Causation After *Microsoft*: Toothless with Bite*

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INTRODUCTION

The Sherman Act dates back more than a century, to a time when industrial production was displacing agriculture as the primary driver of the American economy. Does this bygone law that rather vaguely prohibits "monopolization" remain effective in the information economy of the 21st century? That was the central question posed by the Microsoft case 25 years ago. I revisit that question here, focusing on the critical role of *causation* – the connection between the monopolist's challenged conduct and the perpetuation of its monopoly power.

In the Microsoft case, Microsoft engaged in exclusionary conduct by sharply restricting the distribution of Netscape's Navigator browser and Sun's Java technologies, substantially slowing the growth of their user bases. However, neither of these excluded products was competing in the market where Microsoft had a monopoly – the market for desktop operating systems. Instead, they were used together with Microsoft's monopoly product, Windows. Nonetheless, the government argued that Microsoft had monopolized the operating systems market in violation of Section 2 of the Sheman Act because the entry barriers protecting Microsoft's monopoly would have been lowered if these two products had been widely used. The District Court agreed, and when Microsoft appealed so did the Court of Appeals for the District of Columbia (CADC).[1]

Many observers praised the CADC's decision in *Microsoft* as demonstrating that the Sherman Act was alive and well early in the 21st century. And with good reason. The liability finding in *Microsoft* announced loud and clear that powerful firms in the tech sector were not immune from antitrust enforcement. Microsoft had argued strenuously that it was competing in a software market subject to rapid technological change, so it lacked durable monopoly power as well as the ability to exclude rivals. Those arguments were roundly rejected by a unanimous CADC. Their unanimous liability ruling was a big deal – and by no means a foregone conclusion.

How was the CADC able to conclude that Microsoft had engaged in monopolization even though Microsoft was indeed operating in a highly dynamic industry, especially given that Microsoft's challenged conduct was not even targeted at rival desktop operation systems? The key to that liability finding, and the lasting legacy of *Microsoft* for antitrust law, is the causation standard

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[1] *United States v. Microsoft Corp*. 253 F.3d 34 (DC Circuit, 2001), henceforth *Microsoft*.

the CADC applied to determine liability under Section 2 of the Sherman Act. Under that standard, the government need not prove that the monopolist would indeed have faced stronger competition if not for its exclusionary conduct. Instead, the government need only show that the exclusionary conduct *reasonably appears capable of making a significant contribution to maintaining the monopoly power*.

The CADC was well aware that it was setting a relatively low causation bar for the government to clear to establish liability. The court famously called its own causation standard for liability "edentulous," which means toothless. [*Microsoft* 79] This relaxed causation standard is quite favorable to the government, leaving plenty of room for antitrust enforcement in rapidly changing industries.[2] The *Microsoft* causation standard for liability is especially striking as the case was decided in the midst of fifty years during which the Supreme Court narrowed Section 2 of the Sherman Act.

The CADC's liability finding in *Microsoft* is rightly seen as a major victory for the government, but that finding was not the last act in the Microsoft drama. The CADC remanded the case back to the District Court to determine the appropriate remedy, with the primary goal of restoring the competition lost due to Microsoft's illegal conduct. [*Microsoft* 103] As a counterweight to its "edentulous" liability standard, the CADC instructed the District Court to use a more demanding causation standard when fashioning a remedy: "Microsoft's concerns over causation have more purchase in connection with the appropriate remedy issue, i.e., whether the court should impose a structural remedy or merely enjoin the offensive conduct at issue." [*Microsoft* 80]

In the next act of the Microsoft drama, the Department of Justice then negotiated a consent decree with Microsoft that many viewed as inadequate. Steve Salop cleverly lambasted the Department of Justice for engaging in "catch and release" with Microsoft.[3] Moreover, when a group of states pressed forward in court seeking to obtain far stronger remedies, they came up empty-handed.[4] If one focuses on liability and ignores or downplays remedy, one is apt to overstate the nature and extent of the government's victory in the Microsoft case.

