome has become the most used browser in the United States without preinstallation deals for Chrome on Windows, iOS, or MacOS. Tr. 3344:7-9 (Tinter) (agreeing that Google "competed with [Microsoft] by making their browser available for download on [the Windows] platform"); Tr. 3581:14-17 (Nadella) (Chrome is not preinstalled on any Windows PC

in the United States), 3587:8-19 (Chrome beat Internet Explorer in browser share despite not being preloaded on Windows and needing to be downloaded by users); Tr. 5928:10-25 (Whinston); Tr. 2455:23-2456:1 (Cue) (confirming that "Apple doesn't preinstall Chrome on its devices").

915. Part of the value proposition of the Chrome browser is easy access to Google Search. Tr. 7650:10-17 (Pichai) ("Chrome is a product from Google, and a lot of people value the integrated search experience. That's what they are looking for when they get Chrome."); Tr. 10640:7-13 (Whinston) ("[P]art of the attraction of Chrome is Google's search for some people[.]"); *cf.* Baker Dep. Tr. 34:1-13 ("We have found the search experience in the browser to be fundamental to the browser. In fact, you know, for many, many years, many people didn't -- you know, weren't able to distinguish between where -- what was Firefox and what was search, and so the overall search experience is, you know, one of the fundamental use cases of the browser, and so the quality of the search experience, whether it works for your users, whether people like it is -- maybe it's the fundamental use case, but if it's not the fundamental, it's one of the handful of things that are the most critical about a browser.").

916. Google noticed early on that Chrome users search more. Tr. 7647:11-16 (Pichai); DX0023 at .001 ("[W]e found that a Chrome installation resulted in significantly more Google searches. The summary and the links to full studies are below but the high level is that we see ~48% increase from IE to Chrome and ~27% increase in queries from Firefox to Chrome."); Tr. 7648:9-18 (Pichai) ("[W]hen people adopted Chrome, previous users of Internet Explorer, the query usage increased by 48 percent. And the same is true to a lesser extent from Firefox to Chrome. And so it showed the profound increase in the amount of usage people had when they switched browsers.").

917. Since the first release of the Chrome browser, Google has made the underlying code, called Chromium, open source to improve the state of browsers generally and the web for all. Tr. 7646:18-7647:10 (Pichai) ("[I]t was equally important to us to open source the technology, which was built underneath Chrome, so that others could adopt it and make their browsers better. In some ways, we were just trying to make all browsers better."), 7648:19-7649:5 (Google has "completely open sourced the technology. So any browser can -- any startup, anyone can take that and build a browser."); Tr. 5927:5-6 (Whinston).

918. Competing browsers such as Microsoft's Edge, the Brave browser, and the Opera browser are built using open-source Chromium. Tr. 7648:19-7649:5 (Pichai); Tr. 3585:1-9 (Nadella).

919. Google has configured Chrome to allow users to easily change the default search engine within the browser. Tr. 7650:10-17 (Pichai) (Google "made it very, very easy for people to change and use any default search provider of their choice."); Tr. 5926:21-5927:1 (Whinston) (testifying that he saw statements in the record that "Google . . . has made changing default search engine on Chrome much easier than Microsoft has made changing the default search engine in its various browsers").

IX. PLAINTIFFS HAVE FAILED TO PROVE THEIR ASSERTED RELEVANT PRODUCT MARKETS

A. Google Competes With a Variety of Search Providers to Satisfy Users' Information Needs

920. A user seeking information "can use any number of tools" for his or her query, including general search engines, SVPs, social media, and other apps. Tr. 8199:21-8200:8 (Reid); Tr. 7306:10-13 (Raghavan) (identifying DXD-21.003 as "a sampling of companies where people go to [fulfill] their information online -- information needs online"); DXD-21.003 (listing more than 40 providers).

921. When a user searches for information, the product the user is seeking is an answer to his or her query. Tr. 8380:7-8381:2 (Israel (Google Expert)) ("[T]he product on the user side is really answering questions, answering queries, and so the competition we're studying is who is competing to answer those questions, those queries.").

922. The empirical evidence shows that when searching online, users typically search for information in "short, discrete visits focused on specific topics." Tr. 8417:2-8419:15 (Israel); DXD-29.025. Dr. Israel analyzed Google's sessions data, which tracks "everything the user is doing on Google . . . in any of the forms; mobile, web, whatever," and looked at users' searching behavior across visits, defined as "any series of user actions separated by five minutes of inactivity." Tr. 8417:2-8419:15 (Israel). The data show that the "median length of a visit is less than 20 seconds," meaning that users "interact with Google for roughly 20 seconds before they stop interacting for at least 5 minutes," and the "median number of queries per visit is 1." DXD-29.025. In other words, "the typical behavior when [a user is] interacting with Google is hang out there for about 20 seconds, ask it one question, and then go do something else." Tr. 8417:2-8419:15 (Israel); *see also* Tr. 8416:9-8417:1 (Israel) ("Queries clearly are separate decisions, not a bundle."), 8420:3-9 ("[T]he point I'm trying to make is that most visits are one query. That's the most important point because, to me, that's the opposite of one-stop shopping.").

923. Where a search session includes more than one query, the queries are usually topically similar or otherwise within the same vertical segment. DXD-29.025; Tr. 8417:2-8420:1 (Israel). Looking across all visits, the data show that for [redacted] of visits, users searched across only *one* vertical, and for [redacted] of visits, users searched across only *one or two* verticals. DXD-29.025; Tr. 8419:9-11 (Israel) ("[T]he overwhelming majority of visits are one vertical or one or two verticals."), 8417:21-8419:15. As Dr. Israel explained, "people are really interacting

with the device for short periods of time, mostly one vertical at a time, then there's a break and then they come back and they interact with it in a different way, typically for another 20 seconds." Tr. 8417:2-8420:1 (Israel); *see also* Tr. 8421:1-8422:17 (Israel); DXD-29.026 (demonstrating that Professor Baker's analysis of "visits" (a series of user actions separated by five minutes of inactivity) from his expert report is consistent with Dr. Israel's opinion, and that Professor Baker only provided analysis at trial based on a "session" (a 24-hour period)).

924. Users often select a search provider on a query or vertical basis—"whatever seems most appropriate for the task at hand." Tr. 7306:19-7307:16 (Raghavan) ("[A]s I constantly remind my team, nobody wakes up every morning and says, you know, I have to run a Google query. They go wherever their instinct takes them to address their need."); Tr. 8392:2-11 (Israel) ("[E]ach query made by a user is a meaningfully distinct choice about where to go get information. So when I'm thinking about where to get shoes, and later I'm thinking about where to take a flight, those are distinct choices about who is going to answer that question for me.").

925. Users "can pick different choices for every single [search] need, and they often do use a variety of tools, not a single one." Tr. 8199:21-8200:8 (Reid). "People decide, as they need to search, who can fulfil[l] that query." Tr. 8392:2-8393:19 (Israel).

926. As an example, Google's expert Dr. Israel conducted an empirical analysis in which he analyzed panels data that tracked the desktop and Android mobile online activity of 10,000 people in the U.S. over the age of thirteen between 2021 and 2022. Tr. 8401:1-8402:24 (Israel); DXD-29.018. He looked at three verticals—Auto, Flights, and Shopping—and evaluated how often users went to GSEs versus SVPs during the time period. Tr. 8401:1-8402:24 (Israel); DXD-29.018. The analysis showed that more users tend to use GSEs for Auto

queries rather than using an Auto SVP, while a large majority of users mostly used SVPs for Flights and Shopping instead of searching on GSEs. Tr. 8401:1-8402:24 (Israel); DXD-29.018.

927. Dr. Israel conducted a similar analysis of where searches start: "The patterns tended to be, in shopping, more than half the people started on an SVP," while "on flights, that was high, but a little lower[,] [and] [o]n autos, it was more towards GSEs." Tr. 8403:16-8404:5 (Israel). Based on these empirical analyses, Dr. Israel concluded that "[f]or most commercial queries, Google faces competition . . . [and] competes in those separate verticals." Tr. 8404:18-8405:17 (Israel).

928. Google's competitors for these queries include general search engines, SVPs, and social media. Tr. 7302:7-7303:16 (Raghavan) ("Q. Okay. And can you generally describe [Google Search's] competition? A. So, as users pursue information today, what we see is roughly three buckets of competition. First, the obvious ones, which are other providers who provide an interface much like our own who creates results and present them[, including] . . . Bing. DuckDuckGo. . . . The second bucket would be a range of vertical providers, particularly in the retail and travel segments. . . . The third bucket . . . include[s] the likes of Instagram, TikTok, to some extent Facebook.").

929. These empirical analyses and record evidence thus show that Google competes with the many providers that can respond to a user's information needs. Tr. 8199:16-8200:4 (Reid) ("[A]t the end of the day, we compete with other people who service information needs."), 8201:22-8202:5 ("Q. Who do you view as Google's competitors in search today? A. Oh lots of them[, including] a lot of vertical search sites and apps[, such as] . . . Amazon, for shopping, . . . for food, . . . things like DoorDash and OpenTable, as well as Yelp, Tripadvisor."); Tr. 2362:23-2363:3 (Giannandrea) ("Q. Now, when you were at Google and you were involved

in Search, did you view or did Google view vertical search providers like an Amazon or a Yelp or a Trip Advis[o]r to be [competing] with Google for search queries? A. Not for general search queries, but for overall information intents, yes.”).

1. Google Competes With SVPs in Numerous Verticals, Including Travel, Shopping, and Local, to Satisfy Users’ Information Needs in Those Categories

a. Within Any Given Vertical, SVPs Are Strong Competitors for Users’ Queries for a Variety of Reasons

930. As discussed in Section VI, *supra*, user information needs are grouped by type, or “vertical” category. There are many different SVPs in each commercial or monetizable vertical category. Tr. 8437:24-8439:2 (Israel) (“To me, what the lesson of commercial verticals has told us is that where there’s money to be made, SVPs pop up and they compete for advertising. So, if there were some potential to make money, to actually monetize any of the noncommercial verticals, I think the lesson tells us SVPs would compete for that.”).

931. Accordingly, competition with SVPs in commercial verticals is fierce. Tr. 9189:10-13 (Holden) (“Q. So today, how would you describe the overall trend in competition in the travel vertical in the last ten years? A. I’d say it’s been very competitive and gets increasingly competitive over time.”); Tr. 5348:3-9 (Dijk (Booking Holdings)) (confirming the travel and restaurant reservation and services categories are “intensely competitive, constantly evolving, and subject to rapid change, and current and new competitors can and do launch new services at a relatively low cost”) (reading from Booking Holdings’ 2022 Form 10-K, including its listing of Google as a competitor); DX3114 at .006 (Booking Holdings 2022 Form 10-K); DX0310 at .032 (Tripadvisor 2022 Form 10-K) (stating the “global experiences market,” including travel and restaurants, “continues to grow and move[] online faster” such that businesses like Tripadvisor are investing in their online presence to “accelerat[e] revenue growth, operating scale, and

market share gains for the long-term.”); [redacted] PSX0094A at .001 [redacted]

932. As described in the paragraphs below, SVPs have many competitive strengths. One strength is that SVPs are particularly accessible to users on mobile devices—the devices on which the majority of general search engine activity occurs today—via applications. Tr. 8249:3-22 (Reid) (“Q. And this, in particular, focuses on apps. How have mobile phone applications affected the competition in verticals like local? A. So, it affects it in a few different ways. One is that not everyone sort of has a similar starting place. Instead of going to a browser in a search box, people will install their own -- their favorite apps on their home screen. . . . [A]pps also tend to have more of a relationship with people than on websites[;] . . . [a]nd so people really had this more sense of, okay, . . . I . . . prefer Yelp and other people prefer a different app, and so you got -- users got more split out based on their favorite apps, as opposed to coming to a search engine where you might see four or five different sites and you might change which one you would use. They would develop familiarity and products around specific apps.”).

933. Mobile applications make it easy and convenient for users to begin their search directly on an SVP. Tr. 9203:25-9204:23 (Holden) (“Q. So thinking of Airbnb and Airbnb’s efforts to generate its own direct traffic in the vacation rental space, how has that affected Google competitively? A. Well, Airbnb has come out with a great offering the consumers engage with highly. They have a wonderful native app that people enjoy using.”); Tr. 8428:15-21 (Israel) (“[M]any of our phones look like this. You have apps that are largely your favorite SVPs.

You can add shortcuts to a browser for SVPs."); DXD-29.031; Tr. 5867:22-5868:3 (Whinston (DOJ Expert)) ("Q. Now, SVPs have their own mobile applications that users can download on their mobile devices, right? A. Yes. Q. And the point of having those mobile apps is to make it easy and convenient for users to start searching on the SVP rather than Google, correct? Certainly, yes.").

934. Leading SVPs' mobile applications are well-known and highly used. Tr. 9203:9-24 (Holden) ("Q. And can you describe how apps have impacted the competitive landscape? A. Yeah, we've had a lot of concern about the growth of native apps on mobile devices over time. . . . It's a strategy for sure that many of the large online travel agents have invested a lot in building out their native apps with an objective of trying to have consumers connect with a good app and no longer come to Google for that connection with the partners over time. And they've been effective in doing that in many cases."); Tr. 8427:14-8428:9 (Israel) ("You know, many SVPs are extremely well known. So, people can easily go to Amazon or Expedia or Yelp. . . . [I]n an increasingly mobile world, as I mentioned, because you have apps, even on a desktop you have bookmarks, and so there's no role for a GSE, if you have an app. So, there might be a need to learn of an SVP the first time, but then once you do you know of it and it's competition forevermore.").

935. Users understand how to find, download, and use SVPs' mobile applications, and frequently do so. Tr. 8248:4-15 (Reid) (explaining that in Google's 2015 User Experience Research study, users identified and noted they frequently used mobile applications such as Yelp); DX0062A at .027-.028; Tr. 8408:7-8410:24 (Israel); (". . . SVPs have ways they can compete. Amazon has its app. It's not, like, hard to get to Amazon. People know Amazon. So, that -- I can see that as a dimension of competition, but the data tell me how often that Amazon is

winning an awful lot of queries. And you can put, shortcuts. You can use apps. You know, they [are] different ways of trying to attract these queries, right?"); *see also* Tr. 5867:17-21 (Whinston) ("Q. Okay. And have you done any independent empirical analysis or any consumer surveys that estimate the time or energy that consumers expend or would have to expend to recall or identify a particular SVP that competes with Google for search queries? A. No, I haven't."), 5868:21-25 ("Q. Okay. The cost in time needed to open an SVP app to navigate directly to an SVP website is -- is almost zero, right? A. You know, the time, if you know where you want to go, can be zero.").

936. And SVPs may offer additional features in their apps, such as Expedia's recent incorporation of ChatGPT technology to allow users to begin an "open-ended conversation in the Expedia app" for information needs such as trip planning, and "automatically save hotels discussed in the conversation to a trip in the app." Tr. 6569:19-6570:13 (Hurst (Expedia)); DX0592 at .002.

937. Professor Whinston's contention that general search engines are a "one-stop shop" fails to account for this competitive strength. His finding that "77 percent" of search sessions begin on GSEs was based on a sample of Comscore data that is limited to Windows PCs, and therefore ignored the significance of mobile queries and mobile apps, including those of SVPs, as a starting point for users to satisfy their information needs. Tr. 4614:9-4615:16, 5876:1-9 (Whinston).

938. Professor Whinston's analysis is based on a sample of *all* queries on Windows PCs, and does not address user behavior as to queries in the particular vertical categories where SVPs compete. Tr. 5878:3-7 (Whinston).

939. Importantly, the analysis did not address whether SVPs are the subject of navigational queries on Google. Tr. 5873:20-23 (Whinston). The 77% figure on Windows PCs treats as a general search engine "start" all instances where a user typed into a browser's search bar the name of an SVP and immediately navigated there. Tr. 5878:8-15 (Whinston).

940. For his part, Professor Baker, Colorado Plaintiffs' expert, contended that Google is a one-stop shop based on his analysis of the different vertical categories users queried over a "session," defined as a 24-hour period. Tr. 7030:2-7031:12 (Baker (Colorado Plaintiffs' Expert)); PSXD-11.019; *see also* Tr. 8420:23-8423:7 (Israel). However, an analysis he had done pre-trial (but which Colorado did not elicit at trial) showed that when one looks at the different vertical categories users queried in what he called a "visit" (a series of user actions separated by five minutes of inactivity), nearly [redacted] of user visits involve a single vertical category. Tr. 8420:23-8423:7 (Israel); DXD-29.026 (citing PSXD-11.019 and Baker Reply Report Fig. 4). Another [redacted] involve just two vertical categories. DXD-29.026 (citing PSXD-11.019 and Baker Reply Report Fig. 4). It is only by aggregating all user activity over a 24-hour period that Professor Baker finds that users often search in more than one segment. Tr. 8420:23-8423:7 (Israel).

941. Another strength of SVPs is that they can compete for queries within a segment by focusing on that niche without having to build systems to answer queries across the entire landscape. Tr. 8251:19-8253:13 (Reid); Tr. 8080:14-8081:3 (Gomes) ("Q. How would you describe the competitive landscape that Google faced, particularly in mobile? A. I think, at that time, the competitive landscape -- well, there were other search engines, but the competitive landscape was changing to be a whole collection of apps. So the phone was just one tap, you could go to your browser. But there's also a whole slew of other apps you could go to to satisfy

the same information needs. So if you think about it, [Google's] goal is to satisfy your information need. There are lots of places you can go. Facebook was providing information about -- it had forums on every topic. There were places like Amazon. There were places . . . for ordering food. There were places -- there were places for every different kind of thing -- information need you might have. . . .").

942. SVPs take advantage of their narrower subject matters to direct their investment and innovation most effectively. Tr. 8252:19-8253:13 (Reid) ("Q. In the United States, how would you describe the trend in the level of competition in the local vertical? A. I think it has, honestly, dramatically increased. . . . [Y]ou also get apps -- like, their entire focus is on, like pet sitting and walking. Right? Okay. And that will be, like, a $2 billion valuation of a company, and that's all they focus on. Right? Which is kind of mind-boggling, but that's an example, that you can get somebody who will say, I'm going to enter in the landscape, but I don't have to answer all of the [queries]. I can make a real business focusing on this niche. And so there's a lot more players that just focus on particular angles because people can access them via apps. So they can build those relationships and they can switch between the different apps for their uses."); Tr. 8428:22-8430:18 (Israel) ("My first point here is just the vertical-specific depth provided by SVPs, which you asked about, are a source of competitive strength."); DXD-29.033; *see supra* § VI.C (explaining that SVPs that compete in commercial verticals can monetize all of their queries).

943. SVPs also have powerful brand awareness that they use to compete with other search providers. For example, when people think of vacation rentals, they often think of Airbnb. Tr. 9203:25-9304:8 (Holden). When they think of shopping, they often think of Amazon. *See* Tr. 7313:22-7314:17 (Raghavan).

944. And many SVPs have an advantage as compared to GSEs in that they permit users not only to search for a product or service but to complete a purchase or booking as well. Tr. 7313:22-7314:8 (Raghavan) ("Q. . . . Generally, can you describe to the Court what you have seen over the past five to ten years with respect to users turning specifically to Amazon? . . . How about concluding their shopping journeys? A. That's actually one of the prime advantages . . . of Amazon, because that's a place where you can begin your shopping journey and conclude it"); Tr. 8413:17-8414:24 (Israel) ("Google is trying to answer queries. Amazon is also trying to answer queries. Amazon is trying to do more, I agree. That relates to some of my opinions. People will stay on Amazon longer. They'll also buy on Amazon. But, I think that goes to your earlier question about two different technologies to try to compete for this, right? . . . You're right, Amazon can go on and do more than that [of answering the query], which is the technology Amazon is using to compete . . . .").

b. Google Competes with a Range of Different SVPs in Different Verticals

945. In the travel vertical, Google faces intense competition from large travel SVPs such as Expedia, Booking, and Tripadvisor, among many others for travel-related information needs. *See supra* § VI.D.

946. Users can perform similar travel searches on Google and SVPs such as Expedia [redacted] for products such as flights, hotels, and things to do. Tr. 6570:14-6571:11 (Hurst) (agreeing that a user could search for a hotel, things to do, and a flight on both Expedia and Google); [redacted]

[redacted]

947. Google and travel sites such as Booking.com and Hotels.com have similar search results pages and interfaces. Tr. 7311:5-21 (Raghavan) ("Q. Let me show you the next demonstrative, which is DXD-21.005. What do we see in this demonstrative, Dr. Raghavan? A. . . . [T]he user appears to be looking for -- in a number of these cases, at least, a hotel, for instance, in the Google example, and certainly the Booking and Hotels.com example. And you have essentially the same interface and experience. . . . [T]hese are all viable alternatives to Google when the user is looking to complete their travel journey."); DXD-21.005.

948. Senior Vice President for Google Search Prabhakar Raghavan reported that many users now perform these travel searches across SVPs instead of on Google. Tr. 7310:15-7311:4 (Raghavan) ("[T]he user journey looks more like they want to book flights, they want to book a place to stay -- it could be hotel or Airbnb -- it could be a transportation, and users use apps with which to fulfil[l] those intents and piece together that whole journey so that they can get their ideal vacation. The alternative is to try and do everything from Google. But we don't see users carrying through these journeys entirely through Google. They go in and out and spend a lot of times on these other apps and platforms.").

949. As such, travel SVPs are more significant travel search competitors for Google than other general search engines. Tr. 2363:4-10 (Giannandrea) ("Q. And did Google view specialized vertical search providers like . . . Expedia, for example, in many cases to be more significant competitors to them then, let's say, a Bing or a DuckDuckGo? A. For the queries that they specialized in, like travel . . . queries, yes, more attention was paid to those vertical search providers than to DuckDuckGo.").

950. Indeed, Bing recognizes travel SVPs as significant players in this space as well. Tr. 6221:9-20 (Barrett-Bowen (Microsoft)) ("And Bing competes with vertical search sites for the user queries that result in the Bing answer; right? A. So let me just, if I can, just dig into that a little bit. So we do have the same users, that's correct. But I think it's important to kind of -- to recognize that when we go into partnerships, we're adding value to getting access to users that our partner wouldn't have access to. And so it's important to just point that out. Q. You agree there is an overlap between the users who are searching for a hotel on Bing and users who are searching for a hotel on Trip Advisor? A. There's certainly an overlap.").

951. Travel SVPs for their part identify Google in their securities filings and elsewhere as a primary competitor. Tr. 6571:12-14 (Hurst) ("Q. And Expedia does regularly state in their SEC filings that it competes with search engines, including Google? A. We do."); DX0308 at .0035 (Expedia 2022 Form 10-K); Tr. 5347:9-12 (Dijk) ("Q. What is written there, sir, is 'Google is a serious competitor.' A. Yes."); DX3114 at .006 (Booking Holdings 2020 Form 10-K); [redacted] DX0310 at .015-.016 (Tripadvisor 2022 Form 10-K); DX0285 at .008 (Tripadvisor 2021 Form 10-K); DX0272 at .012 (Tripadvisor 2012 Form 10-K); DX0313 at .015 (Yelp 2022 Form 10-K); DX0576 at .014, .022 (Yelp 2012 Form 10-K).

952. As evidence of this competition, Google monitors and responds to travel SVPs' innovations and quality improvements. Tr. 9191:25-9192:21 (Holden) ("Q. At present, how does Google continue to compete with competitors like [B]ooking.com and Expedia? A. Well, we

continue to compete in the sense that we every day are working on improving the product. The job of having data quality is never done. . . . [O]ur competitors aren't sitting still either. They've been diversifying in other areas. . . . They are looking at [the vacation rental properties] space. We could be building the best hotel search offering and [it] would be left in the dust as consumers start to look across the spectrum of lodging options. . . . So the competition continues and the iteration in the products continue day in and day out."); Tr. 2363:11-15 (Giannandrea) ("Q. Did Google, during your years there, did Google make significant investments and innovations to allow Google to compete more effectively against those specialized vertical search providers? A. Yes, very much so. Particularly in shopping and travel."); DX0046 at .007; *see supra* § VI.D.

953. In the shopping vertical, Google faces intense competition not only from Amazon but also from such SVPs as Walmart, eBay, Etsy, Home Depot, Overstock, and Wayfair. Tr. 8395:13:8396:5 (Israel); DXD-29.017; Tr. 7312:1-14 (Raghavan) ("Q. Let me show you another vertical. Another group of verticals are shopping verticals, correct? A. Yes. Q. Okay. And up on the screen right now is DXD-21.006 [showing SERPs of Wayfair, Amazon, Google, Walmart, and Overstock]. Is this really the same point that you just made with respect to travel that we're now seeing on shopping? . . . And, so, is the conclusion the same in terms of whether Google competes with these verticals? A. I see [Google] as competing with them every day."); Tr. 8395:10-8396:5 (Israel) ("You need to find shoes, Amazon, Walmart, eBay could answer those questions, right? Again, generally these providers are giving you answers to shopping queries."), 7314:2-7315:6 (describing competition with Amazon); Tr. 2363:4-10 (Giannandrea); Tr. 5883:3-5884:12 (Whinston) ("Q. And you don't disagree that for these particular types of search queries, Google faces competition from a specialized search engine like Amazon, correct? A. I think it

does face some competition from specialized search engines. . . . Q. All right. For these types of queries, you would agree that these types of search results for Google and for Amazon are similar, correct? A. . . . [Q]uickly, a glance at it, seems to suggest that . . ."); DXD-15.004-.005; DX0673 at .015.

954. Users can perform similar shopping searches on Google and SVP shopping sites and apps, such as Amazon, Walmart, and eBay. Tr. 7315:1-6 (Raghavan) ("Q. . . . [W]hat is your view as to the claim in this case that Google does not compete with Amazon for users? A. I believe it compete[s]. I feel the competition. So, hopefully I can speak directly for Google, that [Google and Amazon] compete every single day."); Tr. 8201:22-8202:3 (Reid) (noting Google competes against "Amazon, for shopping"); Tr. 8412:8-8415:4 (Israel) ("Google is trying to answer queries. Amazon is also trying to answer queries . . . what constrains Google, what stops Google from not being very good at answering queries? And an answer is, Amazon can answer those queries, right?"), 8395:13-8396:5 ("You need to find shoes, Amazon, Walmart, eBay could answer those questions, right? Again, generally these providers are giving you answers to shopping queries.").

955. Users increasingly begin shopping searches on SVPs such as Amazon. Tr. 7313:22-7314:3 (Raghavan) ("[U]sers are increasingly beginning their shopping journeys on Amazon."); Tr. 3650:24-3651:6 (Nadella) ("Q. And here, what's being reported is that consumers are starting to bypass general search engines? A. Yeah. And, again, you're a hundred percent right that these are the other places people go to."); DX0673 at .015; [redacted]

[redacted]

956. For example, a 2020 Bank of America study reported that, in response to the question, "Which website do you search first when you want to buy something online?", 58% of users said Amazon, compared to only 25% who responded Google. Tr. 8425:15-8426:8 (Israel) ("Q. [DXD-29.028] sticks with this gateway theory. Can you describe what you see here? A. So, Professor Whinston, in his report, I think in his testimony, referred to a Bank of America study where he said his number from Bank of America, the only number he showed in his report, was that 25 percent of shopping visits start on Google. For starters, that's only 25 percent that start on Google. But, what the Bank of America study actually said is that 58 percent -- fully 58 percent of users start their shopping searches on Amazon. So they actually don't even go to Google at all. They go straight to Amazon. This little text callout was in the Bank of America report. [It] says 58 percent of users search Amazon first when shopping online, while 25 percent search Google first. So, again, for shopping, this is shopping alone, but it's, you know, a very large vertical, and an important one. This gateway idea doesn't even hold at all because more people are starting on Amazon."); DXD-29.028.

957. Google and shopping SVPs such as Amazon, Walmart, Wayfair, and Overstock have "essentially the same interface and experience." Tr. 7311:10-7312:11 (Raghavan); DXD-21.006; Tr. 5883:3-5884:12 (Whinston) (comparing the user interfaces and search results on Google and Amazon); DXD-15.004-.005.

958. [redacted]

[redacted]

959. Bing competes with shopping SVPs, too. Tr. 3646:3-11 (Nadella) ("Q. Bing competes heavily against both general search engines and vertical search engines, for example, Amazon? A. Correct. . . ."), 3649:23-3650:6 ("Q. And you understand that if you -- if Bing does a lousy job of answering vertical search queries, people will start going and searching on Amazon directly? A. Yeah, I mean, Amazon's a unique case in this. But, yes, if Microsoft -- if Bing or Google were not doing vertical searches well, or at least not having organic results that people could click to get to vertical search engines, yeah. In fact, vertical search engines do a good job of SEO optimization.").

960. Google's expert Dr. Israel analyzed the query volume over one week for Google's top twenty-five shopping queries, and compared the query volume on Amazon and Bing for those same shopping queries. Tr. 8405:23-8407:14 (Israel); DXD-29.020. Over the week-long period, Google received 5.1 million queries while Amazon received 3.7 million queries, and Bing received 400,000 queries. Tr. 8405:23-8407:14 (Israel) ("Another way I've done it is go to Amazon and figure out what Amazon's top 20 is. That's a nice way to define shopping queries, just what are the top 25 Amazon's getting. If you do it that way, you'll see Amazon is actually getting a lot more than Google. For terms like air pods and air fryers, Amazon tends to get more

than Google."). Dr. Israel concluded that Amazon is a much stronger competitor to Google than Bing is in shopping. Tr. 8411:1-13 (Israel).

961. As evidence of this competition, Google monitors and responds to shopping SVPs' innovations and quality improvements. Tr. 2363:11-15 (Giannandrea); N. Fox (Google) 30(b)(6) (Oct. 6, 2021) Dep. Tr. 33:20-35:11 [redacted] Moxley (Google) 30(b)(6) (Jan. 28, 2022) Dep. Tr. 62:24-64:12 [redacted]

962. In the local vertical, Google faces intense competition from a number of SVPs such as Yelp, OpenTable, and many others. Tr. 8247:7-8248:3 (Reid) (explaining that in a 2015 user survey, Google "found that people were using quite a range of different tools [such as] . . . things that felt more like general engines, whether it's Google or Bing[;] . . .more vertical review sites like Yelp or Urbanspoon[;] . . . things like OpenTable, which specialized in restaurant reservations, but people were actually using it also to actually explore what are the restaurants to go to[;] . . . Apple Maps[;] . . . [and p]eople would go to Groupon to find a discount at a restaurant, so that's where they would decide where they were going to go eat because they wanted a deal"); DX0062A at .027-.028.

963. Users perform the same local queries on Google and many local SVPs. Tr. 8201:22-8202:10 (Reid) (noting Google competes against DoorDash, OpenTable, Yelp, and Tripadvisor for food queries).

964. Google's expert Dr. Israel analyzed the query volume over one week for Google's top twenty-five local queries, and compared the query volume on Yelp and Bing for those same shopping queries. Tr. 8411:1-13 (Israel); DXD-29.021. The analysis showed that over the week-long period, Yelp received more queries with those terms than Google did, with Yelp receiving 12.5 million queries, Google receiving 11.4 million queries, and Bing receiving 200,000 queries. Tr. 8411:1-13 (Israel); DXD-29.021. Dr. Israel concluded that Yelp is a much stronger competitor to Google than Bing is in local. Tr. 8411:1-13. (Israel).

965. Accordingly, SVPs pose a more significant competitive threat for local searches than other general search engines. Tr. 8251:19-8252:18 (Reid) ("Q. Today, who would you consider to be Google's most significant competitors in the local vertical? A. . . . [F]ood delivery sites and restaurant reservations, particularly food delivery"); Tr. 8411:1-13 (Israel) (explaining that subpoenaed data reflects that Google and Yelp receive significantly more local queries than Bing).

966. [redacted]

[redacted]

967. As evidence of this competition, Google monitors and responds to local SVPs' innovations and quality improvements. Tr. 8245:23-8246:3 (Reid), 8248:16-8249:2 ("Q. . . . What did Google do as it was surveying the landscape here and seeing what else was going on in the local search arena? A. So, it was really trying to understand sort of who has the mind share that people turn to, and then from that, what can we learn? And so I believe there's -- whether it was in this study or a subsequent one, there was research to understand how did Yelp and Tripadvisor and others answer these questions, and what can we choose to learn from it to affect our product strategy?") (discussing DX0062A at .027-.028).

2. Google Competes With Other General Search Engines, Including Bing and DuckDuckGo

968. Google competes with Bing and DuckDuckGo to answer a variety of queries. Tr. 8266:15-21 (Reid) ("Q. And you identified several categories of potential competitors with Google. . . . First, you started with general search engines, such as Bing and DuckDuckGo, correct? A. Correct."), 8266:19-25 ("Q. . . . [G]eneral search engines, such as Bing and DuckDuckGo, . . . [d]o you agree that those are search engines that can answer any query that a user might have? A. I think they are aiming to answer any query, as is Google.").

969. As evidence of this competition, Google monitors and responds to Bing and DuckDuckGo's innovations and quality improvements. Tr. 6467:2-7 (Nayak) (agreeing that Google has assessed Bing's latency and quality for approximately 10 or 12 years to determine

where and how it could improve); UPX0238 at -673-680, -692-698 (comparing search quality on Google and Bing, including features or verticals [redacted] -699 (comparing DDG's [redacted] UPX2033; Tr. 8099:14-19 (Gomes) (noting that Google compares its IS4 score to that of Bing and DuckDuckGo).

970. Because Google and Bing have similar search result pages, it is easier for Google to compare itself quantitatively with Bing than it is for Google to compare itself to SVPs and social media, for which Google relies on qualitative comparisons. Tr. 6368:22-6369:5 (Nayak) ("Q. The question simply is, why is it harder to compare something like Google Search to whether it's TikTok or Facebook before it or Amazon, a system such as that as compared to Bing? A. I think the fact that Bing looks so much like Google and we have all the infrastructure set up for evaluating Google makes it easier to make those comparisons. The others, they look different in various ways. And so you have to do more qualitative analysis, and it's not something that you can automate in quite the same way.").

3. Google Competes With Social Media, Including Facebook, Instagram, Pinterest, and TikTok

971. Google also competes with social media companies, which serve user information needs. Tr. 8263:10-14 (Reid) ("Q. Now, the text in the bottom says: Nearly 50 percent of Gen Z say they use TikTok, Instagram for shopping. . . . A. That's correct."), 8199:22-8200:4; DX0241 at .010; Tr. 3651:7-13 (Nadella) (acknowledging that users search for products and information on Facebook, Instagram, and TikTok); DX673 at .015; Tr. 7302:7-7303:16 (Raghavan) (noting Google's search competition "include[s] the likes of Instagram, TikTok, to some extent Facebook[, and] . . . a messaging platform like WhatsApp").

972. Facebook, for example, can meet "pretty much any information need." Tr. 8093:13-24 (Gomes).

973. Social media are increasingly popular places for informational queries. Tr. 8210:11-18 (Reid) ("Q. Is Google's competitor in these sorts of activities someone like Bing or something else? A. So, in a lot of this, I would say TikTok and Instagram are more of the competitors. . . ."); Tr. 6367:25-6368:14 (Nayak) (noting that young people "increasingly turn[] to TikTok for their information needs"); Tr. 8251:19-8252:18 (Reid) ("Q. Today, who would you consider to be Google's most significant competitors in the local vertical? A. . . . [T]here's a variety . . . we do see with younger users they are increasingly using Instagram and TikTok for discovering things like restaurants. . . . So, social media, I do think, is big. . . .").

974. Younger users increasingly use social media such as Instagram, TikTok, and Pinterest for informational and shopping queries. Tr. 8202:11-8203:7 (Reid) (Google is "increasingly seeing people, especially its younger users, will go and use, actually, the search boxes on Instagram and TikTok. So, [Google has] a lot of research that says that's happening increasingly. They're already on TikTok, they think of something or they see something on TikTok, and then they go issue the query in TikTok, and they really like the response of that. . . ."); DXD-15.008 (shopping metrics from TikTok stating 70% of TikTok users discover new brands and products on the app, three in four TikTok users are likely to buy something while using the app, and 83% of users state that TikTok plays a role in their purchase decisions); Tr. 5905:14-24 (Whinston) ("Q. And Pinterest is a -- for certain categories of products, is a very, very popular place for people to go and shop? A. It seems that way. I haven't seen statistics, but it does seem that way. Q. Based on -- I think we've had a similar experience in this regard. You understand that for home purchases, Pinterest is one of the leading places where people will go

to discover, search for, and ultimately purchase products online? A. Yes. I mean, it seems that way. Like -- sorry, I can't testify as to whether you and I have had the same experience, but it seems that way.").

975. Beyond informational and shopping queries, Instagram and TikTok are today two of Google's most significant competitors in local search. Tr. 8251:19-8252:18 (Reid).

976. As an example of the significance of social media as a competitive threat, in 2021, Vice President of Google Search Liz Reid gave a presentation to the Alphabet Board providing an update on trends Google perceived in how users searched that highlighted social media. Tr. 8203:15-8204:3 (Reid) (describing DX0241).

977. Ms. Reid explained to the Alphabet Board that, based on Google's user research, "63% of daily TikTok users age 18 to 24 stated that they use[d] TikTok as a search engine in the last week." Tr. 8205:9-23 (Reid); DX0241 at .010. Ms. Reid further explained that "use as a search engine" referred to using the search box on TikTok as opposed to browsing the feed. While younger users exhibit this search behavior today, there is an expectation within Google that as those users grow older, they will continue to use apps like TikTok to search in this manner. Tr. 8205:9-23 (Reid), 8206:24-8208:11.

978. In response to TikTok's growing competitive threat, Google has innovated in its search product including by incorporating features allowing users to "surface [] information much more effectively" and to make the search experience "feel much more visual," including "[building] out the Google app experience" as well as "[f]ocus[ing] on frequent Gen Z needs" such as Education, Video Games, Fitness, and Beauty. Tr. 8209:18-8210:10 (Reid); DX0241 at .013.

979. And Google continues to monitor and respond to TikTok's innovations and quality improvements. Tr. 6367:25-6368:14 (Nayak) ("[R]ecently, we've been doing comparisons with TikTok, where young people particularly are increasingly turning to TikTok for their information needs, and we want to understand what is it that they're doing there, what are they finding useful, what should we do with Google to address that."), 6467:2-7 (noting Google performed a latency and quality exercise for TikTok); Tr. 8202:11-8203:7 (Reid) (noting Google has "a lot of research" about younger users increasingly searching on Instagram and TikTok); Tr. 5887:22-5888:14 (Whinston) (acknowledging he reviewed an internal Google document expressing concern that if Google doesn't deliver high quality search results for particular commercial queries, then users would begin searching elsewhere first, including TikTok); DX0241 at .029-.039.

980. Beyond TikTok, Google and Facebook have similar user interfaces for search. Tr. 5890:21-5891:5 (Whinston) ("Q. I'll represent to you . . . these are search results on Facebook. If you scroll over and you click on the [shopping] tab that exists on . . . Facebook's mobile application, do you see prices for running shoes on this results page? A. This one I do. Q. Okay. And would you agree that these types of search results are similar in nature and character to the types of results you would get on a Google search results page? A. Again, it's not side by side. But generally, yes.").

981. Google monitors and responds to Facebook's innovations and quality improvements. Tr. 8251:1-8251:18 (Reid) ("Q. Have you observed Facebook efforts to reach out to merchants in this space? A. Yes. Q. And what have you observed? A. They have had a very concerted effort to do that. Over the years, a lot of businesses have Facebook pages because many people are used to posting on Facebook as a sort of more normal user. . . . They made it

possible to search. . . . [T]hey have really made an effort to do that, and it's been very successful."); N. Fox (Google) 30(b)(6) (Oct. 6, 2021) Dep. Tr. 33:20-36:04 [redacted]

982. Users also turn to messaging applications such as WhatsApp and new technologies like ChatGPT, which are not classical search engines (general or specialized), for their information needs. Tr. 8201:22-8202:10 (Reid) ("There's also messaging apps. Particularly in India, people will go ask on WhatsApp where they are. With new technologies like ChatGPT, people will go there for their information needs."); Tr. 7303:1-16 (Raghavan) ("Curiously, some of our user research even showed that with some demographics, a messaging platform like WhatsApp is a point that draws query intent, because there are users who say you know what? [I]t's too difficult for me at this moment to formulate a Google query or a search query in the traditional sense; I'm just going to ask my undergraduate class and get the answer.").

983. Like SVPs, social media also have a range of competitive strengths. For example, social media such as Facebook cross multiple verticals. Tr. 8080:14-8081:11 (Gomes) ("Q. How would you describe the competitive landscape that Google faced, particularly in mobile? A. . . . So if you think about it, our goal is to satisfy your information need. There are lots of places you can go. Facebook was providing information about -- it had forums on every topic. . . ."); Tr. 8267:5-13 (Reid) (noting that social media "have definitely been expanding the type of information queries that they want to be able to answer over the years," including undertaking "a lot more work on collecting very educational content, a lot more work on collecting things like recipes, travel information. And so people will share stories or share videos.").

984. Social media have well-known and highly used mobile applications that permit users to directly search with that application. Tr. 8199:21-8200:8 (Reid) ("Especially in today's world, people have lots of different apps. And they can pick different choices for every single need, and they often do use a variety of tools, not a single one."), 8208:12-8209:10; Tr. 8427:14-8428:9 (Israel) ("We see new apps can quickly achieve popularity, like with TikTok and so on."); DX0241 at .011 ("[Gen Z] [is] increasingly reliant on quick access that Apps provide with login, personalization, and intent-specific experiences."). As Dr. Ben Gomes explained, Google "compete[s] with that whole ecosystem of apps. And the slogan at the time [of the rise in mobile applications] was: 'There's an app for that.' So we had to make sure that the open web actually stayed a viable contender for your information needs; not just us, but the open web as a whole was a viable contender versus these closed ecosystems like Facebook and so on that were also growing dramatically at this time."). Tr. 8080:14-8081:11 (Gomes).

985. Social media compete with other search providers by providing direct, personalized search results. Tr. 8267:14-24 (Reid) ("Q. And if I did a search for a local plumber . . . on Google versus Instagram and TikTok, the result I get on Google is probably more reliable, correct? A. I think if you search on Google for a specific plumber, then the specific information about the plumber is more reliable. If you search for plumbers in general on TikTok, you would probably get people in your neighborhood talking about the plumbers they used or a plumber promoting themselves, which you would find more trustworthy in terms of a review experience. It depends on the user."), 8206:24-8208:11 (noting that a Google study concluded youth have different behaviors that drive what they seek in Search, including "human," or a "desire to really hear from other people that they trusted and related [to]. . . . They don't want just[,] here's this site posted that talks about this travel place. They want to go talk to somebody, hear from

somebody who went and visited and used their camera phone to take a video . . . to hear much more just authentic, like you would talk with a friend that you trusted . . . [which] has made TikTok really successful."), 8249:23-8250:25 (explaining that a Google user behavior study revealed that users "will often follow particular businesses that are their favorites, or they will follow influencers that talk about places. And so the business might say, I have a special tonight, or I have music in my restaurant and come listen. So, it allows merchants to have more of a direct relationship.").

986. Social media use the extended periods of time that users spend on the channels to compete with other search providers. Tr. 7308:22-7309:14 (Raghavan) ("Q. Have you seen studies, Dr. Raghavan, that address the amount of time users spend on the web or on Google Search compared to these social platforms? A. I have. . . . I'll give you a couple of sample data points. Between 2018 and last year, 2022, the average U.S. user's time spent on the web -- when I say 'the web,' I include all web, not just Google -- is constant at about 23 minutes a day. . . . The time they spend on apps has grown from just under three hours to almost four hours a day."); Tr. 8249:23-8250:25 (Reid) ("And then because people are on those social media for so many hours, if they decide that they're hungry or something, they might go and use the search engine to hear what are other folks like that talking about in their neighborhood, about which restaurants they might want to visit or where they might want to go for the weekend. . . ."); Tr. 5891:6-18 (Whinston) ("Q. . . . Have you seen studies regarding the amount of time users spend on social media sites on average in a day versus the amount of time they spend on Google? A. I have. Q. . . . [W]hat did you learn from those studies? A. People spend a lot of time on social media. I didn't need the studies to tell me that. Q. People spend a lot more time on social media

sites looking at various different aspects of things on those sites than they do on a search engine, right? A. Correct.").

987. Social media provide a convenient place for users to perform a broad range of searches while on the channel. Tr. 8202:11-8203:7 (Reid) (explaining that younger users in particular increasingly use the search boxes on Instagram and TikTok to issue a range of queries).

B. Google Competes with a Variety of Digital Advertising Providers

1. Overview of Digital Advertising

988. Digital advertising is "any advertising that is bought and sold on digital properties, whether that be search engines, online websites, social media platforms, but also includes connect to television and other digital delivery channels." Tr. 3803:9-16 (Lowcock (IPG)) (defining "digital advertising"); *see also* [redacted] In digital advertising the product being sold is the "attention of a targeted audience." Tr. 8457:3-19 (Israel).

989. There are various ad formats that are included within digital advertising. The following were a focus at trial:

a. Search ads, which are "advertising that [advertisers] buy in response to people conducting a search on a search engine or platform." Tr. 3803:21-25 (Lowcock) ("Q. . . . How do you define 'search advertising'? A. Search advertising can be defined as advertising that you buy in response to people conducting a search on a search engine or platform."); *see also* Tr. 5585:3-14 (Jerath (DOJ Expert)) ("Q. Now, let's just make a clear record on what you view as search ads because I don't want there to be any confusion. So, text ads on general search engines, those are search ads, correct? A. Yes. Q. And PLAs, or shopping ads, on general search engines, those are search ads, right? A. Yes. Q. And ads on Amazon, for example, that are shown in response to a user typing in a search request, those are search ads, correct? A. Yes, they are."), 5586:5-8 ("Q. Ads on other specialized retail sites where someone types in a search and gets fed an ad, those are search ads, correct? A. Yes. I call them as other search ads."), 5586:9-11 ("Q. And ads on social media that are in response to search queries are search ads, correct? A. Yes, they would be search ads.").

b. Display ads typically means "pictorial ads that are shown on websites not in response to a query," but can be at times a very general term. Tr. 1347:2-7 (Dischler); Tr. 3818:12-19 (Lowcock) ("Display advertising consists of a visual image displayed as a graphic in various sizes and formats.").

c. Social ads are advertising that appears on social media platforms, such as Meta. Tr. 3838:12-3839:3 (Lowcock); *see also* Levy Dep. Tr. 42:22-43:6 (testifying that social ads are "a category name that's been applied to advertising on what's referred to often as social networks"). They are "basically display ads." Tr. 5588:22-5589:3 (Jerath).

990. Digital advertising is dynamic and growing. *See* Tr. 5535:6-9 (Jerath); Levy Dep. Tr. 214:8-25 ("I think advertising is a really dynamic market."), 261:20-262:3 ("I've encouraged

our team to continue to innovate primarily to create a better experience for people and our clients, and part of that is in response to competition as well. Because advertising's dynamic and our competitors are trying to create a better solution too.").

991. Indeed, digital advertising has undergone dramatic change even in just the last few years. Tr. 5535:10-13 (Jerath); Tr. 8453:21-8454:21 (Israel) ("[T]he evolution of digital advertising over the last few years, right, is that different firms, innovations by Meta about how they do it and TikTok about how they do and Amazon, who has gotten much more into advertising, but, how they do it, to have found ways to get the attention of a user who is an individual about whom they know a lot, who has indicated a lot about their preferences.").

992. Google has more competitors now than ever in digital advertising. Tr. 1394:2-12 (Dischler) ("Q. If we think of the pie as the digital advertising pie, how would you evaluate who the competitors are for relative size of the slice one gets? A. Well, so, I mean, there are more competitors now than ever so people are -- there are new entrants coming into the market. . . ."); *see also* DX3243 (illustrating that between 2008 and 2021, the digital advertising market has become progressively crowded) (summarizing DX1228).

993. While overall digital advertising spending and Google's digital advertising revenue has expanded, Google's share of digital advertising revenue in the United States has been declining since roughly 2015, as other advertisers, such as Amazon, Meta, and TikTok, have grown even faster. *See* Tr. 8549:9-8550:17 (Israel) ("Google's share is declining as a percentage of all digital advertising revenue. So it's declined since 2015 or so. That's really been driven sort of in order by three phenomenon -- well, two primarily so far. One is that starting in 2010, here you see the enormous expansion of Meta as an advertiser. . . . Number two, starting a bit later, especially after 2017, you see the growth of Amazon. . . . And I would say others are

copying that, Walmart, other platforms are starting to do similar things. One of the things you see on this chart, it's obviously smaller so far, but it's the more recent growth of TikTok. I mean, to me, that's on the path towards coming -- I mean, I think the numbers -- there's projections of them growing to 10 billion and beyond. TikTok is sort of, to me, on the path of being number three in this series. It was Meta, it was Amazon and now it's TikTok.").

994. Platforms such as TikTok, Snapchat, and Pinterest are attracting younger audiences than Google. *See* Tr. 3928:15-3929:17 (Lowcock); Tr. 7307:17-7308:1 (Raghavan) ("[S]ome platforms, like TikTok, fill the [user] need extremely well, especially for younger demographics."); *see also* [redacted]

995. In the United States, digital advertising output is increasing rapidly, expanding at a rate that has outpaced even industry expectations. *See* Tr. 8553:8-8554:14 (Israel) (discussing DXD-29.120) ("It's looking at U.S. digital advertising spend. So you see this rapid growth. You see the sort of turning up, the kind of exponential growth, especially more recently. So again, just from output numbers, you see an industry that looks to be thriving, not to be suffering from monopoly power."); DXD-29.120 (summarizing DX1225 and illustrating growth of digital advertising spend); DX1225 (eMarketer U.S. digital ad spending data); *see also* Tr. 4779:16-4780:24 (Whinston) (testifying that he used eMarketer, a "standard marketing source," in his analysis).

996. Meta's[6] advertising revenue has "exponentially increase[d]" in the past decade "to the point where today Meta is over $60 billion in revenue, and really roughly equal in size with Google." Tr. 8550:18-8551:5 (Israel) (discussing DXD-29.115) (summarizing DX1290 and showing that Meta's digital advertising revenue increased from approximately $1.5 billion in 2011 to approximately $53 billion in 2021).

997. Amazon's advertising revenue is also on an "exponential path," "grow[ing] by 2021 to being . . . almost 25 billion, and on a rapid growth path showing their ability to compete." Tr. 8551:6-12 (Israel) (discussing DXD-29.116); DX1228 (eMarketer U.S. Ad Spending 2022).

998. TikTok is on a similar growth path as Meta and Amazon in terms of advertising revenue. Tr. 8551:13-19 (Israel) (discussing DXD-29.117) ("Q. And slide 117 is the TikTok example? A. So TikTok is more recent. Through the eMarketer data through 2021, you see 2 billion. They certainly have been growing. I think there was testimony in this case about them hitting 10 billion, I think that was global. But they're on this -- they seem, to me, to be on the growth path of these other examples."); DX1228 (eMarketer U.S. Ad Spending 2022).

999. In the context of advertising, "ROI" refers to return on investment and "ROAS" refers to return on ad spend. Tr. 3849:3-5 (Lowcock), 3948:16-17.

1000. An example of an ROI goal might be one dollar in sales for every 10 cents spent on advertising. Tr. 1291:14-1292:12 (Dischler).

1001. Advertisers determine how to spend their advertising budgets based on ROI. *See* Tr. 5340:23-25 (Dijk) ("Q. And so the way Booking determines its ad spend is driven by the key

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[6] Meta Platforms, Inc. was formerly Facebook, Inc. Levy Dep. Tr. 15:19-16:2. Meta includes both Facebook and Instagram. Tr. 8533:22-8534:24 (Israel).

thing, which is ROI; correct? A. Yes."), 5341:1-5 ("Q. And would you agree, in your experience, that even beyond Booking.com, for marketers making decisions about where to invest their advertising dollars, return on investment is the key thing? Do you agree with that? A. Yes."); [redacted] Levy Dep. Tr. 225:23-226:3 ("Q. Have you had any conversations or heard from advertisers that depending on return on investment and other factors that advertisers may shift spend from Google to Facebook or from Facebook to Google? A. Yes."), 54:22-55:9 (testifying that he is "primarily focused on trying to drive the return on investment that [his] clients see with [Meta's] products" because Meta's "clients are seeking the best ROI from [Meta], from Google, and a number of other providers. So if [Meta] [got] the sense the [their] return on investment is not as good as it can be anywhere else in the industry, [Meta would] hear about it because [its] clients would likely be moving their money somewhere else, and vice versa is true as well"); Tr. 5141:5-17 (Booth (Home Depot)) ("So we would continue to lean our investment into what is producing the greatest return on advertising spend or ROAS, and that's a consistent practice that our teams are always doing."); Tr. 8512:3-22 (Israel) ("Q. What about Google itself, have you seen documents showing whether it uses ROI to make its own ad buying decisions? A. Yes. I mean, Google's an ad buyer, so Google as a seller is moving money around to generate returns.") (describing empirical analysis); DX0187 at .066-.067 (Google survey of advertisers noting, "for Search spend," "[r]eturn on investment is . . . the top factor affecting short term . . . and long term . . . spend."), .070 ("Return on investment is the most prominent factor affecting long term Search spend."); Tr. 1384:14-22 (Dischler) (discussing DX0187 at .066) ("[W]hat it says here is that return on investment is the top factor that's affecting their spend. So it says that for the advertisers in the CX Lab study, which is representative of the typical advertiser, they're making decisions based on their return on investment calculations."), 1290:7-12 ("Q. And this term we used, the acronym ROI, return on investment, how does that play an important role as you understand it for advertisers? A. Advertisers are constantly looking at their return on investment, and they're doing it not only on Google, but also on other channels like Facebook or Amazon or LinkedIn or Bing."); McAteer (Google) Dep. Tr. 178:15-179:11 ("Q. And have you heard that kind of feedback with respect to text ads? A. Well, I would say it's not an ad format discussion I'm involved in. It's more of I -- you know, Google, I've asked you to hit a certain ROAS, an ROI, and it's falling short of that and, A, make some changes so I can get back to where I want to be -- and those are, you know, very frank conversations -- or, B, I'm moving my money. But it's less about the actual ad format. It's purely on a performance basis. Q. But I think you stated earlier that advertisers do make decisions about spend between PLA and text based on ROI; is that right? A. I recall the conversation, I think what I was saying was that ad products can perform differently and advertisers have that choice to move money around. So if text ads is performing better, I will move money. The goal, however, of the team is to get all of our products working so that it performs well regardless of the ad format.").

1002. Advertisers who testified at trial confirmed that they "obsessed" about the ROI from their ad spend. *See* Tr. 4875:3-7 (Lim (JPMC)) ("Q. Now, your job as an ad buy[er] do you ever talk about the return on investment that you receive from search text ads? A. We obsess about return on investment with paid search ads."); Tr. 5342:2-6 (Dijk) ("Q. I like the word 'obsessed,' because we heard it from a witness yesterday that also said ROI is an obsession with marketing people. That has always been your view; correct? A. Yes."); *see also* Tr. 3948:13-22 (Lowcock) (testifying that "[r]eturn on ad spend is typically looked at [by IPG's clients] as a primary measurement"); Levy Dep. Tr. 49:23-50:14 (Meta is "always trying to increase the return on investment for [its] clients."); Tr. 7378:6-9 (Raghavan) ("Q. In your experience, sir, are advertisers focused on ROI? A. In my experience, maniacally so."); Tr. 1290:7-12 (Dischler) ("Q. And this term we used, the acronym ROI, return on investment, how does that play an important role as you understand it for advertisers? A. Advertisers are constantly looking at their return on investment, and they're doing it not only on Google, but also on other channels like Facebook or Amazon or LinkedIn or Bing.").

1003. Advertisers are "agnostic" as to the type of ad (or "ad format") and allocate advertising spend to generate the best ROI. *See, e.g.*, [redacted] Tr. 5342:7-19 (Dijk) ("Q. And in looking at ROI, would you agree that the key job of a marketer is to figure out how we should spend and in what channels? Would you agree with that? A. Yes. Q. And would you also agree that when it comes to picking channels, you're very agnostic? Would you agree with that? A. Yes. Q. And by agnostic, what that means is you will go to whatever channel is generating the best ROI; correct? A. Yes. . . ."); Levy Dep. Tr. 224:8-18 ("The way that I think about advertising budgets is that clients or agencies or people helping clients with their advertising spend are primarily focused on trying to get the best results. And while there may be categories that are created by agencies or departments or consultants to try to classify that spend, most advertisers or agencies are quite dynamic in how they'll move budgets around to try to get the best results possible."); Tr. 1412:5-22 (Dischler) ("[T]he [ad] format doesn't really matter. What matters is the ability to achieve the underlying business objective.").

1004. Advertisers' ability to measure ROI has improved over time, and the most sophisticated advertisers have teams often enhanced by automation and AI—dedicated to computing ROI. Tr. 1385:3-12 (Dischler) ("Q. How has the ability of advertisers to track ROI changed in the last six years? A. It's improved dramatically. It's improved dramatically both because we've had advances in automation and artificial intelligence and also because the industry has become . . . more competitive [such] that advertisers are forced to evaluate their spend on a number of channels in order to understand where they should make investments and where they're going to get the most for their dollar."); Tr. 7378:18-7379:15 (Raghavan) ("The largest and most sophisticated [advertisers] have entire teams and robots dedicated to computing [ROI].").

1005. Facebook, Amazon, and Google all provide tools that allow advertisers to measure ROI. *See* Tr. 1290:22-1291:2 (Dischler) ("Q. And does Google provide advertisers with tools that allow them to track their ROI or ROAS? A. Absolutely. Not only can they track them, but actually, the majority of [Google's] advertisers bid based on those criteria. So if we're unable to achieve their targets, then they will just stop spending."); Tr. 7379:16-20 (Raghavan) ("Q. And in addition to Google providing tools to assist advertisers in assessing ROI, do some of the other platforms provide tools as well? A. My understanding is that several others do, including Facebook. And in fact, Amazon does to its advertisers.").

1006. Advertisers also use statistical models, known as marketing media mix ("MMM") models, to decide where to advertise and to facilitate moving their ad spend to buckets with higher ROI. Tr. 8471:9-8473:20 (Israel); *see also* [redacted] DX0412 at .002 (Kohl's "leverage[s] MMM and testing insights to optimize media mix and maximize ROI" by shifting ad budget across ad formats); Tr. 8471:14-8472:9 (Israel) ("So, here, Kohl's is saying it continues to use such a model, which is a cross-channel optimization channel by its nature, and move money around to maximize ROI.") (discussing DX0412 at .002); DX3058 at .006 (Estee Lauder document stating that "[m]edia planning has been based on results from MMM model, using highest driving traffic and ROAS drivers"); Tr. 8472:16-21 (Israel) ("Q. You also include an example from Estee Lauder? A. It's really the same point. They use a MMM model, which puts money in various buckets, but allocates budgets based on performance. And they basically said, move the money around based on highest driving traffic and ROAS drivers. ROAS is return on advertising spend, which is another way to say ROI.") (discussing DX3058 at .006); [redacted]

1007. Advertisers shift ad spend among channels and across different ad formats in order to optimize their ROI. *See* Tr. 5342:20-5343:4 (Dijk) ("Q. . . . You also used the word 'optimized' in the context of ROI. Do you remember that? A. Yes. Q. And by optimize, do you mean that you're trying to optimize the ROI for a particular channel against other channels? Is that what you mean by 'optimize'? A. Or you're trying to optimize within channels. Q. Okay. And among channels; correct? A. Among channels, too."); Tr. 3958:3-14 (Lowcock) ("Q. . . . The [optimization software] will recommend moving spend from one ad format to another in order to improve ROI; fair? A. Yes. . . ."); Tr. 8472:22-8473:4 (Israel) ("Q. There's also an example in your deck from Skechers? A. So Skechers, slide 71, is quite explicit. They go through a very similar analysis, but they say, let's pull back spend on the lower ROAS[.]") (discussing DXD-29.017); Tr. 7372:12-15 (Raghavan) ("Q. And depending on [ROI], is that when the advertiser will, as you said, shift the ad spend from one to the other? A. They will."); Tr. 1357:7-10 (Dischler) ("Q. Are you aware of advertisers that actually have software that actually will shift ad spend between different types of formats to maximize ROI? A. Yes."); Tr. 8471:9-8472:9 (Israel) (testifying that when advertisers "think about where to put their budgets, they think about ad budgets, and they mix across channels to maximize ROI"), 8466:18-8467:24 ("The punch line will be, advertisers look at ROI as their metric, and they substitute a lot based on ROI."), 8472:22-8473:4 ("[I]f you look in the record, they have channels, like social and search and display, and the consistent theme really is, there's a budget for advertising and we move money around that budget set based on our ROI.").

1008. As Dr. Israel observed, advertisers can find search ads and display ads substitutable even when the alternative formats have price differences based on likelihood of a conversion. Tr. 8536:21-8538:8 (Israel) ("People are focused on ROI. If search is quite likely to lead to a conversion, that's really why you see a price difference between them, search is more expensive. But that doesn't mean they're not substitutes, it means they are. Because you can buy more display ads for your money. And thus, even if it's not quite as effective at getting people to convert, you've got more shots at them. . . . It's sort of like you can get a 10 percent shot with search, and if you think you can get a 2 percent shot with display -- you know, one's 1/5th the price of the other, then you can compensate for that.").

1009. Advertisers use software that optimizes ad spend across different ad formats to achieve the best ROI. *See* Tr. 3958:3-14 (Lowcock) ("Q. . . . The [optimization software] will recommend moving spend from one ad format to another in order to improve ROI; fair? A. Yes."), 3963:3-5 ("Q. Is there a single significantly-sized advertising agency that you're aware of that doesn't have such optimization tools? A. Not that I'm aware of"); Tr. 5638:10-14 (Jerath) ("Q. I take it, Dr. Jerath, that you are familiar with the fact that all major ad agencies have created or purchased ad spend optimization engines, correct? A. Our general level, from what I understand from your statement, yes, they have optimization software that they use."), 5638:15-20 ("Q. Okay. And can we agree, to the extent you know -- and if you don't know, just tell us -- that these software optimization devices, algorithms will shift ad spend between different ad formats in order to optimize performance? Can we agree on that? A. They would."); Tr. 8509:11-8512:2 (Israel) (discussing the various "ad optimization tool[s]" available to advertisers); DX3004 at .009 ("Simultaneously, it recommends budget reallocations away from underperforming channels to outperforming channels for more impactful business outcomes and better ROI verse in-channel optimization only[.]"); DX3198 at .006 ("Maximize your ROI and take the guesswork out of media planning with ChannelMix's revolutionary AI-powered marketing recommendation engine. . . . Maximize ROI with specific scenarios that detail how to allocate budget to a combination of marketing channels such as display, paid search, social media, radio, TV and print with a predicted level of accuracy."); Tr. 1357:7-1358:3 (Dischler)

("Q. Are you aware of advertisers that actually have software that actually will shift ad spend between different types of formats to maximize ROI? A. Yes."), 1358:4-17 ("Q. So these are automated systems [that] will shift advertisers ad spend from, for example, search ads to social ads, correct? A. That's correct. Q. And from social ads to display ads, correct? A. Yes. Q. And from display ads back to search ads? A. Yes. Q. And what is the factor that is driving the shift of the ad spend amongst these channels? A. Their ability to meet the business objective. Q. And would that be ROI? A. It would be their return -- whatever value calculation they have. Their return on investment.").

1010. Advertisers' shifts in ad dollars between channels based on performance do not necessarily result in the shift of their entire budgets. Tr. 8384:20-8386:16 (Israel) ("[O]f course, most advertisers advertise in multiple ways. They use various channels. But when they're figuring out their budgets, they're moving money back and forth based on the performance of the flow channels. Not all of it, but they're moving money, and that's competition. Substitution is -- we call it -- diversion sometimes in economics. Diversion doesn't have to be 100 percent. If it's there and you're losing material amounts of revenue or profits or customers, that's competition."), 8471:14-8473:20 ("People put money in various buckets. It's not going to be 100 percent to any one channel. But, partial substitution is what matters, as I said earlier, and the consistent theme is when you're deciding where to move your budgeted money around, you move it towards the channel that gets you a better ROI.") (discussing DXD-29.068 to DXD-29.071); DXD-29.068-.071 ("Advertisers Allocate Ad Spend to Maximize ROI").

1011. Google has introduced a product called "Performance Max," which is a "goal-based campaign type" that uses automated bidding to place different types of ads across all Google Ads inventory from a single campaign. DX3236 at .001 (Google Ads Help page stating that "Performance Max is a new goal-based campaign that . . . help[s] you find more converting customers across all of Google's channels like YouTube, Display, Search, Discover, Gmail, and Maps"); *see also* Tr. 1372:4-24 (Dischler) ("The idea of Performance Max campaigns is that an advertiser can provide us with a business objective and a set of creative assets, and then we earn the right to show across any surface, on Google, or on the display network. So we can create a search ad which tries to achieve the business objective or an ad on YouTube or an ad on Discover, or an ad on the Display Network, which would be a display ad."); Tr. 7375:1-17 (Raghavan) ("Performance Max is a way for an advertiser to come in with a budget and campaign objectives, as I said a minute ago, and not worry about would they be text ads, PLAs or through YouTube or Gmail. It's really a demand to Google to do the right thing and give them the best return on ad spend."); DXD-21.018 (listing text ads, PLAs, YouTube ads, display ads, Discover ads, Gmail ads, and Maps ads as included in Performance Max).

1012. Performance Max was launched recently and is now Google's fastest growing product. *See* Tr. 1289:13-15 (Dischler).

1013. Google's Performance Max product illustrates how advertisers "care more about meeting their business objective" as opposed to a particular ad format. Tr. 1373:4-11 (Dischler) ("Q. . . . And can you draw any conclusions from your experience with Performance Max about whether advertisers care more about format or whether they care more about meeting their business objective? A. They care more about meeting their business objective, and they also care about a lot of simplicity of system.").

1014. Microsoft also offers an ad product called Smart Campaigns that optimizes different types of ads across Bing search ads, Google Ads, Facebook, and Instagram. Tr. 8508:18-8510:7 (Israel) (discussing DXD-29.074).

1015. SEM tool provider Marin has developed MarinOne, a cross-channel platform that allows advertisers to advertise across Google, Facebook, and Amazon. [redacted]

2. Google Search Advertising and Search Text Advertising Compete with Other Digital Advertising

1016. The parties' experts agree that ads markets should be defined from the perspective of advertisers, who are the buyers of advertising. Tr. 5376:1-8 (Jerath) ("[M]y assignment was to describe certain digital advertising products in the United States, the characteristics and users of these products, primarily from an advertiser point of view."); Tr. 4632:20-4635:20 (Whinston) (listing among the "factors [that] affect the substitutability of the various ad products" characteristics of the audiences from the advertiser's perspective, because "an advertiser is thinking about advertising in the New York Times versus Sports Illustrated. It's a different audience, and some advertisers might want to reach the New York Times kind of audience and some advertisers might want to reach the Sports Illustrated kind of audience"), 5899:18-5900:3 ("Q. When we started this conversation, I read to you the factor from your report that talked about the characteristics of the ad audiences and the decree to which those audiences overlap. A. You did. You absolutely did. Just repeat your last question, and I'm happy to answer it. Q. You would agree, from an advertiser's perspective, the audience overlap between Google and Amazon or Google and Facebook is much more significant than the overlap between Google and Bing? A. Yes. I've already said yes. Right now that's absolutely correct."); UPXD102 at 24; *see also* Tr. 8454:22-8456:10 (Israel) ("[A] market definition should always be from the point of view of the buyer, demander. So now we need to turn our attention around and say the buyer is an advertiser.").

1017. GSEs such as Google Search and Bing, compete with each other for advertisers. Tr. 8859:22-25 (Israel).

1018. Google also competes with Amazon, Facebook, Instagram, and TikTok, among others, for advertisers' dollars. Tr. 7386:10-20 (Raghavan); DX0163 at .005 (comparing Google, Facebook, Instagram, and Amazon in "Consideration and Preference for Paid Products"); Tr. 1393:8-21 (Dischler) ("Q. . . . Why don't you hit some of the ones that you view as the biggest competitors of Google['s] [ads business]? A. Meta, with their Facebook and Instagram properties; [and] Amazon[.] . . . Q. Are these all advertising destinations for digital advertising dollars? A. Yes."), 1394:2-12 ("Q. If we think of the pie as the digital advertising pie, how would you evaluate who the competitors are for relative size of the slice one gets? A. Well, so, I mean, there are more competitors now than ever so people are -- there are new entrants coming into the market. I gave you three examples over the past five years, of Amazon, Apple, and ByteDance or TikTok. I mean what we do is we take a look at the total market and we take a look at Google's share. And if you look at the total market and Google's share, Google's share has been steadily going down over the past five or seven years or so."); Levy Dep. Tr. 212:22-214:5 (discussing Google as a competitor, along with others).

1019. Amazon closely competes with Google for digital advertising spend. *See* Tr. 1397:25-1398:2 (Dischler) ("Q. Does Amazon compete with Google for digital advertising spend? A. Yes."); Tr. 7386:10-16 (Raghavan) ("Q. . . . Does Google compete with Amazon for ad spend from advertisers? A. Absolutely."); Tr. 8549:9-8550:17 (Israel) ("Amazon, obviously an important competitor, I think there's some agreement on that. But what's changed about

Amazon is really an increased focus on advertising revenue. Amazon was more about selling products, but they have recognized this ability to sell ads against searches and against products, and they've grown dramatically."), 8533:22-8534:24 ("So just to make clear, I am not saying that Google and Bing are not in the same advertising market. They're alternative ways to digitally advertise. They have some audience overlap, it's just smaller. So my view would be I agree that Bing should be in this market. But then by the circle principle, so should Facebook and Amazon, because they have better audience overlap.").

1020. Amazon's ad business has continued to grow over time. *See* Tr. 7397:5-14 (Raghavan) (discussing DX0126 at .009); Tr. 1403:18-21 (Dischler) (Amazon's "advertising business is growing at roughly twice the rate of Google's retail advertising").

1021. Google's and Amazon's ads products overlap, including "sponsored search ads/PLAs" and "display ads." DX0126 at .019; *see also* Tr. 7396:16-19 (Raghavan) ("Q. What's being addressed here, sir? I'm under the heading Risks from Amazon. A. I think the authors are talking about areas where Amazon and Google compete more or less directly."), 7397:1-4 ("Q. . . . And so is the point here that these are various products that both Google and Amazon are out there competing for ad spend? A. Both of them offer this. An advertiser sees both.") (discussing DX0126 at .019); *see* Tr. 1397:25-1398:22 (Dischler) ("Q. How does [Amazon] compete [with Google]? A. So Amazon offers product ads. The product ads on Amazon are seen by advertisers as very effective."), 1354:3-15 ("Q. Was the introduction of shopping ads designed in any way to compete with Amazon? A. I mean, yes, to some extent. [Google] definitely looked at Amazon which is becoming more popular as a third-party platform. At the time, they didn't have an ad product, but they definitely were able to offer great distribution for smaller retailers who operated on the platform so that was certainly a consideration. As it turns out, it was kind of a [prescient] notion."); Tr. 8457:25-8460:4 (Israel) ("So one thing is, I don't see a justification for saying some Amazon ads are in and some are out, when they all have this ability from Amazon to target users based on what Amazon knows.").

1022. In 2021, "Amazon's US ads business [was] nearly the size of Google's US retail ads business today, and [was] growing at over twice Google's rate," and "[t]here [were] still untapped opportunities for Amazon to continue its fast growth." DX0231 (January 2021 Google presentation titled "Amazon Growth & Merchant Onboarding—Presentation for Ads and Commerce Teams") at .003 ("Amazon's ads business is big, but growth is in its infancy"); Tr. 7597:15-7598:5 (Raghavan) (discussing DX0231 at .003 and confirming Amazon's U.S. ads business size and potential and actual growth in 2021); Tr. 1404:4-6 (Dischler) ("Q. And what's the view on . . . Amazon's ability to continue to grow [its advertising business]? A. We think that there's plenty of upside still.").

1023. Amazon's "fast growth" has continued since 2021. *See* Tr. 7598:4-5 (Raghavan); Tr. 1354:3-15 (Dischler) ("Right now Amazon, probably by the end of the year, will do $40 billion or so in shopping ads which are very similar to [Google's] shopping ads, and they're growing very rapidly."), 1400:15-19 ("Q. Do you have insight into what has happened since 2021 with Amazon? A. Their share has grown rapidly. Q. Rapidly? A. Yes.").

1024. Amazon can "close the loop" with a consumer, meaning when a consumer searches on Amazon, "Amazon knows their trajectory all the way to the cart and the transaction, and so is able to attribute an ad click on Amazon a dollar volume of transactions." Because of its "closed loop," Amazon can compete for ad dollars in a way Google cannot (as Google does not have a closed loop). Tr. 7397:15-7398:5 (Raghavan); *see* Tr. 1397:25-1398:22 (Dischler) ("[I]n the case of Amazon, they're able to do so on their platform, and they're able to get better data than [Google is] on the effectiveness of their advertising. And so in some cases, budgets have redirected from Google to Amazon as the result of their better effectiveness.”).

1025. Google substantially competes with Facebook for advertisers. *See* Tr. 7307:17-7308:14 (Raghavan); DX3246 at .001 (“[Meta] face[s] significant competition in every aspect of [its] business, including, but not limited to, companies that . . . enable marketers to reach their existing or prospective audiences, including, for example, Alphabet (Google and YouTube), Amazon, Apple, ByteDance (TikTok), Microsoft, Snap (Snapchat), Tencent (WeChat), and Twitter.”); *see also* Levy Dep. Tr. 140:17-141:4.

1026. Google faces competition from social media platforms for advertising dollars “because advertisers on social media properties often have the same performance objectives as they would if they advertised on Google Search, and [social media platforms] have much simpler systems which are easier to get up and running than [Google’s] keyword based system on Google Search.” Tr. 1405:9-25 (Dischler); *see also* Tr. 3940:17-21 (Lowcock) (“Q. How about Instagram? Do your clients spend advertising money on Instagram? A. Yes, they do. Q. And over the past five years, has that also grown? A. The spend has grown.”).

1027. Google performs competitive analyses of Facebook’s advertising business. Tr. 1406:25-1407:3 (Dischler); *see* Tr. 7389:17-23 (Raghavan) (discussing DX0163) (“Q. Now, what is being reviewed and looked at in this particular deck, sir? A. So this deck, as best as I can reconstruct, is the marketing team’s -- just one of the teams at Google, plan to compete more effectively with Facebook.”); DX0163 (October 2019 Google presentation titled “2020 Global Ads Marketing Plan PR review”).

1028. Google innovates in its advertising products to compete with Facebook. Tr. 7391:11-16 (Raghavan) Tr. 1369:13-1370:1 (Dischler) (“Q. . . . Has Google launched any innovations in response to competitive pressure to simplify . . . ad products? A. Yes. Q. Describe. A. So if you advertise on Facebook, for example, they have much simpler targeting criteria. And so [Google finds] that small and medium advertisers are -- even some large advertiser would go to Facebook first before going to Google in order to meet the same business objective because it's easier to set up. They don't have the notion of keywords. And so we've developed a number of different automated systems in order to try to be more competitive with this aspect of Facebook advertising.").

1029. Facebook has "roughly twice the number of advertisers that [Google does], and they have quite a lot of inventory on which to show ads for a variety of advertisers." Tr. 1407:4-11 (Dischler), 1438:2-5 ("Q. . . . Approximately 5-million advertising customers advertise on Google, correct? A. Yes."); *see* Levy Dep. Tr. 24:8-21 (testifying that Meta has "tens of millions of paying advertisers and hundreds of millions of businesses").

1030. Meta's total quarterly revenue, which includes both Facebook and Instagram, increased from approximately $9 billion in January 2017 to approximately $30 billion in July 2023. DX3256 ("Meta Stock Price and Total Quarterly Revenue (January 2017 – July 2023)").

1031. TikTok is an advertising platform that has "exploded over the course of the past five years or so," with annual ad sales growing from zero to "over $10 billion" within this timeframe. *See* Tr. 1382:15-1383:5 (Dischler); *see also* Tr. 3940:6-14 (Lowcock) ("Q. . . . Has your customer ad spend on TikTok in the last three years grown? A. Yes. Q. And has it grown dramatically in that period of time? A. It's gone in fits and starts. Q. Has it grown dramatically in that period of time? A. It's grown -- it has grown.").

1032. TikTok offers an e-commerce site within its platform. *See* Tr. 7393:22-25 (Raghavan).

1033. TikTok's e-commerce site allows a user to "initiate their commercial need[s] on TikTok and complete the shopping task right there on TikTok." *See* Tr. 7394:1-11 (Raghavan) ("[Y]ou have [with TikTok], in some sense, the best of the Instagram world where you divine latent intent, inspire a purchase, but then you close the loop -- so Amazon on the other side. So you have the best of Instagram and Amazon coming together in a very compelling capability.")

1034. TikTok has younger audiences, which is the audience advertisers primarily want to reach. *See supra* §§ IX.A.3, B.1.

1035. Google competes with specialized vertical search providers for advertising dollars, including Yelp, Angi, and Expedia Group. *See* [redacted] DX0586 (Compilation of "Competition" sections of Yelp's Form 10-Ks 2012 through 2021) at .002-.020 (2012 Yelp Form 10-K) (listing Google, Facebook, Yahoo!, Bing, and Twitter as a competitors for managing and optimizing campaigns); DX0308 (Expedia 2022 Form 10-K) at .013-.014 ("We also face intense competition from Google and other search engines. . . . In addition, our brands, or brands in which we hold a significant ownership position, including trivago, compete for advertising revenue with these search engines, as well as with large internet portal sites that offer advertising opportunities for travel-related companies."); [redacted]

[redacted] *see also* PSX01044 at 7 ("The home services industry is highly competitive and fragmented, and in many respects, local in nature. We compete with, among others: . . . search engines and online directories . . . ."); Tr. 9196:18-9197:21 (Holden) ("Q. What kinds of travel businesses buy text ads and hotel ads on Google? A. Online travel agents do, metasearch providers. The suppliers themselves do. And they usually buy across both sets, both hotel ads and text ads. Q. Where else do those travel businesses advertise? A. Well, they have many other places they can go and advertise as well. In many cases, you'll see online travel agents advertising on metasearch providers for traffic. They can go to other general search engines and advertise there as well. They could go -- they often go to places like Facebook, who've featured travel content. And more and more, they're spending time advertising on places like TikTok, too. Q. Do those other platforms for advertising also offer advertising based on user queries? A. They do. They offer the ability for the advertisers to identify and find consumers based on their queries and intent. You know, a user might go to Expedia and they express their intent and do a query based on a location and date selection. They might be on a metasearch provider doing that as well. They could be in Facebook looking at particular content and also searching on Facebook, or they could be on TikTok looking at content or doing searches on TikTok as well.").

a. Search Ads and Non-Search Ads Can Effectively Target the Same Consumers

1036. Consumers spend more time on apps and social media than they do on websites like Google.com, with that tilt towards apps and social media growing over time. *See* Tr. 7308:22-7309:14 (Raghavan) ("Between 2018 and last year, 2022, the average U.S. user's time spent on the web -- when I say 'the web,' I include all web, not just Google -- is constant at about 23 minutes a day. . . . The time they spend on apps has grown from just under three hours to almost four hours a day."); *see also* Tr. 5592:18-5593:3 (Jerath).

1037. Both search and non-search advertising channels effectively target customers using intent signals. Tr. 8541:5-8542:8 (Israel) (testifying that "other channels beyond just search allow effective targeting"), 8457:2-8460:4 (testifying that all of Amazon's different ad formats "have this ability from Amazon to target users based on what Amazon knows"); Tr. 7386:21-7387:13 (Raghavan) ("Q. I want to start with some of the social platforms. Facebook, Instagram, TikTok, what makes those social platforms such significant competitors for Google for ad spend? A. Yeah, you may recall earlier today I talked about latent intent, and the fact that people, especially young people, are spending many hours each day. And over the course of those hours, they're emitting signals of latent intent so that volume of data is put together extremely effectively by TikTok, by Instagram, Facebook to glean insights about when a user is ready to purchase whatever they have a latent intent for. Although on the face of it, it's distinctive from the patent intent they express at a Google or a Bing, right. In the end, what the advertiser cares about is whether they were able to make a sale through their ad spend. And so this vast accumulation and divining of latent intent is what makes TikTok and Instagram and others so powerful.").

1038. Latent intent is intent "captured by . . . observ[ing] the behavior of a user over the course of a day," which is a strength of the likes of "Instagram, TikTok, to some extent Facebook." Tr. 7303:1-16 (Raghavan).

1039. Latent intent signals give advertisers "a really good idea of what's on a person's mind at that point in time." Tr. 8540:8-8541:4 (Israel).

1040. Advertisers use latent intent signals gathered from social media to serve ads to consumers, which appear in a moment and location in social media that increase engagement. *See* Tr. 5593:4-5594:10 (Jerath); Tr. 8541:5-8542:8 (Israel) ("Because people can like a college, they can like a competitor college, and they immediately serve them an ad. And what the performance people are getting is this intent, that these ads are popping up quickly. People are showing what they like, and the ads are popping up."), 8542:9-22 ("TikTok's role in all of this is as a driver of this understanding among social media, that if you get people to engage with your content, watch your videos, click like on your stuff, you know what they're doing right then, you know what they're interested in, and TikTok puts buy now ads there. Again, this is not like old school display where you're just popping up a banner. This is showing somebody an ad in the context of the app based on what they've been doing.").

b. Other Alternatives More Closely Compete with Google Search Ads Than Rival General Search Engines ("GSEs")

1041. Plaintiffs' expert Professor Whinston and Google's expert Dr. Israel agree that the question of substitution as to ads products is a question of whether the audiences overlap. Tr. 4632:20-4635:20 (Whinston) ("[T]he overlap between the audiences is really important for the amount of substitution there will be between ad products . . . Like, I can reach Ms. Smith -- if I don't reach her in the New York Times and the price went up, I can go to Sports Illustrated and reach her. And so, on the other hand, if they're completely separate, the audiences don't overlap, there wouldn't be that substitution"); *see* Tr. 8519:14-8522:17 (Israel) (for "two ad types to be substitutes for one another, they have to allow the advertiser to reach overlapping audiences"), 8519:14-8520:23 ("If I lose access or reduce access at one channel, I want a channel that lets me find those same people so I don't miss out on their spending."); DXD-29.090-.091.

1042. Empirical evidence from Google panels data shows that there is greater overlap between Google users and users of Meta and Amazon than between Google users and users of Bing, Yahoo, and DuckDuckGo. The Google panels data shows a user's "session," which is a user's search activity, potentially including multiple searches, that is separated from another session by at least 30 minutes of inactivity. Tr. 8522:18-8524:13 (Israel) (discussing DXD-29.092) ("So what I ask is for anyone who used Google search during a session, what other platforms were they also found on in that same session. . . . And what you'll see here is that, perhaps probably intuitively, relatively few of them -- very few of them were also on Microsoft Bing or DuckDuckGo, they're not using both general search engines. . . . And then if you go to Amazon or Meta, you see enormous overlap. So if you're not -- if you're missing out on somebody on Google search because you're reducing your advertising there, and you want to get this audience overlap so you can hit that same person and hit them with your message, you're just much, much more likely to find them on Amazon or Meta or some non-GSE property than you are to find them on Bing."), 8525:6-8530:12 (analyzing audience overlap data for Bing, Amazon on desktop, Facebook on mobile, DuckDuckGo, and Google).

1043. Plaintiffs' expert Professor Whinston and Google's expert Dr. Israel agree that in the "current state" an advertiser's "next best alternative" to "reach the people who are on Google" "would be to advertise on Facebook or Amazon, not Bing." Tr. 8524:14-8525-5 (Israel) ("[I]t seems that Professor Whinston and I agree that audience overlap is a very important dimension of substitutability. And that as things stand, he even agreed to the statement that the next best alternative -- right, the question was: 'If I'm an advertiser, again, and I'm looking for alternatives to reach the people who are on Google, my next best alternative would be to advertise on Facebook or Amazon, not Bing, correct?' And he agreed: 'In the current state, that's correct.'"); DXD-29.093 (citing Tr. 5895:22-5896:2 (Whinston), 5897:10-14, 5899:23-5900:3 ("Q. You would agree, from an advertiser's perspective, the audience overlap between Google and Amazon or Google and Facebook is much more significant than the overlap between Google and Bing? A. Yes. I've already said yes. Right now that's absolutely correct.")).

1044. Marketplace realities refute the existence of a Cellophane problem for several reasons, including:

a. Evidence shows that Amazon and Meta (not Google) are the next best alternative to reach users of other GSEs such as Bing and DuckDuckGo. Tr. 8527:3-8530:12 (Israel) (analyzing data showing Bing and DuckDuckGo audiences overlap more with Amazon and Facebook than Google, and "if this was cellophane," you "would see lots of overlap with Google").

b. Google has greater audience overlap with Meta, Amazon and other advertising competitors than with Bing even on the desktop, where Bing is stronger. Tr. 8525:6-8530:12 (Israel); DXD-29.093-.096; Tr. 3495:16-20 (Nadella).

c. Likewise, empirical evidence from Google panels data shows that there is greater overlap between DuckDuckGo users and users of Meta and Amazon than between DuckDuckGo users and users of Google, Bing, and Yahoo. Tr. 8527:3-8530:12 (Israel) (discussing DXD-29.097); DXD-29.097 ("DuckDuckGo Users Are More Likely to Use Meta/Amazon Than They Are to Use Google Search").

d. The audience overlap between Google and Amazon, and the lack of audience overlap between Google and Bing, reflects how users use the internet rather than any impact of the challenged conduct. Tr. 8525:6-8530:12 (Israel) (discussing DXD-29.095 and explaining that "there's no cellophane fallacy" because "[the] fact is: not much overlap between who uses Google and who uses Bing; not much overlap between GSEs, but lots of overlap between Google and Amazon or Facebook").

c. Advertiser Behavior Shows That Search Ads and Other Digital Ads Are Reasonably Interchangeable

1045. Advertisers are increasingly shifting spend from search ads to other digital ads, including ads on social media platforms. [redacted]

[redacted]; Tr. 6551:18-6552:18 (Hurst) ("Q. And overall, Expedia seeks to maximize its incremental return on paid advertising across its advertising types? A. Yes. Q. And Expedia measures and seeks to optimize return on ad spend for a variety of formats of digital search -- digital advertising? A. Yes. . . . Q. So in one quarter, it might choose to spend more money on the paid social advertising as compared to the search engine marketing? A. On a relative basis, I don't think we would have ever spent more on social than search engine marketing. Q. Not more overall. A. Okay. Q. But might shift some spend to the other advertising channels? A. Yes."); Levy Dep. Tr. 225:19-226:3 ("Q. Have you had any conversations or heard from advertisers that depending on return on investment and other factors that advertisers may shift spend from Google to Facebook or from Facebook to Google? A. Yes.").

1046. Plaintiffs' expert Professor Whinston did not himself conduct "any empirical analysis in this case to show that [his] proposed advertising markets satisfy the hypothetical monopolist test." Tr. 5910:15-5911:15 (Whinston).

1047. In contrast, Dr. Israel conducted an empirical analysis of how Nike shifted spend when it paused advertising spend on Meta. Tr. 8512:23-8514:19 (Israel) ("So Nike boycotted Facebook, got rid of all spending on Facebook for July, August and September of 2020. So the way that I think about that is it's effectively like . . . Nike saw a large decrease in the ROI on Facebook, right -- or a decrease in quality, however you want to think about it, a large increase in price, it's equivalent to that, enough that they eliminated all spending on Meta, on Facebook for three months."); DXD-29.086 (showing Dr. Israel's empirical analysis of substitution during Nike's boycott); UPX2076 at -152 (slide titled "Conversion Before and After Facebook Pause").

1048. During its boycott of Meta, Nike "reallocated most of [its] Social investment in DBM (Display) and Search." UPX2076 at -152; *see* Tr. 8512:23-8514:19 (Israel) ("[T]he way I would think about this is effectively a large price increase on ads at Meta. Advertising flowed out of Facebook, and it went to display and search, showing substitution across channel.").

1049. "After relaunch [of ads on Meta], [Nike's] budget allocation shifted back to similar allocations to pre-pause[.]" UPX2076 at -152; *see also* Tr. 8512:23-8514:19 (Israel) ("They indicate they looked at other social investment options that they didn't find as attractive, and they reallocated their money to display and search. And then they indicated that after relaunch of the budget allocation, the percentages have generally shifted back.").

1050. Dr. Israel testified that his empirical study confirmed that in response to Nike ceasing advertising on Meta, "the money [was] reallocated, some within the social channel, but obviously a lot of it to search and to display[,]" with Nike's ad spend on search and display ads "spik[ing] up." *See* Tr. 8515:1-17 (Israel) (discussing DXD-29.083); DXD-29.083.

1051. Dr. Israel further testified that "[g]iven what [Nike's] options were, they found that re-optimization to be optimal." Tr. 8515:1-17 (Israel), 8516:25-8517:11 (discussing DXD-29.086) ("[T]hose bullet points are sort of my summary of what we would take away from this, that there was a big increase in price, effectively a big loss of purchasing at Meta, at one platform. Nike reallocated, they switched a little bit inside the social channel. But they found the options that were available at search and display to be more attractive, and so they switched to search and display in larger portions.").

1052. When examined using regression analysis, Nike's shift in ad spend dollars from Meta to search and display ads shows that "for every dollar of reduction in Facebook advertising, 31 cents went to search," and if time trends are taken into account, "the result went up finding a dollar reduction in Facebook led to 47 cents increase in search." *See* Tr. 8517:12-8518:13 (Israel) (discussing DXD-29.087) ("Q. Did you do some additional empirical work on this study, this particular study of Nike? A. I also did a regression analysis."); DXD-29.087 (Dr. Israel's empirical analysis of Nike's spend shifting during the Meta boycott); DX1292 (Meta ad data); DX1137 (Google search ad data).

1053. Accordingly, Nike's shift of advertising spend from Meta social media to search and display during its boycott shows reasonable interchangeability.

3. Search Text Ads Are Reasonably Interchangeable with Other Search Ads, and, Therefore, with Alternatives to Search Ads

a. Advertisers Use Search Text Ads to Achieve the Same Goals as Other Search Ads

1054. "Search ads" include not just ads on general search engines, but also ads on SVPs and the like. Tr. 5906:6-5907:19 (Whinston) ("When you look at industry recognition, which I talked about, and they're talking about search ads, they're talking not just about general search engines, but they're talking about SVPs and the like."); § IX.B.2.

1055. Search text ads, which Plaintiffs have referred to as "general search text ads," DOJ Compl. at ¶ 101, are search ads that appear above and below organic search results on the SERP. Tr. 3809:13-23 (Lowcock); Tr. 4249:18-24 (Juda); DXD-11.005 (showing an example of SERP); *see also* Tr. 4627:12-25 (Whinston) (discussing UPXD102 at 22) ("So on the left are general search text ads which look like organic results, but they have that little ad symbol boxed in blue."); UPXD102 at 22.

1056. Search text ads and shopping ads are formats of a search ad. Tr. 1177:2-4 (Dischler).

1057. Search text ads and other search ads, like shopping ads (or "PLAs" or "product listing ads") can be purchased by the same advertiser and can appear in response to the same query. Tr. 1354:18-1355:2 (Dischler) ("Q. Can text ads and shopping ads appear in response to the same query? I mean, we see it on the example in front of us, so I guess the answer is yes? A. Yeah. Q. And can a text ad and a PLA purchased by the same advertiser be served in response to the same query? A. Yes. You see a great example of it here, where Cole Haan has a pair of shoes in the shopping ads, and Cole Haan also has a text ad.") (discussing DXD-03.001).

1058. Advertisers perceive search text ads and other search ads like product listing ads (or PLAs) as having an "intersection of purpose" because, for example, a "shopping ad can fulfill the same customer's need . . . when they are submitting a query as a text ad." James Dep. Tr. 234:9-235:4; Tr. 1356:10-17 (Dischler).

1059. Advertisers can use both search text ads and shopping ads to accomplish the same objective. Tr. 1355:12-1356:9 (Dischler) ("Q. Now, one of the claims in this case is that because advertisers bid on both text ads and shopping ads, which may be served at the same time as we see here, that shopping ads are not a suitable substitute for text ads. Do you agree with that claim? A. I disagree. Q. Why? A. Cole Haan here as one objective, which is to sell shoes. They're doing so through slightly different ways. So they're doing so by suggesting a specific product in the shopping ads. They're doing so by trying to drive foot traffic into their stores through the text ad. But it's the same ultimate objective. Q. The goal of the advertiser is to make a sale? A. That's correct. Q. And do -- both text ads and shopping ads, can those both lead to what we call conversion or sale of a product for the advertiser? A. Yes. The primary objective of retail advertisers is to make a sale, and they often will relatively allocate their budgets on text ads or shopping ads in order to achieve that objective at the lowest possible cost and highest effectiveness."); [redacted]

[redacted] *see* [redacted]

b. Advertiser Behavior Shows That Google Search Text Ads Are Interchangeable with Other Search Ads

1060. Ryan Booth, Home Depot's Senior Manager of Paid Media, testified that if his team observed that product listing ads were delivering a higher return on ad spend than a search text ad campaign, he would expect that spend would be reallocated from the text ads to the product listing ads. Tr. 5181:17-5182:6 (Booth) ("Q. The daily reallocation of The Home Depot's budget that you referenced a moment ago also occurs across text ads and product listing ads, right? A. That's correct. Q. So if your team observed today that product listing ads were delivering a higher return on ad spend than a search text ad campaign, you'd expect that within a matter of days, spend would be reallocated from the text ads to the product listing ads, right? A. Yes.").

1061. The Home Depot has increased its investment in product listing ads to the point that it now spends more on Google's product listing ads than on Google's text ads. Tr. 5182:7-13 (Booth) ("Q. And Home Depot's investment in product listing ads on Google, in particular, has sort of increased in recent years to the point that the overall amount spent on product listing ads is larger now than the amount spent on Google text ads; is that right? A. Our spend in product listing ads is higher than [in] text ads, correct.").

1062. Since 2018, shopping ads have become a larger portion of Amazon's marketing expense relative to text ads because Amazon, as a purchaser of ads, saw higher yield as compared with text ads. [redacted]

1063. Dr. Prabhakar Raghavan, Google's Senior Vice President of Knowledge & Information, testified that over the last five to seven years he has noticed that "[a]s PLAs grew in popularity, advertisers started moving more and more of their budgets from text to PLAs" and now "advertisers will freely move money between PLAs and text ads." Tr. 7370:15-7371:9 (Raghavan); Tr. 8546:15-8547:14 (Israel) (same); *see* Tr. 1356:18-1357:3 (Dischler) ("Q. Have you seen any trend from the advertisers' side in shifting spend between text ads and shopping ads over the last several years? A. Yes. You know, as advertisers become more comfortable, they've been shifting more budgets to shopping ads versus text ads. Q. And what does that confirm to you about the substitutability of shopping ads for text ads? A. I believe that they're equivalent. In the view of the advertisers, they're equivalent and substitutable.").

1064. Richard Holden, who led the Google Travel search and ads team for many years, testified that advertisers in the travel vertical "frequently will shift their spend from [search text ads to hotel ads] based on whether they feel the ROI is better in one area or another." Tr. 9197:22-9198:15 (Holden), 9229:24-9230:8 ("Q. From an advertiser's perspective, though, the advertiser's buying hotel ads, think they're getting a more qualified user that has a higher probability of purchase than a user on the Google SERP, correct? A. The advertiser . . . is buying a hotel ad, often is bidding more on that hotel ad than maybe a text ad because the likelihood of conversion may be higher, but they're buying across both those sets of ads all the time and are comparing ROI across them and shift dollars among them.").

4. The Theoretical Purchase Funnel Construct Does Not Describe How Digital Advertising Works in Practice

1065. Plaintiffs' experts largely ignored the evidence of actual advertiser behavior regarding digital advertising in favor of a theoretical construct known as the purchase funnel. Tr. 5589:25-5590:4 (Jerath) ("Q. . . . Did you do any empirical work to test your assertion that other digital advertising options are less effective than search ads at targeting mid- and bottom-funnel consumers? Any empirical analysis? A. No."), 5597:4-12 ("Q. . . . Display ads, including social ads, your opinion is that they are best slotted in, mapped into mid- or upper-funnel, correct? A. That's right. Q. Okay. And I think we can agree, you undertook no analysis or did any empirical work in connection with that opinion to see if your opinion was correct. Can we agree on that? A. In the context of this case, I did not conduct an empirical analysis.").

1066. Professor Jerath also did not review, or could not recall reviewing, the numerous advertiser documents that did not comport with his views about ad formats and the purchase funnel were unfounded. Tr. 5601:11-18 (Jerath) (could not recall if he reviewed DX3057), 5608:15-18 (could not recall if he recognized DX3058), 5610:21-22 (could not recall if he saw DX710), 5614:9-11 (did not remember whether he looked at DX660 while doing his work), 5616:9-23 (did not recall whether he reviewed DX3207); *see also* Tr. 6938:19-6939:15 (Amaldoss (Colorado Plaintiffs' Expert)) (conceding that, in reviewing advertisers' documents to form his opinions about the funnel, he "didn't undertake to do a survey of a random sample or representative sample").

a. The Purchase Funnel Has Become an Outdated Construct in the Context of Digital Advertising

1067. The origins of the theoretical construct of a consumer "purchase funnel" date back to 1900. *See* Tr. 5531:23-5532:2 (Jerath) ("Q. So I think you even mention that the funnel is over 100 years old, right? A. Yes. Q. Okay. So we have a photo of Elias St. Elmo Lewis, who is attributed with being the first to note the funnel all the way back in 1900, so over 120 years old? A. That's right.").

1068. Advertising has changed over the past 120 years, with new digital marketing platforms emerging, including display, search, and social media advertising. *See* Tr. 5532:4-9 (Jerath), 5532:23-5533:15 (acknowledging that "new digital marketing platforms that have emerged include display advertising, search advertising, and social media").

1069. The purchase funnel has become an outdated construct in the context of digital advertising; it does not describe the real world of advertising today. Tr. 1413:9-24 (Dischler) ("[I]it's a now-obsolete marketing framework that had been used for probably 50 years to identify how a consumer goes through a linear journey, starting with awareness of a service and then going to consideration and then going to purchase in this linear flow."); *see* Levy Dep. Tr. 208:17-209:1 ("The funnel's a nice construct for simplifying it, but the real world doesn't exactly work the way consultants draw it up."); Tr. 4891:17-24 (Lim) ("Q. During your career in digital media, have you encountered a concept of a marketing funnel that's sometimes invoked as a mental model of a customer journey towards a purchase? A. Yes, it's a commonly used turn of phrase, yep. Q. And even though it's commonly used, you'd agree that it's sort of less and less attuned to the times today? A. Yes."); Tr. 8539:9-8540:7 (Israel) ("[A]dvertisers do two things when I've talked to them, and you see it in the documents. They both say the funnel is not tight and it's nonlinear, but a lot of them will still speak in funnel language. It gets taught a lot in MBA programs that I've been part of, is people teach the funnel. But then they say the funnel is nonlinear and not really quite a funnel."); Tr. 5647:4-17 (Jerath) ("Q. And on page 134 of this book, there is a paragraph followed by a funnel. And the paragraph preceding Figure 7.3 says: For marketers this means regardless of the specific choice of social media or channel, more and more potential customers are sharing information and joining communities of like-minded interests. This presents an unprecedented opportunity to find and reach potential customers. Social media, in a sense, has changed the traditional marketing funnel. Do you see that? A. I read that. Q. Okay. So according to Jeremy Kagan, the author of the book, the funnel isn't as timeless as you seem to think, correct? A. He seems to think that.") (discussing DXD-14.019).

1070. Whatever pedagogical benefit the funnel might have, when it comes to digital advertising, the levels of the purchase funnel have lost distinction. Advertisers can and do employ ***any*** digital ad format to reach consumers who might be described as being at any level of the funnel. *See* Tr. 5647:22-5648:3 (Jerath) ("Q. Are you familiar with a company by the name a Tinuiti? A. Yes, I am. Q. You know that they're the largest independent performance marketing firm in the United States? Is that consistent with your understanding? A. I mean, I know that they do performance marketing, which is lower-funnel marketing."); DX3073 at .001 (Tinuiti

Homepage) (stating that "[t]he funnel has collapsed," as "[b]rand and performance [marketing] have become one . . . all of it digital, all of it measurable, all of it performance"); Levy Dep. Tr. 104:11-105:6 ("I think marketing does a lot of different jobs, so things that happen lower in the funnel could also drive discovery and awareness, and things that happen at the top of the funnel could also drive things much lower in the funnel in terms of direct purchase too. It would depend on the marketing and the circumstance."), 209:9-25 ("[A]ny ad can serve multiple purposes so an ad that may be classified as lower in the funnel could have positive brand benefit to a company, which would be considered in the simplified form of the funnel as a higher-funnel activity."); Tr. 6935:12-18 (Amaldoss) ("Q. And advertisers can and do differ as to which media channels fall into which stage of the funnel, right? A. Depending on their product and the competition and so forth, yes, there would be differences across how they effectively utilize, how sophisticated they are and their market and so forth. There would be some variation how they're using the ad channels across the funnel.").

1071. Reflecting that fluidity, when Plaintiffs' experts tried to place the various ad formats at certain "funnel" levels, there was no consensus as they placed the same format at different points. *Compare* Tr. 6952:3-10 (Amaldoss) ("Q. Do you agree that there are users who use a general search in order to explore new topics or discover new things? A. Yes."), *with* Tr. 7034:19-7035:5 (Baker) (noting that general search ads are generally used "to target consumers in that middle stage -- research and consideration, that middle stage of their product journey") *and* Tr. 5443:1-5444:4 (Jerath) ("Bottom of the funnel is harvesting the demand that was generated. And this is achieved through search ads."); *compare also* Tr. 4638:22-4640:5 (Whinston) ("So search ads are very -- you know, are further down the funnel . . . .") *and* Tr. 5391:10-23 (Jerath) ("[S]earch ads are most suited and effective for bottom funnel goals and to some extent for mid-funnel goals."), *with* Tr. 7034:19-7035:5 (Baker) ("So advertisers, according to the information I've seen, typically use general search ads to target consumers in that middle stage -- research and consideration, that middle stage of their product journey, while advertisers are typically using ads on SVP sites to target consumers at that lower stage of the funnel closer to purchase.").

1072. Indeed, there was no consensus as to the structure of the funnel itself and the various iterations of the funnel presented by Plaintiffs' experts differed. *See* Tr. 5383:12-18 (Jerath) ("Q. . . . There are different versions of the funnel that exist. Different practitioners, different academics, they can use slightly different versions."), 5583:19-21 ("So now we just looked at funnels with seven, five, four, three levels, correct? A. Yep."); Tr. 6880:9-19 (Amaldoss) ("[T]he idea [of the funnel] is [still] there, and it's still used, but people have partitioned it into more levels, fewer levels, and so forth. And some are mixed up, mindset with actions, also, but the idea is there and people are still using it."); Tr. 3879:7-3880:21 (Lowcock).

1073. Plaintiffs' experts and advertisers concede that consumers' journeys through the "purchase funnel" construct are not linear, meaning a consumer may skip, or go up and down stages. *See* Tr. 5383:4-9 (Jerath) ("Q. Does the funnel require a linear path through the stages that you identified? A. Not necessarily. Consumers can skip stages in some cases. Consumers can be at a stage and then go back to another stage. Let's say they forget about a product. So they can go back, up and down. It doesn't have to be linear."); Tr. 6951:21-24 (Amaldoss) ("Q. . . . Do you agree that consumers may pass through the sequence of funnel stages in varied and nonlinear ways? A. Yes."); Tr. 3884:11-16 (Lowcock) ("Q. . . . Now, would you agree that the consumer journey is not necessarily a linear path from top to bottom that these various iterations of the purchase funnel depict? A. Yes."), 3882:13-16 ("People can enter and exit the funnel at any stage."); Tr. 4632:20-4635:20 (Whinston) ("It's a linear funnel, but potentially people are going -- you know, might get to looking at the product, and then go back and try to become aware of additional products. So it doesn't have to be linear."), 5893:1-8 ("Q. User journeys go in lots of different directions up and down the marketing funnel, correct? A. I see. So if what you're saying is: Do users, consumers, always start at the top of the funnel and progress to the extent that they continue always be going down the funnel? No . . . some consumers may do that sometimes, but other consumers at other times they will circle back and, you know, go back to a point earlier [in the funnel], et cetera."); Tr. 6648:19-23 (Vallez (Skai)) ("Q. . . . Is it fair, in your experience, that the consumer's journey is not linear? A. I mean, every journey is unique, but I would say more often than not, it's no longer linear."); Tr. 8538:10-8539:8 (Israel) ("Q. Did you see evidence from the trial record confirming your view that the consumer journey is nonlinear? A. Yes. . . . I think there's a consensus that the funnel is something that's been taught, but it's not a linear, go from the top to the bottom the way a funnel sounds. It is a journey which is this sort of nonlinear winding path."); *see also* DX0700 at .013-.017 ("To understand the influence of a channel, we need to recognize that a customers journey will encounter different media exposure[.]").

1074. Professor Jerath did not identify a single scholarly article addressing digital ad formats in the context of the purchase funnel, and of the books he cited, the only book that addressed the relationship between digital ad formats and the purchase funnel (authored by Jeremy Kagan) contradicted his theory. Tr. 5538:18-22 (Jerath).

b. Even Within the "Purchase Funnel" Construct, Search Ads, Social Ads, and Display Ads Compete at All Levels

1075. Search ads, social ads, and display ads are used by advertisers to accomplish the objectives described in all levels of the historical purchase funnel. *See, e.g.*, DX3057 at .020, .067; DX3207 at .026; DX3054 at .002; DX0660 at .014; DX0354; DX0665; DX0653; DX0702; DX0703; DX0709; DX0710; PSX00674; PSX00973. Display ads and social ads serve advertising objectives at multiple stages of the purchase funnel, not just what Plaintiffs' experts call "upper funnel." Tr. 5610:10-17 (Jerath) ("Q. So do you see under upper funnel, we have display next to paid media channels? A. Yes. Q. Okay. And do you see we also have social in upper funnel? A. Yes. Q. If you look to the right, we see that both display and social are lower funnel as well, right? A. Yes.") (discussing Wells Fargo document, DX0710 at .006); Tr. 8539:9-8540:7 (Israel) ("So you see in the Wells Fargo document, for example, that they use lower funnel as a phrase still, but they indicate that included in lower funnel is display and social and search and direct mail, for example.") (discussing DX0710 at .006); Tr. 5599:3-20 (Jerath) (discussing American Airlines document, DX3057 at .067); DX0660 at .014; Tr. 5613:22-5614:8 (discussing JPMorgan Chase document, DX0660 at .014); Tr. 6940:5-18 (Amaldoss) (conceding that "advertisers did not universally accept [his] conclusion that display advertising is directed to a higher stage of the [funnel] than search advertising," so he was making a "weak inference"); [redacted]

1076. Search ads provide an alternative not only for obtaining conversions or inducing purchases, but also for obtaining advertiser awareness or brand recognition. *See* Tr. 6952:3-10 (Amaldoss) ("Q. Do you agree that there are users who use a general search in order to explore new topics or discover new things? A. Yes."), 6952:17-6953:1 ("Q. Do you agree that text advertising on Google serves to increase an advertiser's brand recognition with users? . . . A. It can."); Tr. 5618:24-5619:2 (Jerath) ("Q. . . . Now, would you agree, Dr. Jerath, that search ads can perform the purpose of awareness, upper funnel? A. In some cases, they can."); [redacted]

[redacted] Tr. 5624:19-5625:4 (Jerath) ("Q. What I would ask you to do, sir, is turn to page 015. And for brand -- do you see the word "brand" at the very top? A. Yes. Q. Okay. And it's talking about driving awareness and excitement. Do you see that? A. Yes.") (discussing DX0412 at .015), 5625:12-14 ("Q. . . . And by the way, just so we have a complete record, driving awareness is upper funnel, according to you, right? A. Yes."); [redacted]

1077. Search ads are also used by advertisers to target users engaged in research and consideration. *See* Tr. 7034:19-7035:5 (Baker) ("Q. On the marketing funnel, as applied to the question on which you're now opining, Professor Baker, how do you view users on SVP sites? A. Yes, well, I look -- advertiser behavior is what's telling me that SVP users are generally lower in the marketing funnel than general search users. So advertisers, according to the information I've seen, typically use general search ads to target consumers in that middle stage -- research and consideration, that middle stage of their product journey, while advertisers are typically using ads on SVP sites to target consumers at that lower stage of the funnel closer to purchase.”).

1078. Accordingly, even within the funnel framework, search ads compete with alternative forms of digital advertising at each purported stage. [redacted] Tr. 3935:13-19 (Lowcock) (“Q. And can we agree, Mr. Lowcock, that each of [Google, Bing, YouTube, and Amazon] can play the role of awareness, consideration, and purchase? Can we agree on that? A. Yes, we can agree to that.”) (discussing DXD-10.012); DXD-10.012; Tr. 5623:9-5624:3 (Jerath) (“Q. You see at the top it says: TV and search are the primary channels to drive awareness and consideration. Do you see that? A. Yes. Q. And just to make sure we’re clear on the terminology, awareness is upper funnel, correct? A. Yes. Q. And consideration is mid-funnel, correct? A. Yes. Q. So according to this page, this particular company, as reflected on this page, is identifying search as mid- and upper funnel, correct? A. Based on this page, it’s putting them in both of those. Q. And, in fact, if you look at the column called Awareness Channel Performance, the second highest one is search, right? A. Yes. Q. And if you look at the -- to the right, consideration channel performance -- that would be midlevel -- the highest one is search, correct? A. Yes.”) (discussing American Airlines document, DX3057 at -579); Tr. 8540:8-8541:4 (Israel) (“American Airlines on the next slide. American Airlines is interesting, because they explicitly say conversion. American Airlines draws a funnel, and they say conversion includes display, search and social. American also says mid funnel includes display, social and search. So it's not like search is always just at the bottom.") (discussing DX3057 at -579); Tr. 5627:4-7 (Jerath) ("Q. Okay. And, so, [redacted] at least from this page that we're looking at, identifies search as driving awareness, correct? A. That's one of the things it's doing, yeah.") (discussing DX3054 at .002) (stating "Search is the #1 way consumers find information while shopping, and it facilitates [the consumer] buying process throughout the funnel, driving awareness, consideration, and close").

X. PLAINTIFFS FAILED TO PROVE THAT GOOGLE HAS MONOPOLY POWER

1079. As Dr. Israel testified, a monopolist "has to be a firm that has the ability to do what we associate with monopolization, which is to restrict output." Tr. 8387:22-8388:22 (Israel (Google Expert)). The evidence showed that Google lacks that ability.

A. Plaintiffs' Economic Experts Do Not Present or Analyze a But-For World for Search Quality or Output

1080. As DOJ's economic expert Professor Whinston conceded, an economist ideally would assess the effects of Google's conduct relative to a but-for world without the challenged conduct. Tr. 5774:14-25 (Whinston (DOJ Expert)) ("Q. And then do you recall writing in your rebuttal report: 'The likely competitive effects of Google's behavior locking up search access points through the challenged agreements is ideally estimated relative to a but-for world'? A. I do. Q. And what did you mean by 'a but-for world' in that sentence? A. So, Your Honor, just a but-for world, what we mean is thinking about what would have happened in the general case, in the absence of an event or the absence of a behavior. And so that's what we mean. In this case, it would be in the absence of Google's contracting practices."); Tr. 8439:3-17 (Israel) ("And, ultimately, monopoly power is an action. A firm has monopoly power if it can act like a monopol[ist], which means reduce market-wide output. So to establish market power directly, you would need to show that the firm has reduced output relative to some but-for world, right? And this is the case where I really think you need to define a but-for world, because if you're going to go after monopoly power, because it's really an output question and, you know, you don't want to say just, you know, if we see output expanding, you need to say: How do I see this firm has reduced output, relative to some alternative?").

1081. Professor Whinston conceded that Google has long been the highest quality search engine in the United States and has innovated significantly in search. Tr. 5922:1-5 (Whinston) ("Q. And did Google build a strong brand recognition and loyalty by offering a high quality search engine? A. It did. I mean, I think Google, you know, revolutionized search back in, you know, the late 1990s into the beginning of the century."), 6041:15-23 ("Q. You've offered an opinion in this case, in connection with your monopoly power opinion, that Google's search quality was significantly superior to Bing's from 2015 to 2021, correct? A. Yes.").

1082. His theory is that Google might have innovated even more if it had faced greater competition. Despite the central role this proposition plays in Professor Whinston's monopolization claims, he proffered no but-for world level of quality. Tr. 6143:21-6144:8 (Whinston) ("Q. And again, you haven't modeled a but-for world of innovations with substantial market power versus innovations without one; correct? A. It depends what you mean by 'modeled.' Sorry. Ask your question one more time, just so I'm sure I'm answering it. Q. You haven't identified innovations that Google would have brought to market in a but-for world versus ones that they didn't bring to market? A. Specific innovations? Q. Yeah. A. I think you asked me that yesterday as well, and I was talking about, you know, the last document that I referred to, and -- but there wasn't anything specific, no.").

1083. Professor Whinston offered no opinion about "whether or not artificial intelligence advances have lowered the barriers to entry." Tr. 5918:25-5919:4 (Whinston); *see also* Tr. 4765:12-25 (Whinston).

1084. Both search and search ads output have expanded substantially and consistently throughout the period of Google's alleged monopoly maintenance. Yet Professor Whinston failed to analyze what the level of search or search ads output would have been in a but-for world. Tr. 6036:8-11 (Whinston) ("Q. You've not conducted any analysis in this case as to what level of search or search advertising output would have been achieved in any but-for world, correct? A. Correct."); *see also* Tr. 8442:17-8443:11 (Israel) ("The way I'm measuring output here is total query volume. And here I'm showing it on GSEs, what it would be under plaintiffs' market definition. I mean, clearly you see output is exploding in this industry."); DXD-29.045 (indicating that total general search query volume has more than doubled since 2011, and has increased from fewer than 50 billion annual queries in 2014 to more than 70 billion by 2021); Tr. 8551:20-8552:19 (Israel) ("Plaintiffs haven't defined such a but for world at all or shown an output restriction. In fact, on the advertising side as well, output growth has been explosive."), 8553:4-8554:19 ("The general pattern is that advertising spending has -- in nearly all cases they publish, has outstripped their projections. I think it's interesting, even around 2010 when there's -- you know, the allegations here -- or at least that's as far back as they go, you still see output beating projections."), 8439:18-8440:13 ("I don't see any evidence from plaintiffs that could support a direct finding of monopoly power. Because to have a direct finding of monopoly power, you would have to define a but-for world, support it, and say that output in that but-for world, in which there is less Google power in some sense, would be higher than output that we actually see, right? And I have not seen them even attempt to do that, which means they have not taken the task to monopoly power directly.”).

B. There Is No Proof That Google Failed to Innovate on Search or Search Ads

1085. Professor Whinston contended that the challenged agreements have reduced Google’s incentives to improve search, leading to lower quality than would exist in a world without the challenged conduct. Tr. 5782:9-5783:14 (Whinston) (“Google’s incentives are reduced for two reasons. One is for the same reason that the contracts -- the same point that the contracts tie up the market insulate Google. So Google doesn’t have to worry if I lose -- if my quality isn’t so good -- or isn’t as good as it might have been, I’m going to lose a lot of customers. So it affects Google’s incentives in that sense, and having weaker rivals also reduces Google’s concerns over losing customers. . . . Google is going to run faster if it has more competition.”).

1086. In reality, however, Google has consistently and vigorously competed throughout the period of alleged monopoly maintenance to improve search quality. *E.g.*, *supra* § III; Tr. 3532:20-3533:2 (Nadella) (“[Google is] competing every day to improve search . . . But, yes, on search, I think the competition is pretty intense.”); Tr. 6320:2-6321:5 (Nayak) (“One of the most important buckets of work was that first bucket, which is highlighted on this slide here, which is to maintain industry-leading search quality. This is an important objective, important goal for us every year, is to do this investment. And what this slide is describing is the specific metrics we were using and the specific key results, so the specific goals we were trying to achieve to allow us to continue to maintain industry-leading search quality.”); Tr. 8209:14-8210:10 (Reid) (explaining DX0241 at .013 as an example of Google’s studies on how to “evolve and innovate” its product in response to competition from TikTok), 8248:16-8249:2 (discussing a user survey Google conducted on local search competitors to “understand how did Yelp and Tripadvisor and others answer these questions, and what can we choose to learn from it to affect our product strategy”).

1087. Professor Whinston did not conduct any empirical analysis to determine if there had been a diminution in search quality or output, but instead pointed to two anecdotal instances where Google employees noted competitive pressure and Google took action. Tr. 6091:22-6093:7 (Whinston) (“Q. . . . Have you gone and done any analysis in this case to study the quality gap between Google and rivals in a period before alleged anti-competitive conduct versus after alleged anti-competitive conduct? A. I don’t have a period before. Q. You didn’t -- you can’t say whether whatever gap you’re referring to today is greater than, the same or less than any gap that preceded any alleged anti-competitive conduct, correct? A. I don’t have a preceding period. . . .”); UPXD104 at 64 (asserting that “Google responds to (rare) competitive threats by increasing search quality” and citing the 2009 “Introduction of Bing” and the 2018 “European Commission Ruling Requiring Choice Screen”).

1088. As one example, Professor Whinston claimed that Google reacted to Microsoft rebranding its search offering as Bing in 2009 by increasing investments in search. Tr. 5842:4-5844:4 (Whinston).

1089. There is no evidence, however, that Google’s response to Microsoft’s launch of Bing differed from its response to myriad other competitive threats over the years, or that it competed any less fiercely to improve search quality before Microsoft launched it or after Bing had been in the market for years. Tr. 6142:15-19 (Whinston) (“And you haven’t tried to compare the -- the innovative significance of the two episodes you describe here in 2009 and 2018 versus the myriad of other innovations Google has brought to market; correct? A. I have not made that -- done a comparison, no."), 6136:8-18 ("Q. But you haven't tried to track the IS gap over 2009 to, let's say, '12 or '15 or any other later period? A. The gap, no. . . .").

1090. Google regularly compares and evaluates the relative quality between Google Search and its competitors, including Bing. Tr. 6367:16-18 (Nayak) ("Q. Does Google Search ever conduct comparisons of itself to Bing? A. Yes, [it does]."), 6369:6-12 ("Q. And over those 19 years in which Google's been doing those comparisons to Microsoft's search product and other search engines of the same ilk, what has Google seen in terms of the quality differences? A. I think we've seen a fairly meaningful difference in quality. I would guess in the range of three to four points of IS at various points is the gap we've seen.").

1091. Google introduced countless innovations and improvements in search quality before and after the launch of Bing that are indicative of Google's overall approach to continuous improvement, and not tied to a specific event in 2009. *See supra* § III.

1092. Were Professor Whinston's theory that the launch of Bing caused a short-term competitive response, one would expect to see a jump in research and development ("R&D") expenditures at that time and then a decline. That was not the case. Instead, there was a consistent increase over the period for which there is data (through 2021), not only in absolute terms but also as a percentage of revenue. Tr. 8443:12-8445:6 (Israel) ("Professor Whinston, in his report, made a comment about the markets being more competitive when Bing had first entered, around 2009. So, the question I asked is: Has R&D, as a percentage of sales, gone down since those earlier time periods? And the answer is no. It's gone up since those earlier time periods."); DXD-29.046.

1093. Microsoft's CEO, Satya Nadella, did not indicate that there was a merely transitory surge in competitive pressure when Bing launched in 2009, but rather acknowledged that Google is "competing every day to improve search" and that "on search . . . the competition is pretty intense." Tr. 3532:20-3533:2 (Nadella); *see also* [redacted]

1094. As a second example of Google's purported sporadic response to competitive pressure, Professor Whinston posited that Google's implementation of a choice screen on Android devices in response to a 2018 decision by the European Commission led to increased investment by Google in Europe. Tr. 5844:5-5848:14 (Whinston).

1095. There is no evidence that Google's response to the introduction of a choice screen on Android devices in certain European countries differed from its response to myriad other developments in the marketplace, or that it competed any less fiercely to improve search quality before the choice screen launched or since the choice screen has been in place. Tr. 6142:11-19 (Whinston) ("Q. But again, you -- you haven't tried to catalog all of the various competitive responses that Google has made between 2009 and 2018? A. No, I have not."); Tr. 8152:16-22 (Gomes) ("Q. Do you agree that in response to the EU choice screen, that these were Google's plans to invest more money, correct? A. Yes, but this is a relatively -- in the context of a team with thousands of engineers, this was a relatively small delta. But it was in the context of making sure that we had good marketing, should there be marketing against us."), 8155:13-19 ("Q. And it was not until the EU choice screen that Google decided to make the investments identified in UPX0749, the Go Big in Europe, correct? A. We were making investments in Europe all the time. This was on the margin as a couple of extra investments, yeah. The European market is extremely important to us, and so we invest in all those countries in a very big way.").

1096. There is no evidence that Google's investment in Europe following the introduction of the Android choice screen exceeded investments it made in the United States. Indeed, Google typically launches new features in the United States first. Tr. 8150:24-8151:13 (Gomes) ("We launch things principally -- first of all, typically in the U.S. in English, because that's where a bulk of the engineering team resides. And then many of these experiences are then taken to Europe and other countries. On occasion, we have to do specialized things in particular countries because they have different sports, like there's a German league or a French league.").

1097. Professor Whinston also posited that Google provides lower quality to advertisers than it would in a world without the challenged conduct. Tr. 5861:7-5862:17 (Whinston).

1098. In reality, however, Google has consistently and vigorously competed throughout the period of alleged monopoly maintenance to improve search ads quality for both users and advertisers. *See supra* § III.E; Tr. 8554:20-8555:20 (Israel) ("So the way I've tried to measure quality . . . is basically the click-through rate. If ads are higher quality, if they're a better match, then more people are going to click on them. So the sort of goal of targeted advertising is to match it to the right user. . . . So you see in 2011, that was just over 10 percent. So about 10 percent of the time that a query had an ad, it was clicked. By 2021, that's over 30 percent. So the ads that are being put are matching to users better in the sense that they're being clicked on more regularly."); Tr. 7349:7-7350:1 (Raghavan) ("Q. Are you familiar, sir, with various innovations that have been made to Google's search ads functions over the years? A. Some of them, I would say. Q. Okay. And is innovation something that is going on with great frequency? A. I would say it's a fairly constant activity, and it's the reason why hundreds of engineers work on this problem all the time."); DXD-21.007.

1099. Professor Whinston did not undertake any empirical analysis of search ads quality or output to substantiate his assertion that Google's incentives to invest in search ads have been diminished. Tr. 6036:8-11 (Whinston) ("Q. You've not conducted any analysis in this case as to what level of search or search advertising output would have been achieved in any but-for world, correct? A. Correct."), 6025:1-4 ("Q. You didn't do any analysis in this case that tried to capture or estimate the increase in advertiser ROI for Google search ads, right? A. No. That would be impossible with the data.").

1100. Innumerable events have served as an impetus for Google's search ads innovations, including the evolving preferences of advertisers and users, the development of new technologies that enable Google to improve the relevance of search ads and deliver new capabilities to advertisers, and competitive pressure from a wide range of competing digital advertising platforms such as Meta, Amazon, and TikTok. *See supra* § III.E.

1101. Professor Whinston's passing remark that Google engages in a "pantry mode" strategy of keeping innovations "on the shelf until maybe we need to bring them out" lacks any evidentiary support. In making that statement, Professor Whinston referenced an unspecified *New York Times* article, made clear that he was *not* relying on it for his opinions, and further acknowledged that he did not "even know if it was about search." Tr. 5844:5-5846:21 (Whinston).

1102. In all events, Professor Whinston's reference to a "pantry mode" is contradicted by the record, which highlights that Google has relentlessly innovated over the past 25 years to improve its search quality. *See supra* § III; Tr. 6369:13-6370:4 (Nayak) ("[Q.] Was it ever the case in your years at Google that its approach to search quality was to be good enough? A. No, not at all. Q. And what is Google's culture? A. We very much have a culture of trying to improve search for our users. We are consumed by this. We spend all our time doing this. We set ourselves goals to continually improve search. And frankly, there's a lot of work to be done for all sorts of reasons. The most interesting of them is every time we improve search, users ask us harder questions. There's always this sort of boundary of questions that we don't do a good job on. And so there's always lots of work to be done, and we continually expand the boundaries as we go. So there's no sense in which search has ever been good enough.").

C. There is No Proof That Google Has Failed to Compete on Privacy or That There Would be Different Privacy Offerings in the But-For World

1. Users Have Many Options for Different Combinations of Privacy and Functionality from General Search Engines

1103. The data collected and utilized by search engines impact the quality of both the organic search results and the advertisements shown in response to users' queries, creating what can be described as a "trade-off" between the quality of the search engine results page ("SERP") on the one hand and user privacy on the other. Tr. 9904:19-9906:15 (Murphy (Google Expert)) ("Fundamentally, privacy, if we just focus on the users side, involves a tradeoff. As I use more user data, I can give them better results. On the other hand, that probably means somewhat less privacy for them."); Tr. 5937:4-10 (Whinston) ("Q. Have you evaluated in this case the trade-offs that exist between taking steps to increase user privacy and the reduction -- and reductions in search engine or search ads quality? A. So, I haven't evaluated them. There are certainly trade-offs involved, but on the other hand, you can give consumers choice and then they can choose."); Tr. 9073:22-9074:9 (Fitzpatrick) ("[I]t's not always the case that a user is saying I want extreme privacy, understands the implications of that in terms of product quality and information quality that they're able to get back.").

1104. General search engines, like Google and Bing, are generally free of cost for users because they are supported by an advertising model, whereby advertisers purchase ads shown in response to relevant commercial queries. Tr. 1443:4-9 (Dischler) ("Q. And Google needs to earn a revenue on commercial queries to pay for running the entire search engine, correct? Commercial and non-commercial queries, correct? A. Google needs to earn revenue in order to pay for the search engine. We choose to earn revenue by monetizing commercial queries.").

1105. Search ads are helpful to users looking for commercial information, and their removal from the SERP can negatively impact user experience. Tr. 7345:20-7346:1 (Raghavan) ("Q. Wouldn't users be better off just getting organic results? A. That's not what our research shows quite consistently. When users are in a moment of commercial consideration, consistent user studies suggest that they would like to see the right number of tasteful and well-matched advertisements."); Tr. 9073:5-20 (Fitzpatrick) ("It is not an engineering problem to not show ads. It is a -- generally speaking, a user problem. Because many of the questions that people bring to Google are commercial in nature, and often one of the best ways we have to answer those questions is with commercial information, which tends to come from our advertisers. So, it turns out that removing ads from the experience actually has pretty significant costs in terms of overall quality of information that we're able to provide back to people.").

1106. Information about a user can be used by search engines to show advertisements that are more likely to be relevant to that user. Tr. 7457:23-7458:1 (Raghavan) ("Q. . . . You see in the next sentence here on the privacy policy that one of the things that Google does with that uniquely device identified data for signed out users is to use it to help target ads to them, correct? A. Based -- so such as preferred language and relevant search ads based on recent activity."); Tr. 9069:15-23 (Fitzpatrick) ("Q. Okay. And the default is that Google users are retargeted; is that right? A. The default is to use information in a Google -- in a Google user's account to give them more personally relevant ads, because we believe that leads to higher-quality ads and a more relevant information-seeking experience."); Tr. 3737:5-15 (Ramaswamy (Neeva)) ("Q. And you also spoke about personalization. Did you believe that personalization improved the quality of the search experience for users? A. Absolutely. So to give you concrete examples, we had a feature called preferred providers by which people could pick their news sources. Among other things, I have subscriptions to like New York Times and Economist, and I prefer those results. All other things being equal, a search engine just becomes more useful with information like that. And the user feedback that we got was definitely that users liked features like that.").

1107. Advertisers seek information and data from search engines to help them advertise more effectively, including information and data to help track ad conversions—a record of whether the advertisement displayed led to action by the user, such as a purchase. Tr. 1367:7-1368:7 (Dischler) ("Advertisers would like infinitely granular information about every user on Google because it would serve their business interests and they believe that they would use that information responsibly. However, users want to have predictable data exchange with an advertiser. They don't want us handing over their user information."); Tr. 3849:14-3850:7 (Lowcock (Interpublic Group)) ("Q. And turning back just for a moment to the SQRs, the search query reports, how, if at all, has Google changed over time the amount of information it provides clients in the SQRs? A. There have been limits, and Google has deprecated or limited certain types of information that's available. Q. And what was the explanation Google provided for the reason for this reduction in -- A. It cited privacy reasons."); Tr. 3738:20-3739:12 (Ramaswamy) ("[Y]ou cannot show ads today without also being in the business, directly or indirectly, of making sure that somebody knows whether those ads were successful or not. While

DuckDuckGo can reasonably say that they don't maintain profiles of users, somebody is on the basis of the ads that are being shown on them.").

1108. Users have varied privacy preferences, and the same user may have different privacy preferences depending on the context. Tr. 5854:21-5855:18 (Whinston) ("[C]onsumers do vary in how much they care about privacy"); Tr. 8995:17-8996:14 (Fitzpatrick) ("One of the things we really find to be true with privacy, it's not a one-size-fits-all thing. That some people, you know, sort of take it to an extreme and want very, very, you know, sort of, you know, ironclad controls over what personal data that they're willing to put in an online context in the first place. Whereas, other people would happily have a little bit more of their personal [data] shared with their product and service, if it means they get more utility out."); Tr. 3677:16-3678:8 (Ramaswamy) ("Privacy tends to be a remarkably squishy concept" that "means many different things to many people."), 3725:1-14 ("Everybody will assure you that they care about privacy, there's just no question about it, mostly because they don't even know what privacy is. It just sounds like a reasonable thing to say."); Tr. 9059:6-9060:21 (Fitzpatrick) (testifying that some users may have different privacy preferences depending on context).

1109. Users with strong preferences for privacy have readily available options for privacy-focused search—including those offered by Google—and can easily choose the option they prefer. Tr. 2476:2-2477:4 (Cue) ("So what we do is we make Google be the default search engine because we've always thought it was the best engine. And then we make it really easy for customers to switch if they'd like to switch. And so that's worked extremely well for our customers and we certainly believe we've done the right thing for our customers."), 2627:24-2628:1 ("Q. And that Apple is obligated to make it easy for users to be able to switch the default search engine in Safari? A. That's correct."); Baker (Mozilla) Dep. Tr. 96:10-13, 96:21-98:03

("[O]ur users have shown us that when Google isn't default, they find ways to get to Google. They type in Google.com. They change the default. They go elsewhere."); Tr. 8990:18-8992:5 (Fitzpatrick) ("[F]or everything we do in privacy, we want to really focus on both transparency and control for the user. So, we want the user to have a transparency into what of their personal information Google has and has stored in association with their Google account, and to have robust controls to, you know, keep, delete, or otherwise have agency over that data, including removing it from Google whenever and should they so choose."), 9006:22-9007:15.

1110. According to Professor Whinston, because consumers vary in how much they care about privacy, all consumers benefit if it is easy to choose the level of privacy they want. Tr. 5854:21-5855:5, 5937:4-10 (Whinston).

1111. Google endeavors to make it as easy as possible for users to choose their desired level of privacy, and it has invested heavily in engineering and design teams that develop and improve privacy controls and features in response to user research and evolving user needs and preferences. Tr. 7416:12-22 (Raghavan); Tr. 8990:18-8992:5 (Fitzpatrick), 8995:17-8996:14, 9080:23-9083:23.

1112. Google provides users with multiple entry points to privacy settings that provide users with transparency into the personal information stored in association with their Google account and controls over that data, including, for example: Google's Privacy Checkup, a step-by-step experience that explains the relevant settings and gives the user an easy way to review and change them; activity controls in Google Account, which allow a user to control whether their Web & App Activity, Location History, and YouTube History is saved to their Google Account and, if so, the length of retention (3 months, 18 months, 36 months, or indefinitely); the ability to review and delete their saved activity by date and by Google product in the Google

Account dashboard; additional in-product controls allowing users to delete recent searches directly within the interface of Google Search and (on the Google Search App) to delete the last 15 minutes of their activity; and separate controls over whether they received personalized search results and/or personalized ads. Tr. 8995:17-8996:14, 9014:21-9015:3, 9016:20-9017:8, 9023:11-9024:3 (Fitzpatrick); DXD-31.012-.018, .022-.023.