When the dust settled, the remedy did precious little to empower any of Microsoft's rivals to seriously threaten its monopoly over desktop operating systems. In the end, then, did the Sherman Act do its job in this landmark case, or does the case instead represent a failure of antitrust? Does the precedent set by *Microsoft* promote competition in the vital hi-tech sector of the economy, or does it give powerful tech firms free rein to exclude their rivals? Read on.

This article has four main goals. First, I describe the CADC's approach to causation in *Microsoft* and explain how it has influenced modern monopolization law; see Part I.A. Second, I explain how to properly assess causation in monopolization cases, beginning with the *counterfactual conduct* – what the defendant would have done absent the challenged restraints – before turning to the far more uncertain task of evaluating the *counterfactual outcome*. Courts have often

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[2] This article is about monopolization cases brought by the government seeking injunctive relief. Cases brought by private parties seeking treble damages can be greatly aided by a liability finding in a government case, but those private parties still must construct a counterfactual world sufficiently reliable to justify their damage claims.

[3] As reported in Jonathan Baker, "How economists influence antitrust: the contributions of Tim Bresnahan, Janusz Ordover, Steve Salop, and Bobby Willig," 13 *Journal of Antitrust Enforcement* 390, 413 (2025).

[4] *New York v. Microsoft Corp*. 224 F. Supp. 2d 76 (2002), henceforth *Microsoft Remedy*. I testified at the remedy hearing on behalf of these Litigating States.

conflated these two steps, making the analysis less transparent and the results less accurate. I offer a clearer, more disciplined and more reliable framework; see Parts I.B and I.C.

Third, I develop and apply the proportionality principle for remedy: the extent to which the remedy goes beyond merely enjoining the illegal conduct should be proportional to the strength of the evidence that the illegal conduct actually strengthened the defendant's monopoly power. Moreover, I emphasize that any restrictions or obligations imposed on the defendant that go beyond merely enjoining its illegal conduct should be designed to lower the barriers to entry and expansion facing the monopolist's rivals, not to impede the ability or incentive of the monopolist to compete on the merits. Put simply, they should enhance, not lessen, competition in the monopolized market; see Parts II.A, II.B, and II.C.

Lastly, I use the Google Search case to illustrate how the *Microsoft* approach to causation was applied in the most significant monopolization case brought by the government in the past 25 years. Part I.D discusses the liability stage of that case, and Part II.D discusses the remedy stage.

This article is about causation in monopoly maintenance cases. In order to focus on causation, I assume the government has proven that the defendant has monopoly power in a well-defined antitrust market. I also assume that the government has established that the defendant's challenged conduct does not qualify as a form of competition on the merits.[5]

I. CAUSATION AND LIABILITY

Since the passage of the Sherman Act, the courts have grappled with how to treat the causal nexus between challenged conduct and harmful effects. The fundamental problem is uncertainty: in many cases, especially those in markets subject to technological change, no one can know for sure whether the challenged conduct actually perpetuated the defendant's monopoly power.

As early as 1905, the Supreme Court made explicit the probabilistic nature of causation in the context of *attempted* monopolization. In *Swift*, Justice Holmes explained that liability for attempted monopolization could be established based on a "dangerous probability" of success, when combined with evidence of intent.[6] Holmes did not explain just what constitutes a "dangerous probability," but he did give this guidance: "Not every act that may be done with intent to produce an unlawful result is unlawful, or constitutes an attempt. It is a question of proximity and degree. The distinction between mere preparation and attempt is well known in the criminal law. The same distinction is recognized in cases like the present."[7]

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[5] My approach fits well into the excellent framework for monopolization cases put forward by Daniel Francis in "Making Sense of Monopolization," 84 *Antitrust Law Journal* 779 No. 3 (2022). Francis explains that the conduct component of the monopolization offense has three distinct dimensions: (1) a "right to compete," under which conduct qualifying as competition on the merits lies beyond the reach of Section 2 of the Sherman Act, (2) "exclusion," a reduction in the ability or incentive of other firms to compete, and (3) "contribution to monopoly power." The causation inquiry relates to parts (2) and (3).