2. Google's Decision Not to Introduce Additional Incognito Options is Consistent with Its Approach to Privacy

1113. Like any company developing products for users, Google must make choices and judgment calls about what product proposals create the best user experience for the majority of its users. Tr. 9060:22-9061:9 (Fitzpatrick) ("Q. Okay. So, in the 33 months since Ms. Twohill made this privacy suggestion, Google hasn't created prepackaged privacy setting bundles for users to choose from; is that correct? A. We have not. And, as I said before, we have lots and lots and lots of ideas that get brought to the table all the time, including from our senior-most executives who care lots about these issues. That does not mean that every idea that gets suggested is determined to be the right one to pursue or, you know, sort of the ones that make sense.").

1114. Not all technically feasible privacy proposals translate into an improved user experience. Tr. 7474:22-7475:5 (Raghavan) ("Q. But certainly as a technical matter, and as a matter of priority, if Google wanted to, it could put a little toggle on the Google.com search bar that let people click on Incognito mode if they wanted to? A. As a technical matter, yes. That doesn't make a good product design. Q. And you could launch a separate search site, like you've discussed in 2019 and beyond, for Incognito mode? A. Again, that may not be the product design, but yes."); Tr. 4288:15-19 (Juda) ("Q. Okay. Do you recall -- do you recall what your thoughts were at that time about the proposal and how it might impact the product? A. That the utility of the google.com result page would degrade, which would reduce the value to users.”).

1115. In evaluating product proposals, Google considers users’ needs and preferences for privacy alongside other factors, including whether the proposed change would otherwise improve or decrease the quality of the product experience for users. Tr. 7464:12-18 (Raghavan) (“Q. And before implementing a privacy change or a privacy enhancement, you would consider whether that change will result in more or less queries for Google, right? A. That’s not the primary thing I would look at. Did you literally mean more or less queries? Because the first thing I would look at is the impact on the user’s experience before I looked at that question.”), 7474:14-21 (“Q. And Google could offer an Incognito mode for Google Search if it wanted to, right? A. It’s not as simple as that. Part of our challenge is we already have two Incognito modes in our products, and we’ve had fairly vigorous debates about how not to add a third Incognito mode that means something else. So one of the things we are trying to do is figure out how to reconcile this variance.”); Tr. 9057:9-9058:7 (Fitzpatrick) (“We would never choose defaults or elements of product design based purely on what users tell us in survey research. There’s always multiple factors that leads to what will make a good product.”), 9074:10-9075:4 (“We have not determined that there are, you know, enough people that both would be interested in a capability like this at the price that it would likely take, you know, sort of to do it in an economically, you know, sort of feasible way, and to have a positive-enough product quality experience that it wouldn’t actually, you know, sort of hurt them in unintended ways.”); Tr. 4288:20-24 (Juda) (“Q. And, Dr. Juda, when you look at proposals like this, are there trade-offs that have to be made? A. Certainly. It’s very rare that you have a launch that strictly improves every single dimension that we may want to consider.”).

1116. Google also considers its competitors' privacy offerings as one of many data points in evaluating its approach to privacy. However, Google's ultimate goal is to design the best product for its users, not to match, by rote, the approach of any particular competitor, particularly those whose products work differently. Tr. 7410:3-9 (Raghavan) ("Q. How, if at all, do the privacy practices of competing companies impact Google's analysis of whether and how to implement changes to its own privacy protections? A. . . . [W]e have access to them, we look at them. But to me, that's not the princip[al] dimension to look at here. It's what our users want, and how we can keep our products relevant to our users and advertisers."); Tr. 8997:15-8998:10 (Fitzpatrick).

1117. In 2019, the Google Search team presented to the Consumer Council, a group of Google executives that provided teams guidance on issues that had implications across products, the question of whether Google should build different privacy features into Google Search in order to be more like the data-collection practices DuckDuckGo marketed itself as maintaining. Tr. 9031:7-9032:4 (Fitzpatrick); Tr. 7411:4-15 (Raghavan).

1118. The proposal specifically focused on five differences between Google's data-logging practices and DuckDuckGo's public representations of its data-logging practices: (1) logging of IP addresses; (2) logging of user agents; (3) saving cookie or user IDs; (4) saving clicks and queries to a user ID; and (5) targeting search ads based on search history. UPX0811 at -420.

1119. Comparing Google's and DuckDuckGo's approaches to data privacy is not an apples-to-apples comparison because DuckDuckGo does not serve its own search ads and search results, but instead serves search ads and search results it receives from Microsoft (with additional first-party specialized results in certain verticals). Tr. 2065:19-25 (Weinberg) ("Q.

Has DuckDuckGo ever studied the feasibility of using the data that it retains from its users to rank those organic search results, say, in order of relevance to present them to users? A. Probably not in the general sense you're talking about. In specific instances, yes, because we do some ranking of those organic links as well."), 2068:2-8 ("Q. On the sort of Microsoft ads side of the house, do you know which kinds of user and advertiser data Microsoft uses to sort of optimize its ads auction infrastructure? A. I mean, generally I know that they're looking at conversion data and things like that, but I don't know specifically exactly how their algorithm works or what they're using."), 2146:25-2147:25 ("Q. And in the U.S., all of the text ads that appear on. DuckDuckGo's search results page are delivered by Microsoft? A. Yes. Q. And DuckDuckGo doesn't re-rank the ads provided by Microsoft, right? A. That's correct. . . . Q. In the U.S., . . . organic weblinks displayed on DuckDuckGo's search results page are delivered by Microsoft, right? A. Yes.").

1120. For each of these five areas, Google relies on the data it logs to provide users with more relevant results and a better user experience:

a. Google logs IP addresses to improve results and detect fraud and abuse. Tr. 7413:10-24 (Raghavan); Tr. 8999:20-23 (Fitzpatrick), 9032:5-12.

b. The "user agent" is technical information about the state of a user's machine, such as the type of device, that Google uses to detect fraud and abuse and to determine what user interface is best to present to the user and otherwise optimize user experience. Tr. 4169:19-4170:2 (Juda); Tr. 7414:20-7415:11 (Raghavan); Tr. 9033:5-25 (Fitzpatrick).

c. Among the reasons Google logs Cookie IDs, which allows Google to identify a particular device, is to improve user experience by automatically authenticating users and lightly personalizing results where such personalization is helpful to the user. Tr. 7415:12-22 (Raghavan); Tr. 9025:22-9026:24 (Fitzpatrick).

d. For signed-out users, Google saves clicks and queries with a temporary, pseudonymous user ID because a user's initial search provides context that Google uses to autocomplete predictions for search queries and to provide search results for subsequent, related searches in short session. Signed-in users can control whether their activity or location history is stored in their Google account and whether Google may also use this information to deliver more relevant search results or search ads. Tr. 7417:16-25 (Raghavan), 7456:16-20; Tr. 9026:10-9027:4 (Fitzpatrick), 9034:24-9035:12.

e. By default, the information in a user's Google Account, including their search history, influences the ads rendered because the data allows Google to serve more personally relevant ads. However, users can easily customize and limit the information Google may use for personalized ads or turn off personalized ads altogether. Tr. 9069:18-23 (Fitzpatrick); Tr. 7416:12-22 (Raghavan).

1121. Ultimately, Google chose not to adopt the proposal and instead invested in developing additional privacy-improving features and controls, including those it subsequently released, like making it easier for users to enter Incognito mode, delete their search activity, and control their ads experience. Tr. 9037:13-9038:1 (Fitzpatrick); DXD-31.026.

1122. There is no evidence that Google would have implemented the June 2019 proposal or that privacy in search would be different in a but-for world without the allegedly anticompetitive search distribution agreements.

1123. Plaintiffs' experts have not offered an opinion comparing Google Search's privacy policies with Bing, Yahoo, or any other search engine's privacy policies. Tr. 752:19-22 (Rangel (DOJ Expert)) ("Q. You've not compared Google's search privacy policy against any other search engine's privacy policy, have you? A. I have not. My scope was limited to Google for the privacy questions."), 754:3-6 ("Q. You're not offering any opinion in this case comparing Google search's privacy policies with Bing or Yahoo's privacy policies? A. I am not.").

D. Google Lacks Monopoly Power Over Search Ads and Search Text Ads

1124. As Dr. Israel testified, a monopolist over advertising would have the power to profitably restrict output and thus benefit from "the creation of ad scarcity or search ad scarcity." Tr. 8387:22-8388:22 (Israel), 8765:21-8768:11.

1125. Plaintiffs have not identified any but-for world with respect to search advertising or estimated but-for output in any market, and therefore have not shown that Google profitably has reduced advertising output relative to what would have prevailed absent the challenged conduct. Tr. 6036:8-11 (Whinston) ("Q. You've not conducted any analysis in this case as to what level of search or search advertising output would have been achieved in any but-for world, correct? A. Correct."); Tr. 8554:15-19 (Israel) ("Q. Have plaintiffs presented any evidence that you've seen that output would have somehow been higher but for any conduct -- or alleged conduct on the part of Google? A. I haven't seen any discussion of a but for world or a comparison to a benchmark or anything that would show that.").

1. Google is Constrained by Other Digital Ad Platforms Within and Outside of Plaintiffs' Markets Because Advertisers Will Move Their

Advertising Budgets if Their Returns on Investments on Google Are Unsatisfactory

1126. If advertisers do not receive the value they are seeking from Google search ads, or they are otherwise unhappy with Google's offerings, they can and do decrease or discontinue their bids on Google search ads and spend their advertising dollars elsewhere instead. Tr. 1291:6-1292:12 (Dischler) ("Q. Okay. And again, if you're not giving advertisers the value they're seeking, based on your experience, what happens? A. They'll go someplace else, or they'll stop advertising. . . . And often, they're taking a look across multiple channels. So they will just spend someplace else, like Facebook or Amazon or others."); Tr. 4270:21-4271:18 (Juda) ("Q. And, Dr. Juda, if an advertiser is monitoring CPCs and is unhappy with what they're seeing, what options do they have, if any? A. There's probably three sort of buckets of response that they could use to get their costs down. The first is they can lower their bid . . . because the bid dictates the most that an ad can be charged" or they could "simply stop advertising on the objectionable advertisement. They could turn off the keyword, or they could simply stop advertising with [Google] wholesale if they wanted to see their costs go down. Q. And in your experience, if advertisers choose your third option, are there other platforms that they can go to to buy ads? A. I feel so."); [redacted] Tr. 4877:15-22 (Lim (JPMorgan Chase "JPMC")) (testifying that her "experience has been that JPMC observes a positive return on its investment from search ads," but "sometimes an economic factor, such as recent rate environment, for example, would change that and [JPMC] would change [its] paid search strategies accordingly."); Tr. 9197:22-9199:3 (Holden) ("Q. And based on your experience working with Google's travel advertisers, how do they typically look at their portfolio of advertising, including Google? A. They look collectively. . . . They look at what they can drive through search engine marketing, which is both the text ads, as well as through hotel ads. They look at that as a pool of funds. And they look collectively at the spend they make across all those things and determine whether they're getting a positive return on that investment. . . . [B]ut also they're looking across all properties as well. So they may be looking at their spend on metasearch providers, they may be looking at their spend on other sites across the web. . . .").

1127. Some of Plaintiffs' questioning and certain testimony at trial focused on the cost per click (or "CPC") for Google search advertising, the amount that an advertiser will be charged if a user clicks on an ad in response to a search query.

1128. CPCs, standing alone, do not take into account the likelihood that the ad will drive sales activities by a user, and thus do not reflect advertiser value. Tr. 1379:2-9 (Dischler) ("Q. Cost per click, CPC, standing alone, does that reflect advertiser value? A. It does not. Q. Why not? A. Because advertisers typically have a business objective like driving sales, and the cost per click is an input into a function that will allow them to achieve a business objective."); Tr. 5141:5-17 (Booth (Home Depot)) ("So we have thousands of different campaigns, some on Google, some on Bing, some elsewhere. Each one of those, we have a certain level of investment and we're also able to understand how much revenue each one of those generates. So we kind of stack rank them to understand, well, hey, this is producing the greatest outcomes in comparison to the pure set of other similar type products. So we would continue to lean our investment into what is producing the greatest return on advertising spend or ROAS, and that's a consistent practice that our teams are always doing."), 5180:17-5181:2 ("Q. Just to give an example, perhaps, you've observed instances over time where the cost per click of a campaign might be low and declining but it's not profitable from The Home Depot's perspective because it's not driving incremental sales, right? A. That's correct. Q. And conversely, there might be instances where cost per click is increasing over time but it is delivering positive return on ad spend because of the incremental sales resulting from the campaign; is that right? A. That's correct."); Tr. 3975:16-18 (Lowcock) ("Q. Would you agree with me, that CPC going up may or may not impact ROI? A. Correct."); Tr. 8572:4-8573:24 (Israel) ("If the price is just going up with quality, that generally would mean it's a better product, more demand, more advertisers are interested in the better product."); Tr. 6034:19-6035:6 (Whinston) (testifying that "if these [ads] deliver more clicks, we're going to spend more on them"); Tr. 8461:23-8464:12 (Israel) ("So cost per click doesn't quite get you all the way there, right? Cost per click tells you, how much am I paying per click? But, the other thing that matter here is . . . how much profit am I going to make per click? . . . [I]f you took the last step and you translated these costs per click and you accounted for the profits per click, you would get return on investment.").

1129. Advertisers testified at trial that in recent years, they have successfully maintained and improved the ROI they earn from Google search ads. *E.g.*, Tr. 4886:11-18 (Lim) ("Q. And in other words, you're looking backwards here as of October 2020 and seeing that the average amount that JPMC was paying to acquire customer accounts through Google Search ads was declining, right? A. Yes. I don't know what lines of businesses were rolled up into this map, but, yes, on the face of it, that's what it seems to be saying."); DX0663 at .002 (2020 email from T. Lim (JPMC) stating "Despite significantly reduced Paid Search investment ([redacted] YoY), resulting account production only decreased [redacted], netting more efficient Cost per Acquired accounts"); Tr. 5345:18-25 (Dijk (Booking)) ("Q. Page 40 [of DX3114], second paragraph down. It's on the screen. 'In recent years, we observed periods of stable or increasing ROIs.' Do you see that? A. Yes. Q. Okay. So that means either -- that means that the ROIs have either stayed level or your ROIs have gone up in recent years; correct? A. Yes."); DX3114 at .042 (stating in Booking.com's 2022 Form 10-K that "[i]n recent years, we observed periods of stable or increasing ROIs" across marketing campaigns).

1130. Advertisers choose to advertise on Google to the extent that they are satisfied with the ROI they get from Google search ads, as compared to the ROI they can achieve on numerous other alternative advertising platforms. [redacted] Tr. 4877:15-19 (Lim) ("Q. And then comparing the amount that JPMC spends on search ads with the value of the acquisitions generated, your experience has been that JPMC observes a positive return on its investment from search ads, right? A. Yes. And sometimes an economic factor, such as recent rate environment, for example, would change that and we would change our paid search strategies accordingly."); *see also* 4879:2-4880:15 (discussing language in DX0659 that "'[i]n total, barring unforeseen circumstances, [search] costs were forecasted to come down [in 2020], while clicks would rise, yielding a net increase in production and a decrease in CPA'"); DX0659.002; Tr. 4877:23-4878:2 (Lim) ("Q. And certain lines of business at JPMC are actually required to show that their investments in search ads are ROI positive in order to sustain their spend on search ads from one period to another, right? A. Yes."); Tr. 5179:1-6 (Booth) ("Q. And the Home Depot bids to place search ads on google.com because the company has found them to be a profitable investment that drives what you're looking to get out of advertising, which ultimately sales; is that correct? A. That's correct."); Tr. 1334:13-19 (Dischler) ("Q. And, again, what happens if Google fails to allow advertisers to meet their objectives, their financial objectives? A. If we're not able to make advertisers -- if we're -- if advertisers don't meet their financial objectives, then they stop spending on Google, and they often will spend on competitive platform[s].")

E. Google Has Not Raised the Quality Adjusted Pricing of Search Ads

1. Quality Adjusted Prices of Google's Search Ads are Decreasing

1131. As Professor Whinston emphasized when assessing the user-side, the price that matters for economic analysis is the quality-adjusted price. Tr. 10451:16-10453:10 (Whinston). When it came to the ads-side, Professor Whinston's adherence to that principle was less assiduous.

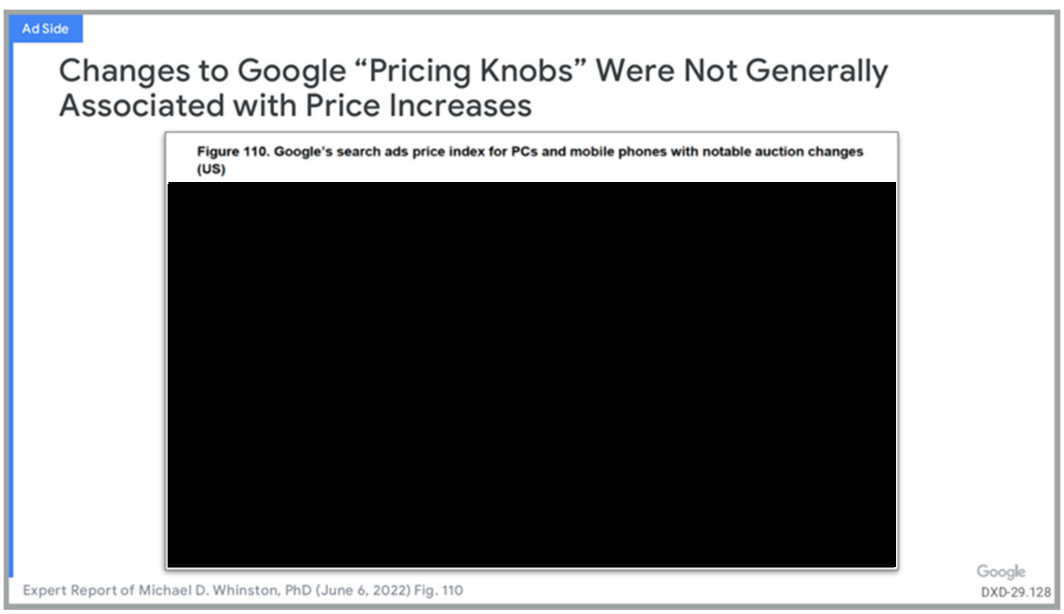
1132. The evidence at trial showed that the quality-adjusted prices of Google search ads have decreased during the period of alleged monopoly maintenance. Tr. 8584:18-8585:18 (Israel) ("So this metric they had, consistently over time the value is negative. Which means all in, accounting for advertiser value -- Professor Whinston says this in his report, too. If you account for advertiser value and what's happening to price, the quality adjusted price is going down. That's what they found in their last full report in 2018. I think there was another statement that it was still true in 2020. But it's all in when you account for the quality and what the price is, the quality adjusted price is lower."), 8572:8-8573:24 (explaining that where "quality is going up, nominal prices don't tell us much -- or anything").

1133. Because higher-quality ads are more likely to be clicked on by users, Dr. Israel measured the quality of Google search ads by looking at "the number of clicks relative to the number of queries that return any ads" (*i.e.*, "the click-through rate"). Tr. 8554:20-8555:12

(Israel) ("If ads are higher quality, if they're a better match, then more people are going to click on them.").

1134. Dr. Israel's measurements revealed that, from 2011 to 2021, the Google search ads click-through rate had grown from "just over 10 percent" to over 30%. Tr. 8555:13-20 (Israel); DXD-29.121 (graph showing ratio of ad clicks to queries returning ads on Google from 2011 to 2021); DX1108 (Google QueryNav data).

1135. Plaintiffs rely on a "search ads price index" as a measure of the price of Google's search ads in an effort to show that "pricing knobs" were a way for Google to increase CPCs. DXD-29.128 (showing Figure 110 from Expert Report of Michael D. Whinston). That reliance is misplaced because, as Dr. Israel testified, "if you look at some of the quote, unquote knobs that we've heard the most about, you'll see that after that knob was implemented, prices clearly go down." Tr. 8567:2-8569:2 (Israel); DXD-29.128 (showing Figure 110 from Expert Report of Michael D. Whinston); *see also* UPXD102 at -065 (Professor Whinston's demonstrative showing the search ads price index).



1136. Comparing the Google search ads click-through rate to the "search ads price index" cited by Professor Whinston, Dr. Israel observed that "the quality line, the ratio of ad clicks line, has started from lower, it's going up by more than the price index." Tr. 8569:3-25 (Israel) (testifying that "this chart looks at what's happening over time to the price index versus a measure of the quality of the auction, which is the click-through rate"), *id.* ("[B]y looking at it over time, you can see which of the lines are increasing more. And you'll see that the quality line, the ratio of ad clicks line, has started from lower, it's going up by more than the price index."); DXD-29.129 (graph comparing increases in the Google search ads price index to increases in ratio of ad clicks to queries returning ads from 2013 to 2021); UPXD102 at -065; DX1108 (Google QueryNav data); DX1141 (Google search ads price data).

1137. Dr. Israel concluded that this comparison showed that looking at this "very basic measure of quality," which includes the percentage of ads clicked on, quality is increasing faster than price. Tr. 8570:1-8 (Israel); DXD-29.129 (graph comparing increases in the Google search ads price index to increases in ratio of ad clicks to queries returning ads from 2013 to 2021); UPXD102 at -065; DX1108 (Google QueryNav data); DX1141 (Google search ads price data).

1138. Dr. Israel also looked at a metric called "excess CPC," which reflects Google's efforts "to measure . . . something like a quality adjusted price." Tr. 8584:18-8585:18 (Israel); *see also* Tr. 6155:25-6158:9 (Whinston) (testifying that excess CPC is a measure designed by Google to capture "how much better off were advertisers").

1139. Excess CPC is consistently negative over time, so "[i]f you account for advertiser value and what's happening to price, the quality adjusted price is going down." Tr. 8584:18-8585:18 (Israel) ("So this metric they had, consistently over time the value is negative. Which means all in, accounting for advertiser value -- Professor Whinston says this in his report, too. If you account for advertiser value and what's happening to price, the quality adjusted price is going down. That's what they found in their last full report in 2018. I think there was another statement that it was still true in 2020. But it's all in when you account for the quality and what the price is, the quality adjusted price is lower."); DXD-29.137 (containing language in a Google document, UPX1054, which shows overall negative excess CPC for desktop and mobile); UPX1054 at -056.

1140. Dr. Juda, Google's Vice President working on Ads Quality for search ads, testified that the search ads price index used by Professor Whinston to show supposed changes in CPCs over time was not used by Google "in any sort of meaningful way" and that it had been years since he saw it used at Google. Tr. 4274:21-4275:6 (Juda).

1141. Indeed, the search ads price index relied upon by Professor Whinston is not even a probative measure of *nominal* price changes because it does not track what any advertiser would actually pay or account for bidding strategies that advertisers actually employ to optimize their CPCs. Tr. 8567:18-8569:2 (Israel) ("[B]ased on the Google documents themselves, including the document that this index has been in, I wouldn't put a lot of emphasis on this index. Because Google itself says this is basically a sort of tracking index on a set of queries. They don't intend for it to represent what an -- any advertiser would actually pay."), 8570:9-19 ("I would stress, again, it's really sort of a narrow price index. It's not even really a measure of the prices that any advertisers pay. But it's -- as it stands, it definitely does not control for quality.").

1142. An increase in nominal prices is consistent with increased quality and demand from advertisers, who have benefitted from improvements to the quality of the search ads auction that Google has continuously implemented, including improvements that make it easier for businesses of all sizes to participate in the auction and optimize their campaigns to achieve their sales objectives. *See supra* § III.E; Tr. 8572:8-8573:24 (Israel) ("[I]f you make the auction work better for people to bid on, you're going to get more advertisers attracted to that auction . . . . And that's going to put upward pressure on prices, because more people are interested in a better auction. That's a quality effect. . . . If the price is just going up with quality, that generally would mean it's a better product, more demand, more advertisers are interested in the better product."); Tr. 5182:14-21 (Booth) (agreeing that "the general industry perspective would be" to "expect a year-over-year increase in cost per click as more advertisers are embracing paid search marketing and are becoming more savvy in their efforts"); [redacted]

1143. As Professor Whinston conceded, the search ads price index does not measure or capture ROI, "doesn't measure or otherwise reflect changes in time in search ads quality," and "doesn't account for improvements in Google searches' advertising technology over time." Tr. 6023:3-18 (Whinston) ("Q. And this chart does not measure or capture return on investment for these ads, correct? A. It's a price index."), 6025:1-4 (conceding that he "didn't do any analysis in this case that tried to capture or estimate the increase in advertiser ROI for Google search ads"), 6022:15-21 ("Q. Okay. The price index, whatever it captures, would you agree with me that it doesn't measure or otherwise reflect changes in time in search ads quality, right? A. Correct, it's a price index. Q. And it doesn't account for improvements in Google searches' advertising technology over time, correct? A. Correct."); *see* Tr. 8569:3-8572:2 (Israel) ("The point is that nothing about this price index is in any way controlling for quality. So we're not looking at a quality adjusted price at all. We're not asking has the auction gotten better, have characteristics of the auction become more attractive to bidders. We are just asking is this price index -- which, again, is not really tied to advertisers, but is this price index going up.").

2. Google Does Not Set or Control CPCs

a. CPCs Are Set in Google's Second Price Ad Auction

1144. CPCs for Google search ads are determined via an auction. Contrary to Plaintiffs' theory at trial, while Google can impact ads pricing, it does not control it. Tr. 4102:4-17 (Juda) (Google's auction parameters can "have an outcome of changing prices," but they do not directly control price), 4200:10-16 (when asked whether "ads quality team control[s] prices at Google," Dr. Juda testified "I don't believe so"), 4198:23-4200:9 (explaining how "users, advertisers, and Google all have roles to play in terms of what the auction determines as a final outcome"); Tr. 8559:18-8562:18 (Israel) (discussing "Google's limited pricing power" and testifying that "Google's prices are ultimately set by an auction" and that "certainly means that Google has less ability to set its prices than most firms").

1145. Google does not use "pricing knobs" to raise CPCs unilaterally. Tr. 4274:17-20 (Juda) ("Q. In your experience with the ads quality team, are there, and I'm going to put in quotes, pricing knobs that allow your ads quality team to raise price unilaterally? A. I don't believe so.").

1146. Advertisers decide what to bid in Google's ad auctions and can lower their bids to lower their CPCs. Tr. 5363:18-21 (Dijk) ("Q. . . . It is Booking that decides what to bid in Google's ad auctions; correct? A. Yes."); Tr. 3977:2-7 (Lowcock) ("Q. At the end of the day, sir, whether CPC prices are going up in a particular period of time or not, it is up to the individual advertiser to determine what they're willing to bid in the ad auction, correct? A. It's up to the advertiser to determine what they're prepared to pay, yes."); Tr. 7385:6-11 (Raghavan) ("Q. . . .

At the end of the day, notwithstanding any aggregate increase in CPC or decrease in CPC, who decides how much to spend on an ad? A. The advertiser."); Tr. 4270:21-4271:14 (Juda) (advertisers can lower their CPCs by "lower[ing] their bid . . . because the bid dictates the most that an ad can be charged" and by "improv[ing] their quality" because "if an advertiser improves their quality, all else equal, that will likely do good things to their CPCs").

1147. An advertiser's "actual cost per click will always be less than or equal to the bid." Tr. 4203:3-8 (Juda) ("Q. Now, just staying on max CPCs with text advertising in the auction, if an advertiser decides to set a max CPC in a text ad auction, is the cost that they would pay, will it ever exceed that max CPC? A. No. By construction, the actual cost per click will always be less than or equal to the bid.").

1148. Advertisers can provide Google with a maximum cost-per-click bid on an optional basis, which creates the upper bound of what they can be charged in an auction. Tr. 4198:23-4200:9 (Juda) (explaining that advertisers are "providing us things like ad copy, and they're providing us with landing pages so that the quality signals are a function of what they're providing us as inputs," and "[a]dvertisers also give us a maximum cost-per-click bid on an optional basis, which is going to create the upper bounds at how much they can possibly be charged").

1149. Google's search ad auction is "a variant of a generalized second-price auction." Tr. 1199:25-1200:3 (Dischler) ("Q. Google's ad auction or search ad auction is known as a generalized second-price auction; is that correct? A. It's a variant of a generalized second-price auction. It's been customized in ways that you likely know.").

1150. Unlike a first price auction, in which "an auction winner will be charged exactly what they had submitted as their bid," in a second-price auction, an advertiser will pay the minimum price needed to beat the runner-up bidder. Tr. 4260:24-4261:6 (Juda); *see also* UPX0008 at -056 (explaining that in a second-price auction, the "[w]inner pays minimum price needed to beat runner up").

1151. In a second-price auction, an advertiser may pay less than their maximum CPC because "it oftentimes can be the case that the advertiser could have submitted a lower bid than they did and still win whatever their allocation had been. So they would be charged less than their bid." Tr. 4261:7-23 (Juda).

1152. Because Google uses a second-price auction, advertisers are "going to have surplus leftover or value leftover because they pay . . . based on the second price." Tr. 8575:25-8577:22 (Israel) ("[T]he winner by competition is going to be the guy with the highest value. And that person is still, by the nature of a second-price auction, not going to pay more than it's worth to them. They're going to have surplus leftover or value leftover because they pay something based on the second price. So I don't see as monopoly power.").

1153. Because Google's second-price auction leaves surplus for advertisers, any price discrimination by Google, as Professor Whinston conceded, is "not necessarily perfect[], of course." Tr. 10453:11-10455:21 (Whinston).

1154. Accordingly, as Dr. Israel testified, price discrimination is merely "evidence of some market power," "not monopoly power." Tr. 8558:8-8559:17 (Israel) ("As I understand the argument, it's that Google has certain -- the argument is that Google has certain levers it can pull or knobs it can turn, it's been said, to change the price of auctions. The argument would be that ability to -- under the argument, to control prices implies monopoly power. The first comment I would make on that is even if it was all true, that, to me, is not monopoly power. At most, an ability to control prices is evidence of some market power. It doesn't tell you they restricted output, so it goes back to market power versus monopoly power.”); *see* 8559:18-8562:18 (“Most firms, even those that clearly don’t have monopoly power, if they want to change their prices, they change their prices. . . . So you’ll see local restaurants increase the prices on a bottle of wine fairly substantially, they have some market power over the ability to do that. They don’t have to run an auction, they just change the price. So if the question is control over prices, all of this discussion about knobs . . . is actually Google struggling with how it can influence its prices, right. Whether it’s a monopoly or not, optimal prices change over time as quality changes, as demand changes.”).

b. The Outcome of Google’s Search Ad Auction is Determined by a Long Term Value Function That Accounts for User Experience and Advertiser Value

1155. Google is focused on ads quality as a means to drive long-term revenue, including by showing fewer ads than it could on the SERP. Tr. 1294:12-1295:4 (Dischler) (“Q. Now, one additional thing related to this on user quality. If you showed more ads in response to a query, wouldn’t that generate more revenue for Google? A. It would. Q. Okay. Why don’t you do that? A. Because it may not generate -- first of all, it may or may not generate more long-term revenue for Google, because we’re so focused on quality.”); Tr. 7348:15-7349:6 (Raghavan) (“We always want the long-term user experience to survive, because we think that’s the best thing for our business as well.”).

1156. Google also prioritizes the user experience by measuring “ad blindness,” which is “this phenomenon where if [Google] were to start showing users lower-quality ads relative to normal, [Google has] been able to empirically observe that not only will [users] click less on those low-quality ads, but they’ll actually learn to issue fewer searches in the future, as well as learn to click on ads less in the future. And so that learning phenomena that [Google] observe[s] users do is referred to as blindness." Tr. 4039:20-4040:6 (Juda) (explaining the beta variable in the LTV function).

1157. In keeping with its goal of prioritizing the long-term user experience, Google's ad auction considers the long-term value of serving ads. Tr. 7355:25-7356:6 (Raghavan) ("Q. And is that all part of the ads auction process, these factors you just described? A. The way you should think about it is the long-term value function is a large component and the objective function that the auction considers, so that it weights both the user experience and the revenue in concluding which ads to serve up.").

1158. Google does so by calculating an long term value ("LTV") score for every ad that enters Google's ad auction. Tr. 4028:2-5 (Juda) ("Q. . . . Would you agree that Google calculates an LTV score for every ad that enters an ad auction? A. Yes."); DX0153 at .004 ("Each candidate gets a score, called Long Term Value or LTV") (emphasis omitted).

1159. The LTV score determines CPC and ad placement on the SERP, and generally, the ad with the highest LTV score gets top placement on the SERP in response to a search query. Tr. 4027:16-19 (Juda) ("Q. Let's take a step back. What is a LTV? A. So, usually, internally, references to LTV refer to the score that we provide to an ad when evaluating it for ranking decisions."), 4028:10-4029:2 (Google "process[es] those LTV scores to determine who is going to show where, as well as what the cost per click will be."), 4032:12-14 ("Q. And the ad with the highest LTV score generally gets top placement on the SERP in response to a search query, correct? A. Generally, yes.").

1160. The LTV score is a function not only of the advertiser's bid, but also the quality of the ad itself, and the quality of the landing page. Tr. 4030:19-4031:16 (Juda) (agreeing that "at its most basic level, the LTV score of each ad is a function of the various components listed on UPX10"); UPX0010 at -054 (stating that "[a]t its most basic level, the LTV Score of each ad is a function of the advertiser's bid, the quality of the ad itself (*i.e.*, the ad copy or ad 'creative'), and the quality of the 'landing page' (*i.e.*, the page on the advertiser's website where the user 'lands' after clicking on the ad)").

1161. In this way, considering both bid and quality, the use of an LTV score reflects Google's focus on longer-term gains for users, advertisers, and Google. Tr. 4115:1-4116:7 (Juda) (testifying that "one might think that the value of an ad to Google could be limited by, like, the amount of revenue it might generate right there in that moment" but Google tries to take "a more holistic assessment of the contribution of that ad"); Tr. 7356:7-18 (Raghavan) ("Q. What was innovative about the LTV function that got introduced that still is there? A. I would say a couple of things. To my knowledge, it was the first formal quantification of user impact. . . .").

1162. If advertisers improve their ad quality, they potentially can submit even lower bids and still have a higher LTV score. Tr. 4240:2-20 (Juda) ("[S]ince the ad score is a combination of bid and quality, if you improve your quality, then potentially you could have submitted an even lower bid . . . and still have had a higher score."); DX3050 at .001; Tr. 4243:3-23 (Juda) (explaining that if an advertiser wants to improve quality, "one option available to them is to provide better written word regarding what the ad copy should look like," and "if one constructs a website that is more relevant to a user's search, that's easier to navigate, easier to conduct business on, these are all things that would likely make the landing page more convenient to a user and so ideally be reflected in improvements in [Google's] predictions of landing page quality"); DX0153 at .007 (including as one of "'nice' properties of the auction" that advertisers "[p]ay less if your ad is of high quality" which creates an "[i]ncentive to produce high quality ads").

1163. A simplified expression of the formula that Google uses to calculate LTV is LTV = bid * pCTR – β. Tr. 4037:4-9 (Juda), in which:

a. The "bid" variable is the advertiser's bid, which an advertiser may manually specify or make via automated bidding in which they specify a business objective and Google's system will construct a maximum cost-per-click bid on their behalf. Tr. 4037:10-4038:3 (Juda).

b. The "pCTR" variable is the predicted click-through rate, a measure of quality that estimates the likelihood a user will click on the ad in question. Tr. 4038:10-13 (Juda), 4248:12-4249:4 (describing predicted click-through rate as "how likely is a user to click on [an advertiser's] ad in response to the search").

c. The β or "beta" variable captures the quality of the ad (the lower the quality, the greater the beta). Tr. 4040:14-24 (Juda) ("if we think that an ad is very lacking in quality, then the beta term will be very high, which then means that when you're subtracting this very high value, the LTV score would be very low. Alternatively, if we think that an ad is of very high quality, this beta term would be very small, and so then the overall LTV would be relatively higher, all else equal.").

c. Ads Quality Launches Cited by Plaintiffs Improved the Auction and Did Not Uniformly Result in Higher CPCs

1164. "The objective of the search ads quality team is to show delightful ads to [Google's] users that satisfy their user needs. If [Google is] able to do that, then the users will come back. Then [Google] want[s] to offer a good value to [its] advertisers. And then if these two things happen in the long term, then that leads to long-term revenue for Google." Tr. 1287:20-1288:8 (Dischler).

1165. Google launches hundreds of ads quality changes a year. Tr. 7382:9-14 (Raghavan) ("Q. You just referred to various ad launches. Does Google make many ads launches in the course of a year, quality ads launches? A. When you say quality ads launches, all of the things that were in that picture that we saw. I would say big and small, of the order of hundreds of launches a year.").

1166. Any particular ad launch is likely to have a different impact on each specific advertiser. Tr. 7384:23-7385:1 (Raghavan) ("Q. And any particular launch could have a different -- theoretically could have a different impact on all 3,000,000 [advertisers]; isn't that right? A. Oh, quite likely will."); Tr. 8559:18-8562:18 (Israel).

1167. Dr. Israel explained that when Google innovates and improves ad quality for advertisers and users by improving the click-through rates, the CPC paid by the winner of the auction tends to decline. Tr. 8559:18-8562:18 (Israel) ("The issue with the Google auctions or the way they work . . . [is] the winner pays a price based on number two. But it's not exactly number two's bid, it's basically adjusted by the relative predicted click-through rates, right. . . . If number one's . . . predicted click-through rate gets better, number one basically gets a discount. It doesn't have to pay as big a price to match number two because its click-through rate is doing the work. So what you see in a lot of these documents is this group called AQ, this auction quality group, is trying to do things to make those click-through rates better. A better auction has better click-through rates. . . . That's good for everybody. But if you do that and nothing else changes, that means number one gets a discount, because that click-through rate got better.").

1168. The ads quality launches that Plaintiffs attempt to characterize as price increases are in fact Google's competitive response to the decrease in CPCs resulting from its investment and innovative quality improvements. Tr. 8559:18-8562:18 (Israel) ("[U]nlike most other firms I've seen, if Google tries to make its auctions better by having a better click-through rate, that's going to cause its price to go down, because that click-through rate is going to create this discount effect. Lots of what's being described in these documents is not how do we raise prices, it's how do we create auction quality while dealing with this other issue; that if we don't do something, auction quality will actually drive our prices down."), 8564:4-8566:19 ("Prices are going down in response to that quality improvement. So lots of discussions you see in Google documents are just grappling with that: We want to improve our quality, but as a profit maximizing firm, we don't want that to drive our prices down."); Tr. 4266:4-20 (Juda) ("So the net effect was, we had a launch. Advertisers generated more value; Google generated seemingly no additional revenue. And this to us seemed a bit disproportionate, because we are paying engineers to work on these launches, we are having to pay for a bunch of machines to make these launches available. So we did incur an expense to provide this innovation.").

1169. Moreover, launches designed to help Google share in the value created by prior launches (*i.e.*, negative excess CPC, discussed *supra*) did not consistently or universally increase CPCs. Tr. 4103:18-23 (Juda) (testifying that after Google launched squashing, "40 percent of the CPCs went down rather than up"); *see also* UPX1054 at -056 ("AQ [the ads quality team] is creating value (negative excess CPC) faster than we can price it").

1170. Dr. Israel concluded that Google search ad prices went down after the implementation of a number of the launches cited by Plaintiffs (such as rGSP, Butternut Squash, and semantic exact), and across all of the launches identified by Plaintiffs "there's no consistent pattern of the prices going up after the knobs that we've been talking about." Tr. 8567:18-8569:2 (Israel) (testifying that "[p]rice goes down for several months after RGSP. You see the same thing for semantic exact which has been referred to. You see the same thing for butternut squash which has been referred to. So you see that -- the sort of the knob's connection to these prices is uncertain at best. If you go through them all and look in the few months before and after each knob, there's no consistent pattern of the prices going up after the knobs that we've been talking about."); DXD-29.128 (showing Figure 110 from Expert Report of Michael D. Whinston); Tr. 1388:7-13 (Dischler) ("Q. . . . These ads quality launches, can they [] cause the CPC to go up? A. Yes. Q. Can they cause the CPC to go down? A. Yes."); Tr. 7384:23-7385:1 (Raghavan) ("Q. And any particular launch could have a different -- theoretically could have a different impact on all 3,000,000 [advertisers]; isn't that right? A. Oh, quite likely will.").

1171. Dr. Juda testified that during his time at Google, some of Google's ad launches created "negative revenue ramifications," some "created neutral revenue ramifications," and some "created positive revenue ramifications." Tr. 4299:9-19 (Juda).

1172. Launches that have positive revenue ramifications for Google generally have followed or been connected to launches that improved advertiser value but which had negative revenue ramifications for Google. Tr. 8559:18-8562:18 (Israel), 8578:1-8582:7 ("Google is a profit maximizing firm. You want it to have incentives to make its pCTR better. You need some mechanism to deal with this issue, which is the general one I talked about with the knobs. Which is if pCTR gets better, you can end up driving the price way down. . . . [T]he callout here exactly describes what I was saying. The auction quality guys are saying we have this learn UI, which is a better mousetrap. It increased the accuracy of our predictions and added clicks, but it lost CPC and was revenue negative. . . . And so the highlighted sentence says: 'Ads quality wants to continue launching such advertiser value creating launches, but needs a mechanism to help Google share in the value that our launches create.'"); Tr. 4265:17-4266:3 (Juda) ("I think sometimes we have launches where advertiser value is created and we just sort of say good job to ourselves and call it a day. I think there's been other launches where we created advertiser value where we felt that the value creation was disproportionately skewed in one direction. And when those things happen, we do sometimes think about subsequent launches that maybe try to split the value a little bit more proportionately between advertisers and Google."); Tr. 1390:2-5 (Dischler) ("Q. And when you increase value to advertisers, do you perceive anything wrong with Google sharing in some of that benefit? A. No.").

1) Format pricing

1173. Dr. Juda testified that format pricing was an example of one such "follow-on" launch where Google tried to share value created for advertisers. Tr. 4265:17-4266:20 (Juda).

1174. Ad formats or extensions are "optional pieces of information that may be annotated onto ads" that take up more space on the search results page. Tr. 4254:3-5 (Juda) ("Q. Okay. What does 'ad format' mean? A. So for me, I usually think of an ad format as being optional pieces of information that may be annotated onto ads."); Tr. 1347:18-1348:2 (Dischler) ("Q. You used the term a moment ago "extensions." What's that? A. Extensions are augmentations to the basic text ad which provide structured information to the user.").

1175. When Google first introduced ad formats, advertisers were receiving more traffic, but paying the same amount. Tr. 4266:4-20 (Juda) ("When we first introduced ad formats, the net effect was one where advertisers received more traffic but roughly speaking were spending the same amount of money as they always were due to some artifacts of how it flowed into predicted click-through rate, which is a nuance that potentially I don't need to go into. So the net effect was, we had a launch. Advertisers generated more value; Google generated seemingly no additional revenue. And this to us seemed a bit disproportionate, because we are paying engineers to work on these launches, we are having to pay for a bunch of machines to make these launches available. So we did incur an expense to provide this innovation, and yet, we received to a first order no compensation for said expense."); UPX0465 at -454 ("When ad formats were first introduced, they had zero influence on the ranking and pricing of ads. This resulted in inefficiencies in ranking (ads more likely to be clicked could appear low on the page) and pricing (advertisers were getting increases in surplus without paying much for the benefit).")

1176. Mr. Dischler analogized format pricing to taking into account whether a newspaper ad was for a quarter page or a half page. Tr. 1219:18-23 (Dischler), 1379:19-1380:16 ("Well, ultimately, what we want to do is offer an attractive advertiser value. . . . Like the thing we were talking about with format pricing, I'll go back to the analogy that I used yesterday. [Google] had a system where you could buy an ad in the newspaper and you pay more for page 1 than the last page, but you don't pay more for a full page ad than you do for a quarter page ad. And that's kind of a crazy system. . . . So we had to increase CPCs to align the incentives so that they would pay the same amount for the additional clicks, for the additional space, as they would for the position.").

1177. Format pricing ads launches attempted "to equalize the value between the text ad position and the space it takes up on the search engine results page," and the effect of format pricing was to, "[i]n some cases, increase the cost per click; in some cases, decrease the cost per click." Tr. 1219:18-1220:9 (Dischler).

1178. Microsoft also charges more for format ads than it does regular search text ads. Tr. 6035:19-23 (Whinston) ("Q. And you're aware, based on the record in this case, that

Microsoft charges more for format ads than it does regular search text ads, correct? A. I mean, I haven't seen that, but I'm sure that's the case.").

2) Squashing

1179. Squashing is designed "to try to prevent runaway winners and to create a chance for smaller advertisers to participate in the auction." Tr. 1221:20-24 (Dischler); *see also* 1386:10-1387:3 ("The primary reason that we implemented squashing was to prevent certain winner-takes-all dynamics in the auction. What we were finding is that there were a few large advertisers that were kind of winning every auction in a particular category, and we weren't sure actually whether that was a good user experience. It was becoming much harder for the runner-up to break through and show up in the top position. And so because of that concern, we implemented squashing to compress the range of outcomes."); Tr. 4281:17-4283:2 (Juda) ("[T]he real shortcoming with predicted click-through rate, is that we're not necessarily getting feedback from users around the quality of each and every ad that they're seeing. We're just seeing the ads on which users click. And so it gives us a first-order preference, but it doesn't really tell us much from a quality perspective. So if one reads too much into it, you could start to think that there's massive disparities in quality when, in fact, there are none.").

1180. Squashing therefore compresses the difference between the highest bidder and the next highest bidder in Google's search ads auction. Tr. 1221:25-1222:2 (Dischler).

1181. Squashing is also a mechanism to help Google share in the value that its quality improvements created. Tr. 8581:10-8582:7 (Israel) (discussing language in a Google document that "'[a]ds [q]uality wants to continue launching such advertiser value creating launches, but needs a mechanism to help Google share in the value that our launches create'" and testifying that "squashing was the way to do that"); DXD-29.134 (highlighting discussion in a Google document, UPX0442); UPX0442 at -868; Tr. 4280:8-21 (Juda) (testifying that squashing addressed "some predicted click-through rate launches that were happening back in the day" that had "exacerbate[ed] some of the negative deficiencies of trying to use predicted click-through rate as a quality signal," and addressed "shortcomings [that] can result in entrenching specific advertisers at the expense of other advertisers").

1182. Because Google shared the surplus from the innovation with its advertising customers, squashing is not evidence of a quality-adjusted price increase, as a higher price with higher quality is not, without more, evidence of an exercise of market power. Tr. 8389:19-8390:16 (Israel) ("One reason that I and economists focus so much on output is it can be a useful summary statistic for what's happened to quality-adjusted prices. If prices go up, the quality goes up more, and you'll see output go up because it's beneficial."), 8578:3-8581:9 ("Google is a profit maximizing firm. You want it to have incentives to make its pCTR better. You need some mechanism to deal with this issue, which is the general one I talked about with the knobs. Which is if pCTR gets better, you can end up driving the price way down. They're not raising the price from the [winning CPC described in the example at DXD-29.133], they're implementing the better pCTR, but at least offsetting this effect.").

1183. Both Google and Microsoft have implemented squashing in their respective text ad auctions. Tr. 6028:10-6029:8 (Whinston) ("Q. You've seen evidence in this case, testimony in this case, from people from Microsoft where they acknowledge that they use pricing mechanisms and pricing knobs to increase prices in Microsoft's auctions, correct? A. That is my understanding, yes. . . . Q. Have you tried to measure the extent to which pricing knobs are used more or less on Microsoft versus Google Ads? A. I have not. I do not have a measure of that."), 6030:13-16 ("Q. Have you done any analysis in this case regarding whether Microsoft or Yahoo! have implemented squashing in their search ads auctions? A. I've seen documents that indicate that they have."); [redacted]

1184. Academic literature refers to squashing as "raising the predicted click-through rate [or "pCTR"] to an exponential factor." Tr. 4279:11-4280:6 (Juda) ("Q. Dr. Juda, let me just ask you about another term that has come up in the case, squashing. What's your understanding of what squashing is? A. So there's a couple of different ways in which one can explain squashing. As we were talking about earlier, within the academic literature, usually squashing refers to raising the predicted click-through rate to an exponential factor. . . . Q. Dr. Juda, if you know, did the term 'squashing' originate within Google or somewhere else? A. I believe it originated -- my exposure to it was within the academic literature before it made its way to Google.").

1185. Google implemented squashing to address limitations in pCTR that "entrench[ed] some advertisers at the expense of others," and Google has tried to improve the accuracy of pCTR through launches "ranging from encouraging [Google's] models to think about new potential patterns . . . to wholesale re-architecting of [Google's] predicted click-through rate systems to try and use the latest and greatest machine learning methods." Tr. 4280:8-4281:16 (Juda) ("Q. And, Dr. Juda, why does Google use squashing, if you know? A. So there was a combination of factors that led to its introduction within Google. Maybe starting with a high-level description, there are some shortcomings with using predicted click-through rate as a signal for quality. Some of those shortcomings can result in entrenching specific advertisers at the expense of other advertisers, which in general is not something that we necessarily want to see. And in tandem with that phenomena, there were some predicted click-through rate launches that were happening back in the day that were exacerbating some of the negative deficiencies of trying to use predicted click-through rate as a quality signal.”).

1186. As Dr. Israel explained, when Google improves its pCTR prediction model, Google “can predict click-through rates more accurately,” “create better matches,” and “put the right ad on the page,” but can also “drive the price way down potentially.” Tr. 8578:3-8581:9 (Israel) (“[S]quashing is really directly going after the point that I raised to you, which is if they improve the quality, if they improve the pCTR, they’ll drive their price down. . . . So what squashing did -- and there’s academic literature on how this can be efficient, it basically squashes the lower predicted click-through rates up towards the higher one a bit, right. . . . But the reason to do that is because now when the auction quality guys come to the businesspeople and say: I can make the auction better, they don’t also have to say: But if we do it, our price is actually going to go way down. That means they can improve the quality without squashing their own revenue.”); DXD-29.133 (providing a hypothetical example of squashing decreasing CPCs through improvements to pCTR).

1187. After Google implemented squashing, CPCs went up 60% of the time and down 40% of the time. Tr. 8582:8-18 (Israel) (testifying that “prices went up 60 percent of the time and down 40 percent of the time” and “it wasn’t like it was a hundred percent price increase, it depended on what the advertisers did”); Tr. 4103:18-23 (Juda) (“Q. Do you agree that Google can directly impact pricing through squashing? A. No. As evidenced by the fact that I believe when we launched that, 40 percent of the CPCs went down rather than up.”); UPX0442 at -868 (stating that butternut squash “serves to tighten second pricing pressure in the auction for about 60% of impressions, however, it also reduces CPC for more than 40% of impressions”).

3) rGSP

1188. Randomized generalized second-price auction ("rGSP") was another auction-related ads launch discussed at trial. Tr. 1222:18-22 (Dischler); Tr. 4175:13-16 (Juda).

1189. At a high level, "'rGSP introduces a probability of swapping between two ads when the LTV scores are close.'" Tr. 4176:21-24 (Juda); UPX1045 at -063, -393.

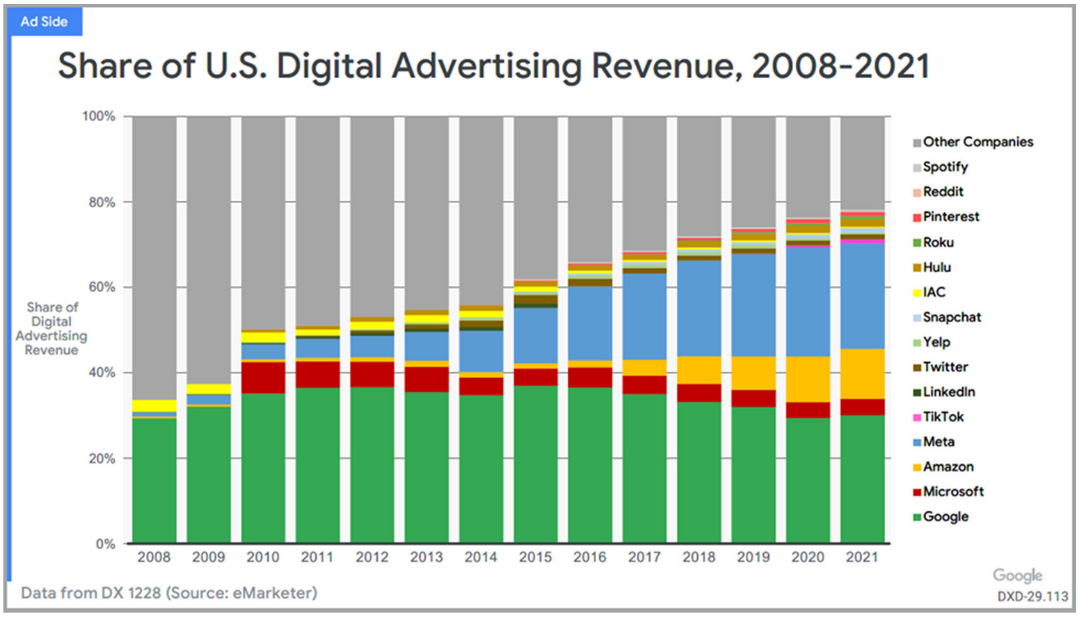
1190. rGSP helped Google "gather more information to potentially have a better prediction both about the first participant in the auction and the second participant in the auction," which facilitates the identification of "new companies . . . when they can offer a good experience to the user" and avoid "a winner-take-all dynamic." Tr. 1387:4-1388:6 (Dischler); *see also* DXD-11.013; Tr. 4275:7-4276:13 (Juda) ("If you look at these LTV scores, the differen[ce] is 0.1. So that would be one-half of a 1 percent difference in LTV score. But because Billie's ad is one-half of 1 percent higher, Billie would be consistently appearing in the first position rather than the second and so likely would be receiving perhaps 20 to 30 percent more clicks . . . even though their difference in LTV scores is only one-half of 1 percent."); Tr. 8582:19-8583:17 (Israel) ("We're trying to figure out who's got the higher value, but that's based on predictive click-through rates. . . . If you don't have any randomization . . . the guy with the higher value wins -- even though it's barely higher, he wins always, he's guaranteed to win. Google's fear has been that that creates a winner-take-all phenomenon; that you never get a chance to see how well that lower option would have performed."); DXD-29.135; UPX1045 at -063-064 (stating that rGSP "[a]voids winner takes all problem," "helps with discovering the right performance," and "creates more 'natural experiments' of showing ads in their not-usual positions" which "is generally beneficial for pCTR since it helps separate intrinsic quality/clickability from the effect of position on the page"); DX0153 at .010 (stating that the "[c]ore idea" of rGSP is "When bids (or LTV to be accurate) are close to each other, why should winner take all?").

1191. rGSP's impact on CPCs and Google's revenue "depend[s] on the particulars," such as "click-through rate differences" and "what users do," so "[t]here would be movements both upwards and downwards." Tr. 4277:12-4278:6 (Juda) ("THE COURT: Okay. And in that situation, Google would receive less revenue than the other way around? THE WITNESS: So it's all going to depend on the particulars. Like on this particular occasion, you will notice that Mona had a lower bid than Billie. So that might imply that the actual CPC for Mona could be lower than what Billie's CPC was. So the clicks may be lower. How much revenue is generated in the immediate term would be a function of the relative click-through rates. . . . THE COURT: So it's not necessarily that Google would receive lower revenue; it just depends on, particularly over the long term, what users do? THE WITNESS: That's right. There would be movements both upwards and downwards, and things would net out in a particular spot and practice."); *see also* Tr. 8567:18-8569:2 (Israel) (testifying that "[p]rice goes down for several months after RGSP" is introduced).

3. Trends in Digital Advertising Spending

1192. Although overall U.S. digital advertising spend has increased significantly, Google's share of digital advertising revenue has declined from 36.6% in 2011 to 30.1% in 2021. *See* DX1228 (eMarketer U.S. digital ad spend data); *supra* §§ IX.B.1, X.D; Tr. 8549:9-8550:17 (Israel) ("[O]ver the last several years, Google's share is declining as a percentage of all digital advertising revenue. So it's declined since 2015 or so."); DX3243 (Share of U.S. Digital Advertising Revenue, 2008-2021); *see also* Tr. 1394:2-12 (Dischler) ("Q. If we think of the pie as the digital advertising pie, how would you evaluate who the competitors are for relative size of the slice one gets? A. Well, so, I mean there are more competitors now than ever so people are

-- there are new entrants coming into the market. I gave you three examples over the past five years, of Amazon, Apple, and ByteDance or TikTok. I mean what we do is we take a look at the total market and we take a look at Google's share. And if you look at the total market and Google's share, Google's share has been steadily going down over the past five or seven years or so."); [redacted] Tr. 7400:2-13 (Raghavan) ("Q. So Dr. Raghavan, if we look at this chart, we see that over the past seven or so years, Google's market share has slowly declined. Do you see that? A. I do. Q. And to what do you attribute that? A. So let me just point out something to the Court before there's any confusion, because this is also a period during which the pie of digital advertising has grown significantly. So that the shrinkage of Google's share is not at odds with any financial performance of Google, any numbers that you see."); *see also* 7400:16-23 ("Q. . . . So the digital advertising industry as a whole is growing, correct, so there's more ad spend? A. Yep. Q. And so when we see decline here on Google's part, does that indicate shrinking revenue in a growing market? A. It does not.").



1193. Google's declining share of digital advertising revenue reflects the growth, among other alternatives, of Meta (Facebook and Instagram), Amazon, and TikTok. Tr. 8549:9-8550:17 (Israel) ("[O]ver the last several years, Google's share is declining as a percentage of all digital advertising revenue. So it's declined since 2015 or so. That's really been driven sort of in order by three phenomenon -- well, two primarily so far. . . . It was Meta, it was Amazon and now it's TikTok."); DX3243 (Share of U.S. Digital Advertising Revenue, 2008-2021); DX1228 (eMarketer U.S. digital ad spend data); Tr. 3943:19-3944:2 (Lowcock) ("Q. And you told us that you've seen Amazon spend, through the lens of your company, over the last five to seven years, increase, correct? A. That's correct. Q. And you've seen Facebook spend increase from IPG clients? A. That's correct. Q. And you've seen TikTok -- which is the pink one -- over the last three years increase, correct? A. That's correct."); Tr. 7400:24-7401:4 (Raghavan) ("Q. So to what do you attribute that Google is losing market share? A. It's clear without doubt from the chart that the big winners, from all we can see, are Amazon. And for the most part, barring a little bit of slack in the middle, Meta/Facebook.").

1194. Meta has experienced "an exponentially increasing growth path to the point where today Meta is over $60 billion in revenue, and really roughly equal in size with Google." Tr. 8550:18-8551:5 (Israel); DXD-29.115 (Meta advertising revenue from 2011 to 2021); DX1290 (Meta advertising revenue data); *see also* Levy (Meta) Dep. Tr. 24:8-21 (testifying that Meta has "tens of millions of paying advertisers and hundreds of millions of businesses"); [redacted] Tr. 7387:14-19 (Raghavan) ("Q. How does Meta's platforms, how do they compare in terms of digital ads business to Google in terms of size? A. They're smaller than us, but they've been fairly consistently -- with few exceptions in the last years, been growing faster than us. So they're effectively taking share from us.").

1195. Meta has tens of millions of paying advertisers while Google has approximately five million advertisers. Levy (Meta) Dep. Tr. 24:8-21 (testifying that Meta has "tens of millions of paying advertisers and hundreds of millions of businesses"); Tr. 1438:2-5 (Dischler) ("Q. . . . Approximately 5-million advertising customers advertise on Google, correct? A. Yes.").

1196. Although Amazon "really turned their attention to advertising a bit later, 2016 and beyond . . . you see this exponential path for them as well to where they've grown by 2021 to being over -- almost 25 billion, and on a rapid growth path showing their ability to compete." Tr. 8551:6-12 (Israel); DX3243 (Amazon advertising revenue from 2008 to 2021); DX1228 (eMarketer U.S. digital ad spend data); *see also* Tr. 3938:24-3939:5 (Lowcock) ("Q. I take it as a result of that, you pretty much had a front row seat to watching the growth of Amazon advertising over the last five to seven years, correct? A. Yes."); Tr. 1403:18-1404:6 (Dischler) (testifying that Google "believe[s] that Amazon's bigger than Google in retail advertising" and

Amazon's "advertising business is growing at roughly twice the rate of Google's retail advertising"); DX0126 at .009 (2018 Google document describing Amazon's ads business as "#3 biggest advertising platform in US, and they're only getting started"); Tr. 8457:25-8460:4 (Israel) (testifying that two-thirds of Amazon advertising is on the search page, and one-third is either on product pages or display ads); DX0231 at .003 (2021 Google document stating "Amazon's US ads business is nearly the size of Google's US retail ads business today, and is growing at over twice Google's rate.").

1197. TikTok's digital advertising platform appears to be on the same growth path as Meta and Amazon. Tr. 8551:13-19 (Israel) ("[TikTok] certainly ha[s] been growing. I think there was testimony in this case about them hitting 10 billion, I think that was global. But they're on this -- they seem, to me, to be on the growth path of these other examples [Meta and Amazon]."); DXD-29.117 (TikTok advertising revenue from 2019 to 2021); DX1228 (eMarketer U.S. digital ad spend data); Tr. 7392:2-7394:11 (Raghavan) (discussing DXD-21.022 and concluding that TikTok "is growing faster than [Google]"); DXD-21.022 ("In 2022, TikTok ad revenues topped $9.9 billion, an increase of 155% over the previous year.").

1198. While Professor Whinston focused on asserted barriers to general search engines entering or expanding as advertising competitors, he did not properly account for the fact that "it's easier to enter as an SVP" as well as "evidence [that] TikTok has entered recently and [is] growing substantially," such that "as soon as you acknowledge competition from social media and SVP[s], the story about entry changes entirely." Tr. 8557:1-12 (Israel) ("[Professor Whinston is] arguing for barriers to entry to become a new GSE -- this is on slide [DXD-29.]124. But he's acknowledged, as I showed before, that it's easier to enter as an SVP, right. So that would be another way to enter as an advertising competitor. Also, particularly relevant in advertising is social media as a competitor for advertising. And here, we have evidence of TikTok has entered recently and growing substantially. So as soon as you acknowledge competition from social media and SVP[s], the story about entry changes entirely."); DXD-29.124 (explaining why Professor Whinston's arguments regarding barriers to entry fail); *see* Tr. 4777:8-16 (Whinston) (testifying about "barriers to entry in the general search text advertising" and "search advertising" markets).

4. Google's Ads Improvements Have Benefitted Advertisers and Users

a. Google Offers Tools for Advertisers to Improve Ad Quality and Performance

1199. Google shares data and analytical tools to help advertisers evaluate their ad performance. [redacted] Tr. 4044:2-15 (Juda) (testifying that Google provides advertisers with "impression share reports," which "tell advertisers estimates of how many auctions they participated in without winning an impression"); Tr. 7378:18-7379:15 (Raghavan) (testifying that "Google[] provide[s] tools to advertisers" that say Google "sent you so many clicks, here was the average price you paid"); Tr. 1290:22-1291:2 (Dischler) ("Q. And does Google provide advertisers with tools that allow them to track their ROI or ROAS? A. Absolutely. . . ."); DX3040; DX3050; UPX8029 at -001, -004; UPX8034; UPX8041.

1200. Google also maintains public help pages on advertising topics such as an advertiser's "Quality Score." Tr. 4235:20-4236:9 (Juda) (discussing DX3049, a help page that explains how Quality Score is calculated and what it means for advertisers), 4238:10-4239:5 (discussing DX3050, a help page describing "the search-time quality signals that [Google] predict[s] for use in the auction"); DX3011 (Google help page explaining how advertisers can use Quality Score to improve their ads, keywords, and landing pages); Tr. 3973:4-13 (Lowcock); DX3049; DX3050.

1201. The "Quality Score" is a diagnostic tool offered by Google, meant to give advertisers a sense of how well their ad quality compares to other advertisers, which allows advertisers to identify where it might be beneficial to improve their ads, landing pages, or keyword selection in order to save money and improve their performance. DX3049 (Google Ads help page, "About Quality Score"); Tr. 4236:10-25 (Juda) (Quality Score is a "diagnostic tool" in the sense that Google "compute[s] the quality signals that are used in the auction at the time of the auction, and it takes into consideration a bunch of auction-time signals that aren't generally available, such as the actual search that the user issued. So rather than -- so what [Google] provide[s] to advertisers instead is something that [Google] can actually sort of compute in a more offline fashion, which is this aggregation of the auction time quality signals to try and provide advertisers with a sense of what their auction time quality signals may be in general.").

b. Google's Keyword Match Type Changes Were Innovative and Helped Advertisers

1202. Although Plaintiffs asserted that Google's changes to keyword matching adversely impacted advertisers, that was neither the purpose nor the effect of the change. Tr.

4297:19-21 (Juda) ("Q. Today, a user cannot opt out of these broad keyword matches; correct? A. That's incorrect"); Tr. 8971:4-20 (Israel) ("You were shown a 2014 document and you were asked about semantic matching and negative keywords. Do you remember that coming up on cross? A. Yes. Q. Have you seen any evidence, Dr. Israel, that an advertiser does not want to match to a query that matches the very product the advertiser is trying to sell? A. I haven't. I would also say that there seems to be some implication that Google could trick people by having queries that don't really match in order to raise prices. The problem with that theory is if users are being tricked, they're going to reduce their bids because they're not getting what they want. You can't trick people with semantic matching into bidding too much, because if suddenly the matches aren't working the way users want or advertisers want, they would lower their bids and that would backfire."); *see also* [redacted]

1203. After developing keyword match types more than a decade ago, Google introduced more advanced methods of keyword match types to better match the semantic meaning of a user's query to "what the advertiser might be interested in." Tr. 7360:25-7362:2 (Raghavan) ("Q. And let's advance to DXD21.012 -- there it is. First, could you very briefly remind the Court what keyword match types are? A. Let me develop the setting. Some 10 years prior to keyword match type, I and many colleagues in the industry and in academia were going around saying search challenge is not to match what the user typed, but the intent underlying what they typed, right. And users have a mismatch between their intent and the query they provide, for a number of reasons. They could just mistype it, okay. But let me give you another example. A user has a problem eliminating rodents in their house, and so they want to find traps. They come and type mousetrap, okay. Is the user looking for traps to catch mice or are they looking for theater tickets to a long-running play in London called Mousetrap. Should that depend on their locale; should it depend on time of day even. And those are things -- cases where you have to be very careful about how you take the user's query and match it to what the advertiser might be interested in. Another example might be the user's perhaps somewhat careless, and instead of typing tennis shoes -- which is what they want, they type court shoes, right. Now, in certain circumstances, that query should trigger an advertisement from an advertiser who offers tennis shoes, right. And so figuring out these semantic matches is the notion of keyword match types. And Google introduced a number of match types where an advertiser could say yes, please broaden my match so I can reach more of my audience."); DXD-21.012 (showing "Examples of Google Search Ads Innovations" including the launch of "Keyword Match Types" in 2012).

1204. Advertisers can choose among match types when bidding on search text ads. [redacted]

1205. Google offers three different keyword match types: broad match, phrase match, and exact match. [redacted] UPX8023 at -001 ("'For the keyword 'lawn mowing service', we can match the following queries – 1. Broad match (comprehensive matching) – Ads may show on searches that relate to your keyword such as "lawn aeration prices". . . . 2. Phrase match (moderate matching) – Ads may show on searches that include the meaning of your keyword such as "lawn mowing service near me", "hire company to mow lawn", or "landscaping service to cut grass". . . . 3. Exact match (tight matching) – Ads may show on searches that are the same meaning as your keyword such as, "lawn mowing service" or "grass cut service").

1206. If an advertiser does not want their keywords to match to a certain query, "[t]here are a couple of ways advertisers can do that. One is they can opt out of some of these broadening mechanisms." Tr. 7366:5-12 (Raghavan).

1207. Advertisers can also use negative keywords: Dr. Juda testified that "by specifying a negative keyword, an advertiser could say something of the form, I don't wish for my ad to show on the search 'shoes for tennis,' and that would enable them not to appear on that search term." Tr. 4297:22-4298:3 (Juda).

1208. Google has made changes to its keyword match types over time "to create a level playing field so that the largest multinationals and the smallest companies in the world can compete" in Google's search ads auction, improve advertiser performance and make it easier to advertise, and to enable Google to more effectively compete with the convenience and performance of advertising platforms such as Facebook. Tr. 1365:23-1366:17 (Dischler) ("Advertisers who are typically unhappy with these kinds of changes are very large and sophisticated advertisers who want to create a competitive advantage by, for example, guessing all the misspellings in the world for every word in the English language so that they can get cheaper ads. But for the typical advertiser and especially the smallest advertiser is by adding these kinds of conveniences, it creates a more level playing field than adds value for the average advertiser because it reduces complexity."), 1369:14-1370:19 ("Q. Has Google launched any innovations in response to competitive pressure to simplify to ad products? A. Yes. Q. Describe. A. So if you advertise on a Facebook, for example, they have much simpler targeting criteria. And so we find that small and medium advertisers are -- even some large advertiser would go to Facebook first before going to Google in order to meet the same business objective because it's easier to set up. They don't have the notion of keywords. And so [Google has] developed a number of different automated systems in order to try to be more competitive with this aspect of Facebook advertising. Q. And looking back, prior to some of these efforts to simplify the process, was the search ads process a highly complex process? A. Yes. Q. Can you describe -- I mean, we're talking about billions of keywords. A. Well, we have -- so, yes, we have some advertisers who have more than a billion keywords in the system. You know, well in excess of the number of words in the English language, for example. It's a very complex system to manage. And so, yes, they're -- given the baseline complexity of such a system, it's going to be frequent that advertisers are going to say that they have a loss of control when we perform simplification, even if that simplification is on average or in the very vast majority of cases beneficial to advertisers like the semantic phrase change which on average improved advertiser ROI.").

1209. "In general, [Google has] moved in a direction of trying to make it easier for advertisers to match all of the searches that are relevant to their products and terms without necessarily having to go through the gymnastics of having to enumerate every single variation," which benefits advertisers and users. Tr. 4283:13-4284:15 (Juda); Tr. 7360:21-7362:13 (Raghavan) ("Q. . . . If a user misspells a query and Google can now correct for that, is that good for the user? A. It's very good for the user I hope. And I hope in the right circumstances, when tastefully done, good for the advertiser as well."), 7365:7-7366:3 ("If the spell correction was done well, it enhances the user's experience by more closely patterning their intent.").

1210. In 2019, Google announced the introduction of semantic meaning to broad match modifier and phrase match. [redacted]

1211. In 2021, Google announced the deprecation of a keyword match type known as "broad match modifier," and the reintroduction of phrase match. Contemporaneous ad agency documents reflect an expectation that this change would not have a large impact on the campaigns managed by those agencies. [redacted] DX0409 at .001 (2021 IPG email) ("Because of our current campaign structure & the best practices that we have deployed, we do not expect [the deprecation of Broad Match Modifier] to have a large impact on our campaigns . . . .") (emphasis omitted).

c. Google Made Changes to Advertisers' Search Query Reports in Order to Protect User Privacy

1212. In 2020, Google "updated the search terms report and Dynamic Search Ads search terms report to meet new privacy thresholds," to align with "[c]onsumer expectations for privacy," which were "higher than ever." DX2022 at .001.

1213. Google made these changes to search term reports in order to protect user privacy. Tr. 4888:11-14 (Lim) ("Q. And your understanding is that those changes were due to the implementation of certain user privacy measures on Google's part, right? A. That's my understanding, yes."); Tr. 1367:7-1368:7 (Dischler) ("If less than a certain threshold of people have looked for a particular query during a particular time period, we don't show that query. And the reason we do that is because we don't want the advertiser to be able to singularly identify a user and target that user off of the report."); [redacted]

1214. Google's search term or search query report ("SQR") "shows the number of times a keyword is searched for" along with other information relating to ads performance. Tr. 3847:2-7 (Lowcock); [redacted]

1215. Advertisers and ad agencies can use SQRs to evaluate their keywords "to determine what terms [they] should be bidding on and whether [they're] getting an effective result." Tr. 3847:8-12 (Lowcock); Tr. 5172:1-12 (Booth); [redacted]

1216. Under Google's new parameters, which were designed to "maintain[] user privacy," Google stopped showing queries that only had one click for that advertiser in the last 30 days, and for a query to appear in the advertiser's report, the query has to receive [redacted]

[redacted] impressions (up from [redacted]. UPX0058 at -768, -770; DX2022.

1217. In September 2021, after the initial changes in 2020, Google announced a further "[i]mprov[ement to] the search terms report" that "show[ed] [advertisers] more queries that meet [Google's] privacy standards." DX2022 at .001; Tr. 5205:17-23 (Booth) ("Q. And since the changes to the search term reports were made in approximately 2020, do you have any understanding of whether The Home Depot has received any additional reporting or information around search terms in a way that is intended to supplement the reporting that's already in place? A. There's been new features, yes.").

1218. Microsoft provides less granular data than Google in its own search term reports to advertisers. Tr. 5512:13-5513:3 (Jerath (DOJ Expert)) ("Q. Do you see in the next paragraph it says, 'The report will include only search terms that resulted in a significant number of clicks in the last 30 days'? A. Yes. Q. And if you know, how does that compare to Google in terms of their minimizing data for when there's not a lot of clicks? If you know. A. Yeah. From what I recall, Google has a window of last 60 to 90 days. . . . From what I recall, Google has counts impression over the last 60 to 90 days. So that's less -- that's more aggregated and less granular.").

1219. [redacted]

[redacted]

XI. THE APPLE SAFARI AND MOZILLA DISTRIBUTION AGREEMENTS

A. Apple Deals Going Back to 2002

1. Apple's Product Designs for Its Safari Browser

1220. Apple is intensely focused on creating the best product that provides the best experience for its customers. Tr. 2530:14-2531:13 (Cue) ("One of the reasons Apple's been so successful is the fact that we treat the customer as the most important thing in the world. . . . I've been at Apple for 34 years. We want to do what's best. We want to make the best product. We don't want to make the most, but we want to make the best product in the world. Sorry, I'm very adamant about that. This is near and dear to my heart and what we do at Apple."), 2586:18-2587:7 ("We don't do things that are good enough, we do things that are great, things that are the best. . . . [W]e don't make our products good enough, that's just an unacceptable thing, and so that's not what we would do. We pick the best products.").

1221. In particular, Apple believes that the out-of-the-box experience that consumers have with Apple products is "incredibly important." Tr. 2618:10-18 (Cue) ("Q. And is the out-of-the-box experience that consumers have with Apple products important to Apple? A. It's incredibly important. It starts with the packaging. If you look at the boxes in which we ship our packages, to the way that you open them, to the material that's used inside, to the fact when you turn it on for the first time. I mean, we care deeply about everything from the moment that you take that box, and everything that happens there on out to get it going.").

1222. Apple's commitment to providing the best out-of-the-box experience to consumers impacts its decisions with regards to preloading applications and services on Apple devices. Tr. 2618:19-2619:4 (Cue) ("[W]hen a customer buys one of our devices, they're excited to take them home, start them up for the first time. And we want those experiences to be incredible, obviously, for them.").

1223. Apple's commitment to providing the best out-of-the-box experience to consumers includes designing the products to be simple to use and work right out of the box. Tr. 2456:20-2457:8 (Cue) ("And so one of the things that we love about Apple products is that they're very clean, very simple to use. When they come right out of the box, they work. And there's nothing like that. It's worked very effectively. Our consumers really like that.").

1224. Apple considers internet browsing and internet search to be critical functionalities that users expect from Apple mobile devices and computers. Tr. 2619:5-11 (Cue).

1225. Having a first-class browsing and search capability out of the box makes Apple products more competitive. Tr. 2619:12-21 (Cue) ("[I]f you go back even to the launch of the iPhone with Steve Jobs on stage . . . the third thing he talks about, it's the internet in your pocket, a mobile device with the full internet, a full browser capability to be able to browse the web for the first time. So it's been a critical component of Apple from the beginning.").

1226. Apple released the its Safari web browser in 2003. Tr. 2620:8-2621:19 (Cue) ("This was a great day for Apple. . . . Prior to this, Apple did not have a web browser. The dominant web browser at the time was Microsoft's Internet Explorer."); DX0267 (Apple press release of January 7, 2003) at .001.

1227. Apple has, over the years, put a great deal of thought into how it designs the Safari browser. Tr. 2623:11-16 (Cue).

1228. Before releasing the first version of Safari in 2003, Apple decided that the browser's interface would include a built-in "search box" that enabled users to search the web by entering a query in the box, without having to first navigate to a search engine's website or install a search engine's browser extension. Tr. 2620:8-2621:19 (Cue) ("[B]efore 2003, the way that you searched the web was you had to go in and type in, you know, Google.com in the URL field -- or you could type another search engine, obviously Yahoo.com or anybody at that time. And we had thought of this idea of like, well, this seems like an extra step for the customer. What if we come up with the idea of if you type in something in the search field and it's not a URL, let's just automatically search and provide the results."); DX0267 (Apple press release of January 7, 2003) at .001 ("Safari's innovative features include Google search capabilities integrated directly into the toolbar;" "Safari's features include: Google search capabilities built into the user interface for convenient and quick searching on the web's most popular search engine").

1229. Apple also decided that queries entered in the built-in "search box" should be routed to a single preset default search engine out of the box, without the user having to take any further action to select a search engine. Tr. 2623:24-2624:9 (Cue) ("When you bring up Safari for the first time and you type something in and you get the search results, it works -- some people would call it magically. Again, we've gotten used to all of this. But at this time, when we're innovating and doing this for the first time, it was incredible. People were blown away with the fact that you could just type in there and you'd get search results. That had never been seen before.").

1230. Apple designs its Safari browser to include the best search engine as the out-of-the-box default and offering users an easy way to change the default. Tr. 2475:8-21 (Cue) ("When we're picking search engines, we pick the best one and we let the customer easily change them. So I have no problem with that. I think we're doing the right thing by customers."), 2476:2-2477:4 ("So what we do is we make Google be the default search engine because we've always thought it was the best engine. And then we make it really easy for customers to switch if they'd like to switch. And so that's worked extremely well for our customers and we certainly believe we've done the right thing for our customers.").

1231. Apple integrates alternatives to the default search engine in the Safari browser and enables customers to easily switch to the alternative search engines as the default. Tr. 2578:21-2579:4 (Cue) ("Q. Why does Apple have agreements with other search providers that are not the default search engine in Safari? A. Again, everyone gets a benefit, because it's easy to switch. And so we give customers the ability to easily switch to one of those search providers, and then they would get the traffic and the advertising and the other things and they would share that with us. And so it's all about the fact that we make our customers and our software be integrated with those search engines to make it really easy for customers to use.").

1232. Switching the default search engine for the Safari browser on an iPhone takes a total of four taps. Tr. 2630:7-2631:19 (Cue) ("I can spell it out directly. You go to settings, you go to Safari. At the very top, it tells you search engines. You tap on it, and it shows you a list and then you pick the one you want [from] it."); DXD-06.001 (screenshots of the steps needed to switch the default search engine for the Safari browser on an iPhone); Tr. 2636:10-25 (Cue) ("[C]ustomers go to settings very often, and so it's not an unusual thing to go in there. You set your wifi, you set airplane, you set a lot of different things, and so it's not an unusual thing. . . . [W]e put it in the place where we think it belongs and where customers would expect it.").

1233. In addition to making it easy for a customer to switch the default search engine, Apple also provides online materials that guide users through the process. Tr. 2636:10-25 (Cue) ("If you go to Apple's website and you look under Safari, we talk about the fact that there are other search engine providers. If you go to our support site where customers go, we itemize and tell you how to do it.").

1234. If an Apple user has a poor experience with the Safari browser because of the quality of Safari's default search engine, that user can easily switch by downloading an alternative browser with an alternative search engine from the Apple App Store and can set that alternative browser as the user's default browser on his/her iPhone. Tr. 2625:11-2626:2 (Cue) ("Again, we have an App Store, it's very easy to download applications, it is not difficult. As a matter of fact, we highly encourage it. Most customers have downloaded tens, if not hundreds, of apps at this point. So it's quite easy to go download another browser or download any other application from that stance.").

1235. Apple has never implemented a search engine choice screen for the Safari browser on any Apple device. Tr. 2632:6-11 (Cue).

1236. Apple does not believe that an Apple device would provide a superior user experience if the Safari browser included a search engine choice screen or other design that does not involve Apple setting a default search engine for queries entered in Safari. Tr. 2471:22-2472:21 (Cue) ("When you take a device out of the box, if you think about it, our customers are very excited about getting their phone and getting it up and running and working fast, right. You just spent a significant amount of money, it's a device you use every day. And so we try to get them up and running as quickly as possible. And so the more choices or the more options that you get, it frustrates customers."), 2476:2-2477:4 ("When you're picking a search engine, we have choices in there that customers have never heard of. DuckDuckGo is a very small one. . . . [S]o you present a user with a choice for something they don't even know. . . . Customers, they don't understand, they're afraid of making the wrong choice.").

1237. In negotiating search revenue share agreements with Google, Apple never made a request for a search engine choice screen on Apple devices. Tr. 2476:2-8 (Cue) ("Q. And the ISA does not permit a choice screen for Apple users to set their default search engine out of the box, correct? A. That's correct, it's not something we've ever wanted. We didn't ask for it in 2002 and it's not something we wanted. We think it's a mistake to ask the customer something like that.").

1238. Apple has never considered offering multiple versions of the Safari browser with different default search engines attached to a different version of the Safari browser on an Apple device. Tr. 2631:20-2632:2 (Cue) ("Q. . . . Mr. Cue, are you aware of any instance in which Apple has considered offering multiple versions of the Safari browser but with different default search engines attached to a different version of the browser? A. Again, on Apple devices, we would never do that. There's no scenario in which I could see us ever doing that, because it doesn't make any sense. We want to give our customers the best experience, so why would we ever do that.").

1239. Apple is proud of, and wants its users to know, the fact that Google Search has been integrated into Safari since Safari's launch in 2003. Tr. 2619:22-2620:4 (Cue) ("Q. And has Apple touted that -- the fact that Google's search has been integrated into Safari for many, many years? A. We are, we're proud of that. It's a great product for our customers, and we wanted our customers to know that they're getting the Google search engine."), 2620:8-2621:19 ("[W]e wanted to talk about the fact that we had integrated search. . . . So we went out looking for what we thought at the time was the best search engine, and so we partnered with Google."); DX0267 (Apple press release of January 7, 2003) at .001 ("Safari's features include," first and foremost, "Google search capabilities built into the user interface for convenient and quick searching on the web's most popular search engine").

1240. Apple believes that users will understand that Google's default search engine status in Safari means Apple views Google as the best search engine because users expect Apple to pick the best. Tr. 2619:2-2620:4 (Cue) ("I think one of the benefits, for example, that Google gets from Apple is that we are telling the world that Google is the best search engine, because that's what they would expect Apple to pick.").

2. History of the Apple-Google Information Services Agreement

1241. Apple and Google first entered into the Information Services Agreement ("ISA") in 2002, and amended the terms of the ISA a number of times in the ensuing years. Tr. 2450:21-2451:2 (Cue); Cue (Apple) 30(b)(6) (Apr. 14, 2022) Dep. Tr. 18:4-8; JX0001 (2002 ISA); JX0002 (2005 ISA Amendment One); [redacted] JX0024 (2014 JCA); JX0033 (2016 ISA Amendment Eight); JX0097 (2021 ISA Amendment Nine).

1242. In 2002, Apple decided to send all search queries entered in the Safari browser—then only preinstalled on Mac computers—to Google Search because Apple believed Google was the best search engine. Tr. 2620:8-2621:19 (Cue).

1243. In 2002, Apple and Google entered into the ISA pursuant to which Google [redacted]

1244. [redacted]

1245. In 2005, Apple and Google entered into ISA Amendment One which provided, *inter alia*, that, subject to certain conditions specified in Amendment One, Google would (1) pay Apple [redacted] and (2) make a one-time payment to Apple totaling $15 million. JX0002 (2005 ISA Amendment) at -818 (§ 2); [redacted] DX2003 at .002-.003 (2004 email from Sergey Brin to Steve Jobs: "[U]pon your request, I did reflect on what more Google could do to make this choice more attractive to Apple. . . . I have decided it is fair for Google to pay Apple the proposed revenue share not just from deal launch but from today on [and] going back retroactively to the original Safari launch.").

1246. The 2005 ISA Amendment One further provided that [redacted] JX0002 (2005 ISA Amendment One) at -819 (§ 3).

1247. In 2007, Apple released the first version of the iPhone. The iPhone came preinstalled with a mobile version of the Safari browser that included Google Search (as the out-of-the-box default) and Yahoo Search (as an alternative search engine that the user can select as default). Tr. 2622:3-2623:10 (Cue) ("Q. Do you recognize this document, Mr. Cue? A. I do. This was the announcement of the iPhone. Q. . . . [A]t this time, did Apple also launch a version of the Safari browser specifically for the iPhone? A. Yes. As I stated earlier, prior to this, when you bought a mobile phone, it came with a quote, unquote mobile browser. Think of that as a browser that was a subset or neutered compared to a full browser that you got on Windows or Mac. One of the innovations that we wanted to bring to phones was to get a full browser so that you would get the same experience that you would get on Windows or on a Mac, for example, on a browser on the phone. Q. . . . Why was Apple promoting both Google and Yahoo! as part of the announcement of the new Safari browser on iPhones? A. [A]t the time we thought Google was the best search engine, Yahoo! was still kind of a close second and was popular. So we -- as we've done since then, we built it in so that customers could easily switch. And so we wanted to make sure that people knew that if they bought an iPhone and they were using Safari, they could also use Yahoo!. And so we made it easy, again, for customers to switch."); DX0270 at .002-.003 (Apple's 2007 press release announcing iPhone stating: "iPhone also features the most advanced and fun-to-use web browser on a portable device with a version of its award-wining Safari™ web browser for iPhone. . . . iPhone's Safari web browser also includes built-in Google Search and Yahoo! Search so users can instantly search for information on their iPhone just like they do on their computer.").

1248. In 2007, Apple chose Google Search as the default search engine for the mobile Safari browser on the iPhone because Apple determined that Google was the best search engine. Tr. 2622:19-2623:10 (Cue).

1249. In 2007, prior to the announcement of the iPhone, Apple and Google amended the ISA [redacted] Cue (Apple) 30(b)(6) (Apr. 14, 2022) Dep. Tr. 34:11-14, 35:9-25, 36:2-16, 36:18; JX0004 (2007 ISA Amendment Two) at -647-648 (§§ 1, 5).

1250. In 2007, for the initial launch of Safari for Windows—a product that is not preloaded on, or compatible with, any Apple devices—Apple briefly considered providing users with a choice of default search engines to aid with potential distribution of Safari for Windows through third parties like Yahoo. Tr. 2633:5-2635:3 (Cue) ("[B]ack in 2007, Apple was developing Safari for Windows, so this would be non Apple devices. . . . [A]t this time, one of the concerns that we had was how do we get distribution for Safari for Windows. . . . [S]o we started talking to other parties from Yahoo! -- and I believe we've talked to AOL, I know we talked to others. . . . And part of that discussion that came about as we were talking to other parties was a question around if you download Safari for Windows somewhere else . . . obviously, I just want to make very clear in case you have any question around it, this has nothing to do with Apple devices. So if you download Safari for Windows on another site -- let's use Yahoo!, for example, Yahoo! wanted the capability such that Yahoo! would be the default search engine for that download of Safari when it got downloaded from Yahoo!."); Tr. 5066:24-5067:4 (Braddi (Google)) ("Q. And so this issue, the question you were asked about users being given a choice as to the default search engine in this time period in 2007, did this involve this version of Safari for Windows only or did it also involve versions of Safari that were coming pre-loaded on Apple devices? A. I understood it only with regards to Windows."); Tr. 7689:7-18 (Pichai) ("This was for a new version of Safari they were planning to launch for Windows.").

1251. Apple ultimately decided to ship Google as the default search engine on Safari for Windows after determining that distribution of Safari for Windows through third parties would be difficult. Tr. 2633:5-2635:3 (Cue) ("And so we considered that, and ultimately we decided not to do it. . . . [N]ot a lot came out of this, because it turned out that distributing software through third parties was difficult. There were -- some parties were asking for money and all these different things, and so it made it difficult. So we, at the end of the day, decided to ship Safari for Windows just like the Mac, and so it's shipped with Google as the default, and again, with the choices on the screen.").

1252. Safari for Windows was a short-lived product that was discontinued by Apple in 2012. Tr. 2635:4-6 (Cue).

1253. [redacted]

1254. [redacted]

1255. [redacted]

1256. [redacted]

1257. [redacted]

1258. [redacted]

[redacted]

1259. In 2014, Apple and Google entered into the Joint Cooperation Agreement; after further arms-length negotiations, Apple and Google reached the compromise that the revenue share percentage be [redacted]. JX0024 (2014 JCA) at -822 (§ 1.1); [redacted]

1260. The Joint Cooperation Agreement carved out certain ex-U.S. countries (China, South Korea, and Russia) where Apple determined that another search engine provided better or competitive search quality to Google. JX0024 (2014 JCA) at -822 (§ 1.3) ("Apple will have the option to select a different default search engine in China and S. Korea on or after July 31, 2014, and in Russia on or after July 31, 2016."); Tr. 2477:11-2478:1 (Cue) ("[O]ver time, there were certain countries where we found that either Google wasn't the best one or there was another one that we thought was very competitive, and so we carved those out in the agreement. . . . In the other countries, we felt very comfortable that Google was by far the best one.").

1261. [redacted]

1262. In 2016, Apple and Google entered into ISA Amendment Eight after roughly a year's intense negotiations. Tr. 2451:15-16, 2451:25-2452:5 (Cue) ("Q. How long did your negotiation over the 2016 ISA take place? A. I think it was roughly a year."); Tr. 7662:15-19 (Pichai) ("Q. Is it fair to say that at the end of the negotiations, both parties had sort of compromised their positions? A. Yes, on pretty much everything. It was an intense back and forth, we didn't agree on everything, but I think we tried to find common ground to make progress."), 7774:23-7775:6 ("[W]e literally felt like a very competitive dynamic. Mr. Cue had made it clear they were considering rival providers. . . . And as I said, there was a lot of uncertainty about what would happen."); JX0033 (2016 ISA Amendment).

1263. In the 2015-2016 time period, Google was motivated to continue the deal due to the increasing usage of Google Search on Apple devices, positive user feedback, and financial value created for Google's shareholders. Tr. 7659:15-7660:9 (Pichai) ("From the time of the deal, Apple had grown tremendously, so we saw great usage growth from the deal. The Google experience on iOS was very valuable. The user feedback was very positive, it was working well. Our queries from iPhones had also been growing significantly since the start of the deal. So it was both increasing usage, creating financial value for our shareholders, and so I thought it was a valuable deal and wanted to continue that deal.").

1264. In the 2015-2016 time period, Apple and Google conducted intense negotiations with respect to the revenue share percentage, and finally reached a compromise at [redacted] JX0033 (2016 ISA Amendment Eight) at -797 (§ 4) ("Google will pay Apple [redacted] of its Net Ad Revenue for the remainder of the Term"); Tr. 2457:9-16 (Cue) ("Q. [W]as one of Apple's goals to increase the percentage of revenue share that it received? A. Yes."), 2575:25-2576:14 ("Q. And you wanted to increase it from [redacted]

[redacted]? A. That's correct. Q. Did Mr. Pichai push back on your request for [redacted]? A. Yes. Look, I mean, it was a negotiation. We took a long time. There was push back from him and push back from me."); Tr. 7659:24-7660:25 (Pichai) ("[Eddy Cue] had acknowledged in our first meeting that there was tension in the relationship, primarily due to the fact that the revenue share had decreased from the amount it was there previously. One of his main objectives was to increase the revenue share from the deal. I obviously wanted to get the deal done at the best revenue share that's possible for Google."), 7662:20-7663:1 ("Q. Did Google agree to increase the revenue share percentage to the amount that Mr. Cue was originally asking for? A. No, we did not. Q. Did Google agree to a compromised revenue share provision? A. That's correct.").

1265. In the 2015-16 time period, Apple and Google conducted intense negotiations with respect to the length of the deal, with Apple wanting a longer one, and Google wanting a shorter one. Eventually, a compromise was reached. [redacted]; Tr. 2577:25-2578:11 (Cue) ("Q. And you wanted a [redacted] deal? A. I did. Q. And Google pushed back on that; is that right? A. That's also correct, they didn't want[] to do a long-term deal. Q. And did the parties end up compromising on that term as well? A. I believe so."); Tr. 7662:3-14 (Pichai) ("Q. Was the term of the agreement an issue that was an important part of the discussions back and forth between the parties? A. In addition to increased rev share, Mr. Eddy Cue had indicated one of the more important aspect of it was to get as long a term as possible. Apple was very interested in a long-term deal. Q. And did you push back on that? A. Yes, I did. . . . You know, the longer the timeframe, there can be uncertainties. But we eventually ended up doing it in a way in which Apple has the right to extend the deal to a longer term, if they choose to do so.”); [redacted]

1266. In the 2015-16 time period, in evaluating which default search engine to select for Safari, the most important factor to Apple was search quality for its customers, with search monetization a secondary consideration. Tr. 2574:15-23 (Cue).

1267. In the 2015-16 time period, Apple decided to extend the ISA with Google because Google provided the best search quality. Tr. 2463:19-2464:7 (Cue) (“My view, as I got into this agreement with Sundar, was I always felt like it was in Google’s best interest and our best interest to get a deal done. I thought we were a great -- we provided great customers to Google, they did an amazing job on the search engine side, and I always felt we would come to an agreement.”).

1268. In the 2015-16 time period, Apple never raised with Google the idea of using a search engine choice screen. Tr. 7804:7-11 (Pichai).

1269. Towards the end of the 2015-16 Apple-Google negotiations, Google proposed language confirming that Apple would continue implementing the Safari default in a substantially similar manner to the way that it had designed and implemented a default search engine on Safari for the nearly fifteen years that the parties had had default search agreements. Tr. 7663:6-17 (Pichai) (“Q. And during the course of the 2016 agreement negotiations, did Google ask Apple to include language requiring Apple to continue implementing the Safari default in a substantially similar manner as it had done to date? A. Yes. This wasn’t a major part of the negotiation for most of the time, but towards the end. . . . [S]o we wanted to make sure, as we contemplate a longer term deal, that the notion of default was reasonably preserved in a similar way, particularly with respect to Apple being able to send queries to rival providers."), 7704:21-7705:11 ("[W]e are paying for a default deal with a rev share, so we need to have some notion of what that value is. And it depends on are they going to send queries to us or to rival providers, right. So that's what we are talking about.").

1270. Specifically, Google sought confirmation that Apple would not divert commercially valuable queries entered in Safari to a third-party vertical search engine, leaving Google with a greater proportion of less profitable queries. Google understood that the "substantially similar" language does not restrict Apple's ability to directly answer queries from Apple's own web index. Tr. 7663:18-7664:22 (Pichai) ("Q. Was there a concern internally within Google that Apple could divert queries to third-party vertical providers? A. Yeah, that was precisely the concern, you know, concern maybe where they would take some queries, for example, and just send it to Amazon for shopping queries and do additional deals. . . . Q. Did Google seek to have this new language included in the 2016 agreement to restrict Apple's ability to directly answer queries from Apple's own index of information? A. No. In fact, particularly Apple was known for really exerting control over how they design their experiences. It was well understood by us. And in fact, I think the agreement captures that clearly so that Apple can continue to improve their services the way they see fit, and they've continued to do that."), 7704:21-7705:11 ("And so the substantially similar refers to being similar to how the default is implemented with respect to other rival providers, other competitive providers. It specifically allows Apple -- which is handled in a separate section about Apple can choose to do what they want to improve their products and services. And that was very, very clear between me and Mr. Cue.").

1271. [redacted]

1272. Under the 2016 ISA Amendment, Apple and Google had the option to mutually agree to extend the agreement until [redacted]. JX0033 (2016 ISA Amendment Eight) at -800 (§ 7); Tr. 2498:18-21 (Cue).

1273. In 2021, Apple and Google agreed to extend the ISA in the U.S., as amended, until [redacted] JX0097 (2021 ISA Amendment Nine) at -357 (§ 1).

1274. In the 2020-21 time period when Apple proposed to Google to further extend the ISA, Apple had the ability to switch the default search engine for the Safari browser. Tr. 2583:11-13 (Cue).

1275. Before deciding to propose the ISA extension to Google, Apple again considered whether to switch the default search engine for the Safari browser, concluded that Google continued to provide the best search experience for Apple users in the United States, and determined that an extension of the ISA would allow Apple and Google to focus on providing the best search experience on Apple devices. Tr. 2583:14-22 (Cue) ("Q. And did Apple again consider whether or not to use Google or some other search provider as the default search engine for Safari? A. Yeah, we're constantly keeping aware of what's happening in the industry, and what other opportunities we have to improve the product. And so we certainly didn't see anything that was anywhere close to Google as far as its capabilities and what it did, and so I was quite comfortable and wanted to extend the deal."), 2583:23-2586:6 ("At that time, I looked at it and said Google still has the best search engine by far, even more so than when I started back in 2015.").

1276. Google was similarly interested in extending the deal because of the continued strong growth in usage and revenue generation of Google Search on Apple devices, the superior user experience, and positive brand image. Tr. 7787:22-7788:5 (Pichai) ("It was a deal where there was exceptionally strong growth and usage of Google Search for many, many years. Year on year, the product was doing well, generating revenue. It was an experience our users liked. I think it helped the brand of our product. And, so, those were the reasons why I valued the concept of the deal.").

1277. Since 2002, Apple has repeatedly selected Google to be the default search engine for the Safari browser on Apple devices because Apple believes that Google is by far the best search engine and Google has constantly improved its quality and lead over rivals. [redacted] Tr. 2478:14-18 (Cue) ("[W]hen we were doing the deal with Google, we wanted the capabilities to provide the best -- the best service, the best application, the best thing for customers. Google was the best one."), 2620:1-4 ("I think one of the benefits, for example, that Google gets from Apple is that we are telling the world that Google is the best search engine, because that's what they would expect Apple to pick.").

1278. Since 2002, Apple has repeatedly selected Google to be the default search engine for the Safari browser on Apple devices because Apple has determined that the ISA has produced a better search experience on Safari and helped Apple in pursuing product innovations. Tr. 2586:7-11 (Cue) ("Q. Do you believe that the Safari agreement with Google has produced a better search experience on Safari? A. I think there's no question about that. It's been true for -- since the beginning, and like I said, continues to be true today."); [redacted]

1279. Since 2002, Apple has repeatedly selected Google to be the default search engine for the Safari browser on Apple devices because Apple has determined that the ISA has benefitted Apple's users. Tr. 2586:12-17 (Cue) ("Q. And do you think that the collaboration between Google and Apple on the Safari default agreement has benefitted Apple's consumers? A. I think it's benefitted the consumers, it's benefitted Apple, it's benefitted Google. I think everyone has won in this.").

3. The ISA Does Not Preclude Apple from Promoting Other Search Engines on Apple's Devices

1280. Apple's agreement with Google does not restrict Apple's ability to promote other search engines, including Apple's ability to preload any alternative search engine application or search engine widget on an Apple device. Tr. 6065:3-6066:25 (Whinston (DOJ Expert)); Tr.

9755:1-5 (Murphy (Google Expert)) ("Apple can promote others. In fact, Apple can preinstall other people. They could put other people on the phone. So there's nothing in that agreement that says you couldn't have a Bing search app on the phone."); DXD-37.051.

1281. Apple has in fact promoted other non-Google search engines in the Safari browser, entering into search revenue share agreements with other search engines, including Bing, Yahoo, DuckDuckGo, and Ecosia. Tr. 9752:21-9753:12 (Murphy) (testifying to "a timeline that shows how long Apple has had those agreements with the various providers"); [redacted] 2579:5-7 ("Q. And do those search engines pay a revenue share to Apple pursuant to those agreements? A. They do.").

1282. [redacted] Tr. 3654:17-3655:12 (Nadella) ("Q. You've been an option to change the default on Macs, iPhones and iPads since 2010? A. Sure.”); [redacted]

1283. [redacted]

1284. Apple has had a search distribution and revenue share agreement with DuckDuckGo since 2014, pursuant to which DuckDuckGo is included as a built-in search engine option that users can select as their default search engine in Safari, and DuckDuckGo agrees to pay Apple a share of the revenue that DuckDuckGo receives from certain search traffic originating from Safari. Tr. 1972:20-24, 2090:22-2091:16 (Weinberg); DX0946 (Apple-DuckDuckGo 2014 Agreement); DX0950 (Apple-DuckDuckGo 2019 Amendment).

1285. [redacted]

1286. [redacted] Tr. 9751:22-9752:20 (Murphy); DXD-37.047 (screen to change default search engine on iOS).

1287. The ISA expressly contemplates that users are allowed to select an alternative search engine as their default search engine. [redacted] JX0033 (2016 ISA Amendment Eight) at -793 (§ 1(a)) (defining "Default" to mean that "the Services will automatically be used for responding to Search Queries initiated from the Web Browser Software, ***unless the End User selects a different third-party search service***" (emphasis added)).

1288. Apple also integrates web links to search engines as bookmarks on the "Favorites" screen on the Safari browser. Tr. 9751:22-9752:20 (Murphy); DXD-37.047 (showing the "Favorites" screen on Safari browser on iOS).

1289. Apple has contractual provisions with Microsoft and Yahoo that require Apple to ensure that Bing and Yahoo Search can be easily discovered in the Safari browser and that users can easily change the default search engine from Google to Bing or Yahoo Search. Tr. 2626:18-2629:14 (Cue); DX0924 (Apple-Yahoo Mobile Software and Services Distribution Agreement) at .004 (§ 5.2) ("Apple agrees that when Apple distributes . . . Yahoo Search in an Apple Device . . . it will provide . . . a readily available and easily discoverable option for the User to change the User's default search services to Yahoo Search through Apple's search selection facility . . . . Apple agrees that it will not design its default search selection facility such that it is difficult for a User to discover the facility or switch to Yahoo Search."); [redacted]

1290. Neither Microsoft nor Yahoo has complained to Apple that Apple has not honored its contractual obligation to make Bing or Yahoo Search readily available and easily discoverable by users. Tr. 2629:21-2630:6 (Cue) ("Q. During the time that these agreements have been in effect -- and I believe these have been in effect for over a decade, are you aware of any instance in which either Yahoo! or Microsoft has complained to Apple that Apple's implementation of the Safari default setting is in violation of Apple's obligation to make discovering Bing or Yahoo! search easy and readily discoverable? A. They have not, and I can't imagine they ever would. It's pretty easy, and so it's -- if you know how to set your wifi, you should know how to switch your search browser. It's the same -- not a difficult process.").

1291. Apple also entered into a partnership with Microsoft in 2013 under which the fallback search for Siri, and later Spotlight, was powered by Bing. The partnership lasted until 2016. Tr. 3105:8-3106:11 (Tinter (Microsoft)).

1292. If Apple believed that an alternative search engine provided superior search quality and was preferred by its users, Apple would switch the default search engine at the end of the term of an ISA Amendment. Tr. 2579:8-11 (Cue) ("Q. And if Apple believed that those other search engines were superior to Google and users preferred them, would Apple switch the default at the conclusion of a Google agreement? A. We would."), 2589:5-19 ("If we thought that Bing was the best search engine, even if we were under contract, we would have continued the discussions and done a deal with Bing whenever the term [with Google] expired.").

4. The ISA Does Not Limit Apple's Product Design Innovations

1293. The ISA does not preclude Apple from making innovations in the Safari browser that, in Apple's determination, would result in a better user search experience. [redacted] Tr. 2632:19-2633:4 (Cue) ("Q. Sir, are you aware of Google restricting Apple's ability to design its software products? A. I am not, no."); JX0033 (2016 ISA Amendment) at -793 (§ 1(a)) ("Apple shall not be limited in its ability to alter, modify and innovate its Web Browser Software"; "Apple may determine an End User's input is not a Search Query so long as Apple's determination is based exclusively on its intent to provide a superior user experience").

1294. The ISA does not preclude Apple from increasing the number of queries Apple could answer itself, including through Safari Suggestions. Tr. 2534:21-2535:5 (Cue) [redacted] A. . . . We still have that. We're trying to answer more questions on Siri today. So it's still a goal today."); Tr. 2345:11-23 (Giannandrea) ("Q. [D]id anything in Google's agreement with Apple, with regard to the Safari browser, did that limit in any way Apple's ability to make these Safari suggestions or Siri suggestions? A. No. I didn't believe there was any limit to what we could do with respect to these suggestions.").

1295. Apple continues to enhance and optimize its capability to answer user queries directly because Apple believes that directly providing answers to certain user queries—as opposed to sending them to a general search engine such as Google—provides the best user experience in certain circumstances. Tr. 2219:18-2220:5 (Giannandrea) ("Our general approach is we think users of our devices are seeking answers, and so if we can provide the answer, we will do that rather than sending them off to a general search engine."); Tr. 2594:16-2595:22 (Cue) ("[S]o our goal was there's things where they're not general search, the customer's just looking for a specific answer, and we'd like to give them that answer and not have it go to Google or anybody else. And so we think that's an area that we can invest in that makes a great experience for our customers.").

1296. With Safari Suggestions, the Safari browser offers users suggestions by Apple as the user starts typing, character by character, in the URL bar of the Safari browser. Tr. 2208:17-2209:4 (Giannandrea) ("Q. Is Suggestions the thing that when I start typing, it pops up with a suggestion of the website I might want to go to? A. Yeah. In a modern browser, people can do the searches in the URL bar, the bar at the top of the browser. And when you start typing there, character by character, most modern browsers give you suggestions. And those might be websites or they could be queries that are popular.").

1297. If a Safari user taps on a Safari Suggestion, the user is directed to that website without going to a search engine result page. Tr. 2217:3-2218:14 (Giannandrea) ("Q. If I hit that button [referring to a Safari Suggestion in UPXD007] with my finger, what's going to happen? A. You're going to go to that website. Q. . . . I'm not going to have to go to a search engine result page, am I? A. No. You would go right to that website."); UPXD007 (Safari Suggestions at the top directing user directly to nike.com as the user types in the query "running sne").

1298. [redacted]

1299. One of the reasons that Apple invests in developing its own web index is that Apple has several products—for example, Siri, Spotlight, Knowledge Graph, Safari Suggestions—that depend on Apple having knowledge of the web. Tr. 2208:8-16 (Giannandrea) ("Q. Now, Apple crawls the web for a number of reasons. Apple has several products that depends on having knowledge of the web; is that right? A. That's correct. Q. And what are those products? A. There's quite a few. Obviously, Spotlight is one, Safari Search [sic] is another. But we use the web crawl for many different things, including improving how your keyboard suggestions work on an iPhone."), 2209:5-7, 2216:2-9 (testifying that Apple's Knowledge Graph product also depends in part of Apple's web index), 2217:15-19 (testifying that certain Safari Suggestions "com[e] from the search index"), 2235:10-13 ("Q. [Y]ou also use [redacted] to answer questions on Spotlight; is that right? A. Yes, we do."), 2241:22-2242:6 ("A. Well, I would like to make a comment, which is: We actually implemented what was proposed here. Q. So [redacted] became the fallback? A. For Siri Search. Q. Okay. And did you conclude that the Apple agreement did not prevent [redacted] [redacted]? A. I wasn't involved in the discussion, but I assumed it turned out to be a nonissue, yes.").

1300. Apple does not operate a general search engine and has no present intention to develop a general search engine in the future. Tr. 2206:2-3 (Giannandrea) ("Q. Apple does not operate a general search engine, correct? A. No, we do not.").

1301. To develop a general search engine, Apple would need to make significant additional investments in multiple aspects of a general search engine that it does not possess, including search advertising technology. Tr. 2598:13-2600:4 (Cue) ("Q. And does Apple today have any capabilities -- or I should say technologies or development of search advertising technology in the way that Google has search advertising technology? A. No, we don't. Q. And is one of the issues that Apple would have to confront, if it ever decided to build its own general search engine, would be how would Apple begin to either develop or implement search advertising technology? A. Yeah, you're just making . . . exactly the point I was trying to make, the work to build what Google has done over a more than 20-year period with some incredible engineers is not an insignificant amount of work to recreate."); Tr. 2333:9-20 (Giannandrea) ("Q. At this time [August 2018], did Apple have a search advertising business akin to what Google's advertising business was or what Bing's advertising business was? A. No, we did not, but we had some people who thought that we should be thinking harder about it. THE COURT: . . . [W]ould it be accurate to say Apple does not have a comparable search advertising business today? THE WITNESS: Yes. It does not.").

1302. Apple has determined that its resources are better spent in other areas of innovation rather than developing its own general search engine because Google already provides a superior search quality for Apple users. Tr. 2540:15-2542:1 (Cue) ("You have to understand that even as successful and as big as Apple is, we have limited resources, and we want to spend our resources in the areas that we think we can make a material difference for our customers. In the case of search, we have somebody that we're working with who is the best in the world at it, is investing significant amounts of money, and we have found a way to work with them on that. We don't want to take our resources and do that and invest in there because I'd rather spend our resources building, you know, the Apple Watch I'm wearing, Vision Pro that we just announced, iOS 17."), 2594:16-2595:22 ("THE COURT: . . . Why had Apple not invested incrementally more to develop its own search engine so that it could monetize the ad revenue that could be generated from that search engine? THE WITNESS: . . . Doing a search engine is a huge amount of work . . . . [I]f we do that, we can't do other things. . . . And our viewpoint was Google's doing a great job at general search. . . . [redacted] These are all engineers, and so you have -- ultimately we have to pick where we invest our resources, and so that just didn't make a lot of sense for us.").

1303. Apple has determined that developing and operating its own general search engine is not the best way to differentiate Apple's products, provide its users the best experience, and enable Apple to better compete in the market. Tr. 2261:20-2262:9 (Giannandrea) (explaining with reference to UPX0240 that "there already are many general search engines in the world that users choose to use. I was very focused, I think, on spending our time and resources on the kind of features that we've just been discussing, which is providing answers more quickly, more contextually, [in] more personal and private ways"); UPX0240 at -507 (Giannandrea: "Can I imagine that Apple can build a search engine to compete. Yes but it's probably not the best way to differentiate our products.").

5. History of Apple's Assessment of Microsoft Bing

1304. Since 2009, Microsoft has approached Apple a number of times to propose that Bing become Safari's default search engine. Tr. 3500:15-3501:4 (Nadella) ("I mean, the one that we tried and continue to try, quite frankly, is the Apple default. . . . I focused every year of my sort of tenure as CEO [since 2014] to see if Apple would be open, and we've had, you know, a series of dialogues with them over the years on it.").

1305. Over the years, one constant reason for Apple's rejection of Microsoft's proposal is Apple's concern with Bing's product quality. Tr. 3351:7-17 (Tinter) ("Q. Apple told you that without regard to contractual restrictions in some agreement with Google, they wouldn't switch the default to Bing; correct? A. . . . They have at various points in time expressed concerns about Bing product quality -- sometimes that's a U.S. based statement, and sometimes that's an international statement -- which is why they have not switched."); Tr. 3655:17-3656:11 (Nadella) ("Q. And one topic that arose frequently during these conversations with Apple has been Bing's search quality, right? A. That's right. Q. And Apple executives have raised concerns about Bing's search quality, right? A. That's correct.").

1306. In 2009, Microsoft approached Apple to propose that Bing become Safari's default search engine. Tr. 3286:6-8 (Tinter) ("Q. So you did propose in 2009 that Bing would be the default on the iPhone, correct? A. Yes.").

1307. In 2009, Apple quickly declined Microsoft's suggestion due to concern with Bing's inferior customer experience. Tr. 3284:20-3285:6 (Tinter) ("I think we had suggested to them, if you guys are interested in Apple powered by Bing, we are very happy to engage that. They were pretty quickly saying, hey, no, we're not interested, and then the 2009 conversations were focused on making Bing an option."); [redacted] Tr. 3579:11-19 (Nadella) ("Q. Over half of new iPhone and RIM users, across clients and browse[rs], only try the Bing mobile product for one day before churning. One day. And that's something you've experienced over the years, people churn off of Bing very quickly, right? A.

Yep. Q. And this is one of the concerns Apple had about switching . . . from Google to Bing, correct? A. That's correct.").

1308. When Microsoft approached Apple again in 2013, Apple remained not interested in replacing Google with Bing as the default search engine on Safari due to concern with Bing's product quality. Tr. 3289:16-3291:21 (Tinter).

1309. Apple also was not interested in replacing Google with Bing as the default search engine on Safari due to concern with the brand risk of switching from Bing to Google. Tr. 3288:6-3289:8 (Tinter) (confirming that DX0454 reflects his understanding in 2013); [redacted]

1310. In 2015, Microsoft approached Apple again to propose that Bing become Safari's default search engine. Tr. 2508:7-10 (Cue); [redacted]

1311. In the 2015-2016 time period, Apple determined that Bing was inferior to Google in search quality and that Microsoft had failed to adequately improve Bing's search quality over the years. Tr. 2512:20-2513:20 (Cue) ("When we looked at the search results and were they getting better over time, they did not get better over time. They've gotten worse over time."); [redacted]

[redacted]

1312. In the 2015-2016 time period, Apple's senior leadership personally conducted assessments of Bing's search quality by switching the default search engine of their own Apple devices to Bing. Tr. 2515:1-21 (Cue) ("Q. And what did you personally do to conduct an assessment of Bing's search results? A. I went to Safari on my iPad, my Mac, and my iPhone and I set the default search engine to Bing. I downloaded the Bing [app]. Bing had an iOS app similar to the Google GSA app, and I downloaded that. And then I used it as my primary search engine for weeks.").

1313. In the 2015-2016 time period, Apple determined that Microsoft failed to make sufficient investments in maintaining a comprehensive search index and that this negatively impacted Bing's search quality. Tr. 2512:20-2513:20 (Cue) ("[O]ne of the most important things for search is you have to go and find all of the information available on the Internet. So you're basically crawling the Internet, as they call it, to find as much information as possible. And Microsoft was investing a significant amount less in doing that."); [redacted]

1314. In the 2015-2016 time period, Apple determined that Microsoft was inferior to Google at search monetization and that Microsoft had failed to improve search monetization over the years. Tr. 2510:19-2511:11 (Cue) ("We already had a deal with Microsoft as a search provider, and they were horrible at monetizing advertising."), 2513:6-8 ("We looked at how they were monetizing on advertising. Again, that didn't get better, that was getting worse.").

1315. In the 2015-2016 time period, Apple determined that Bing's inferior search quality contributed to Microsoft's inferior search monetization. [redacted], 2527:17-2528:21 ("Google has the best search engine. You have to remember, advertising and the revenue doesn't just come in. . . . The way that it works is customers have to go and search on Google or search on Bing, in this example, and then they have to provide great results so the customers keep doing it . . . and using it, otherwise, it's very easy to switch.").

1316. [redacted]

1317. In the 2015-2016 time period, Apple determined that Microsoft was not willing to, and did not, sufficiently invest its resources to improve Bing's search results quality. Tr. 2522:3-2523:23 (Cue) ("Microsoft is a large company. They're certainly . . . equal of our size, equal of Google's size. So if they wanted to invest and they wanted to do something, I certainly believe they had resources to do that. But they didn't seem to. You know, their product wasn't as good. They didn't see the investment in it.").

1318. In 2018, Microsoft again approached Apple with the representation that Bing's search quality had improved from 2016. Microsoft and Apple discussed a number of strategic opportunities relating to search, at least some of which could have led to Bing becoming the default search engine for the Safari browser in the U.S. Tr. 2580:9-17 (Cue) ("[T]hey approached us in 2018, again, saying that their search engine had improved even further from 2015-2016, from the last time, and that they had gotten better and we should do a deal together."); Tr. 2285:23-2286:11 (Giannandrea) (testifying that discussions in 2018 between Microsoft and Google included "whether Apple would want to use Bing," "whether Apple might want to acquire Bing," and "whether Apple might want to do a joint venture with Bing"); [redacted]

1319. Microsoft and Apple had an initial meeting in August 2018 involving John Giannandrea and Adrian Perica on Apple's side and Kevin Scott (Microsoft's Chief Technology Officer) and Jonathan Tinter on Microsoft's side. Tr. 2325:3-2327:9 (Giannandrea).

1320. Apple learned in the August 2018 meeting that Bing's search headcount was on the magnitude of 1,000 people—a number significantly lower than Google's search headcount. Tr. 2329:11-2330:1 (Giannandrea) (testifying that Microsoft had a search headcount as "greater than 1,000 people" compared to "around 6,000 people" at Google).

1321. Apple learned in the August 2018 meeting that Bing had not made sufficient investment in a number of international locales and languages—a deficiency with Bing that

Apple previously raised with Microsoft three years ago in 2015. Tr. 2330:2-11 (Giannandrea) ("One of the opinions I held at the time was that [redacted]. So I was advocating for more investment, and so I was noting that Bing was not particularly any further forward in that regard."); UPX0241 at -416 (Giannandrea: "They are not launched in most of countries I think we care about.").

1322. Apple also learned in the August 2018 meeting that Microsoft's search monetization was significantly worse than Google's, reflecting, at least in part, Microsoft's inferior search quality. Tr. 2330:12-2331:2 (Giannandrea) ("[I]t was my recollection in the meeting that Jon Tinter had suggested that they would be very flexible with revenue share . . . and they might be willing to, in principle, share [redacted] of the revenue with us. And what that told me was that . . . the value of their ad sales was much worse than Google's. . . ."), 2331:8-11 ("Q. Is there a relationship between RPM and the quality of your search ads technology? A. Yes. And the quality of your search results as well, if you're talking about search ads, yes."), 2331:20-2332:20 ("[M]y understanding was that most of the money made from search advertising was to do with the quality of your targeting technology and the quality and size of your sales force. So clearly they were performing much worse than Google was, so that was a concern."); UPX0241 at -416 (Giannandrea: "If Microsoft need[s] to 'give away' the product at [redacted] TAC to get close to the current economics we would need to be really sure that [it's] strategic for both of us. [It's] a sure sign that their ad tech + marketplace is way worse (more than twice as bad in fact). BTW [it's] not so much about the scale of[] the advertiser network (they said [redacted] vs Adsense [redacted]) most of these advertisers churn out quickly. All the $$ is in the top [redacted].").

1323. After the initial August 2018 meeting with Microsoft, Apple's senior leadership had a series of internal meetings to discuss Apple's strategy with respect to a potential relationship with Microsoft on Bing. Tr. 2332:22-2333:8 (Giannandrea).

1324. After spending more time evaluating Bing, Apple's senior leadership agreed that Bing's search quality had failed to improve; that the failure to improve was due, in part, to Microsoft's much smaller investment in search; and that little credence should be given to Microsoft's representation of improved quality. [redacted] Tr. 2284:5-2285:22 (Giannandrea) (testifying with reference to UPX0242 that "in using [Bing] for a few days, I was worried that they were significantly worse in the long tail"); UPX0242 at -662 (Giannandrea: "I have been living on bing for the last few days. Mostly it works fine. Then in the odd long tail query it just doesn't. A recent example is 'annie lennox first band'. Google gets 'the tourists' as a web answer. Bing highlights the same answer but shows a box highlighting the Eurythmics. This worries me a lot."); DX0740 at .001 (email from Giannandrea describing an article concerning user experience with Bing: "Sums up Bing's problems, trying to be a portal, not linking out to the web when it thinks it has a vertical experience (video, recipes, etc.) and just further behind the curve on freshness and spam quality. [It's] what you would expect from a much smaller investment with a differentiate in verticals thesis."), 2286:20-23.

1325. Apple and Microsoft held another meeting in November 2018. After the meeting, Apple determined that Microsoft was unwilling to make further investment in Bing to bridge the product gap with Google. Tr. 2337:6-2338:10 (Giannandrea) ("[T]hey had represented to us in the first meeting that they knew they were behind in international coverage . . . . We asked them about that and they, in the second presentation, showed us a detailed presentation of an investment plan that would -- they believed would get them to parity in those languages, and it was quite -- I mean, my comment here about radical transparency was quite striking, that they gave us a detailed presentation of what they were not doing, presumably to motivate us to say, Hey if we invested in this together, we could do these things.").

1326. [redacted]

1327. [redacted]

1328. [redacted]

[redacted]

1329. [redacted]

1330. Apple's senior leadership also disapproved of a joint venture with Microsoft on Bing [redacted]. Tr. 2348:8-25 (Giannandrea) ("I think generally this option would have been a so-called joint venture option and nobody really liked that idea."); [redacted]

1331. Microsoft's proposals that Apple invest in Bing or that Apple buy Bing from Microsoft were viewed by Apple as desperate measures that indicated a lack of confidence in Microsoft's own search product. Tr. 2348:17-25 (Giannandrea) ("Microsoft was willing to sell Bing, which you wouldn't do if it was a strategic asset."); [redacted]

[redacted] Tr. 2511:12-21 (Cue) ("Q. And did Microsoft later increase its offer to [redacted] percent of revenue share? A. As they got more desperate, they increased their offer to [redacted] percent. They offered to have us invest in Bing. And at one point, offered to us to buy Bing. And they ultimately offered to basically give us Bing. [redacted] Tr. 2581:20-2582:6 (Cue) ("Q. Did you have a reaction to Microsoft offering to sell Bing to Apple in terms of Microsoft's belief and commitment to the Bing search product? A. I did. [redacted]. It was clear they were not investing, as I've stated earlier. They didn't want to continue investing, and so, to me, it was just a desperate move to get rid of it. And so I didn't see it as anything else. I mean, if it was any good, why would you -- if you think of it logically, if it was a great product -- I mean, we would never give away iOS to Microsoft for free, that's not something we would ever consider. So it's a weird offer.").

1332. In December 2018, Apple's CEO, Tim Cook, informed Microsoft's CEO, Satya Nadella, of his decision not to proceed with Microsoft's proposals relating to Bing, and explained Apple's concern with the product gap between Bing and Google and Microsoft's lack of strategic commitment to and investment in search. Tr. 2294:22-2295:2 (Giannandrea); DX0376.

1333. Apple and Microsoft continued to engage in discussions about opportunities involving Bing after 2018, including an approach from Mikhail Parakhin (Microsoft's then-newly hired head of Search) in 2020. Tr. 2295:17-2296:13 (Giannandrea).

1334. In late 2020, Apple decided to conduct a head-to-head evaluation of Bing and Google; the evaluation was carried out in 2021. Tr. 2296:20-2297:17 (Giannandrea), 2349:5-23 ("I recall a conversation in the fall of 2020 where . . . Mr. Tinter and Mikhail and some other people made some strong claims that they had continued to invest in Bing and it was better. And so I suggested that we should do our own evaluation.").

1335. Apple's head-to-head evaluation of Google and Bing did not support Microsoft's claim of improved quality of Bing; instead, it showed that Google had a strong lead in search relevance and that [redacted] Tr. 2349:24-2350:2 (Giannandrea) ("Q. Did your evaluation support the claims that Microsoft was making? A. When we finally did the evaluation and looked at it, it definitely did not."), 2303:9-16, 2304:3-12; [redacted]

1336. Apple's head-to-head evaluation of Google and Bing confirmed for Apple again that it should not switch the default search engine for the Safari browser from Google to Bing. Tr. 2350:3-16 (Giannandrea) ("Q. After you did the evaluation, which I believe was reflected in Exhibit [UPX0]260, did you have a different opinion as to whether Apple should switch the default search engine on Safari from Google to Bing? A. I had a definitive opinion that we should not. Q. And why did you hold that opinion? A. Because in the 2018 conversations we were relying on Microsoft's representations about the relative merits of Bing versus Google. And given that data, we decided not to proceed. [redacted]

[redacted]"), 2351:1-7 ("Q. And did you believe that switching the default search engine from Google to Bing on Mac computers, which is a desktop computer, did you think that would be the best thing for Apple's users? A. Well, regardless of whether or not they were equivalent, I believe that most users would switch back and so we would be making the default something they didn't want.").

1337. No Apple executive responsible for the Safari browser has told Microsoft that Bing was good enough for Apple to switch to as the default search engine on Safari. Tr. 2587:8-16 (Cue) ("Q. Are you aware of anyone at Apple who has told anyone at Microsoft that Bing was good enough for Apple to switch from Google to Bing as the Safari default search engine in the United States? A. Again, I can't imagine anyone would, but I'm not aware of it. I know I didn't do it; I know Tim [Cook] didn't do it; I know Phil Schiller didn't do it; I know Craig Federighi didn't do it. We're the executives at Apple that are responsible for Safari search, we never felt that way.").

1338. Apple did not believe that it would be in Apple's best interest to switch to Bing in the United States but keep Google as the default search engine for certain ex-U.S. countries. Tr. 2588:22-2589:4 (Cue) ("Q. Have you ever believed that it would be in Apple's best interests to switch to Bing in the United States but keep Google as the Safari default in certain countries outside the United States? A. No. Again, we look at it country by country. In the United States, Google is the best search engine by far -- in most countries they are, actually. And in a few countries they're not, and in those we try to carve it out.").

1339. Apple did not indicate to Microsoft that Apple was prepared to switch the Safari default from Google to Bing after the ISA term in the United States but was prevented from doing so by the ISA; nor did Apple believe that the ISA prevented it from doing so. Tr. 2589:5-19 (Cue) ("Q. Did you or anyone else from Apple ever tell anyone at Microsoft that Apple was prepared to switch the Safari default from Google to Bing in the United States, but it was prevented from doing so by Apple's contract with Google? A. No, we wouldn't -- again, I didn't view that we were prevented from doing it. We were prevented from doing it over a time period. If we thought that Bing was the best search engine, even if we were under contract, we would have continued the discussions and done a deal with Bing whenever the term expired. There was no point in time where there was any deal to be done with Microsoft -- I've stated this before. It was never close. We never traded term sheets, we never traded a contract.").

6. History of Apple's Assessment of DuckDuckGo

1340. Apple determined that DuckDuckGo's search quality is not satisfactory because DuckDuckGo is dependent on Bing for its search results. Tr. 2505:3-16 (Cue) ("One thing that is a problem with DuckDuckGo . . . is DuckDuckGo's back-[end] basically searches Bing, so it doesn't have its own search engine. And so they're dependent on Bing. Bing certainly wasn't anywhere near as good as Google."); Tr. 2352:19-2353:4 (Giannandrea) ("Q. To your knowledge, has Apple considered using DuckDuckGo as the default search engine on the Safari browser? A. Not to my knowledge, no. Q. Why not? A. Because DuckDuckGo is, I would describe, a veneer on top of other search engines, specifically Yahoo! and Bing. Q. What do you mean by "a veneer on top of"? A. Well, in order to be a functional search engine, they have to get most of the results from a much larger search engine.").

1341. Due to these quality concerns, Apple determined that it should not set DuckDuckGo as the default search engine for the Safari browser. Tr. 2506:25-2507:3 (Cue) ("Q.

Would you consider DuckDuckGo as an option to be set as the default in the Safari browser? A. No, I would not. That would not be a good thing for our customers."), 2507:4-2508:2 ("Q. And did you consider DuckDuckGo as an option to be set as the default in the Safari browser in 2016? A. No, we did not. Again, that is not a good choice for customers. . . . And so one of the things we've been very clear on from an Apple point of view is, privacy is of utmost importance, but you can't [do] privacy by providing an inferior product. . . . So I don't think it was a good choice to make as a default then, and certainly not a good choice -- it's an even worse choice today.").

1342. Apple also determined that it should not set DuckDuckGo as the default in the Safari browser [redacted] Tr. 2355:2-23 (Giannandrea) ("I knew there were some people at Apple who were excited about the privacy claims that they [DuckDuckGo] were making, specifically, that when they sent searches to Bing, they hid the IP[] addresses of the original browser. [redacted] DX0375 at .001 (Giannandrea: "Just so you know, DDG is actually just the Bing API [redacted]."); DX0377 at .001 (Giannandrea: "Duck Duck Go is really just a franchise of Yahoo's Bing deal. As I mentioned to you in person, [redacted]

[redacted]

1343. Apple further determined that it should not set DuckDuckGo as the default search engine in the Safari browser because DuckDuckGo is not preferred by a majority of Apple's users. Tr. 2593:16-2594:7 (Cue) ("Q. Do you think that DuckDuckGo's differentiation proposition makes it preferred by a majority of Apple's users? A. No, it's not. I think it's preferred by a small minority. . . . In the case of DuckDuckGo, it is the Bing search results, and so it suffers from that issue. So no matter what you do on the privacy side, you have the issue that the search results just aren't good enough."); Tr. 2360:24-2361:11 (Giannandrea) ("Q. And to your knowledge, has Apple internally ever decided that it would be better for Apple's users to make DuckDuckGo the default search engine for any experience, public or private, for Safari? A. Not to my knowledge, no."); [redacted]

1344. Mr. Giannandrea determined that DuckDuckGo's marketing claim of privacy overstates the extent of its actual protection of user privacy. Tr. 2360:4-23 (Giannandrea) ("Q. Have you evaluated DuckDuckGo's public privacy claims? A. Yes, from time to time I've read it in detail. And my opinion is that their marketing about privacy is somewhat incongruent with the details. They're in small print. Q. And how so? A. Well, because in order to make money in DuckDuckGo, they use Bing's advertising ecosystem, and in order to do that they have to allow Bing to do IP address tracking.").

7. History of Apple's Assessment of Neeva

1345. Eddy Cue (Apple's Senior Vice President of Services) reached out to Sridhar Ramaswamy (Neeva's co-founder and CEO) to learn more about the product after reading a news article about the Neeva search engine. Tr. 2591:22-2592:5 (Cue).

1346. Several months after the initial outreach, Apple evaluated the Neeva search engine and determined that it was too early-stage to function as a default general search engine on Safari. Tr. 2592:6-15 (Cue) ("Q. And did you evaluate the Neeva search engine? A. We did. It was very early on, so when I first called him there was nothing yet that actually worked. . . . I think it was several months later -- I don't recall the exact timing of it, it became available . . . . [I]t was way too early, it was an early product. It had some interesting ideas, I will say, but it was in no shape to be a general search engine at that point.").

1347. [redacted]

B. Mozilla Deals Going Back to 2004

1. Mozilla's Product Designs for its Firefox Browser

1348. Since the launch of the first version of the Firefox browser in 2004, Mozilla has consistently designed the browser to have a default search engine along with offering users options to select multiple other search engines, either for one-time use or as the user-selected default. DX0268 at .001 (Mozilla stating, in releasing Firefox 1.0 web browser in 2004, that "Firefox tightly integrates support for leading search services into the toolbar, including Google search, Yahoo!, eBay, Amazon, Dictionary.com, Creative Commons, and more"); Baker (Mozilla) Dep. Tr. 47:24-48:1, 48:3-49:11 ("Q. Has that structure that you described always been in place on the Firefox browser since it was first introduced? A. Firefox browsers have had a search box for a long time before 1.0. . . . The concept of a default search has always been there and from when we made a consumer product, so Firefox 1.0, the prevalen[ce] or the existence of multiple search engines in the product has always been there. . . . [T]hat's rare, you know, and that was a requirement to -- of our first deal, that we were not doing anything exclusive and we would honor user choice. And that turned out to be kind of rare in the tech industry. You know, Microsoft has overridden people's default to Firefox. I think last November [2022] they did it yet again. . . . [W]e work hard to go in the opposite direction and help promote discovery for the other search engines are there, and Firefox, you can change the default if you want, and even easier, every time you do a search, we give you the option of another search engine so you can do a search in Amazon or Bing, you know, right there if you want to.").

1349. Mozilla believes that its Firefox browser is more appealing to users if the browser includes a default search engine such that queries entered in the built-in search box are automatically routed to one search engine, without the user having to take any further action to select a search engine. Baker (Mozilla) Dep. Tr. 46:24-47:23 ("[T]he software that we use is complex enough when you get to the computers and devices, that many users want their device or the software -- I'll talk about browsers. You want the browser to work when it starts, and so the default -- in Firefox, the default in the search box, the awesome bar in Firefox, is what happens if the user makes no choice.").