[6] "Where acts are not sufficient in themselves to produce a result which the law seeks to prevent – for instance, the monopoly – but require further acts in addition to the mere forces of nature to bring that result to pass, an intent to bring it to pass is necessary in order to produce a dangerous probability that it will happen. But when that intent and the consequent dangerous probability exist, this statute, like many others and like the common law in some cases, directs itself against that dangerous probability as well as against the completed result." *Swift & Co. vs. United States*, 196 U.S. 375, 396 (1905) (citation omitted).

[7] *Swift & Co. v. United States*, 196 U.S. 375, 402 (1905) (citation omitted).

In 1951, the Supreme Court reaffirmed this principle in *Lorain Journal*: "To establish this violation of § 2 as charged, it was not necessary to show that success rewarded appellants' attempt to monopolize."[8] In 1993, in *Spectrum Sports*, the Supreme Court adopted a standard under which plaintiffs alleging attempted monopolization must show both intent and a dangerous probability of success.[9] The *Microsoft* court added this: "The determination of whether a dangerous probability of success exists is a particularly fact-intensive inquiry." [*Microsoft* 80]

The Supreme Court also made clear more than a century ago that liability under Section 1 of the Sherman Act could arise for agreements based on their "probable effects." In *Chicago Board of Trade,* Justice Brandeis wrote: "To determine that question [whether an agreement restrains competition] the court must ordinarily consider the facts peculiar to the business to which the restraint is applied; its condition before and after the restraint was imposed; the nature of the restraint and its effect, actual or probable."[10] By including "probable" effects here, Justice Brandeis, ever the realist, must have recognized that the Sherman Act would be a dead letter – especially in new or rapidly changing markets – if plaintiffs were required to establish with certainty what the world would have looked like if not for the defendants' challenged conduct.

Where does that leave us in monopolization cases, and specifically in cases where a monopolist is accused of engaging in conduct to *maintain* its monopoly? This section discusses the treatment of "probable" effects in determining liability in monopoly maintenance cases. At one extreme is a pro-defendant causation standard under which the plaintiff must show that the monopoly power would surely have been substantially reduced if not for the challenged conduct. At the other extreme is a pro-plaintiff causation standard under which the plaintiff must merely show that the challenged conduct might plausibly have contributed to the perpetuation of the monopoly.

A. THE MICROSOFT CAUSATION STANDARD

In *Microsoft*, the CADC articulated a causation standard for cases involving monopoly maintenance. Microsoft had argued that "plaintiffs never established a causal link between Microsoft's anticompetitive conduct, in particular its foreclosure of Netscape's and Java's distribution channels, and the maintenance of Microsoft's operating system monopoly." [*Microsoft* 78] Brushing aside Microsoft's argument, the Court explicitly rejected a liability standard under which "plaintiffs must present direct proof that a defendant's continued monopoly power is precisely attributable to its anticompetitive conduct." [*Microsoft* 78]

Instead, the Court cited with approval Areeda and Hovenkamp, *Antitrust Law* (1996) regarding "the need for courts to infer 'causation' from the fact that a defendant has engaged in anticompetitive conduct that '*reasonably appears capable* of making a significant contribution to … maintaining monopoly power.'" In a memorable turn of phrase, the CADC described its own standard as a "rather edentulous test for causation." [*Microsoft* 79, emphasis added]

Applying its causation test to Microsoft's conduct, the CADC stated that "the question in this case is not whether Java or Navigator would actually have developed into viable platform substitutes, but (1) whether as a general matter the exclusion of nascent threats is the type of

[8] *Lorain Journal v. United States* 342 U.S. 143, 153 (1951).