1350. Mozilla seeks to make it easy for Firefox users to find and use non-default search engines. Baker (Mozilla) Dep. Tr. 46:24-47:23 ("We're very big on choice, and so it's always been a key princip[le] of our search philosophy that users always have choice, and we try to make it easy for people to pick a different search engine if they want it. It's right there in the UI and we reject exclusivity, and so we try to make it easy for people to find other search engines and to use them . . . .").

1351. Mozilla's design allows Firefox users to select and use an alternative search engine simply by clicking on a caret in the search box, which opens a drop-down menu offering a choice of multiple alternative search engines. Baker (Mozilla) Dep. Tr. 57:6-12 ("Q. Could you -- could you explain using the graphic, Ms. Baker, how a user would select a different search engine in Firefox? A. If you looked at the box with the rounded edge at the top and there is the caret at the left, that caret gives you this drop-down menu and then you select the one you want."); DX2036 at .002 (Mozilla press release showing the Firefox drop-down menu offering choices between Yahoo, Google, Bing, DuckDuckGo, Amazon, Twitter, and Wikipedia).

1352. Firefox users can also select and use an alternative search engine on a query-by-query basis by clicking on icons for alternative search engines in the course of entering a query. DX0280 at .004 (Firefox displaying "This time, search with" messaging along with clickable icons for Bing, DuckDuckGo, and other search engines).

1353. In 2021, Mozilla launched a feature known as Firefox Suggest, which provides suggestions—including suggestions from search engines other than Google—as the user is entering a search in Firefox's built-in search box. Baker (Mozilla) Dep. Tr. 90:4-91:3 ("Q. Can you explain using the graphic how Firefox Suggest works? A. Firefox Suggest -- as you type, Firefox Suggest provides suggestions of what you might be looking for and that allows you to go there directly."), 93:1-6 ("Q. If you'd turn to page four of exhibit 10, can you explain the different search engine that Firefox Suggest proposes to the user in that query? A. In this example, Firefox Suggest asks if you're interested in shopping for Van shoes on eBay."); DX0280 at .001-.004 (Mozilla press release containing graphics of Firefox Suggest directing users to suggestions from Google, eBay, and Wikipedia).

1354. Mozilla has maintained commercial relationships, including search revenue share agreements, with certain of the alternative search engine options in Firefox browser. Baker (Mozilla) Dep. Tr. 57:13-58:4 ("Q. Has Mozilla had commercial relationships for revenue sharing with some of the other search engines listed in this graphic in exhibit two? A. Yahoo!, yes; Google, yes; Bing, yes; DuckDuckGo, yes. . . . Amazon, as I said, we had an affiliate, and Amazon has an affiliate program, and so this Amazon.com may well have gone to an affiliate program."); DXD-37.050 [redacted]; DX1005 [redacted]) at .001-.006 (§§ 1, 3.1, 5.1); DX0984 [redacted] at .010 (§ 6.1); DX0991 [redacted] at .007 (§ 6), .016 (Schedule 1 Table 4); Tr. 2092:21-23 (Weinberg) ("Q. DuckDuckGo shares revenue with Mozilla stemming from certain queries in the Firefox browser, right? A. Yes."); DX0947 [redacted] at .004 (§ 4.1), .016 (Ex. D); DX0953 [redacted] at .003 (§ 10); DX1020 [redacted] at .002 (§ 2), .007-.008 (Ex. B).

1355. Google and Mozilla have never entered into an agreement that either (1) restricts an end user from changing the default search engine of Firefox browser or (2) restricts Mozilla from integrating search engines other than Google into the Firefox browser. *See, e.g.*, JX0065 [redacted]

1356. Mozilla believes that having a default search engine that can be changed by users balances Mozilla's mission of user choice with the consumer interest in convenience and ease of use. Baker (Mozilla) Dep. Tr. 55:2-56:7 ("Q. Did you consider setting a default search engine to be inconsistent with Mozilla's mission of user choice? A. We do not consider that at odds. . . . [W]hat's highly unusual about Mozilla is that we're trying to create this internet accessible to all with the characteristics of a manifesto by competing in the consumer marketplace. . . . [T]he hard part is we -- balancing like the purity of what we want or the purity of the manifesto with the consumer marketplace because consumers are very often interested in convenience, ease, and often choice and something isn't working . . . . [A]nd so we felt, A, consumers are choosing Google. We're making search easy for them, and we had added choice in this product in a way that no one else had or had even thought of, and we're making it easy. So that's a pretty good balance."); DX0268 at .001 ("The Mozilla Foundation, a non-profit organization dedicated to preserving choice and promoting innovation on the Internet . . . .").

1357. Mozilla has determined that designing the Firefox browser to have a default search engine provides a superior user experience compared to a search engine choice screen. Baker (Mozilla) Dep. Tr. 300:2-4, 300:7-21 ("Q. Ms. Baker, has Mozilla ever considered offering a search engine choice screen to users when they first download the Firefox browser? A. We -- we consider the user experience . . . . And like the law of physics[,] in software cases that people say they want choice, but they don't want to . . . make decisions, and so you can see like there is research among lots of places. The more -- the longer it takes people to get to what they want to do, the more dropoff there is, and our experience is that, you know, people like opening up the browser and being able to do what they want to do. So, yeah, we thought about it from the very early days and decided that the best consumer experience was to have the default, the thing that people who don't want to think about search engines expect, and then to make it very easy after that.").

1358. Most of the revenue that Mozilla uses to develop and maintain Firefox comes from its search revenue share from Google. Baker (Mozilla) Dep. Tr. 39:1-2, 39:4-15.

1359. In addition to Firefox, search revenue share from Google has funded the development of other products by Mozilla. Baker (Mozilla) Dep. Tr. 45:15-17, 45:19-21.

2. History of Mozilla's Selection of a Default Search Engine for the Firefox Browser

1360. Mozilla has determined that the quality of the integrated search experience offered by the web browser is one of the most critical characteristics or features of the browser. Baker (Mozilla) Dep. Tr. 33:21-24, 34:1-14.

1361. Around the time of its release of the first version of the Firefox browser in 2004, Mozilla evaluated whether Yahoo should be the default search engine in Firefox. Baker (Mozilla) Dep. Tr. 52:22-53:3.

1362. In 2004, Mozilla determined that Google offered the highest quality search experience, and that setting it as the default search engine would be the best option for Mozilla and its customers. Baker (Mozilla) Dep. Tr. 52:4-6, 52:8-19 ("Q. At the time that Mozilla entered into this agreement, did it consider Google to be offering a high quality search product to users? A. When we entered this agreement, there was nothing in the world like Google. Prior to Google, there had been Excite and Infoseek and the Yahoo! directory. I am not sure if Microsoft had started their search at this time, but Google was way ahead. Like search in those days was miraculous and so there was nothing like Google. I mean, it's hard to remember how earth-shattering search was when Google changed the game with their page rank from what, you know, Yahoo! had been doing or the other things that we called search.").

1363. [redacted]

1364. [redacted]

[redacted]

1365. In 2014, Mozilla switched from Google to Yahoo as its preset default search engine for Firefox browser in the United States. Baker (Mozilla) Dep. Tr. 62:9-18.

1366. Mozilla and Yahoo entered into a Strategic Agreement effective December 1, 2014, which provided that, subject to certain conditions, "Mozilla will configure Yahoo as the Default Search for all Search Access Points" for the Firefox browser in the U.S. (and certain international markets provided that Yahoo meets certain launch criteria with respect to these markets as set forth in the Strategic Agreement). DX1012 at .011-.014 (§ 3.1.3), .030-.034 (Attach. C); DX2036 at .002 (Mozilla press release: "Under a new five-year strategic partnership announced today, Yahoo Search will become the default search experience for Firefox in the U.S.").

1367. When Mozilla switched to Yahoo in 2014, Mozilla did not consider Yahoo to be on par with Google in terms of search quality. Baker (Mozilla) Dep. Tr. 71:2-5 ("Q. At the time that you selected Yahoo!, did you consider Yahoo! to be on par with Google in terms of search quality? A. We did not.").

1368. Mozilla nevertheless selected Yahoo instead of Google as the default search engine for Firefox in 2014 because Yahoo had a turnaround CEO with a search background, wanted to make a big bet on Mozilla, and appeared willing to work with Mozilla to innovate and invest in quality search results and a quality search experience. Baker (Mozilla) Dep. Tr. 70:11-71:1, 71:6-7, 71:9-72:9 ("We selected Yahoo! for the ability to work with -- you know, a new

CEO, a turnaround CEO from a search background, who was -- wanted to make a big bet on us and search . . . . [W]e expected that the relationship between Mozilla and Yahoo! or Firefox and Yahoo! Search engine would be a significant part of the future of each of the two companies. . . . We expected to be able to work with Yahoo to innovate, and we expected them to invest in a set of specific things about search results or search experience that I think were outlined in the contract.").

1369. Mozilla believed that if Yahoo invested in its search quality and search experience as outlined in the Mozilla-Yahoo Strategic Agreement, Yahoo could get to parity with Google. Baker (Mozilla) Dep. Tr. 71:6-7, 71:9-72:13.

1370. In 2017, Mozilla terminated the Mozilla-Yahoo Strategic Agreement because Yahoo was not delivering satisfactory search quality and search experience. Baker (Mozilla) Dep. Tr. 77:18-20, 78:9-12 ("Q. Ms. Baker, in your view, did Yahoo! comply with its obligations in its agreement with Mozilla in exhibit five? A. I felt strongly that Yahoo! was not delivering the search experience that we needed and had contracted for and our users were telling us that."); Ramalingam (Yahoo) Dep. Tr. 384:4-6, 386:9-17 (discussing DX0714); DX0714 at .001 [redacted] Tr. 6043:14-21 (Whinston) ("Q. Now, Mozilla's decision to switch from Google to Yahoo! for the Firefox default resulted in significant harm to Mozilla, correct? A. Mozilla wasn't happy in the end. Q. The switch from Google to Yahoo! for Firefox harmed the quality of the Firefox user experience, correct? A. I think they were disappointed with what Yahoo!'s performance was.").

1371. Mozilla also determined that, contrary to its expectations, the number of ads on Yahoo's search result page had increased. Baker (Mozilla) Dep. Tr. 71:6-7, 71:9-72:9 ("Q. And how did you expect to address that problem [*i.e.*, Yahoo not being on par with Google in terms of search quality]? A. We expected Yahoo to reduce the number of ads. . . . Yahoo had many, many, many more ads on a search results page, and so we expected that to decline.").

1372. Mozilla observed that usage of the default search functionality in Firefox declined noticeably during the years that Yahoo was the default search engine due to Yahoo's inferior quality. Baker (Mozilla) Dep. Tr. 75:4-76:4 ("A. And the other piece that I remember is that we had high dropoff of users . . . . Q. Can you explain, Ms. Baker, what you mean by 'high dropoff of users'? A. By high dropoff of users, I meant the number of Firefox users who use the default search functionality."), 235:25-236:4 ("Q. If Yahoo had improved the quality of its search engine when it was the Firefox default, do you believe more Firefox users would have stuck with Yahoo? A. Yes."); Tr. 6054:11-18 (Whinston) ("Mozilla found out that people would leave Yahoo! if Yahoo! wasn't doing a good job."); DX0541 at .002 [redacted]

1373. Mozilla observed that the number of users of the Firefox browser also declined noticeably during the years that Yahoo was the default search engine. Baker (Mozilla) Dep. Tr. 76:5-23 ("Q. Did the loading of Yahoo as the default search engine also impact the number of users who stayed with Firefox? A. The number of users who stayed with Firefox declined noticeably during the years when Yahoo was the default. . . . We found our users trying all sorts of different ways to get back to Google, and we experienced lots of people leaving Firefox and, you know, many of them we can't trace directly, but, you know, Chrome marketplace grew at that time, so you assume a good portion of them just went to Chrome where Google Search is built in.").

1374. Despite Mozilla setting Yahoo as the default in Firefox in the U.S. in December 2014, Google continued to receive more queries from Firefox users in the U.S. than Yahoo. Tr. 9761:23-9764:1 (Murphy); DXD-37.055 [redacted]; Tr. 6079:24-6080:10 (Whinston) ("Q. And once the dust settled, after Mozilla had made that switch, the large majority of search queries were sent to Google, even though Google was not the default on Firefox, right? A. I think we -- you know, I showed the market shares yesterday in a figure, and so it still was, I would say, the large majority, yes."); UPXD101.055 [redacted] DX0727 at .001 [redacted]; DX0728 at .001 [redacted] DX0729 at .001 [redacted]

1375. After terminating its agreement with Yahoo, Mozilla set out to select a default search engine based on user preferences and the nature of the relationship between Mozilla and the search provider. Baker (Mozilla) Dep. Tr. 79:20-80:6.

1376. Mozilla chose to switch its default back to Google in the United States in 2017 based on user expectations and preferences. Baker (Mozilla) Dep. Tr. 80:15-24 ("Q. Which search engine did Mozilla actually choose to replace Yahoo!? A. We replaced Yahoo! with Google. Q. And why did you choose Google? A. Because our users made it clear that they look for and want and expect Google, and that when they get Google Search results and Google as the default, that's what they expect, and they're happy, and because we were able to reach an agreement with Google, that made sense for us."); Tr. 6055:13-22 (Whinston) ("Q. And would you agree that the evidence in this case is what Mozilla entered into its agreement with Google in 2017, because Mozilla believed Google provided the best quality search engine to be the default for Firefox? . . . . A. . . . Yeah, I think in 2017, that was their view."); DX0543 at .006 [redacted]).

1377. In 2020, Mozilla decided to extend the terms of its agreement with Google because Google was providing the default search experience that Mozilla wanted for its customers. Baker (Mozilla) Dep. Tr. 87:17-24; DX0546 at .001 [redacted]

[redacted]).").

1378. Mozilla continuously has discussions with other search engines to assess other options in connection with the Firefox default and also conducts experiments to evaluate user preferences for search engines in advance of the expiration of its agreement with Google. Baker (Mozilla) Dep. Tr. 269:20-269:22, 269:25-270:1, 270:11-270:22.

1379. In 2021-2022, [redacted]. DX0548 at .002 [redacted] .003 [redacted], *id.* [redacted] .004 [redacted]

[redacted] *id.* [redacted], .005 [redacted] Tr. 9724:20-9725:12 (Murphy) ("[I]n general, they found less satisfactory results with the Bing users, I guess is the bottom line. But it also tells me they're continuing to evaluate, what's our alternatives out there, is Bing where we want to go with this."); DXD-37.026 [redacted]

3. Mozilla's Letter to the U.S. Department of Justice

1380. In September 2020, prior to the filing of these actions, Mozilla advised the U.S. Department of Justice of the harm to consumers and competition in the browser market that would result from a prohibition of default search agreements between Google and independent browser companies. DX0547 at .001 ("We appreciated having an opportunity to further explain why consumers and competition in the browser market would be significantly harmed if the U.S. Department of Justice Antitrust Division brings an enforcement action that prohibits small and independent browser companies, such as Mozilla Corporation, from entering into default search agreements with Google."); Baker (Mozilla) Dep. Tr. 94:15-19, 95:1-95:4 ("Q. Did Mozilla authorize its lawyers at Crowell & Moring to send this letter to the Department of Justice? A. Yes."), 102:2-7 ("Q. Ms. Baker, did the Department of Justice interview you before it brought this lawsuit? A. Interviewed me personally? Q. Yes. A. No.").

1381. Mozilla explained that it would be harmed from not being able to enter into a default search agreement with Google because Google provides the best user experience and is preferred by Firefox users. Baker (Mozilla) Dep. Tr. 96:10-13, 96:21-98:3 ("Q. Ms. Baker, can you explain why it is that Mozilla's ability to compete in the browser market would be severely undermined in the manner explained in the letter? A. We would suffer harm in a set of different ways. One, our users have shown us that when Google isn't default, they find ways to get to Google. They type in Google.com. They change the default. They go elsewhere. So that puts us in a fight with our users."); DX0547 at .002 ("Mozilla Corporation has carefully weighed the quality of the search product and user experience offered by both Google Search and Microsoft Bing and has determined that 'Google is the clear winner when it comes to product experience and what users want.'"); Baker (Mozilla) Dep. Tr. 100:3-16, 100:18-24 (Baker confirming that the above-quoted portions of DX0547 remain her view at the time of the deposition and additionally testifying: "[I]f you look at the desktop computers in the world, Microsoft has a massive, massive, massive amount of that, and they ship with Bing and even with that level of putting their products in front of users, users go to Google").

1382. Mozilla also believed that it would be harmed from not being able to enter into a default search agreement with Google because Microsoft's Bing—which Mozilla viewed as the "only remaining option"—has poor retention, lower search volume, and lower monetization rates. DX0547 at .002 ("Mozilla Corporation's analyses have shown that Microsoft Bing, when compared to Google Search, has poor user contention, lower follow-on search volume, and lower monetization rates -- all of which would significantly threaten Mozilla Corporation's competitive and financial viability."); Baker (Mozilla) Dep. Tr. 100:25-101:11, 101:13 (Baker confirming that the above-quoted portions of DX0547 remain her view at the time of the deposition).

1383. Mozilla also believes it would be harmed by not being able to enter into a default search agreement with Google because Microsoft has a history of, and still engages in, conduct that thwarts user choice. Baker (Mozilla) Dep. Tr. 96:10-13, 96:21-98:3 ("Q. Ms. Baker, can you explain why it is that Mozilla's ability to compete in the browser market would be severely undermined in the manner explained in the letter? A. We would suffer harm in a set of different ways. . . . [W]hen Microsoft has a power of market, it is not a good partner. That's been true for much of its history, and we see it with its operating system today. Microsoft continues to try to thwart consumers to use Firefox. It uses its operating system. It overrides user choice in order to make it hard to use Firefox, and, you know, to make it harder for people to switch from Bing, but our issue is our experience with Microsoft, when they have power, they use it in ways, you know, that our experience is far worse than our relationship with Google. . . . [Given] -- you know, Microsoft has the power of the market. It's the only option. No history of Microsoft being generous in that setting. So I wouldn't know what a negotiation looks like. Sorry, I had no choice. You've been trying to kill Firefox every way you can. You're our only possible partner. That's like a death spiral. And then . . . I'd say that we worked to build, as I said earlier, you know, protocols and internet capabilities, and Microsoft is not a partner in that either. So you add all those up and here we are stuck with a company that, you know, actively uses its operating system to thwart user choice to Firefox as our partner? Like business negotiations don't go well in that setting."); DX0547 at .002 [redacted] *id.* [redacted]

C. No Substantial Foreclosure of Rivals

1384. Because the provisions in Google's agreements with Apple and Mozilla do not prevent rivals from accessing or otherwise competing for the default or for any users, they do not foreclose any portion of Plaintiffs' alleged relevant market. Tr. 9689:4-9691:18 (Murphy) ("Foreclosure is about limiting the ability of rivals to compete, right. It's not about whether rivals win or lose, it's about do they have the opportunity to compete."), 10006:17-25 ("[I]f people are not denied the ability to compete, there's no foreclosure.").

1385. Competition for users occurs in multiple ways, including: (1) competition to be preloaded on a device or a browser default search provider and (2) competition for users to select a search engine other than a preloaded or browser default search provider. Tr. 9701:25-9703:1 (Murphy), 9775:25-9781:18 ("So it's not that 33 [percent covered by the default in Professor Whinston's estimation] is off-limits. [Super Duck] can compete for that, both against it before he competes for the default, and for it once he gets the default. So nothing is really off-limits to Super Duck. And if you think about a world where Super Duck can win 67 percent right upfront and then compete for the rest when [the default] comes up [for bid], I don't know how in the world you'd call that foreclosure. How could Super Duck be foreclosed? They could win more than half the market off the bat and compete for the rest.").

1. Competition to Be a Preloaded or Browser Default Search Provider

1386. Google's agreements with Apple and Mozilla do not prevent rival search providers from competing to be a preloaded search provider on any device or a browser default search provider. To start, the agreements are the outcome of competition on the merits between Google and rivals, and rivals are able to compete against Google to win a browser search default deal when those deals come up for bid. *See supra* §§ XI.A.3, 5-7, XI.B.2.

1387. At trial, DOJ Plaintiffs' expert agreed that competition on the merits refers to competition based on the quality of a firm's product and the efficiency of its production. Tr. 6051:13-16 (Whinston).

1388. The evidence shows that Google has won default search agreements with Apple and Mozilla due to its superior quality and monetization. Google effectively has offered browser providers the highest-quality and lowest-priced search service in the United States. Tr. 5930:20-5932:4 (Whinston) (acknowledging Google has had a "search quality advantage over a rival general search engine" since at least 2010); Tr. 6041:15-23 (Whinston) ("Q. You've offered an opinion in this case, in connection with your monopoly power opinion, that Google's search quality was significantly superior to Bing's from 2015 to 2021, correct? A. Yes."); Tr. 9722:9-9727:5 (Murphy) ("Well, so the fact that Google wins based on price and quality is what you would expect if the market is competitive, right. . . . If you have a producer that has the highest quality and the lowest cost, an industry like this where there's no capacity constraints, you might expect, in fact, them to win a large share of the business."); UPXD102 at 55 (Whinston Demonstrative: "Google has significant advantages over its general search rivals" including: "[s]earch services quality," "[b]rand image and reputation," and "[m]onetization advantages, especially in mobile").

1389. When evaluating which default search engine to select, Apple considers search quality to be the most important factor. Tr. 2574:15-23 (Cue) ("Q. What were the most important factors that you considered when evaluating which default search engine to select for Safari during that 2015-16 timeframe? A. We were interested in making sure that we picked the best one, the one that provided the best results to customers. Obviously we looked at it across multiple countries around the world. Those were the primary functions of it. Secondarily was how well they monetized. But primarily, as I said, we wanted to have the best search results for our customers.”); [redacted]

1390. Over the past years, Apple considered whether to partner with other search providers to be the default for the Safari browser, but chose Google because Google delivered a superior user experience. [redacted] *see supra* §§ XI.A.2, 5-7.

1391. Microsoft has approached Apple multiple times in the past 10 years about a potential framework for the Safari search default deal. But each time, Apple determined that Bing’s search quality, investment levels, and monetization were not strong enough to be a viable option for Apple. *See supra* § XI.A.5; Tr. 2511:22-2512:19 (Cue) (“Microsoft search quality, their investment in search, everything was not significant at all. And so everything was lower. So the search quality itself wasn't as good. They weren't investing at any level comparable to Google or to what Microsoft could invest in. And their advertising organization and how they monetize was not very good either.").

1392. Before entering the current agreement, Apple concluded that Google was likely to remain the best search engine in the United States for the duration of the agreement. Tr. 2528:22-2530:13 (Cue) ("Q. And you concluded that it was a sure thing that Google would remain the best search engine in the United States for the duration of Apple's ISA agreement with Google? A. Yeah, I believe that to be the case. We've been working with Google for over 20 years. They've continued to invest and improve the product in a significant way. . . .").

1393. Apple is willing to partner with rivals on future search default agreements in the United States if they can provide a better search experience. Tr. 2528:22-2529:12 (Cue) ("And ultimately, these agreements, as we shared together earlier, they end up having expiration dates, they have an expiration date in one country or another. At the end of the day, if Google, over time, for some reason somebody else came in and was better, we'd have the ability to switch. And in the short term, customers would have the ability to switch. And my experience with this is really clear. I've always believed the best product always wins."); [redacted]

1394. Indeed, Apple has chosen to partner with search providers other than Google in certain international markets where Apple believed the rival provided a better product. [redacted] Tr. 2478:9-23 (Cue) ("We don't treat our customers differently around the world. We want them all to have the best experience. And so in the countries where Google was providing the best experience, we did that. In the countries where they were not, we did not do that.").

1395. Mozilla has also considered other search providers to be the default search engine for its Firefox browser, and indeed used another for a period, but has chosen Google as the current default search provider due to its superior quality. Baker (Mozilla) Dep. Tr. 100:3-16 (agreeing that "Mozilla Corporation has carefully weighed the quality of the search product and user experience offered by both Google Search and Microsoft Bing and has determined that Google is the clear winner when it comes to product experience and what users want."); *see supra* § XI.B.2.

1396. As discussed above, from 2014 to 2017, Mozilla chose to partner with Yahoo as the default search provider on Firefox in the United States (while retaining Google as its principal default search provider in international markets) after Yahoo committed to improving its quality. However, Yahoo failed to meet those commitments, resulting in Mozilla terminating the agreement due to Yahoo's poor quality. *See supra* § XI.B.2.

1397. In 2017, when determining which search provider to replace Yahoo with, Mozilla evaluated various options and chose Google based on its superior quality. *See supra* § XI.B.2.

1398. In 2021-2022, as part of determining whether to renew its agreement with Google, Mozilla conducted an experiment to evaluate Bing's quality by setting Bing as the default on Firefox for a small percentage of its users. *Supra* § XI.B.2.

1399. [redacted]

1400. Google's agreements with Apple and Mozilla to be the default search engine for the Safari and Firefox browsers are the product of competition. Rivals competed to win those agreements, but lost due to their inferior product quality and monetization. These rivals continue to have the ability to compete for future deals to become the default search provider on Apple's Safari and Mozilla's Firefox browsers, and nothing in Google's current agreements prevent them from doing so. Tr. 9775:25-9781:18 (Murphy) ("Say, Whinston's assumptions, 100 percent. Super Duck comes in, runs the table on the first 50 percent because it's open, they just win the

50. They win the 17, too, competing against the default. Now, what's going to happen when that contract comes up? They're going to win that too.").

2. Competition on Browsers Where Google is the Default

1401. Even if a rival search engine is not successful in competing to be the default search engine for a particular browser, it can still compete for users *against* Google when Google wins the default. Tr. 9701:25-9703:1 (Murphy).

1402. To begin, Google's agreements with Apple and Mozilla are non-exclusive and rivals can (and do) obtain promotion for their search engines on the Safari and Firefox browsers. Tr. 9753:15-9755:25 (Murphy).

1403. The agreement with Apple does not prevent Apple from preloading any search engine on an Apple device. For instance, Apple could preload a rival search provider's app or widget on Apple devices. Tr. 6065:11-6066:25 (Whinston); JX0033 (2016 ISA Amendment) at -793-796 (§ 1).

1404. Apple also promotes other search providers within the Safari browser. For instance, Apple has promoted other search providers by providing a "bookmark" within the "Favorites" page which appears when opening a new Safari window or tab. Tr. 9751:21-9752:20 (Murphy); Tr. 6165:3-8 (Whinston); DXD-37.047.

1405. In addition to its agreement with Google, Apple has entered into promotional agreements with [redacted]

1406. [redacted]

[redacted] Tr. 2627:19-2628:1 (Cue) (agreeing that "Apple is obligated to make it easy for users to be able to switch the default search engine in Safari").

1407. Previously, Apple also provided the ability for certain search engines to prompt users to switch the search default. Apple discontinued this capability after determining that rivals were abusing this process, leading to a poor user experience. Tr. 2628:16-2629:20 (Cue).

1408. Mozilla, too, provides promotion to other search providers on its Firefox browser. For instance, each time a user clicks on the address bar in Firefox, Mozilla provides users the option to "this time search with" multiple rival search providers, including Bing and DuckDuckGo. Tr. 9756:2-22 (Murphy); DXD-37.049.

1409. [redacted]

1410. And Mozilla's Firefox browser is not preinstalled on any of the major mobile or desktop devices. Instead, Firefox users chose to download Firefox onto their device. Tr. 619:14-21, 628:6-16 (Rangel).

1411. Both Apple and Mozilla purposefully designed their browser settings to allow customers to easily change the default search provider. *See supra* §§ XI.A.1, B.1.

1412. In addition, even if search rivals do not have a search promotion deal with Apple or Mozilla, users are able to access rivals by navigating to the search provider's website. And users can download rival apps and browsers on Apple devices from the Apple App Store. Tr. 9757:9-9758:7 (Murphy); DXD-37.051.

1413. A significant portion of search on Apple iOS devices—[redacted]—flowed through search access points other than the Google Safari default. Tr. 9758:9-9761:22 (Murphy); Tr. 6072:23-6079:9 (Whinston); DXD-16.006-.007; DXD 37.052.

1414. And from December 2014 to October 2017, when Yahoo was the default on Mozilla, only 23% of Firefox searches were conducted on the Yahoo default. Tr. 9761:23-9764:5 (Murphy); DXD-37.055.

3. Plaintiffs' Flawed Foreclosure Estimates

1415. According to Professor Whinston, Google's challenged agreements "cover" 49.7% of U.S. queries in their alleged search market, of which Google's Apple agreement "covers" [redacted] and other third-party browsers with whom Google has a default search agreement "cover" [redacted] Professor Baker did not provide a "coverage" number broken out by category, but his total estimate of "covered" queries was similar to Professor Whinston. Tr. 5763:14-22 (Whinston); UPXD104 at 36; Tr. 7089:3-7090:3 (Baker (Colorado Plaintiffs' Expert)); PSXD-12. Professor Whinston also claimed that Google's challenged agreements "cover" 45% of U.S. revenue in Plaintiffs' alleged general search text ad market and 36% of U.S. revenue in Plaintiffs' alleged search ad market. Tr. 5772:20-5773:7 (Whinston); UPXD104 at 39-40.

1416. Plaintiffs' experts agree that Google's contracts do not foreclose rivals from all of the search traffic that the contracts cover because Google would have served some of this search traffic even without the contracts. Professor Whinston estimated that if a search engine other than Google had won the default on all Apple, Android, and other third-party browser deals, then approximately 33% of total U.S. search queries may have shifted from Google to other general search engines. Tr. 5749:17-5750:22 (Whinston); UPXD104 at 31; Tr. 7092:10-7093:10 (Baker); PSXD-11 at 69 (suggesting Google would lose "~60% to ~70%" of revenue on 50% of queries under a Google default agreement).

1417. Both Professor Baker's and Professor Whinston's estimates rely in part on user switching on Apple Maps, which had several significant differences compared to users switching default search services. *See supra* § VII.A.

1418. Although Plaintiffs' foreclosure estimates rely on a search engine other than Google exclusively winning all browser deals in the United States, Plaintiffs' experts have not offered the opinion that Apple, Mozilla, and other third-party browsers under contract with Google would have chosen to use a different default search provider but for the challenged provisions in the agreements with Google. Tr. 6087:18-6089:19 (Whinston).

1419. At trial, Professor Whinston suggested that Apple was restricted from several actions under its agreement with Google, including: (1) offering a Safari browser default search engine choice screen; (2) offering a different default search engine in Safari's private browsing mode; (3) offering different defaults for different Apple devices; and (4) offering different defaults in U.S. versus rest-of-world. Professor Whinston did not provide a share shift estimate based on Apple taking any of these actions. Professor Whinston also never opined that Google would have negotiated a different agreement with Apple or any third-party browser in the absence of these supposed restrictions. Tr. 5713:8-5714:14 (Whinston); UPXD0104 at 6.

1420. There is no evidence that Apple viewed DuckDuckGo as a viable option for an alternative private browsing mode default, but was prevented from doing so due to its contract with Google. Apple has determined that DuckDuckGo's search quality is too poor to be a default on Safari. Tr. 2506:25-2508:2 (Cue) ("Q. Would you consider DuckDuckGo as an option to be set as the default in the Safari browser? A. No, I would not. That would not be a good thing for our customers. . . . [T]he quality of the search results of DuckDuckGo are not up to par. And so one of the things we've been very clear on from an Apple point of view is, privacy is of utmost importance, but you can't [d]o privacy by providing an inferior product."); Tr. 2359:4-11 (Giannandrea) ("[A.] The motivating factor for setting DuckDuckGo as the default for private browsing was an assumption on Mr. Adler's part that it was actually going to be more private. Q. And you believed -- I believe you wrote here, 'This is probably a bad idea;' is that right? A. Yes. That was my opinion."); Tr. 6059:20-6060:7 (Whinston) ("I haven't seen evidence that they wanted to offer a different default[.]"); *see supra* §§ V.B, XI.A.6.

1421. Nor is there any evidence that Apple wanted a different default in the United States than the rest of the world. Tr. 6060:21-6061:2 (Whinston) ("Q. Offering different defaults in the United States versus the rest of the world. You're not aware of any evidence in this case of Apple wanting to use somebody other than Google in the U.S., but using Google elsewhere in the rest of the world? A. No. I think it was something Microsoft was hoping to sell Apple on doing."); [redacted]

1422. Nor is there evidence that Apple wanted to offer multiple versions of the Safari browser with different default search engines. Tr. 2631:20-2632:2 (Cue) ("Q. . . . Mr. Cue, are you aware of any instance in which Apple has considered offering multiple versions of the Safari browser but with different default search engines attached to a different version of the browser? A. Again, on Apple devices, we would never do that. There's no scenario in which I could see us ever doing that, because it doesn't make any sense. We want to give our customers the best experience, so why would we ever do that.").

1423. At trial, Professor Whinston presented, for the first time, a new analysis purporting to show that 33% of U.S. queries are "unavailable even to a much stronger rival" (dubbed "Super Duck"). Professor Whinston explained that his analysis was based on a rival that has "gotten as much better than Google as Google now is better than [current rivals]." Tr. 5755:5-5756:25 (Whinston); UPXD104 at 34.

1424. Professor Whinston's analysis suggests that two-thirds of queries "covered" by Google's agreements are unavailable to be won by a superior rival. UPXD104 at 34; Tr. 5755:5-5756:25 (Whinston).

1425. As discussed above, however, where Google has not been the default on Windows PCs, Firefox browser, Windows Mobile devices, and Blackberry RIM devices, the vast *majority* of users switched to the superior rival (Google). *See supra* §§ VII.A-C; DXD-25.009; DXD-37.055, .058-.059.

4. Measured Against a Choice Screen But-For World, Google's Agreements with Apple, Mozilla, and Other Browsers Do Not Substantially Foreclose Competition

1426. Following a July 2018 decision by the European Commission, Google implemented a search engine choice screen on certain Android devices sold in certain European countries. *See supra* ¶ 568.

1427. When presented with that initial choice screen, users selected Google [redacted] of the time, with rivals being selected [redacted] of the time. Tr. 9834:12-9835:23 (Murphy); DXD-37.080.

1428. Subsequently, a different choice screen process was implemented in September 2021. More than [redacted] of users selected Google from September through December 2021, with rivals receiving [redacted]. Tr. 9833:9-9834:11 (Murphy); DXD-37.079.

1429. In September 2021, when the most recent choice screen was implemented, rivals [redacted] their choice screen selections, but did not see a corresponding increase in usage at the time or in the two years after. From September 2021 through July 2023, rivals received just over 2% share of search usage, which was not significantly higher than rivals' share of usage prior to the implementation of the choice screen. Tr. 9834:11-9835:23 (Murphy); DXD-37.080.

1430. The disconnect between choice screen selections and usage was particularly apparent with DuckDuckGo. Although DuckDuckGo received [redacted] of choice screen selections on Android devices from September through December 2021, it received just [redacted] of usage on Android devices in March 2022. Tr. 10615:5-10617:10 (Whinston); DXD-41.021.

1431. Professor Murphy conducted an analysis to estimate the shift in usage from a choice screen in the United States based on the usage shifts that resulted from the European choice screen and Russian choice screen. The analysis adjusted for the strength of rivals in Europe and Russia by plotting the initial share of search usage of rivals before the choice screen against the change in share of search usage after the choice screen. Tr. 9835:24-9838:2 (Murphy).

1432. Based on this analysis, had a similar choice screen been implemented in the United States on Safari, Firefox, and other third-party browsers under contract with Google, approximately 0.9% of total U.S. search queries would have shifted to rivals. Tr. 9838:16-9839:21 (Murphy); DXD-37.082.

1433. Plaintiffs' experts did not evaluate the financial impacts on Apple, Mozilla, or any other browser in using a choice screen for the search engine default. Tr. 6132:9-18 (Whinston) ("Q. Professor Whinston, you've not evaluated, as a part of your work in this case, the cost to OEMs or browsers or wireless carriers of implementing a choice screen; correct? A. Correct. Q.

And you also did not set forth in any of your reports any analysis or opinions about what revenue share payments any search engine would offer to participate in a choice screen; correct? A. That's correct. It would probably depend on the design of the choice screen.").

1434. As discussed below, evidence shows that a choice screen would reduce competition and payments to browsers. *See infra* § XI.E.

D. Google's Browser Default Search Agreements Promote Search Competition/Output

1435. Google's search default agreements with Apple, Mozilla, and other browsers have led to increased search competition and output in the United States. *Infra* § XI.D.

1436. To begin, Google's search defaults on Apple, Mozilla, and other browsers provide users a convenient out-of-the-box search experience with the highest-quality search engine in the United States. This convenience increases search usage (*i.e.*, output) by enabling consumers to use the browser to search immediately, without additional decision-making. Tr. 9698:19-9699:20 (Murphy) ("I get my browser, I can use it day one. . . . Having that out-of-the-box experience is going to be very valuable to the customer, which then, of course, makes it valuable to both the search provider and the browser provider."); Tr. 2624:10-2625:10 (Cue) ("[W]e're trying to address all of our customers. . . . [W]e want customers to have an experience that doesn't force them to understand all these different search engines that potentially are there. Secondly, to pick the best search engine that there is out there for it so that when you do this it just works. If at some point later on you decide that you prefer a different search engine or there's a different one that you want to use, then it's fine, you can switch it over."); Baker (Mozilla) Dep. Tr. 46:24-47:23 ("You want the browser to work when it starts, and so the default -- in Firefox, the default in the search box, the awesome bar in Firefox, is what happens if the user makes no choice.").

1437. The prospect of gaining increased search usage encourages search providers to compete (1) on the basis of quality and price to win default search status as selected by browsers and (2) to get users to switch the default. Tr. 9703:2-9707:1 (Murphy) ("The availability of defaults, however, introduces a strong element of price competition . . . ."), 9713:19-9716:1 ("[T]he fact that a lot of people follow the default actually allows the partner to create a lot of price competition between Google and its rivals by threatening to switch to the rivals.").

1438. In addition, search defaults provide an implicit search engine recommendation to the user by the browser provider. Being chosen as the preferred search provider by a company like Apple is valuable to Google separate from the incremental search usage they receive from those users that take the recommendation. The benefits associated with winning the recommendation of a browser provides additional incentives for search providers to compete aggressively to win default search status. Tr. 742:18-743:5 (Rangel (DOJ Expert)) ("[D]efaults are interpreted by decision makers, by consumers as an implicit recommendation of what is the right product to use."); Tr. 2619:22-2620:4 (Cue) ("[O]ne of the benefits . . . that Google gets from Apple is that we are telling the world that Google is the best search engine, because that's what they would expect Apple to pick."); Tr. 7780:16-7781:3 (Pichai) ("Our brand gets validated by being present as a default in iPhones.").

1439. Because search defaults (1) provide incremental usage to the winning search provider and (2) provide additional value to search engines from being the recommended default search provider, search providers compete vigorously for the agreements on the basis of quality and price. *See supra* § VII.A (discussing incremental search volume), XI.A.5 (discussing Microsoft's attempts to win the Safari default), XI.B.2 (discussing Yahoo's attempts to win the Firefox default).

1440. As to quality, the default agreements incentivize search engines to make quality improvements to convince browser partners to choose their service as the default. For example, as part of Microsoft's pitch that Apple should set Bing as the default on Safari in 2018, Microsoft highlighted its improvements in search quality over the past years. Tr. 2580:9-17 (Cue) ("[T]hey approached us in 2018, again, saying that their search engine had improved even further from 2015-2016, from the last time, and that they had gotten better and we should do a deal together."); *see supra* § XI.A.5.

1441. And in 2014, Mozilla only agreed to set Yahoo as the default search service on Firefox after it committed to improve its search quality. *See supra* § XI.B.2.

1442. As to price, although Google does not charge consumers to use search, the revenue share payments paid by Google are equivalent to lowering the wholesale price of search. Tr. 9703:2-9707:1 (Murphy); DXD-37.015.

1443. Default agreements enable price competition to occur even when weaker rivals do not win. For instance, Microsoft's attempts to win the Apple Safari default generated price competition even though Google remains the default. Tr. 3245:6-3246:18 (Tinter) ("So very clearly, even though we weren't winning, we were helping Apple get more money, and it was costing Google more money."); Tr. 3504:18-3505:23 (Nadella) ("It's in [Apple's] long-term interest to have at least two suppliers because, quite frankly, they're getting the benefits of having two suppliers . . . to bid up the price.").

1444. Competition for default agreements can also reduce barriers to entry and facilitate entry from new rivals by allowing them to "buy" their way into the market. Tr. 9728:21-9730:23 (Murphy) ("Price competition helps cut down the problem by actually allowing me to buy my way in. So I get some success maybe by differentiating, and then I buy my way in through the default and compete for the default through offering a better deal where I'm going to collect on that in the future when I get better. So I would say this price competition actually can facilitate entry.").

1445. By contrast, choice screens reduce price competition among search providers because it can be expected that popular search engines will not have to compete on price to be included on a choice screen. Because choice screens offer multiple search engines from which to choose, it eliminates many of the benefits to a search provider, including providing incremental volume and the value of being the recommended default. *See supra* § VII.A; Tr. 9797:16-9801:10 (Murphy) ("[E]conomics tells me they're probably going to get less revenue because it's not worth as much to bid to be on a choice screen as it is to be a default[.]"); DXD-37.076.

1446. Google's agreements with Apple, Mozilla, and other browser partners have not impaired rivals' incentives to invest. Tr. 9885:24-9887:2 (Murphy).

1447. Historical investment by Google and search rivals shows that being the default does not correlate with higher investment. Tr. 9888:4-9890:1 (Murphy).

1448. For instance, despite a lack of preinstallation early in its history, Google invested significantly in improving search quality in order to overcome competitors' distribution advantages. While Google had little preinstallation at the time, it had three times Microsoft's headcount working on search in 2008, and invested in building an index that was [redacted] the size of Microsoft's by 2011. Tr. 9888:4-9890:1 (Murphy); Tr. 3555:10-3556:12 (Nadella); DXD-37.131; DX2046 at .005 (2005 Google strategy document stating: "Innovation must be so compelling we overcome our competitors' distribution advantage (Windows platform, Office and browser lock-in)"); DX0423 at .002 (email from Satya Nadella showing "the 'gap' [Microsoft] actually ha[s] on Search with Google" on headcount).

1449. During the same time, rivals failed to invest sufficiently to retain and attract users despite having most preinstallations. For instance, in 2011, [redacted] of search usage in the United States occurred on Microsoft Windows–based computers, Bing was the exclusive search engine preinstalled on roughly 80% of Window computers, and Internet Explorer (where Bing was the preset default) made up about 60% of browser usage on Windows computers. Nonetheless, Microsoft failed to invest sufficiently in Bing's search quality to gain users. Tr. 9889:24-9891:10 (Murphy); DXD-37.132-.133.

1450. Similarly, after Yahoo won the Firefox default in 2014, it failed to invest sufficiently to meet its quality obligations. As part of Mozilla's agreement with Yahoo, Yahoo agreed to make certain specific improvements to improve search quality. Yahoo failed to meet those obligations. Tr. 9892:3-15 (Murphy); DXD-37.135; DX1012 at .030 (December 2014 Strategic Agreement between Mozilla and Yahoo); [redacted]

1451. Nor have Google's agreements decreased Google's incentives to invest in search quality. Google continues to have strong investment incentives to improve its quality in order to enhance Google's ability to compete against rivals (both for and against the default). Tr. 9892:16-9893:14 (Murphy); Tr. 3532:20-3533:2 (Nadella) (Google is "competing every day to improve search . . . on search, I think the competition is pretty intense").

1452. Google also has a strong incentive to improve search quality in order to encourage users to search more and thereby increase overall search output. Tr. 9893:15-9894:22 (Murphy)

("Google's investment incentives, a lot of it is driven by growth. It's growing the pie, particularly in mobile."); Tr. 9894:23-9898:25 (Murphy) ("When you're big, you worry about the small guy, but you also worry about growing the market because . . . that's where the growth potential is."); DXD-37.138.

1453. A choice screen would not lead to greater incentives to invest by rivals or Google. As to rivals, there is no evidence that the European choice screen resulted in increased investment in search quality by any rival. Tr. 10609:23-10610:3 (Whinston) ("Q. And have you identified in your expert reports any evidence in the record in this case of Microsoft or Yahoo! or DuckDuckGo increasing their investments to improve search quality in Europe as a result of the choice screen implementation? A. No, the only evidence I've seen was about Google, the Go Big in Europe."); Tr. 2730:9-2731:13 (Parakhin) ("In terms of Europe reference, that was exactly the time and that was very widely discussed. When Google introduced voluntary and a choice screen in Europe and there was big discussion in the team whether Bing should participate. My opinion that we shouldn't. It was not a -- at least my opinion back then, it was that it was more of a marketing ploy.").

1454. As to Google, the European choice screen did not increase Google's incentives to invest to improve search quality. Instead, the choice screen shifted Google's incentives to focus its investments on marketing and other methods to make Google top of mind when consumers made the choice screen selection. Tr. 8152:16-22 (Gomes) ("[I]t was in the context of making sure that we had good marketing, should there be marketing against us."); Tr. 8155:13-19 (Gomes) ("We were making investments in Europe all the time. This was on the margin as a couple of extra investments, yeah. The European market is extremely important to us, and so we invest in all those countries in a very big way."); Tr. 9902:10-9904:18 (Murphy) ("I wouldn't view it as reflecting an increase in competition, per se, but an increase in the benefits of certain types of marketing . . . And product design. I should say, the kind of more visible parts of product design."); UPX0749 at -278 (Go Big in Europe "[k]eep[s] Google top of mind for EU users").

E. Browser Default Agreements Promote Browser Competition, Further Enhancing Search Output

1455. Google's revenue share agreements with Apple, Mozilla, and other browser providers also promote browser competition in the United States, resulting in increased search output.

1456. Search engines are a strong complement to browsers. Tr. 9696:12-9698:17 (Murphy) ("[T]he simplest way to think about that is if I have a browser, to make that browser very useful, I need some kind of search mechanism. Otherwise, I've got to know where I'm going to go and type in the address. So a search is an essential feature of a browser. Kind of like tires are an essential feature of a car. You probably don't want a car without tires. You probably don't want a browser, in today's world, without a search engine, which is one of the reasons why it comes with a default."); DXD-37.010.

1457. Search engine quality significantly impacts users' browser experience. Tr. 6052:6-8 (Whinston) (agreeing "that the default search engine is important to a consumer's view of the quality of a browser"); Baker (Mozilla) Dep. Tr. 33:21-34:13 ("[T]he quality of the search experience . . . [is] one of the handful of things that are the most critical about a browser."); Tr. 2619:5-21 (Cue) ("Q. Does Apple consider internet browsing to be critical functionality that users expect from Apple mobile devices and computers? A. It is. As you know, the internet is a huge piece of what customers do. They use Safari every day -- or a web browser, and so -- and part of using that is searching. So it's a critical experience of our devices."), 2624:10-2626:2

("We like our products to come out-of-the-box and work where it feels like magic. And I think the ability of searching in Safari and doing that with Google, it does feel like magic, it works really well."). Plaintiffs' experts did not analyze competition among browsers, and did not opine that setting a rival as the default search provider would result in a more competitive browser. Tr. 10596:8-25 (Whinston), 10598:19-10599:4.

1458. If the default search engine quality is poor, some users will choose to switch browsers altogether, rather than switching the default. For example, after the switch to Yahoo in 2014, Mozilla lost Firefox users due to the poor quality of Yahoo's search experience. [redacted] Baker (Mozilla) Dep. Tr. 76:5-23 (Mozilla "found our users trying all sorts of different ways to get back to Google and we experienced lots of people leaving Firefox"); [redacted]

1459. [redacted]

[redacted] Baker (Mozilla) Dep. Tr. 269:20-270:1, 270:11-22; *see supra* ¶ 1379.

1460. The price competition generated by browser default search agreements provides significant revenues to browser developers, which effectively lowers the marginal cost of manufacturing and distributing browsers to users, who enjoy browsers at no cost. Tr. 9703:2-9707:1, 9709:19-9711:4 (Murphy).

1461. Independent browsers, in particular, rely heavily on Google's search revenues to fund their operations. Because browsers are generally offered to consumers for "free," much of the funding to support investments in browsers comes from the ability to partner with search providers. Tr. 9703:2-9707:1 (Murphy), 9712:24-9713:18; DXD-37.017.

1462. For instance, in 2020, Mozilla's search revenues accounted for 89% of total revenues. Tr. 9712:24-9713:18 (Murphy); DXD-37.018; Baker (Mozilla) Dep. Tr. 39:1-15 ("Q. How has Mozilla generated the revenue to develop and maintain Firefox? . . . A. Mozilla's major source of revenue comes through the search functionality and the revenue shares for search that Google does with most of the Web I guess. . . . We have revenues from Bing and used to be from Yahoo! and Yandex and, you know, other search engines, and increasingly, we've been working to diversify, you know, revenue into other areas. Still the bulk of it comes from search and the bulk of the Search revenue comes from Google.").

1463. Prior to the Complaint in this case being filed, Mozilla met with the Department of Justice to "explain why consumers and competition in the browser market would be significantly harmed if the U.S. Department of Justice Antitrust Division brings an enforcement action that prohibits small and independent browser companies, such as Mozilla Corporation, from entering into default search agreements with Google." [redacted]

[redacted] DX0547 at .001; Baker (Mozilla) Dep. Tr. 94:15-19, 95:1-22, 96:10-98:3.

1464. Browsers are also a strong complement to search. Higher-quality browsers encourage users to use the web more, which expands search output. Tr. 7646:18-7647:10 (Pichai) ("We realized just improving the state of browsers would overall help users use the web more, will increase online activity and increase search usage, including Google's usage."); Tr. 9696:12-9698:17 (Murphy) ("[I]f you have a higher quality browser, that's going to generate more traffic, which is going to benefit the search provider."); Tr. 5872:16-20 (Whinston) ("Q. And those convenient search bars, whether they are incorporated into a browser or whether it's like a search widget on the Android devices, those convenient search locations cause consumers to search more, correct? A. I haven't measured that. I'm sure that the answer is yes."); DXD-37.011.

1465. Google's search revenue share payments allow browsers to innovate and create a better browser to attract more customers and to expand the use of search from existing customers. Because the revenue browsers earn from Google's search agreements are based on how much searching users do on the browser, the agreements incentivize browser developers to improve the browser in ways that encourage users to conduct more searches (and thereby generate more revenue to be shared with the browser developer). Tr. 9703:2-9707:1 (Murphy) ("They pay it as a percentage of the search revenue generated, and that encourages them, the partner, to sell more search. Now, if I'm a -- if I'm a browser provider, how do I sell more search. I do a better job making my browser, because then they're going to do more stuff on a browser. So [the] existing customer base is going to do more search. And so that expands output of browsers and expands output of search.").

1466. Some of Google's search revenue share payments are passed on directly to consumers in the form of lower prices for devices. For instance, evidence shows that Apple has passed on some of Google's search revenue share payments in the form of lower prices for Apple devices. [redacted], Apple's service margins (which include Google's search revenue share payments) increased. During the same time period, Apple's overall gross margin remained constant and Apple's device sales gross margin decreased. Tr. 9709:19-9711:4 (Murphy); DXD-37.017.

1467. Google's browser default agreements have resulted in higher browser quality and lower-priced mobile devices, resulting in higher search usage and benefitting users. Tr. 9703:2-9707:1 (Murphy) ("[I]f I generate more of a complementary goods, right, I give you a better browser, you're going to do more search, right, that's how I can compete for more search, and just like lower prices expand output, these lower price[s] expand output too, and they're going to expand output not just of search but also out of these complementary products."); DXD-37.016.

XII. ANDROID AGREEMENTS

1468. Plaintiffs challenged three categories of Google agreements that apply to Android mobile phones: (1) Antifragmentation Agreements ("AFAs") and Android Compatibility Commitments (ACCs); (2) Mobile Application Distribution Agreements ("MADAs"); and (3) Revenue Share Agreements ("RSAs"). The Court granted Google's motion for summary judgement with respect to Plaintiffs' claims that rest on allegations relating to Google's AFAs and ACCs. *United States v. Google LLC*, 2023 WL 4999901, at *27-28 (D.D.C. Aug. 4, 2023).

A. MADA

1469. Google provides OEMs a royalty-free license to a suite of proprietary applications, services, and application programming interfaces ("APIs") through the Mobile Application Distribution Agreement. *E.g.*, Christensen Dep. Tr. 41:4-12 ("[T]he MADA . . . is essentially the license agreement that gives us permission to install on our smartphones Google Mobile Services applications, referred to as GMS apps. Those are commonly known as examples of which are Gmail or are YouTube, Google Drive, the Play Store, etc."); JX0049 (Mobile Application Distribution Agreement between Motorola and Google (Jan. 1, 2018) ("2018 Motorola MADA")) at -867-868 (§ 2.1); JX0037 (Mobile Application Distribution Agreement between Samsung and Google (Mar. 1, 2017) ("2017 Samsung MADA")) at -055 (§ 2.1).

1470. In return for a royalty-free license, the MADA provides for certain distribution and placement obligations for Google apps and services. Tr. 9427:13-25 (Rosenberg), 9441:13-9442:7 ("Q. This Court has heard testimony . . . about a provision in the MADA that pertains to instructing users about changing certain out-of-the-box settings of a MADA device. Are you generally aware of that provision? A. Yes. . . . Q. [W]hat is your understanding of the purpose of that provision? A. The purpose of the provision, the spirit of it is not to frustrate the goals of the agreement, the goals of the agreement are the device comes out of the box, there's a certain experience with Google services that is licensed and a handful of placement requirements.").

1471. Google has offered MADAs or equivalent agreements to OEMs since the commercial release of Android. *E.g.*, JX0007 (Mobile Application Distribution Agreement between Samsung and Google (Apr. 1, 2009)); JX0008 (Mobile Application Distribution

Agreement between Motorola and Google (May 1, 2009)); *see also* Christensen Dep. Tr. 41:21-23 ("Q. Does Motorola today have a MADA in effect with Google? A. Yes, we do.").

1472. The Google applications currently licensed pursuant to the MADA include, among others, the Google Search App, the Chrome browser, Gmail, Google Maps, YouTube, and Google Play. Tr. 7655:23-7656:1 (Pichai); JX0049 (2018 Motorola MADA) at -865-868 (§§ 1.12, 1.21, 2.1); JX0037 (2017 Samsung MADA) at -053-055 (§§ 1.9, 1.16, 2.1).

1473. Currently, eleven such applications that are part of the Google Mobile Services ("GMS") suite—including the applications identified above—must be preinstalled if the OEM installs any of them on a given Android device. Tr. 790:14-17 (Kolotouros).

1474. The MADA is a device-by-device agreement. That is, an OEM that signs a MADA is not required to install Google applications on any of its devices. And an OEM that licenses the MADA and preloads Google proprietary applications on some of its devices may also offer other Android devices without any preloaded Google application. *E.g.*, JX0049 (2018 Motorola MADA) at -864, -867-868 (D, § 2.1); JX0037 at -055 (2017 Samsung MADA) at (§ 2.1).

1475. OEMs can enter into MADAs without entering into a revenue share agreement with Google. Tr. 1519:9-12 (Yoo (Google)) ("Q. Well, isn't an RSA always in place when a MADA is in place? A. No, there are MADA devices without an RSA. So a MADA might be the superset, and then RSA might cover some devices.").

1476. The MADA does not restrict an OEM from preloading its own applications or any third-party applications—including search access points—on any of its devices, including devices on which it chooses to install the GMS applications. Christensen Dep. Tr. 49:25-50:4 ("Q. Now, does the MADA that's in effect between Google and Motorola prevent Motorola from preloading any applications manufactured by Motorola or any other third-party? A. No, it does not."); Tr. 9437:19-9438:4 (Rosenberg) ("Q. Are you aware of any examples . . . where your MADA licensees, the OEMs, have pre-installed on devices applications to perform functions similar to some of the mandatory GMS services? . . . A. Yes, it's quite common actually. . . . [M]any Android devices have more than one app store. As an example, many Android devices have more than one web browser, some have multiple email clients. Those are just a handful of examples."); JX0037 (2017 Samsung MADA) at -057-058 (§ 3.3).

1477. The MADA does not restrict an OEM from setting a browser in which Google is not the default search engine as the default browser on any of its devices, including devices on which it chooses to install the GMS applications. *E.g.*, JX0049 (2018 Motorola MADA) at -864, -871-873 (C, § 4.4); JX0037 (2017 Samsung MADA) at -057-058 (§ 3.3).

1478. The MADA does not restrict an OEM from setting a search engine other than Google as the default search engine on any of the OEM's devices, including devices on which it chooses to install the GMS applications. *E.g.*, JX0049 (2018 Motorola MADA) at -864, -871-873 (C, § 4.4); JX0037 (2017 Samsung MADA) at -057-058 (§ 3.3).

B. RSAs

1479. Google has entered into agreements (typically called Revenue Share Agreements (RSAs)) with certain OEMs (such as Samsung and Motorola) and wireless carriers (such as Verizon, T-Mobile, and AT&T) that sell Android mobile devices that provide an opportunity to earn revenue from Google by, among other things, promoting Google services to end users and enhancing device quality by delivering security and operating system updates to those end users. *E.g.*, JX0071 (Mobile Revenue Share Agreement between Samsung and Google (July 1, 2020) ("2020 Samsung RSA")); JX0062 (Mobile Incentive Agreement between Motorola and Google (Feb. 1, 2020) ("2020 Motorola RSA")); JX0093 (Mobile Revenue Share Agreement between

Verizon Wireless and Google (June 1, 2021) ("2021 Verizon RSA")); JX0095 (Android Activations Agreement between T-Mobile USA and Google (June 1, 2021) ("2021 T-Mobile RSA")); JX0091 (Search Revenue Share Agreement between AT&T Mobility and Google (June 1, 2021) ("2021 AT&T RSA")).

1480. In the U.S., consumers purchase Android devices directly from OEMs as well as from carriers. The vast majority of Android devices in the U.S. are purchased from carriers, and carriers account for almost [redacted] of RSA payments from Google in the U.S. Tr. 940:25-942:4 (Kolotouros); Tr. 9854:17-9855:5 (Murphy (Google Expert)) (testifying about DXD-37.099). Samsung accounted for only [redacted] of U.S. Android RSA payments in 2020 and Lenovo/Motorola a mere [redacted]. DXD-37.099.

1481. OEMs and carriers in the U.S. negotiate the out-of-the-box configuration of an Android device sold by a carrier, which may include negotiations regarding which apps are preloaded on the device. Carriers ultimately have the final say as to the configurations of mobile devices that carriers sell directly to consumers. Tr. 9315:7-22 (McCallister (Google)); Ezell (AT&T) Dep. Tr. 43:10-44:01 ("[AT&T has] . . . a discussion/negotiation with that device manufacturer as to what their version [is] that they provide to AT&T, what we want to include on that device in terms of pre-installed services.").

1482. OEMs and carriers are not required to sign an RSA in order to (1) manufacture or sell Android mobile devices or (2) license the Google Play store or any other Google application or service. Tr. 9315:23-9316:16 (McCallister).

1483. Google has entered RSAs pursuant to which an OEM or carrier may typically choose among multiple tiers that provide varying levels of promotion of Google Search, including certain tiers in which an OEM or carrier agrees on a device-by-device basis to set

Google as the default search engine for search access points specified in the agreement, to provide elevated promotion for Chrome, and/or to refrain from preloading alternative search services (as defined in the agreement). Tr. 906:17-907:1 (Kolotouros), 914:20-915:11, 919:23-922:14, 934:13-939:14 (describing tiers for Samsung and Motorola RSAs); Tr. 9328:17-9331:19 (McCallister) (describing tiers for Verizon RSA); JX0062 (2020 Motorola RSA); JX0071 (2020 Samsung RSA); JX0093 (2021 Verizon RSA).

1. Google's RSA with Samsung

1484. Google's RSA presently in effect with Samsung offers Samsung multiple configuration tiers, including the "Core Qualified Device," "Search Enhanced Qualified Device," "Chrome Enhanced Qualified Device," and "Search/Chrome Enhanced Qualified Device" tiers. Tr. 924:1-9 (Kolotouros), 934:13-939:14; JX0071 (2020 Samsung RSA) at -401-403 (§§ 4, 5).

1485. The "Core Qualified Device" tier is a platform commitment (that is, the commitment applies to all MADA devices in Samsung markets, excluding carrier-distributed devices) under which Samsung agrees, among other things, to make Google the default search provider on Samsung's S-Browser. In return, Samsung is paid [redacted] net revenue share on certain search access points. Under this tier, Samsung may preload alternative search providers. Tr. 919:23-920:23 (Kolotouros) ("[T]here's no exclusivity in the core tier"); JX0071 (2020 Samsung RSA) at -401-402, -416-421 (§ 4 & Attachs. A, B-1, B-2).

1486. The "Core" tier's obligation to set the S-browser default to Google does not apply to carrier-sold devices which account for the vast majority of Samsung devices sold in the United States. The Samsung RSA provides a carveout for devices sold through wireless carriers, such that an OEM can configure the device the way the carrier specifies. Tr. 905:15-22 (Kolotouros); Tr. 2869:12-21 (Kartasheva (Google)). This means Samsung can configure for a U.S. wireless carrier a device with a Google rival set as the default in S-browser. Tr. 2869:12-21 (Kartasheva).

1487. On a device-by-device basis, Samsung can elect to enroll the device into one or both of the "Enhanced" categories, which determines the level of payment and search access points on which revenue share is paid. Tr. 919:23-920:16 (Kolotouros) ("Samsung has the choice of electing which of these two different [Enhanced] categories to enroll the device, or both, and then it triggers the payment on the access points specified in exhibit -- Attachment A.") (testifying about JX0071 (2020 Samsung RSA) at -416-418 (Attach. A)).

1488. If Samsung elects to opt a device into the "Chrome Enhanced Qualified Device" tier, it agrees to place Chrome in the hotseat—the set of applications that appear at the bottom of the device and do not change when a user swipes between screens—and set Chrome as the out-of-the-box default browser. In return, Samsung receives [redacted] net revenue share on Google Search advertising revenue generated through use of Chrome. The Chrome Enhanced tier does not have any requirements with respect to search or browser exclusivity. Tr. 937:8-939:14 (Kolotouros); JX0071 (2020 Samsung RSA) at -401-402, -424 (§ 4 & Attach. C-2).

1489. If Samsung elects to opt a device into the "Search Enhanced Qualified Device" tier, it agrees to preload Google Search as the out-of-the-box default search provider on certain search access points specified in the agreement, and agrees not to preload alternative services (as defined by the agreement). In return, Samsung receives [redacted] net revenue share on Google search advertising revenue generated through those search access points. Tr. 916:16-919:12 (Kolotouros); JX0071 (2020 Samsung RSA) at -402-403, -422-423 (§ 5 & Attach. C-1).

1490. If Samsung elects to opt a device into the "Search/Chrome Enhanced Qualified Device" tier, it agrees to the requirements of both the "Search Enhanced Qualified Device" and "Chrome Enhanced Qualified Device" tiers, and in return, Samsung receives [redacted] net revenue share on Google Search advertising revenue generated through those search access points. Tr.

916:23-917:1 (Kolotouros), 919:2-920:16; JX0071 (2020 Samsung RSA) at -402-403, -422-424 (§ 5 & Attachs. C-1, C-2).

1491. Samsung has elected to opt the [redacted] into the "Search Enhanced Qualified Device" tier. Tr. 923:25-924:5 (Kolotouros).

2. Google's RSA with Verizon

1492. Google's RSA presently in effect with Verizon contains a platform tier for "Core Devices," and device-by-device tiers for "Qualifying Devices" and "Preferred Devices." The "Core Device" and "Preferred Device" tiers apply to new devices sold during the term of the current RSA, whereas the "Qualifying Device" tier applies to existing devices sold during the term of the prior RSA with Verizon. Tr. 9328:17-9331:19 (McCallister); DXD-36.002; JX0093 (2021 Verizon RSA) at -496-502 (§§ 2, 4, 5).

1493. Under the "Core Device" tier, Verizon agrees to preload in the hotseat and as the default browser [redacted] with Google Search as the default search provider. In return, Verizon receives [redacted] net revenue share from these new devices. Under this tier, Verizon may preload alternative search providers. Tr. 9328:17-9329:11 (McCallister); DXD-36.002; JX0093 (2021 Verizon RSA) at -498-499 (§ 4).

1494. If Verizon elects to opt a new device into the "Preferred Device" tier, it agrees to [redacted], and agrees not to preload alternative search services (as defined by the agreement), with the exception of Yahoo Search within the Yahoo Home application. In return, Verizon receives [redacted] net revenue share from these new devices. Tr. 9327:2-19 (McCallister), 9331:4-9332:14; DXD-36.002; JX0093 (2021 Verizon RSA) at -499-502 (§ 5).

1495. If Verizon elects to opt an existing device into the "Qualifying Device" tier, it agrees that it will not take any act or omission to change the configuration that was agreed to by

Verizon under the prior RSA; this does not prevent a user from changing the prior configuration. In return, Verizon receives [redacted] net revenue share from those existing devices. Tr. 9329:12-25 (McCallister); DXD-36.002; JX0093 (2021 Verizon RSA) at -496 (§ 2.4).

1496. Under each of the tiers, Verizon also agrees to send security updates and letter upgrades to customers' devices. Tr. 9328:17-9329:1 (McCallister), 9829:12-9331:3; DXD-36.002; JX0093 (2021 Verizon RSA) at -496, -498-502, -519-522 (§§ 2.4, 4, 5 & Attach. D).

3. Google's RSA with AT&T

1497. Google's RSA presently in effect with AT&T provides two device-by-device tiers: one tier for new devices ("Preferred Devices") and one tier for existing devices ("Qualifying Devices"). Tr. 9334:10-25 (McCallister); DXD 36.003; JX0091 (2021 AT&T RSA) at -749-753 (§§ 2, 4).

1498. During negotiations for the 2021 RSA, Google offered AT&T a "Core Device" tier similar to Verizon, but AT&T declined to include this option in the final agreement because AT&T did not feel that it would make use of the "Core Device" tier and instead intended to enroll all AT&T Android mobile devices in the "Preferred Device" tier. Tr. 9334:1-9 (McCallister); Ezell Dep. Tr. 177:16-179:18 (Core tier was "removed . . . at AT&T's request" because "it was in [AT&T's] view that what we had been doing under the prior agreement was more aligned with the preferred tier, and we anticipated that we would continue to primarily configure the device to meet with the preferred tier.").

1499. If AT&T opts a new device into the "Preferred Device" tier, it agrees to preload in the hotseat and as the default browser [redacted] with Google Search as the default search provider, and agrees not to preload alternative search services (as defined by the agreement). In return, AT&T receives [redacted] net Google Search advertising revenue share from these new devices. Tr. 9334:14-22 (McCallister); DXD-36.003; JX0091 (2021 AT&T RSA) at -751-753, -765 (§ 4 & Attach. A).

1500. If AT&T elects to opt an existing device into the "Qualifying Device" tier, it agrees that it will not take any act or omission to change the configuration that was agreed to by AT&T under the prior RSA; this does not prevent a user from changing the prior configuration. In return, AT&T receives [redacted] net Google Search advertising revenue share from those existing devices. Tr. 9334:23-9337:1 (McCallister); DXD-36.003; JX0091 (2021 AT&T RSA) at -749-750, -765 (§ 2.3 & Attach. A).

1501. Under each of the tiers, AT&T also agrees to send security updates and letter upgrades to customers' devices. Tr. 9334:14-9335:18 (McCallister); DXD 36.003; JX0091 (2021 AT&T RSA) at -749-750, -769-771 (§§ 2.3, 4 & Attach. C).

4. Google's RSA with T-Mobile

1502. Google's RSA presently in effect with T-Mobile provides two device-by-device tiers: one tier for new devices ("Preferred Devices") and one tier for existing devices ("Qualifying Devices"). Tr. 9341:18-9342:4 (McCallister); DXD-36.004; JX0095 (2021 T-Mobile RSA) at -695-700 (§§ 2.3, 4).

1503. During negotiations for the 2021 RSA, Google offered T-Mobile a revenue share structure similar to Verizon and AT&T. Although Google prefers to structure RSAs to pay a percentage of revenue, at T-Mobile's request, Google agreed to structure the 2021 T-Mobile RSA on a per device bounty payment basis, rather than as a revenue share. Tr. 9339:9-9341:11 (McCallister).

1504. During negotiations for the 2021 RSA, Google also offered T-Mobile a "Core Device" tier similar to Verizon, but T-Mobile requested it be taken out of the agreement because

T-Mobile did not believe it would make use of the "Core Device" tier, and its intention was to enroll most of its devices into the "Preferred Device" tier. Tr. 9342:5-9343:11 (McCallister).

1505. Under the 2021 RSA, if T-Mobile opts a new device into the "Preferred Device" tier, it agrees to [redacted] In return, T-Mobile receives a bounty payment of [redacted] per new active device per month. Tr. 9341:18-9342:4 (McCallister); DXD-36.004; JX0095 (2021 T-Mobile RSA) at -696-700, -712-713 (§ 4 & Attach. A).

1506. [redacted] In return, T-Mobile receives a bounty payment of [redacted] per existing active device per month. Tr. 9341:18-9342:4 (McCallister); DXD-36.004; JX0095 (2021 T-Mobile RSA) at -695 (§ 2.3).

1507. [redacted]. Tr. 9341:18-9342:4 (McCallister); DXD-36.004; JX0095 (2021 T-Mobile RSA) at -695-700, -714-715 (§§ 2.3, 4 & Attach. B).

C. No Evidence of Any Request to Preload Rival Search Engine Exclusively

1508. Plaintiffs suggest that Google's agreements prevent rivals from being exclusively preloaded on devices. However, there is no evidence that any mobile network operator (*i.e.*, carrier) or OEM sought to exclusively preload a general search engine other than Google on Android devices sold in the United States during the period Plaintiffs claim anticompetitive conduct or effects. Tr. 6044:9-6045:1 (Whinston (DOJ Expert)) (agreeing that he offered no opinion that any mobile network operator or OEM wanted to exclusively preload a rival search engine instead of Google on an Android device), 6105:6-10 (agreeing that there was no evidence that Samsung or Motorola believed that exclusively preloading a search engine other than Google would make the device more competitive in the marketplace), 10583:1-14 (agreeing that "[t]he large majority of people" expect Android devices to come preloaded with Google applications, including Google Search).

1509. AT&T Vice President for Strategy and Business Development Jeffrey Ezell testified that exclusively preloading a search engine other than Google on AT&T Android devices would result in "criticism for carrying a device that didn't have the search product the consumers were expecting on the device." Ezell Dep. Tr. 301:18-302:17, 317:9-21 ("[C]onsumers might look at it less favorably . . . based on this experience that we had . . . with this Backflip device that we were going to get negative criticism in the press[.]").

1510. Ezell also testified that if AT&T did not preload Google on its Android devices, "a number of consumers would simply go around" AT&T's preload of a rival search engine and "download Google Search." Ezell Dep. Tr. 301:20-302:4; *see* DX0386 at .003-.004 ("I also believe that if we refused to distribute Google search on our Android devices . . . then Google would just make Google search available for download from Android Market and a large number of Android users would use it instead of the default search service we might provide from Yahoo.").

1511. Internal AT&T documents show that AT&T understood that "[c]onsumers expect Google services on Android devices (including Google Search)." DX0387 at .001.

1512. Internal AT&T documents also show that AT&T tracked negative consumer reviews of the AT&T Backflip, an early Android device that exclusively preloaded Yahoo search. DX0384 at .001-.009; *see also* Tr. 10585:16-10586:2 (Whinston) (agreeing that "it would be rational for an Android OEM or an Android carrier to be very sensitive to and care about product reviews like these when they go about making decisions about how to configure their devices" and testifying that "when they're confronted with the choice of Google or a rival . . . this would matter").

1513. Verizon Chief Customer Experience Officer Brian Higgins testified that during the time he was responsible for negotiating Verizon's Android RSAs with Google, no one on his team recommended replacing Google Search with another general search engine. Tr. 1087:22-1088:4 (Higgins (Verizon)).

1514. Higgins further testified that he was not aware of anyone from Microsoft reaching out to him or his team to preload Bing on Verizon Android devices. Tr. 1088:5-15 (Higgins).

1515. Nor was Higgins aware of anyone from DuckDuckGo reaching out to him or his team to preload DuckDuckGo's search engine on Verizon Android devices. Tr. 1088:16-20 (Higgins).

1516. During the time period that Higgins managed Verizon's revenue sharing agreements with search providers, Verizon did not solicit bids from Microsoft or DuckDuckGo to preload their search engines on Verizon Android devices. Tr. 1117:6-14 (Higgins).

1517. To the extent Verizon sought to, and ultimately did, preload Yahoo Search on Verizon Android devices, it did so only within the Yahoo Home application and only in addition to Google Search. Tr. 1095:3-15 (Higgins); [redacted]

1518. Higgins also testified that Verizon never found a search engine other than Google "that was compelling enough to explore" preloading on Verizon Android devices. Tr. 1091:19-1092:4 (Higgins).

1519. Internal Verizon documents show that Verizon tracked negative press reviews of the Verizon Fascinate, an early Android device that exclusively preloaded Bing. *See generally, e.g.*, DX0737.

1520. Higgins testified that he never saw a product review for a Verizon Android device "where anyone complained about Google Search being preloaded." Tr. 1116:13-17 (Higgins).

1521. T-Mobile Vice President of Partnerships and Business Development Jeffrey Giard testified that T-Mobile preloads its Android devices with Google Search because that configuration "provides customers with the best overall device experience." Giard (T-Mobile) Dep. Tr. 32:17-33:03.

1522. [redacted]

1523. In considering, and ultimately declining, to sign an agreement with Microsoft to preload Bing on T-Mobile Android devices, T-Mobile evaluated whether "swapping out" Google with Bing as "the default search engine" would improve the "overall device experience." Giard Dep. Tr. 260:18-261:16, 337:20-338:4.

1524. T-Mobile dismissed DuckDuckGo "pretty early on" as a viable alternative to be preloaded as the default search provider on T-Mobile Android devices because DuckDuckGo did not provide a "robust . . . user experience" and did not have a "business model" that T-Mobile considered viable. Giard Dep. Tr. 263:11-21.

1525. [redacted]

1526. [redacted]

1527. Motorola Mobility Executive Director for Software Product Management and Partner Management, Eric Christensen, testified that he has never "believed that Motorola smartphone devices would be more competitive in the market if they had a search engine other than Google Search preloaded on the device." Christensen Dep. Tr. 48:24-49:7.

1528. Christensen also testified that "it would not be a great consumer experience if [Motorola] were to try to ship a device without" any of the eleven GMS applications that Google distributes through the MADA, including Google Search. Christensen Dep. Tr. 151:11-22.

1529. Motorola has never "asked Google for an exemption or a waiver so that it would not have to ship" a mobile phone "with Google Search" preloaded. Christensen Dep. Tr. 45:12-25.

1530. And Motorola believes that preloading Google Search and setting Google Search as the default search engine is in the best interest of Motorola and its consumers. Christensen Dep. Tr. 69:9-17.

1531. [redacted]

1532. [redacted]

1533. [redacted]

1534. [redacted]

1535. [redacted]

1536. Even Microsoft has chosen to preload Google search on its Android device—the Surface Duo—alongside Bing, including in Europe where it can preload Google applications without preloading Google search. *See infra* §§ XII.E, F.

1537. Professor Whinston admitted at trial that during the period he studied (from 2014 on), a mobile phone preloaded with Google "would be more desirable" than a mobile phone preloaded with a rival search engine instead of Google. Tr. 10592:2-21 (Whinston).

D. No Evidence That RSA Preinstallation Exclusivity Provisions Interfered with Preferred Preloads of Rivals

1538. There was also no evidence at trial showing that "an Android OEM or Android wireless carrier preferred, from a product quality standpoint, Bing or Yahoo! or DuckDuckGo to be preloaded on an Android device, but decided not to do that because of the payments they got from Google[.]" Tr. 10586:22-10587:7 (Whinston).

1539. Verizon's Brian Higgins testified that Verizon never found a search engine other than Google "that was compelling enough to explore" preloading on Verizon Android devices. Tr. 1091:19-1092:4 (Higgins).

1540. Higgins further testified that he was not aware of anyone from Microsoft reaching out to him or his team to preload Bing on Verizon Android devices. Tr. 1088:5-15 (Higgins).

1541. Nor was Higgins aware of anyone from DuckDuckGo reaching out to him or his team to preload DuckDuckGo's search engine on Verizon Android devices. Tr. 1088:16-20 (Higgins).

1542. During the time period that Higgins managed Verizon's revenue sharing agreements with search providers, Verizon did not solicit bids from Microsoft or DuckDuckGo to preload their search engines on Verizon Android devices. Tr. 1117:6-14 (Higgins).

1543. From 2014 to 2021, Verizon's agreements with Google contained no provision that prevented Verizon from preloading a search engine other than Google or otherwise reduced the revenue share payment from Google to Verizon if Verizon did so; nonetheless, Verizon never exercised its ability to preload a search engine other than Google. JX0026 (Amendment Five to the Co-Developed Device Strategic Marketing Agreement between Verizon and Google (Nov. 12, 2014)) at -279-280 (§ 3) ("[redacted]); Tr. 10587:14-23 (Whinston); Tr. 1086:20-23 (Higgins) (agreeing that the 2014 Verizon RSA "did not have any restrictions on Verizon's ability to preload other search engines in addition to Google"), 1086:25-1087:20 (testifying that from 2014 to 2021 Verizon did not preload any search engines other than Google on its Android devices); Tr. 9381:20-9382:2 (McCallister) ("[W]e came to understand that Verizon was very well aware that that provision was not in the agreement. But they never pre-loaded any rival search engine, Yahoo! Search or otherwise, during the previous RSA.”).

1544. When Verizon indicated interest in including Yahoo Search (owned by Verizon at this time) on Verizon Android devices within the Yahoo Home application, in addition to but not in lieu of Google Search, Google agreed in the 2021 Verizon RSA to let Verizon do so without any reduction in revenue share paid from Google to Verizon. JX0093 (2021 Verizon RSA) at -500 (§ 5.2(a)(i)) [redacted] Tr. 9327:2-19 (McCallister) (“[W]e were able to come to alignment that they could place the Yahoo! mobile home app on the minus-one screen and still be paid out at the highest revenue share tier.”); Tr. 1095:3-10 (Higgins) (agreeing that Verizon could preload the Yahoo Home application on Verizon Android devices and still get paid out at the highest tier under the 2021 Verizon RSA).

1545. [redacted]

1546. There was no evidence at trial that “AT&T wanted to put another rival search engine on an AT&T Android device but didn’t do so because Google paid them to keep it off.” Tr. 10588:8-12 (Whinston).

1547. Google Vice President of Global Partnerships Adrienne McCallister testified that, during the course of her RSA negotiations with AT&T, (1) there was never any discussion of

AT&T preloading a search engine other than Google and (2) AT&T did not oppose or push back on provisions relating to the exclusive preload of Google Search. Tr. 9333:11-19 (McCallister).

1548. AT&T would exercise its option to preload a search engine other than Google on Android devices if it believed that an alternative would be an [redacted] option that "customers are going to like." Ezell Dep. Tr. 195:7-196:2, 313:1-21.

1549. Jeff Giard testified that, in negotiating the 2021 RSA between Google and T-Mobile, T-Mobile "w[as]n't trying to . . . remove the exclusivity for the devices we chose to configure, according to the agreement." Giard Dep. Tr. 167:11-168:7.

1550. [redacted]

1551. [redacted]

1552. [redacted]

1553. "At the time that Motorola was negotiating [its] 2017 revenue share agreement with Google," no "other search engine approached Motorola [to] seek to have its search engine preloaded on a Motorola mobile device." Christensen Dep. Tr. 58:20-25.

1554. And "[d]uring the course of the negotiation of the 2020 [M]obile [I]ncentive [A]greement" between Google and Motorola, no one "from Motorola express[ed] an interest in preloading a search engine, other than Google Search, on a Motorola mobile device sold in the United States." Christensen Dep. Tr. 67:24-68:16.

1555. Eric Christensen testified that he asked Microsoft to make a formal proposal to preinstall Bing on Motorola mobile devices and Microsoft never got back to him. Christensen Dep. Tr. 126:14-127:1.

1556. [redacted]

1557. [redacted]

1558. [redacted]

E. Search Rivals Are Not Foreclosed from Competing for Users on Android Mobile Devices

1559. Google's MADAs and RSAs do not substantially foreclose rival search engines from competing for users. Competition for users occurs in multiple ways, including: (1) competition to be preloaded on a device and (2) competition against a rival that has been preloaded on a device. Tr. 9701:25-9703:1 (Murphy).

1. Competition to be a Preloaded or Default Search Provider

1560. Google's MADAs with OEMs do not prevent rival search providers from competing to be a preloaded or default search provider. Tr. 9859:20-9861:21 (Murphy) ("There's a lot of promotion opportunities on top of the MADA."); Tr. 9437:4-9441:9 (Rosenberg) (testifying about DX0207 at .002, .029).

1561. First, all of Google's MADAs with OEMs are device-by-device agreements. Therefore, an OEM may choose to preload Google's services on only some or none of its devices. Tr. 9436:22-9437:3 (Rosenberg); UPX0146 at -389 ("MADA [is a s]imple license to pre-load and distribute Google apps on Android compatible devices (device-by-device election) so long as placement obligations are adhered to. *E.g.*, Widget, Play Store and Google Folder on default home screen. Zero exclusivity.").

1562. Second, for those devices for which OEMs choose to preload Google's GMS services, the MADA provides non-exclusive search preload requirements: (1) a Google Search Widget preloaded on the default home screen and (2) Chrome and the Google Search App in a Google folder on the default home screen. Tr. 9427:13-25, 9503:11-17 (Rosenberg); JX0037 (2017 Samsung MADA) at -057-058 (§ 3.3); JX0049 (2018 Motorola MADA) at -871-873 (§ 4.4); DX0103 at .013 ("There are no exclusivity provisions as part of the MADA agreement.").

1563. The MADA leaves significant space for search rivals to be preloaded on Android devices. Tr. 9865:8-9866:2 (Murphy); DXD-37.109, .114. The MADA accordingly is not a "de facto" exclusive dealing agreement. DXD-37.107-.108.

1564. For instance, the MADA does not prevent a rival search provider from being preloaded as the default search engine in a browser in the hotseat, nor does it prevent that browser from being set as the default browser. Tr. 917:19-918:8 (Kolotouros) ("Chrome in the hot seat . . . [is] not a MADA requirement, nor is setting Chrome as the default system browser . . . ."); Tr. 9437:8-10 (Rosenberg); DXD-02.003.

1565. Browsers have long been a significant search access point on Android devices. In recent years, browsers accounted for [redacted] of search revenue on Android devices, with most attributed to a browser preloaded in the hotseat. Tr. 9865:8-9866:2 (Murphy); DXD-37.109, .114

1566. On MADA-compliant devices, rivals can also preload a competing search engine widget anywhere on the device, including on the default home screen or the Plus One or minus 1 screens. In recent years, the Google Search Widget, for example, accounted for similar amounts of Android search revenue as browsers, and historically it accounted for less Android search revenue than browsers. Tr. 947:18-949:2 (Kolotouros) (testifying about DXD-02.003); Tr. 9490:7-11 (Rosenberg) (testifying about DXD-35.010); Tr. 9865:8-9866:2 (Murphy) (testifying about DXD-37.109).

1567. On MADA-compliant devices, OEMs can also preload a competing search app on an Android device, including in the hotseat. In recent years, the Google Search App accounted for roughly [redacted] of search revenue on Android MADA devices where it was preloaded in a folder of other Google applications. Tr. 947:18-948:20 (Kolotouros) (testifying about DXD-02.003); Tr. 9865:8-9866:2 (Murphy); DXD-37.109, .114.

1568. On MADA-compliant devices, OEMs can preload an application "launcher" anywhere on the device, including on the default home screen, so long as the launcher does not automatically change the out-of-box configuration of the device without user action. Tr. 6104:3-21 (Whinston) (". . . I believe they can put it on, and maybe they can't in some sense promote it to a user."); Tr. 952:15-25 (Kolotouros); DXD-02.005; JX0099 (2020 Motorola MADA Amendment) at -997-998 (§§ 1.8, 2.5, 2.6).

1569. When activated by a user, such launchers can automatically (*i.e.*, without further steps for the user) change multiple search access points on a device, including (1) removing the Google Search Widget and Google application folder from the default home screen; (2) placing a rival search widget and rival application folder with quick access to rival's search apps on the default home screen; and (3) placing a rival's search app and browser in the hotseat. Tr. 952:4-953:16 (Kolotouros) (testifying about DXD-02.005).

1570. Microsoft's Surface Duo provides an example of a MADA device which promotes rival search services prominently on the device. The Surface Duo is a multiscreen foldable device manufactured by Microsoft that runs Android. Tr. 9438:21-9441:9 (Rosenberg); Tr. 3096:21-3097:12 (Tinter (Microsoft)); DX0207 at .007, .010, .029; DXD-35.009 (screenshot of Surface Duo).

1571. Microsoft preloads Google applications pursuant to the MADA on the Surface Duo. Under the terms of Microsoft's MADA in the United States, Microsoft preloads Google's Search Widget and the Google folder (containing Chrome and the Google Search App) on the default home screens. Tr. 3119:2-3121:2, 3122:5-25 (Tinter); DX0207 at .005, .008.

1572. The Surface Duo also prominently displays search access points that default to Microsoft's Bing search engine on multiple locations on the device, including: (1) Microsoft's Edge Browser preloaded in the hotseat; (2) Microsoft's Edge Browser set as the default browser for the device; (3) a Microsoft folder containing the Bing Search App preloaded on the default home screen; (4) a Bing Search box preloaded on the minus 1 screen; and (5) a Bing search bar accessed by swiping down from the home screen. Tr. 3123:1-17 (Tinter); Tr. 9440:2-9441:9 (Rosenberg); Tr. 9861:23-9865:6 (Murphy); DXD-37.108; DX0207 at .007, .010, .029; .031; DX2045 at .002.

1573. Given the space available to search rivals, the MADA's placement of the Google Search Widget on the default home screen does not prevent rival search providers from being able to compete successfully against Google's RSA payments. In recent years, Google's effective RSA payments to Android partners have ranged from [redacted] of search revenue, while revenue flowing through search access points other than the Google Search Widget was above [redacted]. Tr. 9865:8-9866:2, 9871:4-18 (Murphy); DXD-37.109, .114; DXD-02.003.

1574. In addition, for many years, Google's RSAs with Android OEMs and carriers have permitted search rivals to be preloaded, either without restriction or on a device-by-device basis.

1575. Since 2011, the earliest RSA entered between Google and AT&T, Google's RSA with AT&T has been a device-by-device agreement. Therefore, AT&T has always had the choice to preload search rivals on a some or all of its devices. Ezell Dep. Tr. 192:12-193:14 ("[W]e decide whether to put a device under the terms of the RSA or not[.]"); Tr. 9334:14-22 (McCallister) (discussing 2021 AT&T RSA "which, again, was device-by-device, so AT&T could, for any device model, choose to enroll it or not"); Levine (Google) Dep. Tr. 176:20-177:15 ("[M]eet[ing] the requirements of the RSA . . . was a unilateral option that AT&T had"); JX0015 (Mobile Agreement between AT&T and Google (Feb. 1, 2011) ("2011 AT&T RSA")); JX0021 (Mobile Agreement between AT&T and Google (Feb. 1, 2013) ("2013 AT&T RSA")); JX0050 (2018 AT&T RSA); JX0091 (2021 AT&T RSA).

1576. [redacted]

1577. Since 2014, Verizon has had the choice to preload search rivals on some or all of its devices. As discussed above, the 2014 Verizon RSA that continued in effect until June 30, 2021 contained no provision that prevented Verizon from preloading a search engine other than Google or otherwise reduced the revenue share payment from Google to Verizon if Verizon did so. Verizon never took advantage of this option to preload a search engine other than Google on any devices covered by the 2014 RSA. *See supra* § XII.D.

1578. Under the 2021 Verizon RSA, restrictions on preloading rival search providers are limited to the device-by-device "Preferred Device" tier. Verizon has the choice to preload search rivals on some or all of its devices, and those devices will still receive [redacted] net revenue share on qualifying access points under the "Core Device" tier. In addition, Verizon has the ability to preload Yahoo Search as part of the Yahoo Home application and still qualify for the "Preferred Device" tier and a [redacted] net revenue share. *Supra* § XII.B.2.

1579. Since 2017, Samsung has had the choice to preload search rivals on some or all of its devices. The 2017 Samsung RSA that was in effect until 2020 was a device-by-device agreement. Therefore, Samsung had had the choice to preload search rivals on some or all of its devices, and only those devices where a rival was preloaded would not qualify for revenue share payments. Tr. 888:17-25 (Kolotouros); JX0041 (2017 Samsung RSA) at -975-976 (§ 2.5).

1580. Under the 2020 Samsung RSA, restrictions on preloading rival search providers are confined to the device-by-device "Search Enhanced" and "Search/Chrome Enhanced" tiers. Samsung nonetheless has the choice to preload search rivals on devices and still be eligible to receive [redacted] net revenue share on qualifying access points if Samsung meets the requirements for the "Core" tier, and [redacted] net revenue share on the Chrome Browser if Samsung meets the requirements for the "Chrome Enhanced" tier. *Supra* § XII.B.1.

1581. Since 2021, Google's RSA with T-Mobile has been a device-by-device agreement. Under that agreement, T-Mobile has the choice to preload search rivals on some or all of its devices, and those devices would not qualify for revenue share payments. *Supra* § XII.B.4; Tr. 9341:18-9342:4 (McCallister); Giard Dep. Tr. 194:11-19 ("Q. So T-Mobile has the ability to decide on a device-by-device basis if a device is going to comply with the requirements of that agreement? A. That's correct.").

1582. [redacted]

1583. [redacted]

1584. The 2020 Motorola RSA provides two tiers: a platform tier for "Foundation Tier Devices," and a device-by-device tier for "Premier Tier Devices." Motorola receives monthly incentive payments for meeting "Foundation Tier" requirements and, additionally, based on [redacted]

[redacted] of devices that enroll in the "Premier Tier." JX0062 (2020 Motorola RSA) at -197-200 (Attach. A).

1585. Under the 2020 Motorola RSA, the restriction on preloading alternative search services is only in the device-by-device "Premier Tier." Motorola has the choice to preload search rivals on some or all of its devices, and those devices would not be "Premier Tier Devices." Tr. 840:20-841:4, 906:17-907:1 (Kolotouros); JX0062 (2020 Motorola RSA) at -186-187, -198 (§ 5.1 & Attach. A).

1586. While the agreement initially contained a drafting error that provided that alternative search services could not be preinstalled on Foundation Tier Devices, Google clarified in a waiver letter to Motorola that this was not a requirement for Foundation Tier Devices. Tr. 840:20-841:4, 910:2-11 (Kolotouros); DX0214 (August 2020 letter to Motorola).

2. Competition Against the Preloaded/Default Search Provider(s)

1587. A rival search engine can still compete for users even if it is not successful in competing to be a preloaded or default search engine. Tr. 9701:25-9703:1 (Murphy).

1588. Google's MADAs with Android OEMs and RSAs with Android OEMs and carriers do not restrict end users from installing and using alternatives to any Google application, including the Google Search App, the Google Search Widget, and the Google Chrome browser. JX0049 (2018 Motorola MADA) at -864 (C); JX0071 (2020 Samsung RSA) at -393, -404 (C, § 9.2); JX0091 (2021 AT&T RSA) at -742, -753 (B, § 5.1); JX0093 (2021 Verizon RSA) at -488, -502 (C, § 6.1); JX0095 (2021 T-Mobile RSA) at -688, -700 (C, § 5.1).

1589. Users can download rival search applications, widgets, and browsers on Android devices, including from the Google Play Store. Tr. 617:10-22 (Rangel (DOJ Expert)).

1590. Users can easily remove the Google Search Widget with only two steps: long pressing on the Widget and selecting remove. Tr. 945:9-16 (Kolotouros) ("[I]t's as simple as a long press on the widget itself, and then hitting the Remove or Delete button which appears when the long press on the widget is performed by the user."); Tr. 560:2-561:25 (Rangel) ("Now you want to change [widgets], you're going to take out the Google one, you do a long press there, up, remove, and now you have completed a change.").

1591. MADAs and RSAs do not prohibit partners from offering customers information and instructions on their websites about how to remove the Google Search Widget and download alternative search widgets. Similarly, MADAs and RSAs do not prohibit partners from providing instructions on their websites about how to change the default settings in Chrome from Google Search to a search rival. Many of Google's partners provide such information to users on their websites. Tr. 978:22-980:22 (Kolotouros); Tr. 9441:13-9442:24 (Rosenberg); DX0738 at .002-.003 (Samsung webpage providing users information on how to delete the Google Search Widget); DX0739 at .001 (Motorola webpage providing similar information).

1592. Users know how to remove the Google Search widget, and do so in significant numbers. One Google analysis found that although the Widget was a popular search access point, [redacted]. UPX0562 at -991, -993; UPX0076 at -184, -188 [redacted]; Tr. 945:1-947:6 (Kolotouros) (Widget "is preferred by users to conduct searches in the United States on an Android device which has GMS preloaded"). [redacted]; there is no evidence that any significant number of users remove the Google Search Widget because they prefer a rival's widget instead. UPX0562 at -995 ([redacted]); UPX0076 at -208 [redacted].

1593. Plaintiffs' experts conducted no empirical analysis to determine how many users want to change the Google Search Widget to an alternative but cannot figure out how to do so, and there is no evidence in the record to suggest that number is sizable. Tr. 708:6-14 (Rangel (DOJ Expert)).

1594. In contrast to the implementation of the Google Search Widget under the MADA and RSA, Microsoft has a non-removable search widget that cannot be changed from Bing on the Amazon Fire tablet. Tr. 696:3-699:11 (Rangel) ("[C]hanging default on the search bar on this tablet was beyond my capabilities[.]"); DXD-01.014.

1595. Google has designed the Chrome browser to enable a user to easily change the default search engine that receives queries entered in the browser's integrated search box. Tr. 7650:5-17 (Pichai) ("[W]e made it very, very easy for people to change and use any default search provider of their choice."); Tr. 5926:21-5927:1 (Whinston) (acknowledging evidence in the record that "Google . . . has made changing default search engine on Chrome much easier than Microsoft has made changing the default search engine in its various browsers").

1596. Similarly, Samsung's S-Browser provides easy access to alternative search providers. A user can change the default search engine that receives queries entered in the browser's integrated search box. And a user can also access alternative search providers for individual searches through the S-Browser's "drop down menu" located directly next to the browser's integrated search box. Tr. 858:7-859:6 (Kolotouros); JX0041 (2017 Samsung RSA) at -993 (Ex. F) ("[redacted].").

1597. Plaintiffs' experts did not opine that any significant number of users wish to use an alternative search provider on Android phones but have not been able to do so or do not know how to do so. Tr. 708:6-14 (Rangel) ("Q. Have you done any particular empirical study or research as to how many people want to change the Google search widget out, and they can't figure out how to do that? A. I have not collected data, no. Q. And you haven't seen any data that suggests that any sizable number of people don't know how to search with another search engine on an Android device if that's what they want? A. Specific to that issue, I have not."); Tr. 6045:12-20 (Whinston).

F. No Substantial Foreclosure of Rivals from MADAs or RSAs

1598. The Android Platform accounts for approximately [redacted]% of Plaintiffs' alleged general search market in the United States. Tr. 9858:21-9859:19 (Murphy) (testifying about DXD-37.105).

1599. Because the MADAs and RSAs do not prevent rivals from competing for any users, these agreements do not foreclose from rivals any portion of Plaintiffs' alleged relevant market. *Supra* § XII.E; Tr. 10006:18-25 (Murphy) ("[I]f people are not denied the ability to compete, there's no foreclosure.").

1600. Even conservatively estimated, however, foreclosure from MADA's and RSA's is insubstantial for the reasons discussed below.

1. Measured Against an "Unbundled" But-For World, the MADA Does Not Substantially Foreclose Competition

1601. As discussed previously, in the United States, the MADA is a zero-price barter exchange, with Google providing an OEM valuable mobile applications and services ("Google Mobile Services" or "GMS") in exchange for the OEM promoting Google Search through (1) preinstallation of the Google Search Widget on the default home screen and (2) the Google Search App and Chrome in a folder on the default home screen. *See supra* § XII.A; Tr. 9849:17-9851:1 (Murphy) (testifying about DXD-37.094).

1602. Following a July 2018 decision by the European Commission, Google changed the MADA licensing structure in the European Union. Google "unbundled" the Google Search Widget, Google Search App, and Chrome browser from the rest of the MADA (relabeled the "eMADA"). Tr. 9866:3-9868:6 (Murphy); DXD-37.110; Tr. 9443:3-9445:20 (Rosenberg).

1603. As a result, Google charged OEMs a positive license fee for each device that preloaded GMS in the European Union. Tr. 9866:3-9868:6 (Murphy); DXD-37.110; Tr. 9443:15-9444:2 (Rosenberg).

1604. Google then offered to pay OEMs a royalty-free license to Google Search and Chrome, with a placement bounty for preloading Google Search and Chrome as in the MADA (*i.e.*, the Google Search Widget on the home screen; Chrome in a folder) on devices sold in the European Union. Tr. 9866:3-9868:6 (Murphy); DXD-37.110; Tr. 9444:6-9445:13 (Rosenberg).

1605. No OEMs have entered in the eMADA without also separately licensing both Google Search and Chrome. Tr. 9866:3-9868:6 (Murphy) ("And what you found in Europe is nobody split the MADA. Everybody just did what they were doing before and [took] the full bundle."); DXD-37.111; Tr. 9445:14-20 (Rosenberg) ("Q. . . . Focusing on the period between the implementation of this EMADA structure and when you left your strategy role in late '22, what is your understanding, if any, as to whether any Android OEM in Europe that licensed the EMADA declined to also license Search and Chrome? A. I'm not aware of that happening.").

1606. Despite having the option to preload Bing exclusively on the Surface Duo in Europe, even Microsoft chose to take the Google bounty payment to preload Google Search and Chrome in the same manner as the MADA on the Surface Duo. Tr. 9866:3-9868:6 (Murphy) ("Microsoft in Europe . . . could have done the E-MADA, but they didn't. They took the MADA, the GMS and Play on the one hand, and also took the Google placement with the widget and then put their stuff on top."); Tr. 3417:12-3419:24 (Tinter) ("Q. So Microsoft decided to ship the duo in the European Union with the same experience as in the United States, meaning Google Search and Chrome would be included on the device? A. That's what this [DX0535] says, yes."); DX0535 at .001 (internal Microsoft email: "We are looking to ship Duo in the EU with the same experience as we do in the US. This would mean Google Search and Chrome are included on the device."); [redacted]

1607. At the same time, while the eMADA unbundling has not changed search outcomes, it has created additional operational difficulties, including tracking payments, and addressing other logistical and regulatory issues related to transfers among global companies. Tr. 9867:19-9868:6 (Murphy) ("[O]ne of the things that happened with the unbundling is there's more transaction costs, right, because you now have two agreements and everything else."); Tr. 9444:6-9445:13 (Rosenberg) ("This whole change was a huge operational change for [European OEMs]. It was actually a hardship. They had to manage their device configurations differently, the money had to actually change hands in both directions when it hadn't before, that implicated a whole new operational process on their side. Sometimes there were tax implications they had to deal with in certain countries.").

1608. Because there is no evidence that OEMs or carriers would have licensed a rival search provider with an "unbundled" MADA that did not include Google Search, the MADA has not foreclosed rival search providers from distribution on any Android mobile devices. Tr. 9866:3-9868:6 (Murphy) ("So based on that, I would say it's not the bundle that's driving things. Beyond bundle, I don't see any evidence that people would do something different."); DXD-37.111.

1609. By contrast, "unbundling" the MADA would sacrifice many of the efficiencies of the MADA barter that helped make Android a successful operating system and competitor against Apple. *See supra* §§ VIII.E, XII.I.

2. Measured Against a Choice Screen But-For World, Google's MADA and RSA Do Not Substantially Foreclose Competition

1610. A choice-screen world is not an economically valid but-for world because it arose from regulation, not competition. *See supra* § VII.E.2. Nonetheless, assessing foreclosure relative to a choice screen but-for world is conservative, because it reflects an alternative Plaintiffs themselves have put forth. Tr. 9791:10-17 (Murphy), 9832:7-9833:8; DXD-37.116.

1611. As discussed previously, following a July 2018 decision by the European Commission, Google implemented a search engine choice screen on certain Android devices sold in certain European countries. *See supra* ¶ 568.

1612. Had a similar choice screen been implemented in the United States on Android devices, adjusting for strength of rivals in the United States, Google's expert Professor Murphy estimated that less than ***0.6%*** of total U.S. search queries would have shifted to rivals. Tr. 9875:23-9876:5 (Murphy); DXD-37.116.

1613. This is consistent with estimates from Plaintiffs' experts. Professor Whinston estimated that if the European choice screen design had been implemented on all Android devices in the U.S., then the shift in market share from Google to search rivals would be less than 1% of U.S. search volume. Tr. 6046:16-19 (Whinston), 6089:20-6091:21.

1614. Plaintiffs' experts did not evaluate the financial impacts on any OEM or carrier of setting a search engine choice screen on Android mobile devices. Tr. 6132:9-18 (Whinston) ("Q. . . . [Y]ou've not evaluated, as a part of your work in this case, the cost to OEMs or browsers or wireless carriers of implementing a choice screen; correct? A. Correct. Q. And you also did not set forth in any of your reports any analysis or opinions about what revenue share payments any search engine would offer to participate in a choice screen; correct? A. That's correct. It would probably depend on the design of the choice screen.").

1615. As discussed below, evidence shows that a choice screen would reduce competition and payments to OEMs and carriers. *See infra* § XII.H.

3. Plaintiffs' Flawed Foreclosure Estimates

1616. According to Professor Whinston, Google's challenged agreements "cover" 49.7% of U.S. queries in Plaintiffs' alleged general search services market, of which Google's Android agreements "cover" [redacted]%. Tr. 5763:14-22 (Whinston); UPXD104 at 36. Professor Baker did not provide a "coverage" percentage specifically for Android, but his total estimate of "covered" queries was similar to Professor Whinston. Tr. 7089:3-7090:3 (Baker (Colorado Plaintiffs' Expert)); PSXD-12. Professor Whinston also claimed that Google's challenged agreements "cover" 45% of U.S. revenue in Plaintiffs' alleged general search text ad market and 36% of U.S. revenue in Plaintiffs' alleged search ad market. Tr. 5772:20-5773:7 (Whinston); UPXD104 at 39-40.

1617. Plaintiffs' experts acknowledged that Google's contracts do not make unavailable to rivals all of the search traffic that the contracts cover because Google would have served some of this search traffic even without the contracts. Professor Whinston estimated that if a search engine other than Google had been the exclusive preinstalled default search engine on all search access points on Android devices in the U.S., then approximately 11.6% to 13.5% of total U.S. search queries would have shifted from Google to other general search engines. Tr. 6161:16-6164:10 (Whinston).

1618. Professor Baker estimated that Google would retain [redacted] of revenue on queries covered by a default agreement if Google were to lose its default position at a search access point. Tr. 7092:10-7093:10 (Baker); PSXD-11 at 69. If one were to apply this figure to Professor Whinston's [redacted] "coverage" estimate, it would equate to a similar shift to rivals of [redacted]

1619. There is no evidence that any Android OEM or carrier would have exclusively preloaded a rival search engine instead of Google if not for Google's Android Agreements with OEMs and carriers. Tr. 6044:9-6045:1 (Whinston) ("Q. My question was: You've not offered any opinion that [OEMs and carriers] wanted . . . to replace Google with a rival search engine? A. No."), 6105:6-11 ("Q. Have you seen any evidence in this case that Samsung or Motorola believed that exclusively pre-loading Bing or Yahoo! or DuckDuckGo on any Android device instead of Google would make that device more competitive in the marketplace? A. Instead of, no. I think there was evidence that they were potentially interested in in addition to.").

G. Branch Metrics, Inc.

1620. DOJ Plaintiffs assert that Google's RSA agreements with OEMs and carriers denied distribution to a technology offered by Branch Metrics, Inc. ("Branch"), an alleged potential rival in the market for general search services. Tr. 7:21-8:1 (DOJ Opening Statement). As described below, the evidence at trial did not support this assertion, nor did the evidence at trial demonstrate that any Branch technology likely would have impacted competition in the alleged general search services or search advertising markets.

1. Overview of Branch

1621. Branch is a technology company founded in 2013 that focuses on increasing user engagement with mobile apps. Its primary customers are mobile app developers. Tr. 2892:14-21, 2906:3-21 (Austin (Branch)).

1622. Branch markets a number of technologies, one of which is called "Discovery." Discovery allows users to search the content of apps on mobile devices using so-called "deep linking," which refers to hyperlinks that direct a user to a specific page within an app rather than the home screen or main menu. Tr. 2893:18-2894:2 (Austin) ("Q. And at the time you founded Branch, was there a key product that you envisioned Branch would build? A. At the time we initially decided . . . deep linking is the focus, which was an idea that we had had, actually, a few years prior, but became sort of the core focus. Within, you know, I would say three to four weeks of that time, the primary mission of the company became building an app search engine."); Tr. 4495:9-16 (Chang (Samsung Next)) ("Q. And the Court has heard some testimony about Discovery before but at a high level, can you please explain what Discovery is? A. Yes. Discovery also is a product that kind of evolved over time. But initially when Discovery was fi[r]st started, it was supposed to be targeted as a mobile app search product.").

1623. Branch seeks to monetize Discovery's app search functionality by including advertisements for apps that can be downloaded. Specifically, Branch sells ads to app developers and then shares a portion of the revenue generated from those ads with its OEM and carrier partners. Tr. 2901:9-25 (Austin); DX0614 at .002-.003 (Emails from Branch to Samsung describing "promoted result" monetization proposal).

1624. The advertisements that Branch sought to sell as part of Discovery were to appear in an OEM's app search functionality, and not in response to a web search engine query. Tr. 2901:9-25 (Austin).

1625. Branch primarily distributes Discovery by integrating it with an OEM's existing on-device app search functionality, such as S-Finder on Samsung phones or the app tray on Motorola phones. Tr. 2896:24-2897:15 (Austin) ("[T]he primary way that [users] get to apps is by swiping up, and then they see what we refer as the app tray, sometimes called app grid, and there's a search bar at the top. In that search bar, you can filter the list of apps. It's a very, very basic functionality that Android had. You know, most people don't even think twice about it, but the search bar is actually used very frequently, which was exciting to us as a promising, you know, distribution platform for our innovation."), 2950:10-2951:6 ("Q. Mr. Austin, you've been handed a demonstrative marked as DXD07, which we can also go and place on the screen. . . . I wanted to try to just summarize for the Court the current implementation of Branch functionality on Samsung phones that exist today. . . . I believe this is the version of the functionality that you described as limited or restricted functionality; is that right? A. Yeah. I would assume it's the same, yeah. Q. Let's take a look at page 2 of the demonstrative. So, on the left side, you have the home screen of the Samsung phone, correct? A. Yes. Q. And then to access the app finder -- or, the S-Finder functionality, you can swipe up or swipe down; is that right? A. I know swipe up. I'm not sure about the swipe down, but -- Q. Fair enough. You may know better than I. And then it gives you the opportunity to input something in that search bar at the top? A. That's right."); DXD-07.002 (showing access to Discovery through Samsung's S-Finder).

1626. Discovery was first deployed as part of Samsung's S-Finder in 2019. Tr. 2915:11-14 (Austin).

1627. Although Discovery searches app content resident on a mobile device, it uses an internet connection to synchronize certain background analytics and settings. Tr. 2955:1-5 (Austin).

2. Branch Does Not Compete (and Has No Potential to Compete) in Plaintiffs' Asserted Market for General Search Services

1628. The evidence at trial showed that neither on-device app search functionality generally, nor Branch's Discovery technology in particular, competes with or threatens to compete in Plaintiffs' general search engines market. Tr. 2960:25-2961:10 (Austin) ("Q. Sir, you've also repeatedly told your partners that the app search functionality you were working on is not substantially similar to web search; correct? A. Yeah. The intended use case was not to conflict with or overlap with web search because we knew that that would be -- you know, generally, if we're trying to scale this thing and our first partner goes live and, you know, Google Search traffic drops 50 percent, they would flip out because we're just too nascent to actually be able to offer a meaningful revenue compensation. And so they need to be confident that they're not going to see some dramatic impact there."); Tr. 4564:12-14 (Chang) ("Q. Would you agree with me that the Branch discovery app is not a general search engine? A. Correct, yes, it is not a general search engine."); Tr. 6146:3-5 (Whinston) ("Q. And you've testified Branch Metrics is not a general search engine; correct? A. Correct."); PSX00065 at -531 ("Branch's search use case is totally different and distinct from Google search, and there is *zero impact* on Google search traffic after implementing Branch." (emphasis added)).

1629. In particular, Discovery does not crawl the web or index the web, which are preconditions to developing web search capabilities. Tr. 2957:3-15 (Austin) ("Q. In order to have a web search engine, you would need to crawl the web; correct? A. Yes. Q. You haven't done that; correct? A. No. Q. And if you wanted to have a web search engine you also need to index the web? A. Let me correct that. We have deployed web crawling for certain, you know, [e]dge cases and instances of a broad Branch product suite. So I don't want to say that we've never done web crawling, but just -- Q. You haven't indexed the web? A. We have not, no.").

1630. There is also no evidence that Branch aspires to have Discovery crawl or index the web. Tr. 2960:25-2961:10 (Austin) ("Q. Sir, you've also repeatedly told your partners that the app search functionality you were working on is not substantially similar to web search; correct? A. Yeah. The intended use case was not to conflict with or overlap with web search[.]").

1631. Nor is there any evidence that Branch has sought to partner with a general search engine such as Bing. Tr. 6147:3-5 (Whinston).

1632. Branch has instead intended Discovery to be a complement to a general search engine like Google Search, in that it searches the app content on a user's phone rather than the web. Tr. 2960:25-2961:10 (Austin); PSX00065 at -532 ("Google search returns website results based on crawling the web whereas Branch returns app pages[.]"); Tr. 4564:15-19 (Chang) ("Q. You had also referred to the fact that in those discussions, I believe Samsung had made the point that Branch was complementary to Google search. Do you recall that? A. That was our argument, that we felt that Branch was complementary to Google. It enabled all parties to benefit.").

1633. Indeed, Branch repeatedly conveyed to its partners that Discovery addresses a different use case from Google Search and does not impact or potentially impact Google Search traffic. Tr. 2959:23-2960:7 (Austin) ("Q. [PSX00065 at -531] says 'No web search' on the third bullet; correct? A. Yes. Q. And then if you look down to the product design section, this describes, again, that the search use case for this product is totally different and distinct from Google Search; correct? A. Yeah. I mean, it's a very broad kind of marketing statement that -- but, sure, we wrote that. Q. It's a statement you made to your partners; correct? A. Yeah. Yeah, that's fine."); PSX00065 at -531 ("Branch's search use case is totally different and distinct from Google search, and there is *zero impact* on Google search traffic after implementing Branch." (emphasis added)).

1634. The evidence at trial also showed that Google likewise understood that Discovery was a complement to, and not potentially competitive with, Google Search. Tr. 2881:11-15 (Kartasheva) ("Q. What do you take from the presence of Google [S]earch at the bottom of the screen, in terms of whether Google Search offers an experience competitive with the Branch experience? A. Google offers a different and compl[e]mentary experience that allows users to search the web.").

1635. Google also did not believe that on-device search functionality like Discovery siphoned queries from Google Search, nor did it threaten to do so. Tr. 2815:14-21 (Kartasheva) ("Q. And she writes, 'We did have an on-device search experience on the Android search box that let users search through previously visited app deep links, along with apps and contacts. We unlaunched this last year due to poor usage, though we did keep app launches, the most widely used of all the on-device content types.' Do you see that? A. Yes." (discussing UPX0694 at -599)); UPX0694 at -597 ("On Pixel devices, [redacted]% of AGA queries are generated from the searchbox via the app drawer.").

3. Google's Agreements Did Not Detrimentally Impact Branch's Distribution or Usage

1636. Branch's Discovery technology is available on Android mobile devices offered by every major carrier and OEM in the U.S. today. Tr. 3049:19-25 (Austin) ("Q. . . . There are Verizon, Motorola and Samsung phones on the market today with Branch's app search technology; yes or no? A. With the extra information that I added, yes."), 2943:20-23 ("Q. Was a deal to integrate Discovery on T-Mobile phones ever reached? A. We did achieve a deal with the reduced scope product that we had pivoted to from the original vision in 2020."); PSX00065 at -531 ("All our operator partners (Top 7 in the world) have confirmed that they don't see any overlap with their Google RSA.").

1637. As discussed in Section XII.B, *supra*, carriers, not OEMs, sell the vast majority of Android mobile devices in the U.S., and thus carrier RSA terms typically govern U.S. mobile phone users' devices, and carriers thus can influence the configuration of OEM devices out of the box.

1638. As explained in more detail below, all three major U.S. carriers and both major Android OEMs have approved of the implementation of Discovery, and these partners' RSAs allow Discovery to be preloaded on devices without any impact on the revenue share paid by Google for those specific devices. PSX00065 at -531 ("All our operator partners (Top 7 in the world) have confirmed that they don't see any overlap with their Google RSA."); JX0091 (2021 AT&T RSA) at -743 (§ 1.5) ("Alternative Search Service" definition [redacted]; JX0093 (2021 Verizon RSA) at -489 (§ 1.5) ("Alternative Search Service" definition [redacted]); JX0095 (2021 T-Mobile RSA) at -689 (§ 1.3) ("Alternative Search Service" definition [redacted]); JX0062 (2020 Motorola RSA) at -177 (§ 1.7) ("Alternative Search Service" definition [redacted]); JX0071 (2020 Samsung RSA) at -394 (§ 1.5) ("Alternative Search Service" definition [redacted]).

1639. Furthermore, each major carrier's current RSA applies device-by-device, which means that even if Discovery's implementation on a device were deemed in conflict with a partner's RSA, that would only impact revenue share for that particular device and not for the partner's other devices. JX0091 (2021 AT&T RSA) at -748 (§ 1.58) ("Qualifying Device" definition), -751 (§ 4.1) (Preferred Device "Device Requirements" section defining revenue share eligibility in terms of *devices* that qualify for revenue share without any platform-wide search requirements); JX0093 (2021 Verizon RSA) at -494 (§ 1.60) ("Qualifying Device" definition), -499-500 (§ 5.1) ("Device Requirements" section defining revenue share eligibility in terms of *devices* that qualify for revenue share without any platform-wide search requirements); JX0095 (2021 T-Mobile RSA) at -693-696 (§§ 1.58, 4.1) ("Device Requirements" section defining eligibility for payment under the agreement in terms of *devices* that qualify for payment without any platform-wide search requirements).

a. Verizon

1640. Verizon's current RSA [redacted] JX0093 (2021 Verizon RSA) at -489 (§ 1.5) ("Alternative Search Service" definition).

1641. Consistent with these provisions, Verizon's Chief Customer Experience Officer, Brian Higgins, testified that Google never instructed Verizon not to partner with Branch. Tr. 1112:22-1113:5 (Higgins (Verizon)) ("Q. . . . [D]uring the time that you were involved in the Google relationship, did anyone from Google ever reach out to you and instruct you not to work with Branch Metrics? A. No, not with me. Q. Did anyone on your team ever report to you that they had received an outreach from Google instructing them not to work with Branch Metrics? A. No.").

1642. Branch's former CEO Alex Austin further confirmed that Verizon devices on the market today include Branch's Discovery technology. Tr. 3049:19-25 (Austin) ("Q. . . . There are Verizon, Motorola and Samsung phones on the market today with Branch's app search technology; yes or no? A. With the extra information that I added, yes.").

b. AT&T

1643. AT&T's current RSA [redacted]. JX0091 (2021 AT&T RSA) at -743 (§ 1.5) ("Alternative Search Service" definition).

1644. AT&T and Google [redacted]. *Compare* JX0050 (2018 AT&T RSA) at .003 (§ 1.7) ("Alternative Search Service" definition), *with* JX0091 (2021 AT&T RSA) at -743 (§ 1.5) ("Alternative Search Service" definition).

1645. At the time, S-Finder already incorporated Discovery. Tr. 2915:11-14 (Austin) ("Q. And you talked about Discovery launching on a Samsung phone in March 2019. I don't think you said the model. Do you know what model it was? A. It was the S10 device."); Tr. 4497:7-10 (Chang) ("Q. Was Branch preloaded on the S10? A. Branch was integrated -- on the initial launch, Branch was integrated within a product called S Finder. The capabilities were preloaded.").

1646. AT&T is thus able to preload S-Finder, with the Discovery functionality, on its devices without impacting the revenue share those devices earn. JX0091 (2021 AT&T RSA) at -743 (§ 1.5) ("Alternative Search Service" definition).

1647. In addition, there is no dispute that the 2021 AT&T RSA permits AT&T to implement S-Finder and Branch's Discovery technology. *Compare* JX0050 (2018 AT&T RSA at .003 (§ 1.7) ("Alternative Search Service" definition), *with* JX0091 (2021 AT&T RSA) at -743 (§ 1.5) ("Alternative Search Service" definition); PSX00065 at -531 ("All our operator partners (Top 7 in the world) have confirmed that they don't see any overlap with their Google RSA.").

c. **T-Mobile**

1648. T-Mobile's RSA also allows T-Mobile to preload Samsung's S-Finder and Branch's Discovery technology on its devices without impacting the revenue T-Mobile earns from Google on those devices as long as those technologies are not [redacted] which they are not (*see supra* § XII.G.2). JX0095 (2021 T-Mobile RSA) at -689 (§ 1.3) ("Alternative Search Service" definition).

1649. T-Mobile's Vice President of Partnerships and Business Development, Jeffrey Giard, further testified that T-Mobile saw no conflict between its RSA and Branch. Giard Dep. Tr. 144:22-145:12 ("Q. . . . Were there any concerns at any point that it would conflict with the 2017 RSA? THE WITNESS: I believe some of my team brought it up as a potential risk, but I never considered it as such. Q. Okay. How about under the . . . 2021 search distribution agreement? Were there concerns that a Branch partnership would conflict with the terms of that agreement? THE WITNESS: No.").

1650. T-Mobile has implemented Branch's Discovery technology on devices that are on the market today. Tr. 2943:20-23 (Austin) ("Q. Was a deal to integrate Discovery on T-Mobile phones ever reached? A. We did achieve a deal with the reduced scope product that we had pivoted to from the original vision in 2020.").

d. **Motorola**

1651. Branch's Discovery technology is available on Android devices offered by Motorola under its RSA. Tr. 3049:19-25 (Austin) ("Q. . . . There are Verizon, Motorola and Samsung phones on the market today with Branch's app search technology; yes or no? A. With the extra information that I added, yes.").

1652. Motorola's Mobile Incentive Agreement with Google [redacted] JX0062 (2020 Motorola RSA) at -177 (§ 1.7) ("Alternative Search Service" definition).

1653. Eric Christensen, Executive Director of Software Product Management and Partner Management at Motorola, further testified that Motorola understood that Google did not object to the implementation of Discovery on Motorola devices. Christensen Dep. Tr. 276:17-277:10 [redacted]

e. Samsung

1654. DOJ Plaintiffs center their Branch argument on the Samsung RSA. The Samsung RSA, however, covers approximately [redacted]% of Android devices sold in the United States. Tr. 9854:17-9855:5 (Murphy); DXD-37.099 (calculating that Samsung accounts for [redacted]% of U.S. RSA 2020 payments).

1655. Discovery has, furthermore, been deployed on Samsung devices as part of Samsung's S-Finder without interruption since it first launched on Samsung's flagship mobile device in 2019. Tr. 2915:11-14 (Austin) ("Q. And you talked about Discovery launching on a Samsung phone in March 2019. I don't think you said the model. Do you know what model it was? A. It was the S10 device."); Tr. 2884:14-17 (Kartasheva) ("Q. Ms. Kartasheva, do you have an understanding of whether Samsung's S-Finder still implements Branch on RSA-enrolled devices[?] A. In my personal experience, yes.").

1656. Samsung's 2017 RSA, which was the operative RSA as of 2019, permitted this implementation, [redacted]. JX0041 (2017 Samsung RSA) at -975-976, -987-990 (§ 2.5(b)(i) & Exs. B, C) ([redacted]); Tr. 4518:16-21 (Chang) ("Q. Was Samsung allowed to preload connected search products under the 2017 Samsung-Google agreement? A. I think so. I don't know the exact whole scope of it. But I thought that carve-out that we had put in place allowed for it."), 4500:4-12 ("Q Do you know whether there is a carve-out in the Samsung-Google agreement for -- that permitted Branch to be preloaded on Samsung devices? A There was a carve-out that we worked with in a -- in an early iteration of the agreement, but it was more focused around flexibility for Samsung. And one of them, it was inspired by Branch Metrics. So as an investor for Branch Metrics, we were hoping that it left some room for Branch Metrics to be integrated into Samsung devices."), 4587:17-4588:1 ("Q. And your recollection was that Samsung Next had sought and obtained the carve-out that they wanted in that 2017 agreement in order to preserve the, I think, optionality that you wanted for the products and services that Samsung Next wanted to invest in; is that correct? A. I don't know if it's around software and services that Samsung Next wanted to invest in, but it was more the optionality for various different products and services that we could potentially integrate that were either investments or partnerships or anything.").

1657. Testimony at trial also confirmed that the 2017 Samsung RSA provided Samsung with the flexibility to conduct internet-connected search using Branch technology. Tr. 2954:15-25 (Austin) ("Q. You also testified, sir, that your understanding is that the Google agreement prohibited any internet connection for the implementation; is that right? A. At the time that this was initially done, it did not. This was, again, the first version of the product that was done under the premise of web search being the only scope of exclusivity. After the revision of the RSA -- from what we understood -- to internet search, no further Branch changes were made about the functionality or scope of the product. And, so, that internet component of it was not a factor at the time of implementation of it.").

1658. Samsung's 2020 RSA likewise allows Samsung to partner with Branch through S-Finder, because the definition of "Alternative Search Service" [redacted], which S-Finder with Branch's Discovery technology is not, *see supra* § XII.G.2. JX0071 (2020 Samsung RSA) at -394 (§ 1.5) ("Alternative Search Service" definition [redacted]).

1659. Despite DOJ Plaintiffs' suggestion to the contrary, the 2020 Samsung RSA does not bar paying revenue share if S-Finder connects to the internet, and S-Finder does in fact benefit from an internet connection today. Tr. 2955:1-5 (Austin) ("Q. Am I correct, sir, that the current implementation of the Branch technology and S-Finder actually does benefit an internet connection? A. Yes, it does. The current -- the version that was launched in 2020 does benefit from an internet connection."); *see also* Tr. 2882:22-2883:12 (Kartasheva) (noting difference between a Samsung 2020 RSA term sheet (UPX2003) [redacted] and the executed agreement, JX0071 (2020 Samsung RSA) at -394 (§ 1.5) ([redacted]

1660. The trial record shows that the only Branch proposal Samsung rejected was a proposal to monetize Discovery in S-Finder by returning ads, or "promoted" search results, in response to user queries. Tr. 3060:15-3061:8 (Austin) ("Q. Sir, Samsung told you that they had their own product strategy, which is why they did not want to do a monetization deal that Branch preferred . . . -- correct, yes or no? . . . A. You would need to ask Samsung. . . . Yes. Then it was in an email. I can't tell you whether or not that was the truth of their situation."); DX0614 at .001, .002 (Emails from Samsung to Branch rejecting "promoted result" monetization proposal).

1661. There is no evidence that Samsung's decision to reject Branch's monetization proposal was caused by Google and, in any event, the monetization proposal has no bearing on the alleged general search services or search advertising markets. Tr. 3060:15-3061:8 (Austin) ("Q. Sir, Samsung told you that they had their own product strategy, which is why they did not want to do a monetization deal that Branch preferred . . . -- correct, yes or no? . . . A. You would need to ask Samsung. . . . Yes. Then it was in an email. I can't tell you whether or not that was the truth of their situation."); DX0614 at .001-.002 (Emails from Samsung to Branch rejecting "promoted result" monetization proposal).

4. No Evidence Supports DOJ Plaintiffs' Speculation That Samsung Limited Branch's Implementation Because of Google's RSAs

a. DOJ Plaintiffs' Assertion That the RSAs Impeded Samsung's Deployment of Branch's Discovery Technology Is Based on Speculation and Hearsay

1662. DOJ Plaintiffs' assertion that Google's agreements with OEMs and carriers—and with Samsung in particular—hindered deployment of Discovery is not only contradicted by the agreements themselves, but is also based purely on speculation and hearsay.

1663. Importantly, DOJ Plaintiffs called no percipient witness to Samsung's internal decision-making with respect to Branch, or with firsthand knowledge of Samsung's RSA. Tr.

2978:22-2979:1 (Austin) ("Q. You haven't seen any Google agreements with any OEMs or carriers; correct? A. I have not, but I could basically reconstruct them, as I've done here, from what I've heard from the various employees of these places."); Tr. 4567:23-4568:4 (Chang) ("Q. And I believe you had testified that during that July through October period, you understood that there were those at Samsung that were negotiating the agreement with Google, correct? A. Correct. Q. But you have not seen the agreement, correct? A. I have not seen the agreement, no.").

1664. Testimony from Mr. Austin and former Samsung Next employee Patrick Chang on these topics was not admissible or reliable. In particular, this testimony and related exhibits constitute inadmissible hearsay and do not establish why Samsung may have limited its implementation of Discovery (if it even did so). *See* Fed. R. Evid. 801(c), 802.

1665. First, Mr. Austin admitted that he had no direct knowledge of Samsung's agreements, or the reasons why Samsung purportedly limited the Branch implementation, and could therefore only speculate that Google was a cause. Tr. 2978:22-2979:1 (Austin) ("Q. You haven't seen any Google agreements with any OEMs or carriers; correct? A. I have not, but I could basically reconstruct them, as I've done here, from what I've heard from the various employees of these places."), 3048:10-23 ("Q. Then the same individual at Samsung responds again the very top of the email thread on page 1, and here again this individual says, 'Basically our decision was made with the Branch business opportunity in mind, and explaining transparently, it was not a matter of monetary value but a priority of our own product roadmap.' That's what Samsung told you, correct, sir? A. Yeah, but I had direct interaction with a Samsung employee who talked to the senior executive -- Q. Sir, my question was, that's what it said. Your counsel can ask questions if they would like. A. It was in the board deck that we just reviewed that cites Google being the main issue. Of course they're not going to put that in the email to me."), 3060:15-3061:8 ("Q. Sir, Samsung told you that they had their own product strategy, which is why they did not want to do a monetization deal that Branch preferred . . . -- correct, yes or no? . . . A. You would need to ask Samsung. . . . Yes. Then it was in an email. I can't tell you whether or not that was the truth of their situation.").

1666. Second, Mr. Chang's testimony was similarly off-point. Mr. Chang worked for Samsung Next, which is a corporate venture capital firm that operated as an innovation arm for Samsung and was responsible for identifying potential technology partnerships for Samsung. Tr. 4485:2-16 (Chang) ("Q. At a high level, what is Samsung NEXT? A. Samsung NEXT has evolved over times, but when I first joined, it was kind of in the inception of phases of Samsung NEXT. But at a high level, Samsung NEXT was an innovation arm for Samsung, really trying to focus on capturing innovation within the Silicon Valley but also enabling Samsung Electronics to tap into some of these key technology partners. Q. Have you heard of it described as a corporate venture capital firm? A. Yes. So, you know, Samsung NEXT isn't -- as a whole, when I joined, wasn't only just a corporate venture capital firm. I was part of the venture capital team that was the corporate venture capital arm of Samsung NEXT."), 4496:13-16 ("Q. Would you consider part of your role in working with Branch Metrics as business development? A. Yes, . . . it was one of many roles that I did for Branch Metrics as an investor for Samsung NEXT.").

1667. Mr. Chang repeatedly disavowed any personal knowledge of Samsung's relationship with Google, or its implications for Discovery's distribution on Samsung devices. Tr. 4516:21-4517:12 (Chang) ("Q. And I'd like to draw your attention to your longer chat at 2:47 a.m. And you write at first, 'But I believe we need DE's intervention here since this is ultra time-sensitive.' What was time-sensitive? A. You know, at the time when I sent this message, you know, we get most of our information from, you know, various different parties in Korea that work with various different team members. You know, I had gotten information from Harry, who is a colleague of mine based in Korea, who interacts with a lot of the various different team members from business units to partnerships team and contract negotiation team. And the information that I was getting from him, I thought it was an urgent matter to discuss certain agreements that may impact Branch's likelihood of being integrated into S Finder."), 4550:1-4 ("Q. You said you never had contact with Mr. Kim. Do you mean about this meeting in August 2020 or you're saying you've never spoke to Mr. Kim at all? A. I've never spoken to Mr. Kim directly."), 4567:23-4568:4 ("Q. And I believe you had testified that during that July through October period, you understood that there were those at Samsung that were negotiating the agreement with Google, correct? A. Correct. Q. But you have not seen the agreement, correct? A. I have not seen the agreement, no.").

1668. Mr. Chang's second-hand knowledge of Samsung's Google agreements reflected an understanding that Samsung had flexibility to conduct internet-connected search using Branch technology. Tr. 4518:16-21 (Chang) ("Q. Was Samsung allowed to preload connected search products under the 2017 Samsung-Google agreement? A. I think so. I don't know the exact whole scope of it. But I thought that carve-out that we had put in place allowed for it.").

1669. Other evidence offered by DOJ Plaintiffs was similarly inadmissible and unreliable. In particular, Exhibit UPX0664, a June 2020 internal Google email thread purportedly relaying information from unspecified individuals at AT&T regarding AT&T's discussions with Samsung, is inadmissible for the truth of those statements. UPX0664 (Internal Google email thread discussing investigation of S-Finder functionality).

1670. UPX0664 includes a Google employee's description of what Samsung purportedly told AT&T about its implementation of Branch. Although the email itself may be a Google business record, this does not resolve the double hearsay contained in that record because, among other things, there was no showing that AT&T had a duty to report the information or that it was verified before being transmitted internally at Google. UPX0664 (Internal Google email thread discussing investigation of S-Finder functionality).

1671. As a result, nothing in the trial record shows that Google ever determined that Discovery was an "Alternative Search Service" under any of Google's RSAs, or that Google ever instructed Samsung or any other partner not to implement Discovery as a condition of receiving revenue share for any device. UPX0664 (Internal Google email thread discussing investigation of S-Finder functionality); Tr. 2883:13-23 (Kartasheva) ("Ms. Kartasheva, are you aware of Google having ever told an OEM or carrier partner not to implement Branch on its mobile devices? A. No, I'm not aware of that. In fact, I am aware of agreements that specifically clarify that S-Finder implementation is permitted. Q. Are you aware of what decision, if any, was reached after your factfinding in June of 2020, apart from the testimony you just gave? A. The decision-makers didn't notify me.").

1672. In addition, even if the Court were to consider this inadmissible evidence, it does not show that Discovery's deployment was impeded in ways that might somehow impact competition in the market for general search services or search advertising. *See supra* § XII.G.2; PSX00065 at -531 ("Branch's search use case is totally different and distinct from Google search, and there is *zero impact* on Google search traffic after implementing Branch." (emphasis added)).

b. Samsung Chose Not to Expand Its Branch Partnership for Reasons Unrelated to Google

1673. Even if the Court considers the above-referenced inadmissible testimony and documents about Samsung's consideration of Branch, the trial record shows that Samsung's internal product strategy with respect to S-Finder was the primary reason Samsung rejected Branch's request for an expanded partnership. Tr. 3060:15-3061:8 (Austin) ("Q. Sir, Samsung told you that they had their own product strategy, which is why they did not want to do a monetization deal that Branch preferred . . . -- correct, yes or no? . . . A. You would need to ask Samsung. . . . Yes. Then it was in an email. I can't tell you whether or not that was the truth of their situation."); DX0614 at .001-.002 (Emails from Samsung to Branch rejecting "promoted result" monetization proposal); DX0696 at .001 (Samsung Next Slack message).