[9] *Spectrum Sports, Inc. v. McQuillan*, 506 U.S. 447 (1993)

[10] *Board of Trade of Chicago v. United States* 246 U.S. 231, 238 (1918).

conduct that is reasonably capable of contributing significantly to a defendant's continued monopoly power and (2) whether Java and Navigator reasonably constituted nascent threats at the time Microsoft engaged in the anticompetitive conduct at issue." [*Microsoft* 79]

The CADC answered both of these questions in the affirmative: "As to the first, suffice it to say that it would be inimical to the purpose of the Sherman Act to allow monopolists free reign to squash nascent, albeit unproven, competitors at will—particularly in industries marked by rapid technological advance and frequent paradigm shifts. Findings of Fact pp. 59-60. As to the second, the District Court made ample findings that both Navigator and Java showed potential as middleware platform threats. Findings of Fact pp. 68-77." [*Microsoft* 79]

In the Microsoft case, a *combination* of evidence was sufficient to trigger liability under the CADC's forgiving causation standard: (1) powerful evidence that Microsoft's conduct had the purpose and effect of greatly slowing the growth of Navigator and Java, which were cross-platform middleware; (2) clear evidence that Microsoft *feared* that Navigator and Java, if widely used, would lower the applications barrier to entry that protected its Windows monopoly.

Whether and when Navigator and Java would *actually* have enabled a rival operating system to grow and pose a serious threat to Windows if not for Microsoft's challenged conduct was impossible to know, but not especially likely any time soon given that the evidence did not identify any rival operating system that was poised to take advantage of Navigator and Java as forms of cross-platform middleware. Indeed, the CADC accepted the District Court's finding that "middleware will not expose a sufficient number of APIs to erode the applications barrier to entry in the foreseeable future." [*Microsoft* 55]

The causation standard articulated in *Microsoft* was by no means entirely novel. To the contrary, by 2001 several circuit courts had employed a Sherman Act causation standard for liability that resembled the "reasonably appears capable of making a significant contribution" standard adopted by the CADC in *Microsoft*. Daniel Francis writes that the causation standard used in *Microsoft* "is found in the Areeda treatise at least as early as 1978 and was widely adopted in federal law by multiple circuit courts of appeal in the early 1980s."[11]

Nonetheless, the causation standard articulated in *Microsoft* has been highly influential. Why? Because of the extremely high visibility of the Microsoft case. Because *Microsoft* was carefully reasoned and took the form of a unanimous *en banc* decision by the highly respected DC Circuit. Because *Microsoft* applied the Sherman Act in a rapidly changing high-tech market. Because the excluded products were not even in the monopolized market. For all of these reasons, *Microsoft* has had extraordinary salience for the past 25 years. Notably, the *Microsoft* causation standard has been repeatedly cited and reaffirmed by appeals courts over the past 25 years.[12]

Further bolstering the *Microsoft* causation standard, in 2013 the Supreme Court explicitly stated, in the *Actavis* case, that eliminating the *risk* of future competition is anticompetitive:

> "The owner of a particularly valuable patent might contend, of course, that even a small risk of invalidity justifies a large payment. But, be that as it may, the payment (if

[11] Francis, op. cit. p. 809, providing citations to cases from the 1st, 5th, 10th, and DC circuits.

[12] See, for example, *United States v. Dentsply* 399 F.3d 181, 187 (3rd Circuit 2005) and *McWane v. Federal Trade Commission*, 783 F.3d 814, 833 (11th Circuit 2015). Francis, op. cit. provides additional citations at p. 809.

otherwise unexplained) likely seeks to prevent the *risk of competition*. And, as we have said, that consequence constitutes the relevant anticompetitive harm."[13]

The FTC's case against Meta provides a good example of the Microsoft causation standard in action. Meta moved for summary judgement, arguing that the FTC's case was deficient because the FTC had failed to show that Meta's challenged acquisitions harmed consumers, e.g., in the form of higher prices or lower product quality. The District Court denied Meta's motion, relying heavily on *Microsoft*. "*Microsoft* is the key case, and each party seeks refuge in it." "Again and again, *Microsoft* holds that anticompetitive conduct by a monopolist is simply conduct that maintains or expands its monopoly other than through competition on the merits." And this: "Following *Microsoft*, then, the Court holds that, as a general matter, the acquisition of actual competitors or nascent threats by a monopoly is 'the type of conduct that is reasonably capable of contributing significantly to a defendant's continued monopoly power.' 253 F.3d at 79." [14]

In summary, under *Microsoft* the government can prevail in a monopoly maintenance case by showing the defendant monopolist engaged in anticompetitive conduct that "reasonably appears capable of making a significant contribution to maintaining monopoly power." Under this standard, the government is required to present evidence that establishes a meaningful connection between challenged conduct that is something other than competition on the merits and the maintenance of the monopoly – not with certainty but with some real likelihood. However, the government is *not* required to prove "that a defendant's continued monopoly power is precisely attributable to its anticompetitive conduct."