1674. As discussed above, Branch pitched to Samsung a plan to monetize Discovery by returning ads in response to user queries. *See supra* § XII.G.3.

1675. In February 2021, Samsung told Branch in writing that Samsung was not moving forward with Branch's monetization proposal because of Samsung's "own search and recommendation solution/roadmap in S-Finder, being developed by Samsung R&D." DX0614 at .002 (Email from Samsung to Branch).

1676. Mr. Chang also testified that he understood that the Samsung product team responsible for S-Finder had concerns from a business strategy perspective about a broader Branch integration. Tr. 4515:6-22 (Chang) ("Q. Do you have an understanding if Samsung wanted to limit the scope of Branch features on the S10 as implemented? A. Yes, Samsung's product team had interest in limiting the scope, correct. Q. Why did they have an interest in limiting the scope? A. You know, I think it had multiple different factors involved. One from a product perspective and another from a business perspective. Q. What was the concern from a business perspective? A. From a business perspective, Samsung had multiple different teams working on new business agreements and new type of services, and they were looking to integrate S Finder directly with certain applications, mainly big applications and having their own direct rev share agreements with them.”).

1677. Samsung also had concerns about Discovery’s user experience, including that the technology did not work well for navigational searches, such as searches for particular app names. DX0698 at .001 (Samsung Next Slack message stating: “TSG stands by S-Finder R&D team’s evaluation that Branch slows down the finder product Slows down the browser Drains the battery Overclocks the cpu hence damaging the phone”).

1678. Samsung had also encountered performance issues with its implementation of Discovery, which ran too slow. Tr. 2976:24-2977:12 (Austin) (“Q. And, in fact, the original version of Branch’s discovery functionality that had been implemented had some latency issues; correct? A. Yeah. Anything that connects to the internet does require roundtrip to the internet. So, you know, Google Search, Branch app search all requires internet connectivity and, therefore, ad[d]s latency to the request. Q. And Samsung actually came to Branch and said this latency is an issue, we would like to look at a version that does not connect to try to fix the latency; correct? A. That was a proposed solution to improve latency. But it, you know, reduced the scope of functionality. You can’t do broad search and, like, provide a Discovery use case if you’re constrained to only provide results from the local device.”), 2980:15-24 (“Q. That’s something you’re highlighting because of the concern that Samsung had raised with respect to the first version of Discovery, correct? A. I mean, we -- so first off, it’s zero latency relative to a network roundtrip. And it’s referring to, probably, network latency because there’s still some latency in this version. Even today I think their -- the team is grappling with latency issues and

LDS. But, yeah, the idea was that you don't need to connect to the internet anymore and, therefore, it can provide the results directly from the phone.").

1679. Samsung had also found that Discovery had low user engagement, due in part to the fact that users were not choosing to opt in to using the technology. This is because users were prompted to opt in to using Discovery when S-Finder was first activated and if they opted out, they were not easily able to change their selection or subsequently were prompted to opt in. Tr. 4578:10-25 (Chang) ("THE COURT: Just before you move on, you had said that users had not opted in because they did not see it. Can you tell me, what did you mean by that? THE WITNESS: Yes. . . . So with terms and service agreements, in order to opt into a certain product, you have to click on agreeing to the terms of services. Many times within devices, all of those terms of services are loaded up on the beginning of setup. In certain cases within Samsung devices -- or maybe other devices, I'm not exactly sure, the terms of services are shown when you activate a service. And the flow of where to opt into Branch for this within S Finder was kind of hidden, and it never showed back up again. So people, if they accidentally clicked no, they could never, ever see it again and opt into the service."), 4574:6-24 ("Q. . . . [D]irecting your attention to the top message that you wrote at 6:50 p.m., you write there: 'WJL's team' -- is that a reference to Won-Jin? A. Yes, correct. Q. 'Wants to help convince VP Sally.' Do you understand that this is a reference to Branch? A. Yes. Q. 'She is stuck on how she doesn't want to change anything. She also has reservations because engagement isn't high on current Branch links.' Do you see that? A. Correct. Q. Do you know, what were you referring to when you said 'engagement isn't high on current Branch links'? A. Yes, here I was speaking about the current usage of Branch's features on the S Finder device. Q. And when you wrote engagement isn't high, is that a reference to users clicking on the links? A. Correct, the users using the product."); DX0695 (Samsung Next Slack message).

1680. Some Samsung personnel also believed that Branch was an untrustworthy partner because Branch was playing the carriers and Samsung off one another in the course of its negotiations with partners. Tr. 4586:6-14 (Chang) ("Q. You then write: 'Samsung feels that Branch is not a trustworthy partner, because they think they are using the carrier to bully Samsung into integration. Carriers are using Branch as a negotiation chip at the moment to threaten Samsung about not integrating other features. They believe Branch is playing both sides.' That was your takeaway that you shared with the rest of the Samsung Next team on that date, correct? A. Yes."); DX0697 (Samsung Next Slack message).

5. Other Branch Partners Shared the Concerns That Samsung Had About Branch

1681. The evidence at trial showed that concerns about the quality and usefulness of Branch's Discovery technology also led other third parties to decide not to partner with Branch or not to expand existing Branch partnerships.

1682. For example, AT&T, like Samsung, had concerns about Discovery's user experience, including with respect to the number of ads it displayed. Ezell Dep. Tr. 247:6-249:9.

1683. Others, such as T-Mobile, had privacy concerns with Discovery, since it required the provision of user data to Branch. Giard Dep. Tr. 145:14-146:4 ("Q. Okay. So you mentioned that T-Mobile and Branch are still in discussions about a potential partnership; is that right? A. That's correct, yes. Q. Where -- what is -- what has slowed down the process? A. For us, it was a privacy review. One element of Branch is collecting data as part of the service, and we are very sensitive and careful about who collects and who has access to customer data. And part of our concern was that we want to make sure that customers have visibility, transparency and choice into what data is collected and how it's used."); Tr. 3059:12-22 (Austin) ("Q. Other carriers also raised privacy concerns before implementing Branch, correct? A. It's a pretty universal concern among everybody. I mean, I don't want to say privacy concerns. It's, you know, are you a good steward of the data that you get from the devices, is the key question, which is -- one of the core components is, are you protecting the privacy of our users. But there's other concerns like are you storing the data, do you have proper security protocols, et cetera, et cetera.").

1684. Indeed, Branch was unable to secure a partnership with Apple because of these privacy concerns, even though Apple had no RSA provision that could possibly have limited Branch's implementation. Tr. 3055:4-11 (Austin) ("Q. The reason that Apple rejected a partnership with Branch, sir, was because Apple was concerned about privacy issues with respect to Branch's technology, correct? A. That was the feedback that we'd received at that time, yes. Q. Because Apple is concerned about sharing iPhone user data with a third party like Branch? A. That's correct."); JX0033 (2016 Apple ISA).

H. Google's Challenged Android Agreements Promote Search Competition and Output

1685. Google's Android agreements promote search competition and output in the United States.

1686. To begin, Google's MADAs with OEMs provide all Android users in the United States with a convenient out-of-the-box search experience with the highest-quality search engine in the United States on several access points that work seamlessly with Google Search. For instance, the MADA provides for the placement of the Google Search Widget on the default home screen. The Google Search Widget is a popular way to access Google Search, and placement of the Widget on the default home screen increases search usage on mobile devices. Tr. 945:1-5 (Kolotouros) (Widget is "the very high majority access point that is preferred by users to conduct searches in the United States on an Android device which has GMS preloaded"), 976:25-977:16 ("Q. And I believe you testified that one of the reasons, of the purposes, of the MADA is to provide a consistent user experience; is that right? A. Yes. Q. Can you describe for the Court what you meant by a 'consistent user experience'? A. The consistent user experience is meant to assure OEMs and users that, if they're moving from one Android phone to another, whether it be by one OEM's line of devices or another OEM's line of devices, that there is a predictable set of utility in UI that is available out-of-box that increases the preference for the particular user to engage with Android devices amongst different OEMs. So the consistent user experience . . . does not refer only to the UI, but also to the existence of applications which have been proven to be popular and are expected on a smartphone and how it's configured."); Tr. 9434:16-9435:5 (Rosenberg) ("Q. What is your understanding, Mr. Rosenberg, of the reasons Google distributes what are called the mandatory GMS services as a suite? A. Well, as I said, this collection of apps provides a very strong experience out of the box on an Android device, whether that refers to browsing the web, downloading an app, making a search, navigating. . . . It gives Android a really strong baseline in that regard."); UPX0076 at -199 (Google document reporting that [redacted]).

1687. The MADA also includes a license to preload Google Chrome, the most popular browser in the United States, out of the box. As discussed above, high-quality browsers result in higher search usage. *See supra* §§ VIII.F, XI.E.

1688. Google's RSAs with OEMs and carriers also promote search competition and expand search output. As with Google's browser default search agreements, the incremental search volume available and value of being an implicit recommended preloaded default search engine drives price and quality competition among search engines competing to be preloaded. *See supra* §§ VII.A, XI.D; Tr. 9856:24-9857:16 (Murphy); Giard Dep. Tr. 32:17-33:03 ("Q. Okay. What is your understanding of why T-Mobile enters into search distribution agreements with Google? A. Well, there's a few reasons. One is it provides revenue for T-Mobile. We also take a lot of effort to provide our customers with the best handset experience, and so we believe configuring them the way we are, not only provides T-Mobile with additional revenue, but provides customers with the best overall device experience.").

1689. Google's RSA payments increase search usage by incentivizing OEMs and carriers to develop higher-quality, lower-priced devices and improved data plans and wireless networks. Tr. 9855:6-9856:1 (Murphy) ("Higher quality is another way to get more users and, therefore, get more search and, therefore, more search revenue. So, this enhances search output, partly by directly encouraging search, because that's where the payment is coming from, but, indirectly, also, by pushing the people to have -- push the platforms."); Tr. 6050:11-19 (Whinston) ("Q. Would you agree that from 2010 to the present, that wireless carrier networks have significantly expanded and improved the performance of mobile devices? A. You know, that's my personal experience. Q. Would you agree that better mobile devices operating on better wireless networks have resulted in increases in sales of mobile devices in the United States? A. Again, I haven't studied the device market, so -- I mean, I'm sure it's true.").

1690. By contrast, where a choice screen has been used to determine the default search provider on Android mobile devices, search providers have less incentives to engage in price competition, resulting in lower payments to OEMs and carriers. These decreases in search payments to OEMs and carriers can also decrease the incentive to promote search on Android devices. Tr. 9797:16-9801:1 (Murphy) ("[E]conomics tells me they're probably going to get less revenue because it's not worth as much to bid to be on a choice screen as it is to be a default[.]"); Tr. 5735:11-5737:16 (Whinston) (discussing the change from an auction based choice screen on Android phones in Europe to a choice screen set by popularity).

1691. After the European Choice screen was enacted, Google started revising its RSA agreements with OEMs to decrease payments on devices sold in Europe. [redacted]; Tr. 9469:17-9470:13 (Rosenberg) ("The underlying philosophy of these revenue share agreements is to pay the partners for configuration decisions that are under their control. With the ultimate remedy in Europe, a couple of the things that were in the choice or control of the OEMs moved to the choice and control of users; specifically, the search provider in the widget and the default search engine in Chrome. And as such, whereas in the past we might have paid a partner to choose Google there for promotion or to enhance the promotion of those access points, because that was no longer under the partner's control, it didn't make sense for [Google] to pay.").

1692. The RSA tiers that require preinstallation exclusivity also prevent opportunism and protect the value of the enhanced search promotion that preinstallation exclusivity provides. Without preinstallation exclusivity, an OEM or carrier would earn revenue share on all traffic, even if a rival search engine was promoted, decreasing the incremental promotion that Google receives under the RSA. The exclusivity provision therefore leads to greater revenue being shared with OEMs and Carriers. Tr. 9857:17-9858:19 (Murphy) ("THE COURT: So the exclusivity, in your mind, has procompetitive benefits because it aligns interest to promote search? THE WITNESS: Correct. It's sort of -- you can think about it as a way of enforcing the benefit of that bargain, preventing opportunistic behavior."); DXD-37.103; Tr. 9360:14-22 (McCallister) ("But we clearly felt that if we are going to pay a carrier out at the highest revenue share, in order to be a good partner, we would expect them to not promote a rival search engine."); Tr. 9428:24-9429:9 (Rosenberg) (Google "want[s] [its] partners to have in line aligned incentives in growing that business with [it] and growing Android with [it] in this reinforcing mechanism.").

1693. Search usage on mobile phones in the United States has increased significantly during the term of Google's Android Agreements. From 2012 to 2022, Google search queries on mobile increased more than 500%. On Android devices in particular, the growth in search since early 2018 has come entirely from increased intensity of use. Although sale of Android devices in the United States has remained flat, Google search queries on Android devices has continued to grow significantly. Tr. 9847:5-9848:6 (Murphy) ("[T]here's been enormous growth in mobile search. And, you know, that comes from many things, right? You got more devices. We got more search per device. The device quality has gone up. There's more search things to search these days. Search engines and browsers are better than they used to be. Lots of things are driving it. . . . How did Google grow its mobile search? By getting more total mobile search, not by winning it away from other people."), 9899:1-19 ("There hasn't been a lot of growth in Android devices. But queries, it continued to go up. Why is that? Well, you know, the marketplace has been successful in generating more queries per device, basically, is what we can infer."); DXD-37.091, .138-.139.

I. Google's Android Agreements Promote Smartphone Competition That In Turn Expands Search Output

1694. Google's MADAs and RSAs promote competition within the Android ecosystem and with iOS. Tr. 9846:23-9847:4 (Murphy) ("[I]f you make the Android platform do better, it's going to compete better with iOS[.]"); DXD-37.086 ("The Android agreements (including MADAs and RSAs) . . . enhance Android's ability to compete against other platforms, including iOS[.]"), .090 ("Android Enhances Intra- and Inter-Platform Competition[.]"); Tr. 9431:4-7 (Rosenberg) (agreeing that Android would "face even more challenges in competing with Apple in the United States . . . without the MADAs and RSAs as . . . presently configured"); Tr. 9351:8-9352:6 (McCallister) (expressing view that Google's 2021 RSAs with U.S. carriers "absolutely" help make Android devices more competitive with Apple devices).

1695. Search is an important complement to mobile devices and mobile device platforms. Tr. 9840:1-9842:19 (Murphy) ("Android is a platform . . . for mobile devices . . . . And one of the things Android has done as a platform, is it expanded as a platform for search. . . . And just like when we talked about browsers [and] search as complements, platforms [and] search can be complements as well, particularly on a new area like mobile."); *see* Ezell Dep. Tr. 60:2-61:23 ("[O]ne of the things people do all the time [on mobile devices] is search. So we want to make it easy and quick for you to search from the home screen.").

1696. Therefore, enhancing Android's ability to compete with Apple in turn expands search output. Tr. 9847:5-9848:6 (Murphy); DXD-37.091; Tr. 9420:1-9424:7 (Rosenberg). Plaintiffs' experts did not analyze competition among smartphones, including the impact competition among smartphones has on search competition and output. Tr. 10582:11-25 (Whinston) ("Q. As part of your work in this case did you conduct any analysis of competition in the U.S. smartphone market? A. No, I haven't studied it. Q. In your expert reports, you did not conduct any analysis of whether competition among smartphones in the United States has impacted search competition in the United States, correct? A. That's correct. . . . Q. In your expert reports, you did not set forth any analysis of whether competition among smartphones in the United States has impacted search usage in the United States. A. That's correct.").

1697. ***The MADA underpins a high-quality out-of-the-box experience that facilitates competition with iOS.*** The MADA applications and APIs provide key functionalities for smart mobile devices. Tr. 9425:12-9426:16 (Rosenberg) ("[The MADA] provides for a collection of high quality apps that are available out of the box when you start up this device, and these apps serve a lot of key functions on the mobile phone. Apple has a similar collection of apps that it preloads on iPhones."), 9434:16-9435:5 ("[T]his collection of apps provides a very strong experience out of the box on an Android device, whether that refers to browsing the web, downloading an app, making a search, navigating. . . . [T]hese are all really important experiences on a smartphone[.]"); Tr. 7655:13-22 (Pichai) ("Q. And what is the MADA, as it's sometimes referred to? A. The MADA is effectively a way for OEMs to license a set of Google Mobile Services. It allows for a suite of applications to be licensed. It is non-exclusive, but it has some placement requirements. Again, this gives users a consistent way to navigate across phones. Also, developers, when they write across Android applications, need a consistent set of APIs. It also gives developers access to the Google Play Store so they can update their applications, and it's a distribution channel for them. So all of that is part of MADA."); Tr. 781:12-25 (Kolotouros) (testifying that the GMS bundle provides "core services that [Google] believe[s] are critical for the user experience which allows [an Android device] to compete, hopefully and successfully, with iPhone"); Christensen Dep. Tr. 151:11-22 (". . . I would say they're almost certainly the most popular apps of all, the Google applications, so, you know, it would be not a great consumer experience if we were to try to ship a device without those."); Ezell Dep. Tr. 60:2-61:23 ("[O]ne of the things people do on Android devices is they access applications. So having on the home screen the icon for the Play Store makes sense. It's a core functionality of the device. Similarly Search, one of the things people do all the time is search. So we want to make it easy and quick for you to search from the home screen.").

1698. Preloading the set of eleven Google Mobile Services applications meets customer expectations for essential out-of-the-box functionality on Android phones. Users strongly demand these applications, with eight of the eleven GMS applications having over one billion daily active users. [redacted]; Tr. 946:13-23 (Kolotouros) (explaining that certain GMS apps have "more than 1 billion users . . . [and Google] find[s] them to be core utilities that are part of an expected smartphone experience out of the box"), 977:4-16 (GMS applications "have been proven to be popular and are expected on a smartphone and how it's configured"); Christensen Dep. Tr. 151:11-22 (". . . I would say they're almost certainly the most popular apps of all, the Google applications, so, you know, it would be not a great consumer experience if we were to try to ship a device without those.").

1699. Preloading Android phones with GMS applications also differentiates Android phones from Apple's iPhone. Tr. 7656:2-9 (Pichai) ("Q. Has Google found that, over the years, these are highly demanded and popular applications for consumers? A. These are extraordinarily popular applications, even on other platforms. But one of the reasons I think people prefer

Android is that they are seeking -- they realize it's an operating system from Google, and . . . this differentiates Android from iPhones, and helps the OEM compete better with iPhones.").

1700. For example, the Google Search Widget that is preloaded on the default home screen of Android devices—pursuant to the MADA—is a key differentiator for Android devices. Tr. 9351:8-9352:6 (McCallister) (explaining that an easily accessible Google Search Widget on the default home screen provides "differentiation vis-a-vis Apple iPhones"); Ezell Dep. Tr. 60:2-61:23 ("[O]ne of the things people do all the time is search. So we want to make it easy and quick for you to search from the home screen."); [redacted]

1701. The out-of-the-box experience the MADA offers enables Android OEMs to better compete with Apple in the U.S. Christensen Dep. Tr. 151:11-22 ("Q. Okay. And what of those [GMS] applications does Motorola consider must haves for phones that they distribute in the United States? . . . A. So I would say they're almost certainly the most popular apps of all, the Google applications, so, you know, it would be not a great consumer experience if we were to try to ship a device without those. So they're all equally important."); Tr. 7654:15-7655:8 (Pichai) ("Q. In addition to providing a free Android operating system to OEMs to build smartphones, has Google supported Android OEMs through the development of Google applications that run on those Android devices? A. Yeah, [Google has] invested a lot to develop a set of useful applications called Google Mobile Services. They're available for OEMs to license. . . . [P]eople don't buy an operating system, right, people are buying a phone at the end of the day. And so when they buy a phone, they expect essential out-of-the-box functionality to work off the gate. And their choice is to either buy an Android phone or a phone from Apple, an iPhone. So making sure the phones are comparative out-of-the-box in the retail store, has the essential out-of-the-box functionality for users I think has been very important. It's been also important to make sure users have a consistent experience. You know, across devices, they can switch from one Android device to another, and giving them a sense of consistency has been very important as well.").

1702. ***The MADA's placement requirements fund Google's investments in Android.*** The inclusion and placement of Google Search and other revenue generating apps and services in the royalty-free MADA provide Google revenue to invest in the platform and support innovations on Android. This benefits users and application developers, and enhances Android's ability to compete against iOS. Tr. 7716:1-11 (Pichai) (The MADA "helps [Google] support the business model of -- because [Google] provides Android for free, and [it] invest[s] tens of thousands of engineers to compete with Apple."); Tr. 9435:20-9436:4 (Rosenberg) ("Q. And what role, if any, does distributing these services as a suite play in the economic model for Android you previously described? A. Well, some of these apps, as I mentioned, are revenue generating for us, and so . . . knowing that they're going to be on every phone where a partner chooses to work with us, gives us the confidence that we'll have revenue from that device and be able to continue our investment in the platform and in the ecosystem at the same levels."), 9427:16-25 (explaining how MADA placement terms contribute to financial model for Android by making Google services "convenient" to users to access); Tr. 816:20-25 (Kolotouros) ("[T]he MADAs themselves are the mechanism to fund the ecosystem via the presence of the widget and the Play Store icon on the home screen.").

1703. ***MADAs and RSAs support a consistent high-quality out-of-the-box experience that enhances both intra- and inter-platform competition and expands search output.*** Apple configures all iOS devices consistently, and users expect easy access to core applications on mobile devices. Ezell Dep. Tr. 174:18-175:6 ("[E]very iPhone looks exactly the same, has exactly the same services on it[.]"); Giard Dep. Tr. 273:23-274:23 ("Consumers have gravitated towards iOS because of its consistency between the available devices operating on iOS, and that same consistency has not existed on the Android side."); Tr. 978:3-15 (Kolotouros) ("My understanding is that when it comes to Apple devices and going from device to device . . . there's an elegance to the movement from Apple to Apple phone which makes it very, very easy to continue on an Apple phone, which we try to compete against by having consistent experience and high-quality services available on a device."); Tr. 9853:15-9854:16 (Murphy) ("[T]hey [Apple] have more control about what goes on the device . . . . They just control it directly."); DXD-37.097.

1704. Google's MADAs and RSAs include preload and placement provisions that ensure a high-quality baseline consistent user experience across enrolled devices promoting competition with Apple. Tr. 781:12-25 (Kolotouros) (the MADA "provides a consistent experience across devices that have been elect[ed] to have GMS"), 818:6-9 ("[T]he revenue share deals ensure a consistent out-of-box search experience for users."); Tr. 9435:6-19 (Rosenberg) ("[The MADA] gives [users] confidence that, for a certain set of really important things, those things will be there as they switch from device to device."), 9428:24-9429:9 ("Q. Why does Google seek preinstallation exclusivity for Google Search in revenue share agreements[?] A. Well, for the reason I mentioned, I think on the product side, we think Search is best in class. We think that it's a great experience to promote Google Search to end users on these devices. It's an important business for us. We want to grow that business. And we want our partners to have in line aligned incentives in growing that business with us and growing Android with us in this reinforcing mechanism."); Ezell Dep. Tr. 45:14-48:16, 190:12-191:15 (explaining that the new terms in the 2021 RSA were related to the "broader objective that Google was saying that they felt like they were losing share to Apple, in part, because the Android experience was not as streamlined and simple and consistent as Apple, that was their context for saying, we want to put requirements around how the device experience is particularly at setup in order for you to earn this higher preferred device tier revenue share"); UPX0129 at -904 (MADA offers "a vehicle to drive consistency of experience").

1705. The out-of-the-box availability and easy access to Google Chrome across numerous Android devices, pursuant to the MADA and RSA, are key differentiators for Android devices in competing against Apple and promote user loyalty to Android. Tr. 9351:8-9352:6 (McCallister) ("[T]he enhanced placement that [Google] get[s] from the RSAs of the Chrome browser is incredibly important in differentiating."); Christensen Dep. Tr. 49:17-24 (testifying that over the past 10 years, he has not believed that Motorola devices would be more competitive in the marketplace if a browser other than Chrome were preloaded), 70:16-21 (agreeing that preloading Chrome and setting it as the default browser on Motorola devices is in best interest of Motorola and its consumers)[redacted] Tr. 937:14-19 (Kolotouros) ("Q. And does Google believe that placing Chrome in the hot seat of an Android device makes the device more attractive to users? A. We believe so, yes. Q. Does Google believe that's an important part of setting up an Android device to compete against the iPhone? A. Yes.").

1706. A consistent user experience across Android devices also facilitates easy device switching among Android devices and encourages consumers to stay within the Android ecosystem when purchasing a new device. Tr. 7654:15-7655:8 (Pichai) ("It's been also important to make sure users have a consistent experience. You know, across devices, they can switch from one Android device to another, and giving them a sense of consistency has been very important as well."); Tr. 9844:22-9846:12 (Murphy) ("[T]he MADA is going to . . . facilitate users moving among Android devices. . . . [I]t's going to have the same Android operating system with the same basic suite of apps."); DXD-37.096; Tr. 9425:12-9426:16 (Rosenberg) ("The fact that those apps are available consistently across Android gives users confidence that they can try multiple types of Android devices for multiple manufacturers and have consistency in their experience."); Tr. 977:4-978:2 (Kolotouros) ("The consistent user experience is meant to assure OEMs and users that, if they're moving from one Android phone to another . . . that there is a predictable set of utility in UI that is available out-of-box . . . . [P]redictability or consistency of experience is important to stay competitive."); Giard Dep. Tr. 273:23-274:23 ("[T]he more we could do to make the out-of-box experience at least similar between devices, our belief was the better off and the better Android would be a viable competitor to iOS."), 274:25-275:20 ("[T]he consistency in moving from one device to another . . . helps in overall customer satisfaction and a lower likelihood for moving from one operating system to the other.").

1707. Notwithstanding the preload and placement provisions in Google's Android revenue share agreements, Android OEMs and mobile carriers retain great flexibility to customize the configuration of their Android devices, flexibility that Apple does not provide. Tr. 2455:4-22 (Cue) ("We don't preload any third-party apps[.]"); Tr. 1101:17-24 (Higgins) ("We do not have the ability to preload apps on the [Apple] device . . . . We do have that flexibility on Android."); Giard Dep Tr. 287:20-24 (testifying that OEMs and carriers "have some flexibility to preload and define the user experience on Android devices, and . . . have no such ability on iOS"); [redacted]

[redacted] Tr. 7652:1-22 (Pichai) ("We felt the best model was to build a world-class operating system and make it open source, and make it free for OEMs to use and adopt which facilitated both adoption of the product, as well as allowed OEMs to customize and meet the needs of people around the world"); Tr. 9416:4-19 (Rosenberg) ("Android has a set of underlying capabilities. Manufacturers have a lot of flexibility in terms of what sort of devices they build with those capabilities."); DXD-35.002-.005.

1708. The above aspects of the challenged Android Agreements enhance both intra- and inter-platform competition, ultimately intensifying competition with Apple. Tr. 9846:13-9848:6 (Murphy); DXD-37.090-.091; Tr. 9431:4-22 (Rosenberg) ("Q. Would Android face even more challenges in competing with Apple in the United States . . . without the MADAs and the RSAs as are presently configured? A. Yes, I believe so . . . because [Android] wouldn't have this strong, consistent out-of-box experience with this collection of applications.").

1709. ***The zero-royalty MADA and RSA payments and terms facilitates competition with iOS that expands search output.*** Google's provision of GMS applications for free, combined with Google's revenue share payments, allows Android OEMs and carriers to price their devices at lower price points and to provide higher-quality devices and better wireless networks. Tr. 9855:6-9856:1 (Murphy) ("[Y]ou're going to pass some of that . . . through, one of the ways you do that is through lower prices, but, also higher quality."); DXD-37.100; Tr. 1097:1-17 (Higgins) ("[W]e have reached terms that allow us to invest in the Android ecosystem.") (testifying about PSX00987 at -594); Tr. 6050:15-6051:3 (Whinston) (agreeing that "better mobile devices operating on better wireless networks have resulted in increases in sales of mobile devices in the United States"); Giard Dep. Tr. 277:15-278:3 (testifying that Google's revenue share payments to T-Mobile "helped support some . . . reduction in direct cost to consumers of the services that [T-Mobile] provided"), 343:20-25 (agreeing that "T-Mobile's current arrangement with Google in the Android Activations Agreement helps T-Mobile provide a quality user experience to its customers"); Christensen Dep. Tr. 70:22-71:3 (testifying that the revenue share payments Motorola receives from Google are "important to [Motorola's] business").

1710. Android devices are typically offered at a lower price point than iOS devices. Tr. 9851:2-9852:18 (Murphy) ("40 percent [of Android devices] are below $200[.]"); DXD-37.095; Tr. 1105:12-17 (Higgins) ("Generally, Android will go lower than what you would see for iPhone.").

1711. The availability of lower-priced Android devices, in turn, enhances competition with Apple. Tr. 9419:10-22 (Rosenberg) ("Q. . . . [W]hat, if anything, [does] this illustrate[] about Apple-Android competition in the United States? A. What this is showing is -- this is showing the dynamic when Apple started to keep prior generation iPhones on the market in order to target lower price segments of the market. And this was a response to Android having more affordable phones than iPhones that were available because iPhone was focused on the premium segments. So what Apple did is they kept their prior generation iPhones available at lower prices. And what this is showing is that that was a successful strategy in -- for some quantities, in switching users from Android to iPhones.") (testifying about DX0135 at .015).

1712. Competition between Apple and Android expands search output. Tr. 9847:5-9848:6 (Murphy); DXD-37.091.

1713. Because they receive these applications from Google for free, OEMs can focus their development efforts on hardware innovations and software differentiation, further enhancing competition against iOS and expanding search usage. [redacted]

[redacted] Tr. 9426:19-9427:7 (Rosenberg) ("[W]hat [the MADA] does is it enables [OEMs] to innovate in other ways, innovate on the hardware, innovate on differentiating . . . their user experience in other ways."), 9420:25-9423:1 (describing innovations Android pioneered that Apple later implemented including innovations that "make access to Search easier for users"), 9486:10-9492:16 (providing numerous illustrations of Android innovations); DXD-32.002-.005; DXD-35.002-.014.

1714. Forcing Google to unbundle the MADA or abrogate its placement requirements would—as in Europe—lead Google to charge a positive price for Android, endangering these benefits. Tr. 9876:6-9877:2 (Murphy) ("So, for example, if you do the E-MADA, . . . unbundling the MADA, like was done in Europe, it raises costs."); DXD-37.117.

1715. Without the ability to seek preinstallation exclusivity, defaults, and/or placement terms through RSAs, Google would offer partners lower or no revenue sharing, reducing partner's incentives to promote Android devices, all to the detriment of search competition. Tr. 9479:19-9480:20 (Rosenberg) ("Q. How would you expect the absence of placement default or pre-installation exclusivity in an Android search revenue share agreement to affect the revenue share percentage that Google is willing to extend to partners? A. If we did an agreement with the absence of those, I wouldn't expect that we would pay at the same level. Q. What would the level be, higher, lower? A. Lower. . . ."); Tr. 9876:6-9877:9 (Murphy) ("[A.] OEMs would get less, and if they get less, that's less incentive to expand search and less incentive to sell more Android Devices. . . . Q. And would that decrease in competition have a spillover [e]ffect on search? A. It would. . . .").

1716. ***RSA terms that condition revenue share payments on enhancing device quality promote competition with Apple and expand search output.*** Google provides security updates for Android devices for free. Tr. 9453:71-9454:2 (Rosenberg) ("... Android would develop the patch.").

1717. Nonetheless, Android OEMs and carriers both play a role in the implementation of these updates on users' Android devices; there are real costs associated with ensuring that the latest security updates are installed on mobile devices, and these costs often mean that OEMs and mobile carriers' short-term interests are not aligned with implementing these security updates. Tr. 9856:2-22 (Murphy) ("... Google relies on the carriers to do the updates. And carriers have incentive to do updates, but not totally. Because if my Android phone doesn't work, some of that cost will fall on the carrier, but some of it will fall on Android platform more generally."); DXD-37.101 ("Because Apple is vertically integrated into the supply of iOS devices, it can push OS updates to its entire range of devices on a timely basis[.]"); Tr. 2871:20-2872:19 (Kartasheva) ("And only with the RSA we were able to fix that, because it was expensive to provide these updates. It costs money to the carriers and manufacturers, and we wanted to support them and RSA is the good vehicle to do that."); Tr. 7657:9-24 (Pichai) ("[S]ometimes [OEMs and carriers] are incented to sell devices, but sometimes there's a lot of cost and effort which goes into updating these devices."), 7658:17-7659:12 ("[O]n paper they should be incented to [make security upgrades]. But I think some of the OEMs have short-term pressures and long-term pressures . . . . [U]pdates are costly . . . so sometimes they make trade-offs. . . . [Google has] found that the compliance wasn't fully there as what you would expect compared to Apple.[]"); Tr. 9455:6-11 (Rosenberg) (explaining that security updates "brought with it costs on the engineering side, on the integration side, the operations side, the customer support side. It had a cost through the system"); Ezell Dep. Tr. 150:2-151:1 ("[W]e have to orchestrate that across, you know, millions of devices[.]").

1718. Security is important to users and Apple markets iOS as being a more secure platform than Android. Tr. 2871:20-2872:19 (Kartasheva) ("And that has been a longstanding marketing communication from Apple, that, you know, their devices are more secure and fresh, and that's why you should buy them."); Tr. 9454:3-15 (Rosenberg) ("Apple used . . . marketing about the security of Android and the security of Android devices, and we felt like, as an ecosystem, we needed a strong answer to that."); Ezell Dep. Tr. 150:2-151:1 ("If it's a security update, it does make sense to get it out onto devices.").

1719. Apple is able to implement security updates without assistance from carriers or any third party. Tr. 9453:1-9454:2 (Rosenberg) (". . . Apple can sort of control that end to end.").

1720. The security update provisions in Google's Android agreements, which condition full revenue share payments on meeting certain security update targets, align partner incentives with consumer demands to help Android devices better compete with iOS devices on security. Tr. 2871:7-19 (Kartasheva) ("[I]t's my belief that the devices covered by revenue share are able to better compete with Apple because they provide heightened level of security updates and software updates that bring new features to users."); Tr. 9351:8-9352:6 (McCallister) (testifying that "security [updates] and letter upgrades" are "incredibly important"), 9330:1-9331:3 (Google "really needed to ensure that the carriers helped push those letter upgrades, as well as the security upgrades, so [Android] could be competitive with Apple's iPhone."); JX0050 (2018 AT&T RSA) at .009 (§ 2.2); [redacted]

1721. Similarly, Google provides Android operating system upgrades (including "letter updates" named after each version of Android) for free. Tr. 9330:1-16 (McCallister) ("Approximately once a year, Android pushes a new version of the operating system to improve the user experience, add new features and functionality.").

1722. These upgrades, too, impose real costs on OEMs and mobile carriers to implement, and the OEM or carrier partner may prefer for a user to purchase a new device rather than upgrading the software on an old one. Tr. 2871:20-2872:19 (Kartasheva) ("And only with the RSA we were able to fix that, because it was expensive to provide these updates. It costs money to the carriers and manufacturers, and we wanted to support them and RSA is the good vehicle to do that."); Tr. 7657:9-24 (Pichai) ("[S]ometimes [OEMs and carriers] are incented to sell devices, but sometimes there's a lot of cost and effort which goes into updating these devices."), 7658:17-7659:12 ("[O]n paper they should be incented to [update devices]. But I think some of the OEMs have short-term pressures and long-term pressures . . . . [U]pdates are costly . . . so sometimes they make trade-offs. . . . [Google has] found that the compliance wasn't fully there as what you would expect compared to Apple[.]").

1723. Apple is able to implement their own operating system updates on their own without the coordination of any carrier or third party. Tr. 9330:17-9331:3 (McCallister).

1724. Consumers value the ability to upgrade their existing device to the latest version of the Android operating system. Tr. 2871:20-2872:19 (Kartasheva) ("[Y]ou can keep your old device for many years, and you will continue getting new software features and updates so your device is fresh and -- you know, as if you went and bought a new phone."); Tr. 6109:13-16 (Whinston) (agreeing that operating system updates improve the performance of devices); Tr. 9330:19-9331:3 (McCallister) (explaining that prior failure of Android OEMs and carriers to regularly update the Android operating system software "ended up being viewed as negative about Android phones").

1725. The upgrade provisions in Google's Android agreements, which require partners to meet certain upgrade targets in order to receive full revenue share, align partner incentives with consumer demands to help Android devices better compete with iOS devices on longevity. Tr. 2871:7-19 (Kartasheva) ("[I]t's my belief that the devices covered by revenue share are able to better compete with Apple because they provide heightened level of security updates and software updates that bring new features to users."); Tr. 9351:8-9352:6 (McCallister) (testifying that "security [updates] and letter upgrades" are "incredibly important"), 9330:1-9331:3 (Google "really needed to ensure that the carriers helped push those letter upgrades, as well as the security upgrades, so [Android] could be competitive with Apple's iPhone.").

1726. It makes no business sense for Google to offer partners a payment, separate and apart from the RSA, for implementing security updates or letter upgrades beyond those the MADA requires because Google believes that "a strong commitment to security on Android devices" is "a pre-condition" for partners who wish to sign Google's "highest value commercial agreement." Tr. 9455:12-9456:19 (Rosenberg).

1727. ***RSAs efficiently align incentives to promote Android notwithstanding the introduction of the Go-To-Market agreements to even better align incentives.*** Google's revenue share payments "enhance . . . OEM[s'] desire to build better devices." Tr. 9844:22-9846:12 (Murphy) ("[B]etter device means more search, more search means more search dollars.").

1728. RSA payments also seek to incentivize wireless carriers, who have the option of promoting Apple devices, to invest in and offer high-quality Android devices. Tr. 9449:19-

9450:9 (Rosenberg), 9428:24-9429:9 ("Q. Why does Google seek preinstallation exclusivity for Google Search in revenue share agreements[?] A. Well, for the reason I mentioned, I think on the product side, we think Search is best in class. We think that it's a great experience to promote Google Search to end users on these devices. It's an important business for us. We want to grow that business. And we want our partners to have in line aligned incentives in growing that business with us and growing Android with us in this reinforcing mechanism."). Carriers have some incentive to invest in Android because "none of the carriers wanted to live in a world where Android's share continued to decline. It's not in their best interests to become an iPhone reseller solely." Tr. 9339:13-9340:1 (McCallister); Giard Dep. Tr. 287:8-19 ("[T]he more customers chose iOS, the fewer options T-Mobile had for introducing new services or revenue opportunities for the company."); Tr. 1080:23-1081:10 (Higgins) (agreeing that "having the right experience [on Android devices] is important" to "compete effectively against Apple and iPhone"); [redacted]

1729. Over time, Android's share of active mobile devices has declined substantially. DX0213 at .002 ("Android has been losing premium share in key markets since 2015 . . . . If trend persists, Google stands to lose $6.8-9.3B in margin[.]"); Tr. 9317:20-9318:13 (McCallister) (Google "had been seeing for several years that . . . Android share was either stagnant or declining . . . [r]elative to the entire smartphone market, which is essentially iPhone versus Android.").

1730. Despite this decline, Google's revenue share payments to mobile carriers in the United States have increased. Tr. 9317:20-9318:13 (McCallister) (Google "had been seeing for several years that [its] revenue share payments to the carriers had continued to increase, and at the same time [its] Android share was either stagnant or declining with those carriers."); Tr. 9449:19-9450:9 (Rosenberg); UPX0287 at -407.

1731. In 2021, Google restructured its RSAs with U.S. mobile carriers to incentivize those carriers to sell more Android devices. DX0204 at .003 ("This compelled [Google] to rethink US Carrier RSAs so that [it] can align carrier incentives and retain (& grow) users on Android[.]"); Tr. 9376:6-15 (McCallister) ("The general concept was that [Google] took where [carriers] were at the beginning of the term of the deal, and to the extent that they were able to drive Android actives, [Google] would pay them incrementally. So [Google] wanted to incentivize [carriers] to continue to drive Android actives."); Ezell Dep. Tr. 173:10-174:8 ("[I]t was a new structure that specifically created incentives for AT&T to increase our number of Android active devices on the network."); Tr. 1098:9-18 (Higgins) (". . . Google had come back to Verizon with a new architecture in the agreement where you've got . . . a mobile service agreement where we would engage in various marketing activities to try and help build the Android ecosystem."); [redacted]

1732. This restructuring—and a similar restructuring of Samsung's RSA in 2020, UPX0786; Tr. 9467:13-9469:5 (Rosenberg)—moved some of the payments that Google otherwise would pay to U.S. carriers under prior revenue share agreements had the revenue share percentages not changed to separate Go-To-Market agreements, which required the carrier to use a portion of these funds to promote sales of Android devices. Tr. 9324:15-9326:1 (McCallister) ("[I]t was never our intention to pay out less money . . . We just wanted the money that we spent to be more impactful by moving some of this into this go-to-market deal for a separate function. . . . [W]e wanted to make sure that [carriers were] giving Android equal share of voice in some of the advertising that they did. . . . We also wanted to make sure that they trained their retail store associates about Android. And we kind of went through a whole list and back and forth about some of these other marketing-type activities that Verizon [was] uniquely able to do in order to help drive additional sales of Android devices."); Ezell Dep. Tr. 196:7-24 ("[T]he two agreements were delivering comparable value, just doing it in a different structure[.]"), 197:7-198:21 ("[T]he incentive agreement provides a mechanism where Google will provide AT&T with marketing funds, and the incentive structure is that that amount of marketing funds changes based on the number of active Android devices that AT&T has on its network. So we get more incentive funds if we're growing our different Android devices. We get an adjustment in the opposite direction; we get less funds if the number of Android devices is declining."), 202:8-203:5 ("[W]e felt net-net of three years, we were going to make more money [o]n average per year."); Tr. 1058:16-25 (Higgins) ("[T]he overall revenue didn't change materially . . . it stayed very similar over the years[.]"), 1098:9-18 (Google "had come back to Verizon with a new architecture in the agreement where you've got a standard revenue share agreement, . . . and then a mobile service agreement where we would engage in various marketing activities to try and help build the Android ecosystem."); [redacted]

1733. This restructuring helped Android devices better compete with iOS devices at the point of sale. Tr. 9378:13-22 (McCallister) (testifying that "the activities described under the go-to-market deal were marketing, promotional, training type activities and obligations that the carriers would take on that they could uniquely do in their retail store environment" and agreeing that "the purpose of supporting those marketing activities was to support the sale of Android devices"); Ezell Dep. Tr. 173:5-176:24 (the restructuring of the 2021 AT&T RSA was designed to correct for things that Google believed "contributed to the fact that they [Android] were not as successful as Apple had" been); [redacted] 1100:23-1101:10 (agreeing that "the more Verizon Android devices that [Verizon] successfully sold in competition with iPhone, the more Verizon stood to benefit financially").

1734. Even with funds allocated to the new Go-To-Market agreements under the commercial arrangements with both Samsung and U.S. wireless carriers, the RSA agreements with both sets of partners continues to play a key role in enhancing Android's ability to compete with Apple, to the benefit of search output; completely abandoning the RSA in favor of Go-To-Market agreements would eliminate the incentive alignment the RSA provides. Tr. 9484:1-17 (Rosenberg) ("Q. Why not scrap the search revenue share agreement and just put all your eggs in the go-to-market agreement? A. A couple of reasons. I mean, those [Go-To-Market] agreements are . . . very cumbersome operationally, they require lots of discussion and debate on the deployment of funds and [are] a difficult mechanism to scale, where there's direct alignment of two businesses, as one does better, the other does better. [The RSA] has operational simplicity to it. . . . [W]ith go to market . . . it has less deterministic effects in terms of outcomes."); *see also*

Tr. 9468:20-9469:1 (Rosenberg) (agreeing that RSA in the revised structured "had a role to play in enhancing Android-Apple competition").

1735. Partners have an opportunity to earn more total dollars under the revised arrangement (RSA plus Go-To-Market), and a reduction in the RSA percentage does not correspond to a decline in the total dollars a partner could earn under an RSA because partners earn more revenue at a given revenue share percentage as Google's monetization increases. Tr. 9462:5-9464:6 (Rosenberg).

XIII. COLORADO PLAINTIFFS FAILED TO PROVE ANTICOMPETITIVE HARM RELATING TO RIVALS' ABILITY TO PARTNER WITH SVPS

1736. Colorado Plaintiffs contend that, as a result of Google's alleged anticompetitive conduct, Google's rivals—in particular Microsoft and its Bing search engine—were harmed in their ability to enter into partnerships with specialized vertical providers (SVPs). Tr. 7138:22-7139:2 (Baker (Colorado Plaintiffs' Expert)) ("Well, with greater competition, it would be easier for small rivals like Bing to obtain more partnerships and use them more effectively to expand their business and compete with Google.").

1737. Colorado Plaintiffs failed to prove that search engine rivals, let alone search competition, suffered any cognizable harm resulting from those rivals' ability to enter into partnerships with SVPs.

1738. The only testimony offered by Colorado Plaintiffs at trial about specific search engine rivals related to Microsoft. Microsoft partners with some of the largest SVPs in the world, spanning a wide range of verticals, in order to provide content in response to Bing queries. Tr. 6212:23-6215:10 (Barrett-Bowen (Microsoft)) (listing Microsoft's partnerships with, among others, Booking, Expedia, Tripadvisor, and OpenTable).

1739. Microsoft has reached content agreements with over 300 partners since 2005. DX1305 at .017-.028 (listing current and former partners).

1740. Microsoft possesses—and uses—ample financial resources to maintain these relationships. Tr. 6209:7-11 (Barrett-Bowen) (estimating Microsoft's annual budget for Bing content partnerships as $80 million); Tr. 3644:13-17 (Nadella) ("Q. And Bing has been a profitable multibillion-dollar business for Microsoft for numerous years, right? A. Yeah, I would say maybe 2015 or '16, I don't remember the exact crossover. But, yes, for a substantial number of years now.").

1741. Against this backdrop of hundreds of partnerships, Colorado Plaintiffs produced only five examples in which they claimed Microsoft did not reach a content partnership with a SVP. Tr. 6187:20-6188:10 (Barrett-Bowen) (mentioning Hopper); Tr. 7134:25-7136:4 (Baker) (testifying about Microsoft's efforts to reach partnerships with Yelp, Booking, Expedia, Hopper, and [redacted] PSXD-11 at .116-.117 (describing the same); Tr. 7256:8-14 (Baker) ("Q. . . . During the course of . . . these supposed alleged anticompetitive agreements, did you see examples of Bing trying to get a deal done or Yahoo! or DuckDuckGo and it failing because of a lack of distribution? A. Well . . . nothing other than [the attempted partnerships] I talked about yesterday . . ."). None shows harm to competition.

(1) *Yelp*

a. From 2012 to 2019, Bing and Yelp participated in a content-sharing agreement. Tr. 7264:13-15 (Baker) ("Q. And Yelp had an agreement with Microsoft from 2012 to 2019[,] correct? A. Yes."); Tr. 6200:24-6201:1 (Barrett-Bowen) ("Q. . . . Microsoft had a partnership with Yelp going [as of November 2019]; correct? A. We did.").

b. Per the agreement, Yelp [redacted] Tr. 6201:24-6202:1 (Barrett-Bowen) ("Q. So prior to [November 2019], what content partnership, if any, did Microsoft have with Yelp? A. Yelp [redacted].").

c. In November 2019, Yelp raised a number of concerns to Microsoft, including that Bing drove insufficient traffic to Yelp. Tr. 6203:10-21 (Barrett-Bowen) ("So without getting into too much detail . . . [Yelp wasn't] happy with the traffic we were providing to them.").

d. Yelp also expressed concern that Microsoft was using Yelp's data in a manner inconsistent with what was allowed under the then-existing Microsoft-Yelp contract. Tr. 6211:17-21 (Barrett-Bowen) ("Q. . . . A concern that Yelp raised was that they were upset with the way that Bing was using their data; correct? A. Correct."); [redacted]

e. [redacted]

f. [redacted]

g. Instead, [redacted]

h. Microsoft views its former partnership with Yelp and current partnership with Tripadvisor as serving the same purpose. Tr. 6199:20-25 (Barrett-Bowen) ("We had Yelp and Trip Advisor. And so they were both providing similar types of data. . . ."); [redacted].

i. Yelp has told Microsoft that it is interested in working with Microsoft again, and the two companies were engaged in exploratory discussions at the time of trial. Tr. 6212:6-12 (Barrett-Bowen) ("[W]e're having discussions with Yelp. They're interested in working with us.").

j. Colorado Plaintiffs did not present evidence at trial that Yelp licenses any content to Google. Accordingly, Microsoft's failure to reach a partnership with Yelp did not disadvantage Bing in competing with Google in providing search results.

(2) *Hopper*

a. Hopper is an SVP in the travel vertical. Tr. 6187:25-6188:10 (Barrett-Bowen) ("So if you're looking for a flight and you want to lock the price of the flight, then, you know, [Hopper] provide[s] the service to do that."); Tr. 9199:16-21 (Holden) ("Hopper is a provider of -- was typically in the past, flight search capabilities. I think they might have hotel search capability as well now too. But it's another place that consumers can go to look for travel information.").

b. Microsoft discussed a potential content partnership with Hopper. Tr. 6187:25-6188:10 (Barrett-Bowen).

c. Hopper did not flatly reject a partnership with Microsoft; it simply told Microsoft it had other, more immediate priorities. Tr. 6187:25-6188:10 (Barrett-Bowen) ("We were in discussions with Hopper, and the outcome of that was they said to us, look, we can't work with you right now, it's not something that we can do given the penetration and the distribution you have, we have other partners that we would like to work with ahead of you. And so the deal didn't actually go ahead.").

d. Although it did not immediately secure a partnership with Hopper, Microsoft continues to enjoy partnerships with three much larger providers within the same vertical: Booking, Expedia, and Priceline. Tr. 6212:23-6214:4 (Barrett-Bowen) ("Q. . . .You have a partnership with Booking.com; correct? A. Correct. Q. It's one of the largest online travel agencies; correct? A. It is. . . . Q. And [Microsoft has a relationship with]

Expedia? A. Correct. Q. Priceline? A. Correct."); Tr. 7262:17-18 (Baker) ("Q. And [Booking, Expedia, and Priceline are] all much bigger than Hopper, right? A. Likely.").

e. Google does not today and has not in the past had a partnership with Hopper to provide data for inclusion in Google search results. Tr. 9199:22-23 (Holden) ("Q. Has Google ever had a partnership with Hopper? A. We have not.").

(3) *Car Rental Agencies*

a. Microsoft entered into a content partnership with Kayak wherein Kayak would provide information about car rentals in response to Bing queries. Tr. 6189:24-6190:3 (Barrett-Bowen) ("Q. And does Microsoft have a partnership with Kayak? A. We do. Q. And what is the nature of that content partnership? A. So . . . they're the provider of car rentals for us.").

b. [redacted] Tr. 6190:7-20 (Barrett-Bowen) ("So when we go into partnerships, one of the things I look at is, what is the return we're going to give back to the partner. [redacted]. So fragmenting it amongst other partnerships just isn't a great thing . . . for them.").

c. Because Kayak itself aggregates car rental listings from other providers, Microsoft's partnership with Kayak gives Bing users access to rentals from a variety of car rental companies. Tr. 6210:2-6 (Barrett-Bowen) ("Q. . . . Does Kayak itself offer the car rentals, or does Kayak partner with, like, the Hertzes and the other. . . car rental agencies of the world? A. So Kayak partners.").

(4) *Expedia and Booking*

a. Colorado Plaintiffs' expert economist Professor Jonathan Baker testified that Expedia and Booking were examples of SVPs that were hesitant to partner with Bing due to its scale. Tr. 7135:17-7136:4 (Baker) ("Q. . . . In your view, does small scale affect the interest that SVPs have in working with Bing? A. Yes. Bing's small scale means that it can't offer SVPs as much traffic as if it had large scale. So that limits what value it can provide . . . and makes it harder for it to partner with the SVPs. Q. And can you summarize the evidence on which you rely? A. Here [on PSXD-11 at .116] are three examples of testimony from a Microsoft executive, an Expedia executive, and a Booking executive essentially making that point.").

b. Regardless of how hard it allegedly may be for Microsoft to enter into deals with SVPs, the record at trial established that both Expedia and Booking today have content partnerships with Microsoft. Tr. 6212:23-6214:2 (Barrett-Bowen) (agreeing that Microsoft has content partnerships with both companies); Tr. 7258:1-11 (Baker) ("Q. Bing has a partnership with Expedia, doesn't it? A. Yes. Q. And Bing has a partnership with Booking.com right? A. I think you're right about both, but I'm not 100 percent sure. Q. Nothing about this testimony pertains to the question of whether Bing has been able to enter into partnerships with Booking.com or Expedia to improve Bing's search results, right? A. No, this goes to the importance of scale and traffic to the SVPs in working out arrangements with general search firms. Not specific partnerships, no.").

c. There is no evidence that either Expedia or Booking ever expressed unwillingness to continue their content partnerships with Bing because they were dissatisfied with Bing's scale.

1742. Professor Baker acknowledged that he could not link any alleged difficulty Microsoft faced in reaching SVP content partnerships—either as to specific partnerships or generally—with any decline in Bing's search quality or with Bing's competitive positioning against Google. Tr. 7262:21-7263:1 (Baker) ("Q. You've not performed any analysis to assess whether a lack of a partnership with Hopper has impacted Bing's search quality, correct? A. I did not analyze it, that's correct. Q. Or its ability to compete with Google? A. That's correct.").

1743. Colorado Plaintiffs failed to prove that the purported inability of Microsoft and other of Google's rivals to form more or different partnerships with SVPs decreased their ability to compete with Google for general search users.

XIV. SEARCH ADS 360

A. Alleged Anticompetitive Conduct

1744. Colorado Plaintiffs assert that Google limited the interoperability of Google's Search Ads 360 ("SA360") Search Engine Management ("SEM") tool in a manner that anticompetitively maintained monopolies in search engine and search advertising markets by denying or delaying implementation of certain Microsoft Advertising features.

1745. Colorado Plaintiffs at trial presented testimony on four Microsoft Advertising features: "dynamic search ads"; "responsive search ads"; "local inventory ads"; and Microsoft Automated Bidding (sometimes referred to as "auction-time bidding" or "real time bidding"). Tr. 6915:21-6916:11 (Amaldoss (Colorado Plaintiffs' Expert)); Tr. 7114:6-17 (Baker (Colorado Plaintiffs' Expert)).

1746. Three of those four features had been implemented in SA360 prior to trial.

a. SA360 implemented dynamic search ads functionality for Microsoft Advertising by November 12, 2021. PSX00572 at -748-749; DX0294 at .001; Tr. 7002:11-12 (Amaldoss).

b. SA360 implemented responsive search ads functionality for Microsoft Advertising by November 12, 2021. PSX00572 at -748-749; DX0294 at .001; Tr. 7002:16-17 (Amaldoss).

c. SA360 implemented local inventory ads functionality for Microsoft Advertising by November 12, 2021. PSX00572 at -748-749; DX0294 at .001; Tr. 7002:13-15 (Amaldoss).

d. Although not raised by Colorado Plaintiffs at trial, the Complaint identified an additional functionality, "call extensions." Colo. Pls.' Compl. [ECF No. 1-2] ¶ 160. SA360 implemented call extensions functionality for Microsoft Advertising by November 12, 2021. PSX00572 at -748-749; DX0294 at .003; PSX00833 at 1, 3-4.

1747. Colorado Plaintiffs focused at trial on the fourth feature: auction-time bidding for Microsoft Advertising. This was also referred to within Microsoft as automated bidding, autobidding, or real-time bidding. [redacted] Tr. 6659:16-19 (Vallez (Skai)).

1748. SA360 is currently testing with third-party advertisers an integration of auction-time bidding for Microsoft Advertising. PSX00572 at -748-749 (November 12, 2021 internal Google email stating: "Began alpha testing for Microsoft Ads Auction Time Bidding (ATB)"); Tr. 4407:9-18 (R. Krueger (Google)) ("My understanding is as of today . . . there is a limited alpha for customers, but it's not fully launched."); Tr. 1246:4-13 (Dischler) ("Q. And at this time, Google does not offer real-time bidding for Microsoft Ads through SA360; correct? A. I believe it's in beta."); Tr. 7003:16-18 (Amaldoss).

1749. SA360's full launch of the Microsoft Ads auction-time bidding functionality to all advertisers will follow successful completion of customer-driven testing. PSX00577 at -560-561 ("Based on beta performance and potential new features launched in MSFT Ads, SA360 product team will determine if Byx is ready for launch to all SA360 customers."); PSX00588 at -328-329; *see also* Tr. 4443:8-4445:23 (R. Krueger).

B. Advertisers' Options for Buying Online Advertising

1750. Advertisers have many options for purchasing online advertising, including using native tools offered by advertising platforms; using third-party tools such as a search engine marketing ("SEM") tool; or implementing custom solutions. Tr. 1423:3-12 (Dischler); Tr. 6599:10-6600:6 (Vallez); Tr. 7152:2-25 (Baker).

1751. Native tools are offered by advertising providers (such as Microsoft and Google) and allow advertisers to buy advertisements directly from their platforms. Tr. 6759:17-23 (J. Krueger (Google)); Tr. 6592:23-6593:2 (Vallez) ("Q. Have you heard the term 'native tool' used to refer to a tool used to place ads on a specific search engine? A. Yes. Q. And both Google and Microsoft have native tools? A. Yes.”).

1752. SEM tools are software that allow for centralized management of search ad campaigns across multiple search engines. Tr. 1232:16-18 (Dischler); Tr. 6591:6-12 (Vallez); Tr. 5153:3-17 (Booth (Home Depot)).

1753. Advertisers also may develop custom applications for purchase of search advertising, for instance by using application programming interfaces to build features and functions to help them manage their particular advertising programs. Tr. 6602:10-25 (Vallez) (“Q. And the third category here says ‘build in-house.’ So first of all, what does build in-house mean? A. It means that they would actually build -- they would actually take the APIs available from the different marketplaces, whether it be Google or Microsoft, and they would build features and functions to help them manage their advertising programs on a day-to-day basis.”).

1754. [redacted]

1755. Advertisers can place search advertising using more than one option, such as native tools or SEM tools. Tr. 1244:14-1245:1 (Dischler) (“Q. . . . That’s [referring] to utilizing a SEM tool such as SA360 rather than an advertiser having to use separate native tools; correct? A. That’s correct, although -- although the truth is, for many of [Google’s] advertisers, they’re often going into the native tools as well. We haven't fully solved that problem."); Tr. 7009:1-7 (Amaldoss).

1756. Advertisers using SA360 can and do go directly to native platforms such as Microsoft Ads or Google Ads, by navigating to that platform's website, to use particular features offered by those platforms, including Microsoft auction-time bidding. Tr. 4407:24-4408:17 (R. Krueger) ("So they can -- any customer at any point, if they're [SA360's] customer or not, they can go to Microsoft, use Microsoft auction-time bidding with Microsoft's conversion measurement source or whatever Microsoft supports. So even if they're [SA360's] customer, they can go directly to Microsoft to do that. The same with Google, they don't have to use your platform. They can use [SA360's] platform or not."), 4409:3-4410:11.

C. SEM Tools

1757. There are four major SEM tools available in the United States: Marin, Skai (formerly "Kenshoo"), Adobe, and SA360. Tr. 6591:13-24 (Vallez) (listing SEM tools); Tr. 7154:25-7155:1 (Baker) ("Q. Okay. And how did you define 'major SEM tool'? A. As the four that were listed on the left.") (discussing PSXD-11 at 73, listing SA360, Skai, Adobe, and Marin).

1758. Marin's SEM tool supports digital advertising on search engines, social media, and online retail websites. [redacted]

1759. Skai offers a SEM tool that allows advertisers to place digital advertising on search engines, social media, online retailer, and other websites. Tr. 6583:10-25 (Vallez) ("I would say the channels that we typically work on are search, social, apps, retail media, and display advertising.").

1760. Skai's social media advertising partners include Facebook, Instagram, Snapchat, Pinterest, LinkedIn, and TikTok. Tr. 6647:11-6648:14 (Vallez) (discussing DX3226 at .001), 6584:13-16.

1761. Adobe also offers a SEM tool. Tr. 6591:13-24 (Vallez).

1762. Microsoft does not offer a SEM tool. It considered purchasing [redacted], but decided not to do so. [redacted]

1763. Microsoft Ads has pursued partnerships and feature development agreements with SEM tool providers [redacted]

1764. Advertisers can and do switch between SEM tool providers. Tr. 7106:18-7107:3 (Baker), 7175:20-22 ("Q. And you are aware of evidence in this case of advertisers that do switch SEM tool providers; right? A. I'm aware that some advertisers have switched, yes."); Tr. 6603:1-3 (Vallez) ("Q. In your experience, do advertisers sometimes switch from using one SEM tool to a different SEM tool? A. It happens, yes."); PSX00578 at -195.

1765. Advertisers perform a cost-benefit analysis and switch between SEM tools when it makes sense to do so despite transitory costs incurred in switching. Tr. 7106:18-7107:3 (Baker) ("Advertisers are heterogenous. They have different -- basically different benefits from switching, and the costs might not be identical for each one of them. So they will make their own calculation. And some -- it's not surprising that some switch, even though there are these kinds of switching costs.").

1766. Colorado Plaintiffs' experts have not engaged in any quantitative analysis of what, if any, switching costs advertisers incur in moving from one SEM tool to another, or how often such switching occurs. Tr. 7174:24-7175:3 (Baker) ("Q. All of those different examples of switching costs, you have not done any analysis or study that has led you to offer an expert opinion as to what the specific cost of switching in any of those scenarios is; is that right? A. No quantitative number, if that's what you're asking."); Tr. 7010:14-16 (Amaldoss) ("Q. You haven't done any survey or analysis of how frequently advertisers switch SEM tools, correct? A. I have not done any survey.").

1767. Some advertisers have switched away from SA360 to use other SEM tools. Tr. 4755:14-16 (Varia (Google)) ("Q. During your time at SA360, did advertisers switch away from SA360 to other platforms? A. Yes, that would happen."); Tr. 6655:25-6656:7 (Vallez) ("Q. . . . Verizon is a customer of SA360's that switched some business to Skai, correct? A. Correct."); *see also* Indacochea (Google) Dep. Tr. 126:15-20 [redacted]

1768. Advertisers can and do use more than one SEM tool at the same time, a practice referred to as "multi-homing." Tr. 5155:3-16 (Booth) ("Q. [On] which SEM tool does your team spend its time? A. We actually have two, the first one is Search Ads 360, or what we call SA360. That's, I would say, probably the source of truth where most of the activity happens. In addition to that, we now supplement that tool with an alternative technology called Skai . . . . Q. And you said that's where most of the activity happens. Do you have a general percentage of how much spend goes through SA360 versus Skai? A. All activity goes through both platforms simultaneously."); Tr. 7009:16-7010:1 (Amaldoss).

1769. The Home Depot is an example of an advertiser that engages in multihoming. It uses SA360, as well as Skai, through which it accesses Microsoft Ads auction-time bidding. Tr. 5159:18-24 (Booth) ("THE COURT: But I hear you saying that you do all of your ad placements through SA360 and, therefore, your Bing placements are not done through an auction-time bidding strategy; is that correct? THE WITNESS: Through SA360? We talked about having a secondary technology called Skai. We do use auction-time bidding through Skai's platform for Bing."), 5160:2-6 ("Q. But do you go, when you have campaign setup through SA360, do you, within that campaign, go to Microsoft Ads to use auction-time bidding while it's running on SA360 as well to use a tool? A. We use Skai for that purpose."), 5161:13-16 ("Q. So since you've been using Skai -- and I think you mentioned you've been using auction-time bidding for Microsoft Bing through Skai? A. That's correct."); Tr. 7174:3-7176:24 (Baker).

D. SA360

1770. SA360, Google's SEM tool, allows advertisers to purchase search engine advertising on Google Ads, Microsoft Ads, Yahoo Japan, and Baidu advertising platforms. Tr. 4745:13-21 (Varia).

1771. SA360 and Google Ads are separate products within Google, and the product teams that oversee each product area are separate. Tr. 4439:24-4440:9 (R. Krueger) ("Q. Maybe to clarify, what's the relationship between SA360 and Google ads? A. [SA360 and Google Ads are] separate products within the company. Q. Is there any overlap in the teams or budget or things like that? A. We have engineering teams that we can -- like, the engineering team works a little different than the product team but the product team is separate. Q. So in terms of making the decisions of what to support, those are separate teams? A. That's right.").

1772. SA360 does not support every Google Ads feature. Tr. 4751:5-7 (Varia) ("Q. At that point, did SA360 support every feature in Google Ads? A. No -- def- -- no."); Tr. 4413:6-17 (R. Krueger) ("THE COURT: . . . But, in other words, to go to Google ads, as you've said before, you have to open another browser and open up another portal to get to -- it's not as if you can get to Google ads through SA360? THE WITNESS: Not the full Google ads experience. It would be only the features that [SA360] support of Google ads, and the same for Microsoft, whatever features [SA360] support[s].").

1773. SA360 salespeople do not receive commissions on sales of Google Ads. Tr. 1507:7-19 (Dischler) ("Q. And the salespeople make their commissions on sales of Google ads? A. No, actually the salespeople who are responsible for Search Ads 360, I believe they -- in fact, I'm not even sure if they're commissioned. They certainly are not commissioned on Google ads, it's based on advertiser success outcomes with the platform product. Q. Well, one of the things you would look for is feedback from your salespeople who are selling Google ads, correct? A. Not to my knowledge actually, it's the people who are selling Search Ads 360. We try to segment that so that we don't create perverse incentives. We want people to have good outcomes for the tool.").

1. SA360 Feature Development Process

1774. SA360 implements new or improved functions and features based on a "roadmap" planning process that incorporates input from the SA360 product team, engineering team, and sales and business team. PSX01205 at -293; PSX01206 at -872.

1775. In developing product roadmaps, the SA360 product and engineering teams consider, among other things, routine product support; new features arising from SA360's own in-house innovations that work across multiple search engines; and features for specific search engines that customers ask for. Tr. 4466:4-22 (R. Krueger) ("But for the roadmap specifically, [SA360] look[s] at generally three categories. First is engineering investments to keep the lights on, so, you know, back-end infrastructure, things, pipeline changes, engineering-led initiatives that are not customer facing. There's a second category which is new products offerings that are not related to engine features but are our own in-house innovations. So [SA360 has] features that [SA360] offers that help customers automate certain tasks or, you know, [SA360 has] a rules feature where customers set up a rule and it automatically does things. So [SA360 has] [its] own features that as product team we want to innovate on. And then a third is supporting engine features that [SA360's] customers are asking for."); Tr. 4745:13-4746:4 (Varia) (discussing DX0132 at .005 and "cross engine" features that work with multiple search engines); DX0188 at .011-.014; DX0189 at .011-.016.

1776. SA360 has tens of thousands of customers, who often have a "laundry list" of capabilities and features they want to see supported in and integrated into SA360. Tr. 4731:1-18 (Varia) ("Q. [W]ith each roadmap cycle, were there features that had some customer feedback that wouldn't make -- make it on to the roadmap for a six-month period? A. That was -- yeah, that was pretty common for [SA360]. Q. Why is that the case that a feature with some customer feedback would not make it on to the roadmap for a six-month period? A. Yeah. . . the challenge would be, you know, [SA360 has] lots of customers, like tens of thousands of customers, and they oftentimes have a laundry list of capabilities and features that they would like to see in the product. It's, you know, ultimately [the SA360 team's] job to kind of take that into account in our prioritization process but account for existing things we're working on, the resources we have available. And so oftentimes we would have to defer some functionality to -- in our prioritization cycle.").

1777. In deciding which features or functionality are developed as part of the SA360 product, the SA360 team has to account for the engineering resources available. Tr. 4436:23-4437:17 (R. Krueger) ("So the product team determines what features are built or not. They -- they're the ones that have to secure the resources from engineering. So the product managers are responsible for that. And then as the GPL team, we would put that into the roadmap deck or from the marketing, go to market perspective and then we would distribute that to [SA360's] customers and partners.").

1778. In each product roadmap cycle, there are features that do not make it on to SA360's roadmap. Both Google Ads and Microsoft Advertising features often did not make it onto the roadmap. Tr. 4730:19-4731:18 (Varia); [redacted] PSX01110 at -156 (H1 2020 draft roadmap with prioritized projects and "painful cuts").

1779. Features that are not included in the roadmap at one point can be considered and included in subsequent roadmap cycles. Tr. 4749:9-13 (Varia) ("Q. And I think you testified to this before, but was there ever occasion for a feature to be on this 'out' or 'not on the roadmap' list that then made it in subsequent periods of time on to the 'in' list? A. Yeah, that was pretty common for that to happen.").

1780. The SA360 team often excluded Google Ads features from SA360's roadmap because of resource constraints, lack of demand, or other reasons. Tr. 4718:23-4719:4 (Varia) ("Q. In your experience with SA360, did the SA360 team have occasions to not include . . .

Google or Google Ads features in SA360? A. Yeah, that would happen quite often. It would just, kind of the resource constraints [the SA360 team] operated under, we always needed to prioritize kind of that which we could fund."), 4731:19-25 ("Q. Were there times when you worked at SA360 where your team communicated to Google Ads that their features did not make the roadmap? A. Yes, that would happen.").

1781. SA360's decisions whether or not to implement features or functionality for Microsoft Ads prioritized considerations of customer demand and available resources, and were not made with any intent to harm Microsoft. Tr. 1425:4-13 (Dischler) ("Q. What, if any, part of that it improvement and innovation related to trying to hurt Microsoft in some way? A. There was no intent to hurt Microsoft in any way. What we do is -- when we want to support features for other platforms, what we would do is we would go out to our advertisers and ask them what are the most important features. We have a fixed period of time that we can devote to our entire team's development, and we prioritize those features based primarily on advertiser feedback of [SA360's] existing advertisers and [its] potential advertisers.").

2. Project Amalgam: Launch of a New Platform for SA360

1782. Project Amalgam was the internal project name for a recent complete rebuild of the SA360 platform. Tr. 4467:25-4468:6 (R. Krueger) ("Q. And in the time period that we're sort of discussing in this case, like starting in late 2019 and running for the next few years, was there some project that was going on that was resource intensive in SA360? A. So we had Project Amalgam, which is now the new Search Ads 360, and that took up almost the majority of our resources because we were rebuilding the platform."), 4468:7-19 ("Q. Do I have it right, there was a prior version of SA360 and then now there's a new version? A. That's right. Q. Is there any relation to the two or was it sort of a complete rewrite? A. It's a completely new product.

And we had to basically rebuild all of [SA360's] features on to the new product, plus migrate customers' data and settings and everything to the new product as well.").

1783. The new SA360 platform that resulted from Project Amalgam was announced in February 2022. Tr. 4744:13-19 (Varia) ("Q. . . . And when did -- when was Project Amalgam announced publicly? A. It was after I left, but I mean, I recall that there was an announcement, I think, sometime in February of 2022."); DX0282 at .001.

1784. Project Amalgam consumed significant resources of the SA360 team. Tr. 4467:25-4468:6 (R. Krueger) ("So we had Project Amalgam, which is now the new Search Ads 360, and that took up almost the majority of our resources because we were rebuilding the platform.").

1785. For instance, the SA360 team estimated almost half of its engineering capacity was dedicated to Amalgam in the January-June 2019 period. Tr. 4745:1-12 (Varia) ("So for a planning cycle, [SA360 has] a certain number of engineers that are available to work on the product, and so this is just saying 48 percent of that eng capacity, or engineers, are going to be working on Amalgam."); DX0132 at .005.

1786. As part of Project Amalgam, Google built new Microsoft features. Tr. 4724:21-4725:2 (Varia); Tr. 4468:20-22 (R. Krueger); DX0282 at .001, .003-.004.

1787. The new SA360 platform that resulted from Project Amalgam supports more than ten additional Microsoft Advertising features, including four of the features identified by the Colorado Plaintiffs: Microsoft responsive search ads, dynamic search ads, call extensions, and local inventory ads. Other new Microsoft features included five additional Microsoft audience types and Microsoft Audience Network for search campaigns. Tr. 4726:3-22 (Varia) ("Q. And below she mentions 'responsive search ads, more Microsoft audiences, Microsoft audience network in search, dynamic ads, and more.' And does that -- is your recollection that these features were launched in Amalgam? A. Yeah, these are features [SA360 was] working on when I left, and [it was] set to launch so, yeah, those launched."), 4736:2-7 ("Q. Dynamic search ads and responsive search ads are listed here. Do you see that? A. Yes. Were those features built into Amalgam, also known as the new SA360? A. Yes, they were."); Tr. 7002:11-18 (Amaldoss); PSX00572 at -748-749; DX0282 at .001, .003-.004.

3. Project Myx: Implementation of Google Ads Auction-Time Bidding in SA360

1788. Project Myx was the internal project name for the integration of Google Ads auction-time bidding technology into SA360. Tr. 6751:1-5 (J. Krueger); Tr. 4691:12-15 (Varia).

1789. Project Myx began in late 2016 and took approximately three years to complete. Tr. 6812:9-19 (J. Krueger) ("I want to say from the time that we began requirements, which preceded my time as even a rotating product manager, was maybe early 2017, maybe late 2016, until the launch fully in September of 2020 . . . ."); Tr. 4729:3-7 (Varia) (Project Myx took "three or more years for [Google] to be able to get to a launch -- or get to an announcement."); DX0086 at .002 (explaining "What is Myx"), .006 (2016 Plans).

1790. Project Myx commenced after observing "customers were leaving in droves" from SA360 to use the Google Ads native tool following the launch of Google Ads auction-time bidding. Tr. 4427:15-4428:15 (R. Krueger) ("When [SA360] did the Google ads auction-time bidding, when that started, customers were leaving in droves from [the SA360] platform, and so it was very obvious quickly to the product team that there was a lot of demand.").

1791. Hundreds of advertisers had expressed interest in SA360 integrating Google Ads' auction-time bidding technology. Tr. 6846:14-6847:4 (J. Krueger) (describing "many hundreds" of advertisers expressing interest for Google's auction-time bidding).

1792. The Google Ads auction-time bidding functionality was so technically complicated that Google was initially unsure if it would be possible to integrate the feature into SA360, and it took years to do so. Tr. 1238:4-13 (Dischler) ("Q. Now, you said SA -- I'm sorry. Google's auction-time bidding feature was available on Google Ads going back a number of years; correct? A. Several years, yes. Q. All right. And that was before it was available through SA360; correct? A. Yeah, that's correct, because it was so technically complicated that we didn't know whether it would be possible to actually move over to SA360, but we figured out a way to do it after several years of development.").

1793. Developing the Google Ads auction-time bidding functionality was complex because it required SA360 to integrate with a separate product (Google Ads), which had implications for the initial build of the feature and also for longer-term maintenance. Tr. 4441:12-22 (R. Krueger) ("[A] lot of the complexity with auction-time bidding is [SA360 has] to integrate with another product which brings its own level of complexity, not just on the initial creation and compatibility but also the long-term maintenance as things change on both platforms, it's, you know, something we monitor closely.").

1794. A bidding technology integration, such as auction-time bidding, is more complex than merely providing support for a simpler feature. Tr. 6811:7-6812:8 (J. Krueger) ("Q. Could you explain to the Court why it's different to integrate, let's say, a bidding technology rather than support a feature? A. So the way I would put it is, the general expectation of supporting a feature is to make available a feature that an engine supports. This could be something as simple as a campaign setting from a search engine. Maybe for example, it targets a certain location. And these features that [SA360] support[s], there's a very clear understanding that it's not Search Ads 360 that is developing the feature; however, it's simply allowing an advertiser to enable, disable, and in some cases report on that feature. Why this is important is if that feature performs inadequately, it's quite trivial to inform an advertiser, for example, you were targeting a specific location and you saw some traffic outside of that location, please reach out to the engine that is owning that feature and resolve the inquiry. In other words, Search Ads 360 is not under any obligation to more or less explain that it worked, more or less that it was correctly configured, for example. By contrast, an integration -- and there aren't that many that I can think of at the moment -- typically involves two systems of algorithms or artificial intelligence, machine learning that have to work together. Both of these systems are continuously evolving. They may have issues. And there's several orders of magnitude complexity of integrating, given some of those considerations.").

1795. During the integration of Google Ads auction-time bidding functionality into SA360, bugs and other implementation issues caused the bidder to not perform as expected. This resulted in Google having to refund money to advertisers to compensate for spending above the advertiser's goals. Tr. 6814:14-6815:15 (J. Krueger) ("Q. Do you recall any circumstances during the beta testing or any other testing of Project Myx where an advertiser sought credits from Google or Google gave credits to an advertiser due to any malfunctions? A. Yes. Q. And why would an advertiser seek credits, or why would Google give credits during a bidding testing like that? A. So generally speaking, advertisers that use automated bidding have a[n] expectation that [SA360] would hit their goals as they've set. For example, if they want to hit a $50 target CPA, it should be somewhere in that ballpark unless we could explain a good reason otherwise. For various instances, there might be an issue with the way the conversions were exported and conversions had some issue, the algorithms had some issue, and as a result, the performance may not be aligned to their expectations. A common case where we would consider a credit or a refund is when we spent too much money, so instead of a $50 CPA, it was much higher, 500. In other words, [SA360] bid far too high. For these bugs that we had validated to be real issues, we would often consider and deliver a refund in the amount of the overspend to what we call make good and help the advertiser reasonably achieve what they would have performed had the bug not occurred. And these were only instances where we would give refunds if there was an actual identified bug, and we would subsequently attempt to fix that bug as soon as possible.").

1796. Although SA360 saw significant customer interest in Google Ads auction-time bidding with advertisers reporting a performance improvement, SA360 also did its own extensive testing to validate that its implementation of Google Ads auction-time bidding functionality gave similar performance improvements. Tr. 6809:7-6810:16 (J. Krueger) ("Our product, Search Ads 360 automated bidding, we have a responsibility to advertisers to ensure that we can achieve their goals ideally as optimally as possible within reason. To incorporate a new feature, we want to have a very high level of quality standard, which ensures that we also can see those performance effects, for example, that they're not biased by seasonality, one of the reasons we want the test to be what's called A/B split at the same time as opposed to before and after. And just as importantly, we need to consistently see quality performance."); DX0146 at .002 (announcing launch of auction-time bidding in SA360 for bid strategy types after an "extensive testing period").

1797. According to an analysis done during beta testing, Google Ads' auction-time bidding functionality as integrated into SA360 led to a lift in conversions for advertisers of 15% to 30% at the same or better return on investment. Tr. 6757:4-24 (J. Krueger) ("[T]he main attempt of this statement is to indicate that advertisers saw additional lift in conversions, 15 to 30 percent additional at the same objectives that they had set."); PSX00909 at 1 (September 18, 2019 blog post announcing launch, "During beta testing hundreds of Search Ads 360 advertisers enabled Google Ads auction-time bidding and saw an average lift in conversions of fifteen to thirty percent at the same or better ROI.").

1798. Auction-time bidding functionality for Google Ads in SA360 was implemented in stages due to its complexity. In September 2019, Google Ads auction-time bidding became generally available in SA360 for Google Search campaigns and launched in open beta for shopping campaigns. PSX00909 (September 18, 2019 blog post announcing launch); Tr. 6756:5-10 (J. Krueger) ("Q. Okay. And at this time, Project Myx was still in beta testing; right? A. So there was several stages of the launch. I want to say at this time, [SA360] had launched one component out of beta, which would be for search campaigns, while there were other components of the Myx project that were still in beta.").

1799. Google Ads auction-time bidding in SA360 was fully launched in September 2020. Tr. 6812:20-6813:9 (J. Krueger) ("Q. Okay. So just so the Court knows, I think we saw the blog post that was September 2019. Between September 2019 and what you described as the full launch in September 2020, what happened in that year? A. If I recall, the first announcement in September of 2019 was for Google Ads search campaigns, also known as text campaigns. And I believe the supported goal types for bidding strategies were target CPA. I might be misremembering one of the details, but subsequently over the course of the next year, [SA360] launched support of Myx for shopping campaigns, a different campaign type, budget bid strategies, which is a different objective, spend-based instead of ROI-based, and then I'm not sure, but I think the value-based target ROAS also came later, but I'm not quite sure of that timeline."); PSX00213 at -574 (announcing that SA360 has "enabled auction-time bidding for the majority of Search Ad (*i.e.*, Text Ads and DSA) advertisers in SA360 for CPA bid strategy types" and is "adding support for ROAS bidding in Q2, followed by Shopping campaigns, Smart Shopping campaigns and Budget Bid Strategies in early Q3").

E. Online Advertising Technology: Background on Relevant Features and Functionality

1. Dynamic Search Ads, Responsive Search Ads, and Local Inventory Ads

1800. Dynamic search ads, responsive search ads, and local inventory ads refer to particular types of advertisements offered on advertising platforms.

1801. Dynamic search ads use an advertiser's website content to select landing pages from the advertiser's website and generate headlines for ads. UPX8021 at .002.

1802. Responsive search ads allow advertisers to enter multiple headlines and descriptions when creating an ad and, over time, Google will automatically test different combinations and learn which ones perform best. PSX00194 at -504.

1803. Local inventory ads allow advertisers to advertise products that are available in particular stores close to a customer searching for items. DX0350 at .001.

2. Bid Strategies and Bidding Technology (Including Auction-Time Bidding)

1804. When designing an online search advertising campaign, advertisers may choose from one or more bid strategies. Bid strategies are defined by an advertiser's goal, such as maximizing conversions (*e.g.*, clicks, or sales) within a set budget or at a set cost per action. Tr. 6758:20-6759:8 (J. Krueger) ("Q. Okay. And a bid strategy is the objective or goal that the advertiser wants to achieve? A. So a bid strategy is a few things. It is a collection of campaigns, one, could be many. It has an objective type. So it could be conversions. And then it has typically an efficiency return on investment. Those would be the main components of a bidding strategy.").

1805. Advertising platforms like Microsoft Ads and Google Ads offer bid strategies to meet advertiser objectives. Tr. 6759:17-23 (J. Krueger) ("Q. . . . Are there also bid strategies within native tools? A. Can you define 'native tools,' just so I'm on the same page? Q. Google Ads, Microsoft Ads. A. The search engines themselves do offer their own versions of bidding strategies, correct.").

1806. For example, advertisers bidding on Microsoft Ads may choose between Enhanced cost-per-click ("eCPC"), Max clicks, Max conversions, Target cost-per-action ("CPA"), and Target return-on-ad-spend ("ROAS") bid strategies. Tr. 4736:13-20 (Varia).

1807. SEM tools also offer their own in-house bid strategies. [redacted] Tr. 6639:19-6640:7 (Vallez) ("[A]t that point in time, a lot of third parties, like Skai, had their own bidding technologies.").

1808. Once the advertiser has selected a bid strategy, advertising platforms and SEM tools use complex bidding technologies to implement and optimize bids according to that bid strategy. At trial, evidence was introduced regarding two bidding technologies: intraday bidding and auction-time bidding. Tr. 6760:22-6761:5 (J. Krueger) ("Q . . . The bid strategy you've just been referencing is the objective, while intraday or auction-time bidding is the frequency at which data signals are updated to achieve that objective? A. I'd say the way to describe it is a bid strategy is a way for an advertiser to say these are the portfolio campaigns that I would like an objective to be set upon, and intraday bidding or auction-time bidding would be a mechanism of how the bids are optimized."), 6762:1-7 ("Q. Okay. So I said I would try to break this down into three separate steps. The first step is, we've talked about, advertiser selects a bidding strategy in SA360. After they do that, the advertiser would select whether it wants to run that strategy with intraday bidding or auction-time bidding; right? A. That would be a setting within the bid strategy, correct.").

1809. In Google's SA360 SEM tool, intraday bidding adjusts bids "anywhere from four to six times a day." Tr. 4407:4-8 (R. Krueger).

1810. Auction-time bidding, on the other hand, determines a price to bid at the time of every auction. Google Ads auction-time bidding will "adjust a bid as that system sees fit per auction or per query." Tr. 6751:15-19 (J. Krueger).

1811. Auction-time bidding is a complex technology that uses a variety of signals to inform bids at the time of every search ads auction. [redacted] Tr. 6768:14-6769:14 (J. Krueger) (discussing PSX00655 at -410) ("Q. . . . Is this describing the process of the integration of Search Ads 360 and Google Ads that we've been talking about this morning? A. This is, I would say, a highly oversimplified diagram of what the integration looks like. The actual mechanisms are much more nuanced than this diagram. But for an audience that was trying to understand what signals would be available, I think the main goal of this, again, which Ryan, I believe, wrote, was to emphasize some additional signals, which were also presented on one of the previous slides.").

1812. Signals that are incorporated into auction-time bidding include conversion path, device, time of day, language, and others. PSX00909 at 2; PSX00655 at -406, -410.

1813. A key input required for auction-time bid strategies is conversion tracking data. Tr. 4315:12-4316:3 (R. Krueger) ("Q. And advertisers have to provide that information in order for auction-time bidding to really work; right? A. It doesn't have to be floodlight. Engines themselves have their own tracking measurement tools. So Google Ads, for example, they have Google Ads conversion tracking, they call it. I mentioned Google Analytics. I think there's a free and a paid version. And then Microsoft has their own tracking mechanism as well that customers can use.").

1814. Conversions are events that an advertiser finds significant (*e.g.*, clicking on an ad, selling a product, or filling out a web form) that are tracked in the course of online advertising. Tr. 1241:6-18 (Dischler) ("A conversion is whatever event that an advertiser thinks is significant. It might be something like selling a product or visiting a store, filling out a web form, making a phone call. It's basically a significant business event for the advertiser."); Tr. 6774:11-6775:14 (J. Krueger) ("A specific floodlight conversion would typically be as you described, a meaningful action upon an advertiser's website, filling out a form, for example, or when a purchase of a retail product, e-commerce, a tag will fire. . . .").

1815. Floodlight is Google's brand name for its conversion tracking technology. Tr. 4752:7-13 (Varia) ("Q. What is Floodlight? A. Floodlight refers to the DoubleClick or -- I think now it's the Google marketing platform's version of conversion tracking."); Tr. 4312:24-4313:15 (R. Krueger) ("THE COURT: Just a clarification. Floodlight conversion or floodlight data, can you tell me what that means? THE WITNESS: Yeah. So as a part of Google marketing platform in which we sit in as Search Ads 360, there's a measurement tool called 'floodlight.' If you heard of Google Analytics, it's another tool similar to that where it measures click-based activity on the web for media spend and can say these clicks are tied to these website actions, like say a purchase on a retailer's site.").

1816. Conversion data is not unique to SA360 or Google, and other advertising platforms, including Microsoft, offer conversion tracking. Tr. 6771:22-6772:10 (J. Krueger) ("It's important to mention that Microsoft Ads offers a version of conversion tracking, as does Google."); Tr. 4752:21-4753:3 (Varia) ("Q. If you know based on your experience working at SA360, do other ad platforms, meaning outside of Google, offer conversion tracking? A. Yeah, pretty much all of them do. Q. Is Floodlight tracking, as far as you know, unique to Google? A. No, there's -- there are many other types of conversion tracking products that are comparable.").

1817. SA360 offers ways for advertisers to take their Floodlight conversion data out of SA360 and bring it to another platform. Tr. 4734:2-12 (Varia) ("Q. . . . Does SA360 offer the ability for advertisers to, for example, take their conversion data out of SA360 and bring it in to another platform? A. Yeah, [SA360] offer[s] a variety of ways, through data exports, APIs, and downloads, they can do that."); Tr. 6770:9-25 (J. Krueger) ("Q. But it couldn't be used for auction-time bidding in other search engines, correct, in non-Google search engines? A. Through the particular integration of Search Ads 360 with Google Ads, the integration of shared floodlight conversions to Google Ads, there are -- advertisers own their own data, and there are many mechanisms for advertisers, if they chose, to send their conversion data anywhere they would like, which could include to other engines. So just to clarify, this is just speaking about the integration that [SA360 has], but it doesn't prohibit advertisers from moving floodlight conversions anywhere they wish. Q. They would have to import that data out of SA360; correct? A. One way that an advertiser can get their floodlight data is to download that data and upload it to another search engine. And I'm aware of many advertisers that would write a script for this process and upload it accordingly. That's sort of how it would be done.").

F. Microsoft's Demand for Feature Parity and Auction-Time Bidding in SA360

1. Microsoft's Preliminary Conversion Data Testing Request

1818. In or around September 2019, shortly after SA360 publicly announced the integration of Google Ads auction-time bidding functionality, Microsoft asked members of the SA360 team about how the integration worked. Tr. 4309:5-16 (R. Krueger) ("Q. When Google announced that it had integrated the auction-time bidding feature in Google Ads into SA360, Microsoft made a similar request as to the auction-time bidding feature in Microsoft Ads; right? A. Sorry. You're referring around the September time period? Q. Yes. A. So I believe around that time period, they started asking questions about like how does this integration work. They wanted to learn more about the Search Ads 360 integration with Google Ads. And then I'm not sure of the exact timing, but they did mention that they had an auction-time bidding feature as well.").

1819. SA360 at that time did not support auction-time bidding for Microsoft Ads, as the feature first needed to be built. Microsoft requested that the SA360 team perform conversion data testing as a first step in determining whether Microsoft's auction-time bidding feature could work with SA360, and Microsoft sent SA360 a proposed plan for conversion data testing on October 16, 2019. Tr. 4317:15-19 (R. Krueger) (discussing PSX00645 and PSX00646) ("Q. So in Exhibit 645, Mr. La Force had said, 'our plan is to send you one,' and then if you turn to the first page of 645, you see on October 16, he sent you the one-pager; is that correct? A. That's correct.").

1820. Microsoft proposed a test involving sending advertisers' Search Ads 360 Floodlight conversion data to Microsoft to test use of that data for auction-time bidding on the

Microsoft platform. Tr. 4310:23-4311:14 (R. Krueger) (discussing PSX00645) ("Q. All right. And so you understood that at this point Microsoft was proposing to test for floodlight conversion integration with Microsoft Ads in SA360; right? A. Not exactly. So this specific proposal was taking Search Ads 360 floodlight data, customer-owned data on their behalf with their consent, sending that to Microsoft for use in the Microsoft platform itself. So this is not -- the test was not in SA360. This is in Microsoft with the floodlight data. So I just wanted to make that distinction.").

1821. This proposed test was not a test of auction-time bidding functionality for Microsoft Ads on SA360. It was a preliminary step to determine whether it was even technically feasible to build auction-time bidding for Microsoft Ads on SA360. Tr. 4314:14-4315:4 (R. Krueger) ("This would have been the first step in a long evolution to get into [SA360's] platform, but if Microsoft didn't have the ability, which I think there were certain features that they didn't have that we would need, we would have to request that they build it so the data could actually get in. So it was both a technical feasibility and general understanding of like how it uses information, how does it behave under various stress environments like outages happen and things like this. So there's a pretty wide range of things that happen with the data.").

1822. At the time Microsoft proposed this conversion data testing in October 2019, Microsoft's auction-time bidding functionality was not on SA360's feature roadmap. PSX01147 at -979 (H2 2019 roadmap).

1823. In January 2020, Microsoft provided a list of customers "that could qualify" for conversion data (Floodlight data) testing, but did not confirm with the customers if any would actually want to participate in testing. Tr. 4332:6-18 (R. Krueger) (discussing PSX00462) ("My understanding of that was they did some assessment on their side to say these customers could qualify, but they didn't confirm with the customers yet. But they said they had -- and I'm confirming they said they were ready to start that process of recruitment."); PSX00462 at -323 ("This will take some time as we need to communicate/educate our sellers on the pilot opportunity and then they need to present this pilot to their respective client.").

1824. Because the resources to develop support in SA360 for Microsoft's auction-time bidding functionality had not yet been approved within Google, the SA360 team asked Microsoft to hold off on "outreach to customers [for testing] until the roadmap" was finalized. Tr. 4334:2-7 (R. Krueger) ("Q. And you advised your colleagues, 'For now, I'll reply back and let them know to hold off on outreach to customers until the road map is shared with them'; correct? A. Yeah, so we didn't want them to start recruiting customers for this test until we've confirmed on our side that we secured the resources as a part of the road map, that's right."), 4333:8-20; PSX00462 at -323.

1825. On March 6, 2020, the SA360 team notified Microsoft that the H1 2020 roadmap was finalized. The roadmap included three Microsoft features: Parallel Tracking, Prominence Metrics, and Expanded Support for DSA (Dynamic Search Ads). PSX00433; Tr. 4341:15-22 (R. Krueger) ("Q. Okay. And you say, 'Thank you for your patience as we finalized our road map. Below are the current Microsoft Advertising features we plan to begin development on in H1 2020.' So at this time, your team had finalized the road map that you were discussing with Microsoft in January? A. Yeah, this is the same road map I referenced in January, yep.").

1826. The SA360 team told Microsoft at that time that it "did not have the engineering resources allocated" for the Microsoft conversion testing for auction-time bidding integration, but "remain[ed] open to revisiting this feature based on customer demand in future planning cycles." PSX00433; Tr. 4342:12-21 (R. Krueger) ("Q. And you say towards the bottom of your e-mail, 'For this planning cycle, we have elected to defer running a Microsoft auction-time auto bidding test but remain open to revisiting this feature based on consumer demand in future planning cycles.' A. 'Customer demand,' but yes, that's right. Q. So the SA360 team had decided to defer the testing that you had been discussing with Microsoft since October 2019? A. That's correct. The team did not have the engineering resources allocated for the road map, that's correct.").

1827. The SA360 team reiterated to Microsoft that it "prioritizes feature investments based primarily on feedback from our customers." PSX00668 at -310; Tr. 4447:6-19 (R. Krueger) ("Q. And what, if anything, did the SA360 team tell Microsoft about whether or not it was going to build the features or functionality that is listed in this table? A. We've had, you know, consistent regular meetings, including the, I think, the reference -- the meeting on 11/13 where we took their input and it goes into our prioritization process and we build based off of customer demand. Q. And so when Mr. Kachachi here says in this email at the top, 'As we've mentioned in our prior meetings, SA360 prioritizes feature investments based primarily on feedback from our customers,' is that consistent with the message that you are familiar with that was given to Microsoft? A. Yes.").

1828. The SA360 team also advised that Microsoft needed to develop related features that would improve performance for an auction-time bidding integration, including support for fractional conversion data, before SA360 could incorporate auction-time bidding for Microsoft Ads. PSX00433 at -859; Tr. 4470:19-4471:2 (R. Krueger) ("Q. And the last sentence there, you say, you know, 'Additionally, for further considerations we would need to see broadened support of features,' and then you list some things. What were you telling Mr. Humphrey by that sentence? A. That -- to build the feature there that we were discussing, we would need to see fractional conversions and the ROAS-based bidding strategies."); PSX00460 at -916-917 (describing the value of fractional conversions in providing advertisers a more accurate representation of the true value of their advertising).

1829. The SA360 team had noted its concerns regarding Microsoft's lack of support for fractional conversions in its analysis of Microsoft's preliminary conversion testing proposal. Tr. 4324:23-4325:10 (R. Krueger) (discussing PSX00765).

1830. Fractional conversions, also known fractional attribution or "non last click reporting" data, allow an advertiser to understand if a user clicked on multiple ads before a conversion (*e.g.*, a purchase). For example, fractional conversions could allow 10% of conversion credit to be attributable to the first click, 30% to the next click, and 60% to a final click. Tr. 6819:5-6820:25 (J. Krueger) ("The fractional attribution credit refers to when [SA360] export[s] conversions from Search Ads 360 to an engine, Google offers what's called fractional credit, which means it's very common, most common for an individual user searching to click on multiple ads before a purchase, running shoes, brand Nike shoes, and any particular model. When that conversion occurs, [SA360] call[s] this an attribution credit. [SA360] might give 10 percent of the conversion credit to the first click and 30 percent to the next click and 60 percent to the next. This is very important, because each of those clicks have some meaningful contribution to the end event. By contrast, Microsoft, at the time of my evaluation, only offered full integer conversions.").

1831. Use of fractional conversions, calculated by more sophisticated attribution models and used by many SA360 customers, improves auction-time bidding's performance. PSX00460 at -916-917 ("Search Ads 360 . . . allow you to automatically assign the appropriate value of each of these touchpoints through the use of data-driven attribution. Data-Driven Attribution uses machine learning statistical models to analy[ze] how each type of touchpoint influences the likelihood of a user converting at each point in the journey. By weighing these influences against each other, it is possible to fractionally redistribute the value of the conversion (and conversion value) back in time across the various touchpoints in each journey. By doing this, you can get a more accurate representation of the true value of your advertising and use that to better optimize towards the ads that matter.").

1832. Most SA360 customers use fractional attribution functionality. Tr. 6821:22-6822:24 (J. Krueger) ("And the previous four, five years that I had worked on Search Ads 360, I had seen most of [its] advertisers gradually mature to these data-driven fractional attribution model credits, as well as periodically or in a sustained state using various goals at the same time."); Tr. 4457:17-23 (R. Krueger) ("Q. And what percentage of SA360 customers use fractional conversions? A. It's a good question. Not -- I don't have it offhand but it's quite high. It's the most sophisticated measurement model that [SA360 has].").

2. Microsoft's Demand for Full Feature Parity

1833. On November 22, 2019, shortly after Microsoft began discussions with the SA360 team about conversion data testing, Microsoft demanded that Google (1) achieve feature parity by building features that SA360 supported for Google Ads but not Microsoft; and (2) maintain feature parity in the future by building features for Microsoft "no later than 90 days following Google Ads." PSX00668 at -310.

1834. Microsoft identified a list of 54 features, 27 of which it understood "SA360 supports for Google Ads, but not for Microsoft Advertising." PSX00668 at -311. Microsoft specified 10 of these as its "prioritized list." PSX00668 at -311-313.

1835. The list was inaccurate as to what features Google did and did not support for Google Ads as of November 2019. Tr. 4326:23-4327:18 (R. Krueger).

1836. Among the features listed in a chart in Microsoft's November 22, 2019 email were five Microsoft bid strategies (Enhanced CPC; Max Clicks; Max Conversions; Target CPA; Target ROAS) and two bidding-related technologies (Auction Time Bidding; Conversion Sharing). PSX00668 at -312-313.

1837. The Enhanced CPC, Max clicks, Max conversions, Target CPA, Target ROAS, Auction-time Bidding, and Conversion Sharing functionality for Microsoft Ads would each have to be built and implemented separately in SA360. Tr. 4740:3-9 (Varia) ("Q. . . . These rows being shown here, based on your understanding of what Microsoft was asking, did SA360 need to build all of these separately? A. Yes, each one of these would have been a separate implementation process.").

1838. Microsoft's auction-time bidding (also referred to within Microsoft as automated bidding, autobidding, or real-time bidding) is not one feature, but comprises multiple elements or strategies provided by Microsoft's advertising platform that assist advertisers in optimizing for different advertiser goals. [redacted] Tr. 6659:16-19 (Vallez) ("Q. And is it fair to say, when you describe Microsoft auto bidding, this is the solution that may have multiple objectives and features, correct? A. Correct."), 6660:8-18 ("Q. . . . Is it fair that some of the features and objectives in Microsoft auto bidding launched over time? A. Yes. Q. So Skai supported features as they were launched; is that fair? A. No, but by the time we started dealing with Microsoft, I would say they were about halfway through launching the objectives. And so some of the objectives were already out there, but over time they started launching more, and we supported them as they came live, yes.").

1839. To build the full auction-time bidding functionality demanded by Microsoft, the SA360 team would first need to build conversion sharing, and would also have to build the Microsoft bid strategy types to work with the auction-time bidding functionality. Tr. 4449:5-4450:1 (R. Krueger) (discussing Microsoft's priority requests in PX00668) ("Q. So then returning to these ones at the bottom of page 312, those seven highlighted features, including the one on the next page -- I think we see auction-time bidding on that page? A. Yep. Q. Is there any relationship between auction-time bidding and these other -- the functionalities that are listed there? A. The three above it would be Microsoft's bid strategy types that presumably use their auction-time bidding. In itself, it's not -- it's not its own thing to build, it's part of all the other strategy types. Q. And in order to build auction-time bidding are any of these other functionalities required to be built first or simultaneously? A. The conversion sharing is a fundamental part of it. I think that's on the next page. So that would have to be built. So that's the piece where [SA360] send[s] the advertisers' data to Microsoft. And then the other ones are individual strategy types that would have to be developed and tested individually because they're all different.").

1840. In early 2020, Microsoft elevated its feature demands to the executive level. On April 22, 2020, Chris Weinstein of Microsoft emailed Joan Braddi at Google to confirm that

Microsoft was asking SA360 to support Microsoft "auto-bidding functionality," listing four Microsoft bid strategies that advertisers should be able to use "in lieu of the SA360 bid strategies." The email listed Enhanced CPC, Maximize Clicks, Max Conversions, and Target CPA, but did not specifically list "Auction-Time Bidding" or "Conversion Tracking," as had been included in the November 22, 2019 email feature list. PSX00483 at -531; PSX00461 at -300-303.

1841. This email, and subsequent emails and draft letter agreements exchanged between Google and Microsoft from May 2020 through September 2020, reflect a range of descriptions of which features Microsoft was seeking. Tr. 3185:13-3186:9 (Tinter (Microsoft)) ("And I think there was a lot of confusion on exactly what it was that Microsoft was asking for."); PSX00483; PSX00466; PSX00467; PSX00668; DX2013; PSX00514; PSX00515; PSX00516 at -137-139 (July 31, 2020 email from Joan Braddi to Chris Weinstein expressing confusion about Microsoft's requests from April 2020 to July 2020).

1842. On May 7, 2020, Google provided Microsoft with a first draft of a letter agreement under which Google would commit to develop certain "Priority Features" for Microsoft, which included the same four bid strategies in Chris Weinstein's April 22, 2020 email (Enhanced CPC, Maximize Clicks, Max Conversions, and Target CPA). PSX00467 at -919.

1843. The letter agreement specified under "Autobidding" that "SA360 will enable customers to manage the following bid strategy settings for supported Microsoft Advertising campaigns: Enhanced CPC, Maximize Clicks, Maximize Conversions, and Target CPA." PSX00467 at -919.

1844. On July 17, 2020, Microsoft provided a revised draft letter agreement (dated July 16) to Google that specifically listed "Auction-time bidding" and "Floodlight conversion data."

PSX00468 (July 17, 2020 email transmitting July 16 Microsoft draft letter agreement to Google); PSX00469A (extracted text of July 16, 2020 letter agreement (not visible in imaged version of exhibit) indicates addition of “Auction-time bidding” and “Floodlight conversion data”); compare PSX00467 at -919 (Google draft letter agreement dated May 7, 2020) and PSX00515 at -925 (Microsoft draft letter agreement dated May 18, 2020).

1845. Chris Weinstein of Microsoft followed up with an email on July 22, 2020 to Joan Braddi at Google, noting that Microsoft’s July 17 draft had added “Auction-time bidding” and “Floodlight conversion data” to its previous description of the autobidding item in Google and Microsoft’s previous draft letter agreement. PSX00514; PSX00515; DX2013 at .003.

1846. Over the course of the executive-level discussions between Microsoft and Google, Microsoft changed its demand with respect to SA360’s implementation of auction-time bidding and Floodlight conversion data for Microsoft Ads. Tr. 5048:6-14 (Braddi) (“Q. You didn’t -- the product team didn’t understand that access to the Floodlight data was essential to the integration of Microsoft’s auction-time bidding within SA360? A. Not to its standalone auction-time bidding. Floodlight data, in my understanding, is only part of the SA360 bid strategies, not Google Ads bid strategies and not Microsoft bid strategies. That was what I was told from the product team. Once they put in Floodlight data into their document, we understood there was a disconnect of what they were asking for.”); PSX00516 at -137-139 (July 31, 2020 email from Joan Braddi to Chris Weinstein expressing confusion about Microsoft’s requests from April 2020 to July 2020); DX2013 at .002 (July 23, 2020 email from Joan Braddi to Chris Weinstein stating “We have agreed to support what you requested by building the ability for SA360 customers to use and manage the MSFT bidder in SA360 just as we support the use of the Google Ads bidder .

. . Floodlight data is out of the scope for the standalone Microsoft bidder . . . That data is not shared to any standalone bidder, including for Google Ads.”).

1847. On July 23, 2020, Chris Weinstein (Microsoft), in an internal Microsoft email, stated to Jon Tinter (Microsoft) that he “expect[ed] that Google will complain about this as a late ask” and noted that “that wouldn’t be wholly unfair.” DX2013 at .001.

1848. During discussions between Google and Microsoft about feature requests, Microsoft informally suggested that it might consider financially reimbursing Google for feature development costs involved in supporting Microsoft auction-time bidding for SA360 as part of its negotiating strategy, but Microsoft did not further pursue that offer. Tr. 3187:15-3188:9 (Tinter) (“Q. During these discussions between you and Mr. Harrison, did Microsoft ever offer to pay for expenses connected to supporting SA -- connected to supporting Microsoft realtime bidding through SA360? A. Informally, yes. So there was one point in time where Don and I were talking and I think he made the point that says, you know, we don’t see enough advertiser demand relative to the engineering work required to do this, or some point on that. And I sort of said, I said, hey, look, if this is really just about money, I’m certainly willing to consider where we would pay you some form of NRE or otherwise reimburse your engineering expenses to do this. And he kind of laughed and said, you know, maybe, and then it never came up again and we didn’t really explore it. I said it honestly, because it was half negotiating strategy of trying to ferret out what the real issue was and I’m like, if this is really about money, let’s see if I can take money off the table.”).

1849. In Fall 2020, Microsoft declared an impasse on Microsoft’s feature demands and the parties’ discussions ended. Tr. 5059:1-3 (Braddi) (“Q. At this point, Microsoft ended the executive escalation, correct? A. Correct.”); Tr. 3185:13-3186:9 (Tinter) (“But ultimately Google was very definitive around both what they were prepared to do, what they were not prepared to do, and the timing of doing it. And we ultimately looked at that and said, we did not feel like it sufficiently addressed our concerns, which is why we both walked away."); PSX00337 at -030.

G. Project Byx: Implementation of Microsoft Ads Auction-Time Bidding in SA360

1850. Project Byx was the internal project name for SA360's consideration and implementation of Microsoft Ads auction-time bidding technology. Tr. 6789:23-6790:4 (J. Krueger) (Project Byx is the "project name for Microsoft Ads' auction-time bidding integration with Search Ads 360.").

1851. At the time of the executive-level discussions between Google and Microsoft in 2020, SA360 had already begun a project to evaluate building auction-time bidding for Microsoft. Project Byx was initiated by the beginning of 2020. Tr. 6791:11-16 (J. Krueger) ("Q. Okay. And you had created a point of view earlier that week on Project Byx? A. I know some time in January of 2020, I wrote what we kind of call a one-pager or one-sheeter. I'm not sure if that was before or after this. I'd have to see the timelines. I do know it was around January when I wrote that POV."); PSX00563.

1852. During the course of discussions between Google and Microsoft in 2019-2020, the SA360 team never refused to build any feature for Microsoft Ads, including auction-time bidding. Tr. 4724:13-20 (Varia) ("Q. . . From the time in November 2019 when Microsoft made feature requests to you, until you left the product in 2021, did Search Ads 360 ever refuse to build features for Microsoft? A. No, we never refused.").

1853. Although Google and Microsoft were not able to reach a resolution of Microsoft's feature demands and timeline in 2020, the SA360 team continued to evaluate the feasibility of building Microsoft auction-time bidding in SA360. PSX00563; PSX00446 at -895 (SA360 product team "one-pagers" evaluating the feasibility of building Microsoft auction-time bidding).

1854. The SA360 team evaluated customer demand, technical feasibility, and available resources in response to Microsoft's request that Google integrate Microsoft auction-time bidding into SA360. DX0179 at .001, .008-.016; DX0165A; DX3233 (documents and presentations for 2019-2020 reflecting customer prioritization and demand); PSX00446 at -895 and PSX00563 at -898-899 (Project Byx "one-pagers" evaluating technical feasibility); PSX00588 at -324-328 (product design document describing potential testing phases and technical feasibility); PSX00459 (feature overview comparing potential hours and resources needed for Microsoft and other features).

1. Customer Demand for Microsoft Auction-Time Bidding in SA360

1855. SA360 had not heard customer demand for Microsoft's auction-time bidding technology prior to 2020. Tr. 4427:1-14 (R. Krueger) ("Q. All right. So there were a number of advertisers who were interested in having the availability of the Bing auction-time bidding strategy through SA360, correct? A. Yeah, this is late 2020, and this is when we started first seeing some demand. [SA360 has] tens of thousands of advertisers so these are a few, but this is when we started to see customers begin to be interested in. And as we described in the diagram, is they went to Microsoft to use it. And when they had success cases if we didn't have it, they sometimes stayed, sometimes left. But this is late 2020 when they started to -- this is the first signs that we started to see customers actually testing it or at least from my desk, yeah.").

1856. SA360 customer feedback received in late 2019, which was considered in relation to features to be built for the first half of 2020 ("H1 2020"), did not reflect customer demand for Microsoft auction-time bidding. Tr. 4462:21-4463:9 (R. Krueger) (discussing DX0165A) ("Q.

And in this list as of late 2019, is there anything that reflects advertiser demand for Microsoft auction-time bidding? A. It does not appear to be in this list, no.").

1857. Colorado Plaintiffs and their experts identified no evidence of customer demand for Microsoft auction-time bidding prior to a May 8, 2020 deck titled "SA360 2020H2 Product Prioritization Sales & Gtech" (PSX00457) summarizing an SA360 customer survey. Tr. 7167:1-22 (Baker) ("Q. Okay. And this -- the date of this survey is May 8, 2020; is that right? A. That's the date in the footnote. So that sounds correct. Q. And is this the first time -- this is the first evidence you cite in your expert reports of Google learning about some sort of demand for auction-time -- Microsoft's auction-time bidding? A. It's -- well, as I sit here, it's the only one I remember. Q. Okay. And does this document that you reference in slide 86, does it identify a single United States customer that is demanding auction-time bidding? A. I don't recall. Q. You don't see any reference in the slide your counsel created to any United States customer, do you? A. No. Q. In fact, the only customer that's referenced in that slide is a Japanese customer, Rakuten; correct? A. That's correct. Q. And you're not aware of any auction-time bidding appearing on any prior Google customer surveys before this May 2021; correct? A. I'm not aware of it, but I don't know one way or the other.").

1858. Colorado Plaintiffs focused on one slide in the May 8, 2020 "SA360 2020H2 Product Prioritization Sales & Gtech" deck, which identifies "auction-time bidding for other engines," including for Microsoft Advertising and Yahoo Japan, as one of the top 20 feature requests mentioned in the customer survey, but the "large client/region affected" column lists only a Japanese customer. PSX00457 at -740; Tr. 4349:5-4350:2 (R. Krueger).

1859. The section of the May 8, 2020 "SA360 2020H2 Product Prioritization Sales & Gtech" deck that summarizes specific customer feedback in an "American Customer Survey" does not list Microsoft auction-time bidding as a customer request. Tr. 4465:8-15 (R. Krueger) ("Q. And then if we turn to the page you were directed to, page 748, under Engine Requests, the first bullet point says, "More Bing parity," and then lists "RSA, audiences, and other formats." You were asked about those yesterday. Are any of those features Microsoft auction-time bidding? A. No.").

1860. A separate deck, dated April 6, 2020, about the same American Customer Survey cited in the May 8, 2020 "SA360 2020H2 Product Prioritization Sales & Gtech" deck also does not refer to any customers seeking auction-time bidding for Microsoft. Tr. 6847:20-6848:1 (J. Krueger) ("I believe what is represented are an aggregated stack rank list of feature asks. I think this was from [SA360's] America's customer survey, meaning America's customers and our sales teams asking for specific features from those customers.") (discussing PSX00457 at -070); Tr. 6850:25-6851:13 (J. Krueger) ("Q. And just having you have a look at this, does this describe the customer survey that you were just discussing? A. Yes. Q. Okay. And having had a look at this particular customer survey, does it appear to be the same timeframe as the deck that I showed you previously, PSX457? A. I believe so, yes. Q. Okay. Having had a look at this particular exhibit . . . were you able to see any reference to specific customer demand or requests from Microsoft's auction-time bidding or automated bidding? A. No.") (discussing DX3233); PSX00457 at -740; DX3233 at .002.

1861. In December 2020, two customers reported to the SA360 team that they had tested Microsoft auction-time bidding through the Microsoft native tool and had favorable results. Tr. 4356:3-18 (R. Krueger), 4417:9-15; PSX00441 at -903 (internal SA360 team email from Amit Varia, dated December 3, 2020, noting "looks like we're starting to see real world testing of Bing ATB. It'll be something we should keep a close eye on.").

1862. SA360 customer demand for Google's auction-time bidding functionality was "several orders of magnitude larger" than for Microsoft's auction-time bidding functionality. Tr. 6846:14-6847:4 (J. Krueger) ("Q. . . . If you recall, as compared to the response for Project Myx, what was the interest you were aware of with regard to Project Byx or with regard to Microsoft feature? A. . . . My recollection is, it was several orders of magnitude larger for Google; many hundreds, I had heard, some directly and some indirectly, for Google's. And I have only recollection of a small handful, maybe two or three advertisers that had mentioned testing Microsoft's auction-time bidding.").

1863. The SA360 team in 2020 also heard from customers that tested Microsoft auction-time bidding in Microsoft's native tool and were not satisfied. Tr. 4472:16-4474:3 (R. Krueger) ("Q. Did you ever receive feedback from advertisers who tested the Microsoft auction-time bidding and were not satisfied? A. We did. . . ."); PSX00435 at -673-675 (feedback in email dated August 17, 2020).

1864. [redacted]

[redacted] PSX01159 at -048.

1865. During late 2019, Skai observed that demand for Microsoft's auction-time bidding functionality was "nascent." Tr. 6662:7-6663:4 (Vallez) ("Q. At that time, you described Microsoft's feature as 'nascent,' correct? A. Yes. Yes.").

1866. [redacted]

2. Google's Implementation of Microsoft Auction-Time Bidding in SA360

1867. In February 2021, Jason Krueger, an SA360 product manager, updated his January 2020 Project Byx memo. The memo noted specific features that Microsoft did not support that would limit the value of any integration of auction-time bidding into SA360. Tr. 6800:19-6801:13 (J. Krueger) ("A. I believe my statements here were along the following lines: I started off by summarizing that there's a limited set of features that restrict customers, and then subsequently, I stated that if those features were not supported, it would be infeasible to activate on specific campaigns using those features. So I don't think I was stating an opinion on whether it could be done. I think I was stating which features were missing and lack of those features would be limiting."); PSX00563 at -898; PSX00446 at -895-896.

1868. Microsoft's auction-time bidding lacked two important features that Google's auction-time bidding provided: fractional conversion attribution and campaign-level conversion goals. Tr. 6818:5-6819:4 (J. Krueger) ("Q. . . . But was there any functionality that you knew that Google Ads auction-time bidding had that Microsoft auction-time or automated bidding did not have as of this time period? A. . . . Two notable features which I had highlighted in my requirements proposals included something we call fractional attribution and credit and campaign-level conversion goals.").

1869. Campaign-level conversion functionality allows an advertiser on SA360 to specify ad campaign goals on a campaign-by-campaign basis, as compared to setting a goal for all campaigns on an account level. Tr. 6819:5-6820:25 (J. Krueger) ("Microsoft would allow you to select one or many of those, but all the campaigns would object to that same conversion. So purchases, for example, is the main goal. A campaign-level conversion goal would say maybe the overall objective is purchases, but certain campaigns would have a different objective. Purchases might not be the main goal; it might be something else, like find a dealer or -- and so Google Ads offered the ability to do both. At the account level or at the campaign level, you can modulate goals. Whereas, in Microsoft, it was only available to choose at the account level. So that's the campaign-level conversion goal selection.").

1870. The lack of fractional conversion attribution and campaign-level conversion functionality meant that integrating Microsoft's auction-time bidding into SA360 would be challenging and of limited value. Tr. 6821:22-6822:24 (J. Krueger) ("Q. And, Mr. Krueger, the lack of those two functionalities, did that give you any sense of how developed Microsoft's auction-time or automated bidding was at the time you were doing the one-pager? A. When I first was looking into the requirements of the one-pager and was dictating what would be required, I was quite surprised that Microsoft didn't have this capability. I hadn't previously looked into their offerings. And the previous four, five years that I had worked on Search Ads

360, I had seen most of [SA360's] advertisers gradually mature to these data-driven fractional attribution model credits, as well as periodically or in a sustained state using various goals at the same time. To support bidding through custom configurations of credit and goals, significantly, perhaps an order of magnitude, increases the complexity of automated bidding. So it made me think that their level of sophistication was at least not tackling some of the more complicated challenges.").

1871. For example, SA360 customers that used data driven attribution models, which was a "quite high" percentage of customers, would not be able to use their same fractional conversion data in connection with Microsoft auction-time bidding because Microsoft could not ingest the fractional conversion data. Tr. 4457:7-23 (R. Krueger) ("Q. Let me just talk about fractional conversions for a second. What's the relationship of fractional conversions in the auction-time bidding functionality? Is it required or how does that work? A. For [SA360] customers that use those data driven attribution models or models that use -- the output of that is fractional conversions, they would not be able to use that same data in Microsoft without Microsoft being able to ingest that data. Q. And what percentage of SA360 customers use fractional conversions? A. It's a good question. Not -- I don't have it offhand but it's quite high. It's the most sophisticated measurement model that we have."); *see also* Tr. 4471:14-19 (R. Krueger) ("Q. What would be the impact of not having fractional conversions available for Microsoft or for Microsoft? A. A good portion of [SA360's] customers that wanted to use Microsoft auction-time bidding with their Floodlight data, we wouldn't be able to get it into Microsoft so they couldn't use the feature.").

1872. Project Byx was much more complex than Project Myx because SA360 had to integrate with a platform outside of Google, including a requirement that the integration allow for very quick computations (within the 200 milliseconds or less that it takes the auction to run) and "call out to Microsoft and have them respond within that time frame." Tr. 1426:15-1428:21 (Dischler) ("Q. What, if anything, was the additional complexity of implementing auction-time bidding for Bing that did not exist for implementing it for Google? A. So, I mean, the whole thing of implementing auction-time bidding is that that auction takes 200 milliseconds or less, and you have to use that as a signal in order to help -- in order to allow an advertiser to adjust their bid up or down. And so the fact that you're dealing with these very tight time frames means that you have to do computation very quickly. Now, if [SA360 is] actually implementing it for Bing, that means that not only do we have to do that computation quickly, but [SA360] now ha[s] to call out to Microsoft and have them respond within that time frame. And so you're now crossing the company borders with these very tight latency targets, which makes it very difficult. And so since they didn't have an interface for doing this, we had to work on it together with Microsoft to try to get it working within the latency constraints that we had.").

1873. The SA360 team commenced building auction-time bidding functionality for Microsoft Ads, and internally announced in November 2021 that SA360 had begun alpha testing of that functionality. PSX00572 at -749 (November 12, 2021 email from Jolyn Yao stating: "Began Alpha testing for Microsoft Ads Auction Time Bidding (ATB).").

1874. Project Byx is now in testing with SA360's customers in a beta testing phase. Tr. 1246:4-13 (Dischler) ("Q. Now, I believe you testified a moment ago that Microsoft Ads has a similar feature to Google Ads called real-time bidding; correct? A. Correct. Q. And at this time, Google does not offer real-time bidding for Microsoft Ads through SA360; correct? A. I believe it's in beta. Q. But as of today, it's not available? It's in testing? A. Yeah, I believe it's in beta. The reason that [SA360 doesn't] offer it is because of an unsolved technical problem.").

H. Skai's Implementation of Microsoft Ads Auction-Time Bidding

1875. From 2020 until the present, an advertiser that wanted to manage campaigns on a SEM tool that integrates with Microsoft auction-time bidding could use Skai. Tr. 6660:19-6661:9 (Vallez); Tr. 5159:18-24 (Booth) ("We talked about having a secondary technology called Skai. We do use auction-time bidding through Skai's platform for Bing."); PSX00954 (announcing "product launch[] of auto bidding" in the first quarter of 2020).

1876. It took Skai at least two years to integrate Google auction-time bidding. Tr. 6639:19-6640:7 (Vallez).

1877. It took "somewhere in between" one year and two years of full investment for Skai to implement Microsoft Ads auction-time bidding in Skai's SEM tool. Tr. 6659:23-6660:1 (Vallez) ("Q. Okay. In your deposition, you said it took two years of full investment. Which was right? Was it one year or two years? A. Probably somewhere in between.").

1878. Skai uses its support for Microsoft features "as a way to compete" against SA360 and other SEM tools. Tr. 6636:15-23 (Vallez) ("Q. We spoke -- so that's about Google features. Do you have a sense of the extent to which Microsoft features are supported on Skai as compared to on SA360? A. I'm pretty confident that Skai supports more. And we use it as a way to compete, to be quite honest. We use it as a way to demonstrate that we're investing in publishers where maybe our peers or others -- not just SA360, but whomever, we try to focus on using that as a competitive advantage because we know that we're more invested.").

I. No SEM Tool Offers Full Parity with Any Ads Platform

1879. No SEM tool offers full feature parity with Microsoft Ads. [redacted]

1880. [redacted]

1881. Skai's feature development agreement with Microsoft has no requirement to achieve feature parity. Tr. 6665:15-21 (Vallez) ("Q. So, looking at 2.2(b)(1), I'm not going to read that but just at a very high level, does Skai ever view itself as having a requirement to meet feature parity between Microsoft and Google features? A. Who would be the requirer? Q. Either party, Google, Microsoft -- or, just does Skai have a requirement to meet feature parity? A. No, no. It's not with any publisher.").

1882. Marin's SEM tool does not offer feature parity with Microsoft Ads. [redacted]

1883. SA360 does not offer feature parity with Google Ads. Tr. 4751:5-7 (Varia) ("Q. At that point [2021], did SA360 support every feature in Google Ads? A. No -- def- -- no.").

J. SEM Tool Revenue Share

1884. In 2020, approximately [redacted] percent of U.S.-based search ad revenue on Google and Bing came through the four major SEM tools (SA360, Skai, Adobe, and Marin). Tr. 7154:3-24 (Baker) (discussing PSXD-11 at 73 ("[redacted] of general search ad revenue on Google and Bing comes through a major SEM tool")).

1885. In 2020, less than [redacted] percent of U.S.-based search ad revenue on Google and Bing came through SA360. Tr. 7155:25-7157:15 (Baker) (discussing PSXD-11 at 73).

K. Google's SA360 Conduct Has Not Harmed Competition in Any Asserted Market

1. Plaintiffs Did Not Define Any Relevant Market for SEM Tools

1886. Colorado Plaintiffs' experts did not define a relevant antitrust market in which SA360 competes. Tr. 7153:14-18 (Baker) ("Q. And you have not offered any expert opinion in this case that SEM tool ad buying, in other words this third channel down here on this slide, is its own separate antitrust-relevant market; correct? A. I have not defined any kind of market like that.").

2. Plaintiffs Failed to Prove That Google's Conduct as to SA360 Had Any Impact on Search Advertising Pricing, Output, or Quality

1887. Colorado Plaintiffs presented no evidence demonstrating that overall U.S. search advertising revenue in the U.S. was adversely impacted by Google's alleged delay in SA360's implementation of Microsoft features.

1888. Colorado Plaintiffs presented no evidence demonstrating that pricing of U.S. search advertising was adversely impacted by Google's alleged delay in SA360's implementation of Microsoft features.

1889. Colorado Plaintiffs presented no evidence demonstrating that the overall output in U.S. search advertising was adversely impacted by Google's alleged delay in SA360's implementation of Microsoft features.

1890. Starting in late 2019, advertisers' spending on Microsoft Ads through SA360 in fact grew. Tr. 7159:14-23 (Baker) ("Q. And over this time period that you've looked at here, we see Microsoft Ad spend growing on SA360; correct? A. You mean in share of -- yes, of its total, yes, that's correct.") (discussing PSXD-11 at 74).

1891. Microsoft's share of ad spend on SEM tools also grew from 2019 through 2020. Tr. 7159:14-7160:1 (Baker) ("Q. And Microsoft's share of ads on SEM tools is growing, too; correct? A. Yes.").

1892. Colorado Plaintiffs presented no evidence demonstrating any adverse impact on search advertising quality, on users of general search engines or on any other consumer-focused market alleged in these cases.

3. SA360's Integration of Google Ads Auction-time Bidding Increased Output Without a "Spend Shift" Away from Microsoft

1893. After the September 2019 launch of Google Ads auction-time bidding in SA360, Google investigated whether there was a spend shift away from Microsoft Ads and to Google Ads, and found that there was not. The SA360 team found that for customers that had enabled auction-time bidding for Google Ads, Microsoft spend was flat to slightly increasing. Tr. 4749:14-4750:20 (Varia) ("Q. . . . [D]id your team conduct any analysis of 'customer other spend'? A. Yeah, they ended up doing that. Q. And do you recall what the outcome was of that analysis? A. Yes. So when the team kind of put together analysis, what we saw was that, you know, customers who were using SA3 bid strategies, when they were enabling -- enabling the auction-time bidding feature for Google Ads side, what we were noticing is that their Google ad spend was growing, and then their Microsoft spend was -- it was stable, if not growing just a little bit on -- you know, generally. So, yeah, we were kind of seeing that it was stable to growing for Microsoft."); Tr. 6794:4-14 (J. Krueger), 6795:24-6796:10; PSX00537.

1894. Colorado Plaintiffs did not offer evidence at trial of a single advertiser who used SA360 and decided not to spend more on Bing as a result of any delayed adoption of Microsoft auction-time bidding. Tr. 7177:24-7178:4 (Baker) ("Q. Now, Professor Baker, you've not identified a single advertiser who during this period used SA360 and decided not to spend more on Bing Ads as a result of any delayed adoption of auction-time bidding functionality; correct? A. That's correct . . . .").

4. Plaintiffs Failed to Prove That Google's Conduct as to SA360 Had Any Impact on Microsoft, Much Less Competition Between Google and Microsoft for Search Advertising Customers or Advertising Spend

1895. Colorado Plaintiffs presented no evidence demonstrating purported harm to competition in search advertising, whether by lost revenue or advertising customers, from delays by Google in integrating Microsoft-specific features into SA360.

1896. In [redacted], [redacted] an email referencing a "low precision" estimate in a range of [redacted] PSX00754 at -255.

1897. [redacted] PSX00754 at -255.

1898. [redacted]

1899. [redacted]

1900. [redacted]

1901. [redacted]

1902. Each witness who was deposed about these emails was unable to explain how the supposed lost revenue estimates were derived, and no Microsoft witness who testified live at trial offered any testimony about these emails or any analyses related to the estimates in these emails. [redacted]

1903. [redacted]

1904. [redacted]

[redacted]

1905. [redacted]

1906. [redacted]

1907. [redacted]

1908. [redacted]

1909. [redacted]

1910. Colorado Plaintiffs' expert economist did not perform any independent analysis to estimate whether Microsoft lost any revenue as a result of any SA360 delay in implementing any Microsoft Ads features, and had no independent basis to evaluate Microsoft's estimates. Tr. 7189:2-7193:15 (Baker) ("Q. You have not done any independent analysis that allows you to offer an opinion about what revenue loss has occurred as a result of a failure to adopt auction-time bidding for Microsoft; correct? A. That's correct. Q. And can you tell me what methodology Microsoft adopted -- A. No. Q. -- to come up with these numbers? A. I don't know what Microsoft used, how Microsoft reached those conclusions. Q. Do you know what data was used? A. I don't know how they -- how they reached these -- determined the numbers that are reported in this slide. . . .").

1911. There was no evidence at trial explaining the factual basis or methodology used to generate the estimate of Microsoft's potential revenue gains from SA360's development of support for Microsoft Advertising's auction-time bidding functionality as presented in PSX00763 and PSX00764.

1912. The 15 to 30% uplift in conversions referenced in the September 2019 Google blogpost about the launch of Google Ads auction-time bidding in SA360 does not reflect revenue gained or advertising revenue that Microsoft Ads would have generated; rather, it is an "average lift in conversions at the same or better ROI" from Google Ads. Tr. 6757:4-6758:7 (J. Krueger) (discussing PSX00909).

1913. There is no evidence in the record that Microsoft's auction-time bidding functionality was the same from a technical and/or advertiser performance perspective as Google Ads' auction-time bidding functionality. To the contrary, the evidence of record suggests Microsoft Ads auction-time bidding functionality would perform differently due to differences between it and Google Ads auction-time bidding as implemented on SA360. Tr. 6821:22-6822:24 (J. Krueger) ("Q. And, Mr. Krueger, the lack of those two functionalities, did that give you any sense of how developed Microsoft's auction-time or automated bidding was at the time you were doing the one-pager? A. When I first was looking into the requirements of the one-pager and was dictating what would be required, I was quite surprised that Microsoft didn't have this capability. . . . And so I was at the very least concerned or surprised that Microsoft hadn't begun their explorations into this level of customization, and my immediate thought was should they choose to build it, they would likely have to overcome various challenges associated with the customization framework. And [SA360's] level of standard is very high. So you would have to support, you know, 99 percent of use cases, which I personally observed to be very challenging to overcome. So it made me think that their level of sophistication was at least not tackling some of the more complicated challenges that we had observed in Search Ads 360 and to some extent Google Ads."); PSX00565 (July 2021 emails between Google and Microsoft employees where [redacted]

1914. Even if Colorado Plaintiffs could substantiate their estimate of Microsoft's purported revenue loss, it is, by their own measure, just a drop in the relevant market bucket. The highest end of Microsoft's "low precision" estimate [redacted] is just [redacted] of the approximately [redacted] in total search ad revenues earned by Google and Bing in 2020. PSX00754 at -255; Tr. 7155:25-7157:15 (Baker) (discussing PSXD-11 at 73 ("General Search Ad Revenue" for 2020 is [redacted])).

1915. Because Microsoft's [redacted] estimate includes both SA360 and Skai revenues, the maximum harm purportedly attributable to SA360 is even smaller than [redacted]. PSX00745 at -327.

5. Advertisers Have Not Been Harmed Because Alternatives to Access Microsoft Ads Auction-Time Bidding Abound

1916. Advertisers have been able to access Microsoft Ads auction-time bidding since its launch in the Microsoft native tool, and advertisers have done so. Tr. 4407:24-4408:17 (R. Krueger) ("So they can -- any customer at any point, if they're [SA360's] customer or not, they can go to Microsoft, use Microsoft auction-time bidding with Microsoft's conversion measurement source or whatever Microsoft supports. So even if they're [SA360's] customer, they can go directly to Microsoft to do that."), 4409:3-4410:11; Tr. 7005:8-21 (Amaldoss) ("Q. . . . During the entire time period that you analyzed for purposes of your opinions with respect to these features, each of these features was available to advertisers on Microsoft's native tool, correct? A. Yes.").

1917. Certain advertisers today are participating in SA360's testing of Microsoft Ads auction-time bidding, and when the feature launches on SA360, all advertisers will be able to access that functionality. Tr. 1246:4-13 (Dischler) ("Q. But as of today, it's not available? It's in testing? A. Yeah, I believe it's in beta. The reason that [SA360 doesn't] offer it is because of an unsolved technical problem."); PSX00577 at -560-561 ("[redacted]").

1918. Skai has integrated Microsoft auction-time bidding into its platform, and advertisers can access that functionality via the Skai SEM tool. Tr. 6639:12-14 (Vallez) ("Q. And does Skai support realtime auto bidding for advertising on Bing? A. Yes."); Tr. 5159:18-24 (Booth) ("We do use auction-time bidding through Skai's platform for Bing.").

1919. As of April 2022, Marin had built partial support for Microsoft's auction-time bidding functionality, [redacted] Tr. 7171:22-7172:7 (Baker) ("Q. Okay. And did Marin adopt -- has Marin adopted Microsoft's auction-time bidding into its third party -- A. . . . I believe that Marin has in part, but that's my recollection. Q. Marin hasn't adopted auction-time bidding full functionality; correct? A. That's what I think, I recall.").

1920. [redacted]

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Respectfully submitted,

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