Notwithstanding this "edentulous" causation standard for liability established by the CADC, proving that the defendant's exclusionary conduct reasonably appears capable of making a significant contribution to maintaining its monopoly power still requires the plaintiff to compare the defendant's actual conduct to some counterfactual conduct. This showing is logically necessary in all cases, including the many cases where it is impossible to know with certainty whether the monopoly power would have been significantly reduced or eliminated if not for the challenged conduct. So, while the causation standard for liability in *Microsoft* is quite favorable to the government, it still has some bite. The bar that the government must clear may be low, but it is not on the floor.

B. IDENTIFYING THE DEFENDANT'S COUNTERFACTUAL CONDUCT

I now discuss how to properly assess causation in monopoly maintenance cases under the *Microsoft* causation standard.

Logically, to evaluate whether the monopolist's challenged conduct is capable of making a significant contribution to maintaining its monopoly power, one must specify, at least in general terms, what the defendant would have done instead. This is logically necessary because the very concept of making a *significant contribution* to monopoly power inherently involves comparing the defendant's monopoly power in the real world to its monopoly power in some counterfactual world in which the defendant did not engage in the challenged conduct.

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[13] *Federal Trade Commission vs. Actavis* 570 U.S. 136 (2013) (emphasis added).

[14] *FTC v. Meta*, Memorandum Opinion, p. 55, 56, and 61, Civil Action No. 20-3590 (JEB), November 13, 2024. One year later, following a trial, the District Court ruled in favor of Meta on the grounds that Meta no longer had monopoly power in a properly defined relevant market. As of this writing, the FTC has appealed that decision.

In this article, I refer to the defendant's alternative permissible conduct as the defendant's *counterfactual conduct* or as the defendant's *but-for conduct*. The defendant's counterfactual conduct cannot be chosen arbitrarily. That would lead to an unprincipled and unpredictable analysis. Rather, it should be (a) consistent with the evidence regarding the defendant's business strategy and economic incentives, and (b) permissible as a matter of law.[15]

Given the central role played by the defendant's counterfactual conduct in evaluating the effects of the defendant's challenged conduct, the courts have been surprisingly vague about the methodology they apply to determine the defendant's counterfactual conduct and what specific counterfactual conduct they are using in any given case. So far as I can determine, the courts generally have in mind that the counterfactual conduct was simply for the defendant to have *refrained* from engaging in the challenged conduct. As I now explain, that intuitive approach can work for some categories of Section 2 cases, but is nuanced or fraught for others.

1. *Deception*

In cases where the challenged conduct involves deception, the counterfactual conduct is relatively straightforward: be truthful instead of engaging in the deceptive conduct.[16]

In the Microsoft case, Microsoft provided software developers with a set of tools to assist them in designing Java applications. The District Court found that "Microsoft deceived Java developers regarding the Windows-specific nature of the tools." As a result, "developers who relied upon Microsoft's public commitment to cooperate with Sun and who used Microsoft's tools to develop what Microsoft led them to believe were cross-platform applications ended up producing applications that would run only on the Windows operating system." [*Microsoft* 76]

Here, Microsoft's counterfactual conduct would still involve developing a Java Virtual Machine ("JVM") that was incompatible with Sun's JVM.[17] The CADC found that to be a form of competition on the merits and thus permissible because Microsoft's JVM "does allow applications to run more swiftly [on Windows] and does not itself have any anticompetitive effect. Therefore, we reverse the District Court's imposition of liability for Microsoft's development and promotion of its JVM." [*Microsoft* 75]

Microsoft also could have developed tools for designing Java applications that produced applications that only worked on Windows and provided incentives for developers to use those tools. However, Microsoft's counterfactual conduct does not include deceiving Java developers about those tools. Instead, Microsoft would have accurately informed Java developers about the Windows-specific nature of the code created using its tools. As discussed below, that leaves open

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[15] Francis, op. cit. p. 805 describes these same two prongs very nicely: " A claim of exclusion presupposes that the plaintiff can identify a baseline or counterfactual against which exclusionary impact can be measured. This baseline is both descriptive, in that it makes a claim about what the defendant would in fact have had the ability and incentive to do as an alternative to the challenged conduct, and normative, in that the purported antitrust wrong lies in the defendant's deviation from that alternative course."

[16] Cases in this category include *NYNEX v. Discon* 525 U.S. 128 (1998) and *Rambus v. Federal Trade Commission* 522 F.3d 456 (DC Circuit 2008). Cases involving torts and abuse of process are treated similarly. Of course, there are many ways to be truthful, but in practice they will often lead to largely the same consequences.

[17] Logically, Microsoft could instead have developed a JVM that was compatible with Sun's JVM, or it could just have used Sun's JVM. That counterfactual conduct would have lowered the applications barriers to entry even more.

the question of what tools Java developers would then have used and the implications for Microsoft's monopoly power. Those are questions about the counterfactual *outcome*.

2. *Conditional Dealing*

A monopolist engages in *conditional dealing* when it enters into agreements with customers with terms that depend on whether and how much those customers either deal with the monopolist's rivals or themselves compete against the monopolist. A monopolist also engages in conditional dealing when it unilaterally adopts a policy of treating customers differently on these same bases, whether explicitly stated or not.[18]

In conditional dealing cases, the most natural counterfactual conduct is for the defendant instead to have made offers to those same customers that were *not* conditional on whether and how much they deal with the monopolist's rivals or themselves become one. The counterfactual conduct still involves the monopolist competing to win the business of these customers – but without engaging in the prohibited conditional dealing.

Exclusive dealing is one species of conditional dealing. The extreme version arises when the monopolist refuses to deal at all with customers that purchase anything from its rivals. *Lorain Journal* and *Dentsply* are notable examples of exclusive dealing cases.[19] Exclusive dealing can greatly impede rivals when used by a monopolist with customers who would find it very costly to refrain from purchasing anything at all from the monopolist. Exclusive dealing prevents those customers from splitting their business by purchasing *some of their needs* from other suppliers, perhaps on a sample basis or to help those suppliers grow into stronger rivals to the monopolist.

In exclusive dealing cases, the counterfactual conduct is for the monopolist to deal with customers *without* the exclusivity requirement. That approach makes good sense, but it can be incomplete because it does not address the prices or other terms the monopolist would have offered customers in the absence of exclusivity. The courts have generally ducked that question, most likely because of the difficulty of determining these counterfactual prices and terms.

Comparing the price that the monopolist would likely have charged in a non-exclusive counterfactual agreement with the price it actually charged in an exclusive agreement depends on the facts of the case.[20] One complication is that the counterfactual conduct may involve volume discounts. Volume discounts can maximize the monopolist's profits by allowing it to charge higher prices for "inframarginal" units, for which the customer has no viable alternative, while simultaneously offering lower prices for "marginal" units, which the customer could realistically purchase from the monopolists' rivals.[21]

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[18] For a detailed and thoughtful discussion of liability in cases involving conditional dealing, see Daniel Francis, "Monopolizing by Conditioning," 124 *Columbia Law Journal* 1917 (2024).

[19] *Lorain Journal v. United States* 342 U.S. 143 (1951). *United States v. Dentsply* 399 F.3d 181 (3rd Circuit, 2005).

[20] If the monopolist offered lower prices as an inducement for customers to accept exclusivity (which is sometimes characterized as sharing the monopoly profits), then the counterfactual price might be higher, at least initially. That higher price would tend to further facilitate entry or expansion by rivals, albeit at some cost to the customers. Alternatively, the monopolist might set a lower counterfactual price to discourage entry (a form of limit pricing) if it cannot deter entry using exclusive dealing. In that case, customers would benefit from these lower prices, but profitable entry or expansion by rivals might also be difficult or limited in the counterfactual world.

[21] The "inframarginal" units are sometimes called "non-contestable," and the "marginal" units called "contestable."

The illegal conduct at the heart of the Microsoft case was similar to exclusive dealing, making it relatively straightforward to describe Microsoft's counterfactual conduct.

- Microsoft entered into "First Wave" agreements with dozens of important independent software vendors ("ISVs"). "In exchange for costly technical support and other blandishments, Microsoft induced dozens of important ISVs to make their Java applications reliant on Windows-specific technologies and to refrain from distributing to Windows users JVMs that complied with Sun's standards." [*Microsoft* 75] Microsoft's counterfactual conduct toward ISVs was to *not* prohibit them from distributing JVMs that complied with Sun's standards.
- Microsoft prohibited original equipment manufacturers ("OEMs") from "removing any desktop icons, folders, or 'Start' menu entries." [*Microsoft* 61] Microsoft's counterfactual conduct toward OEMs was *not* to have this prohibition in its agreements with OEMs.[22]

Loyalty discounts are a second species of conditional dealing, whereby the price charged by the monopolist is higher if the customer purchases from the monopolist's rivals.[23] In cases involving loyalty discounts, the counterfactual conduct is for the monopolist not to condition the prices it charges on whether or how much a customer buys from the monopolist's rivals. But, again, what are those counterfactual prices? Volume discounts, which do not reference rivals, are a natural choice for the counterfactual conduct in these cases, especially if the feasibility of such non-linear pricing (a form of price discrimination) has already been demonstrated in the real world.

A third species of conditional dealing arises when the monopolist deals with a counterparty on the condition that the counterparty either (a) not itself compete against the monopolist, or (b) limit how it competes against the monopolist. The following allegation by the FTC in its complaint against Facebook provides a good example of such a non-compete provision:

> "Facebook required that developers seeking to use Facebook Platform and access commercially significant APIs agree to contractual restrictions imposed by Facebook" including "requirements that developers agree that their apps would not compete with Facebook (including, at relevant times, by 'replicating core functionality' offered by a Facebook product) and would not promote competitors."[24]

Cases with non-compete provisions can involve either (a) an explicit provision barring the counterparty from competing against the monopolist, or (b) a unilateral policy established by the monopolist under which it will not initiate, or will terminate, its dealing with counterparties that compete against it. The economics of types (a) and (b) are very similar, but only type (a) can be reached using Section 1 of the Sherman Act. Both types can be reached using Section 2.

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[22] This element of conduct was found to be exclusive in practice. It may more naturally be seen as a form of tying, a category I do not develop in this article. That classification would lead to the same counterfactual conduct and hence the same causation analysis, so would not alter what follows.

[23] Exclusive dealing contracts are an extreme version (and special case) of loyalty discounts, in which the price charged by the monopolist is prohibitive (refusal to deal) if the customer buys anything from the monopolist's rivals.

[24] *Federal Trade Commission v. Facebook*, Second Amended Complaint, September 8, 2021, ¶133. The District Court dismissed this part of the FTC's Complaint based on incorrectly characterizing it as an unconditional refusal to deal rather than a form of conditional dealing, and the CADC affirmed. *Federal Trade Commission v. Facebook*, 549 F. Supp. 3d 6, 27 (2021) and *New York v. Meta*, 66 F. 4th 288, 304-306 (DC Circuit, 2023).

In cases involving such non-compete provisions or policies that are not justified based on protecting the defendant's intellectual property, the natural counterfactual conduct is for the monopolist (a) to enter into agreements with counterparties *without* the non-compete provision, or (b) to drop its policy of not dealing with counterparties that compete against it. As with exclusive dealing cases and loyalty discounts cases, how those counterfactual prices compare with the prices actually set by the monopolist will depend on the facts of the case.

3. *Predatory Pricing*

In 1993, the Supreme Court in *Brooke Group* established two prerequisites that a plaintiff must meet to establish competitive injury from a rival's low prices: (1) "that the prices complained of are below an appropriate measure of its rival's costs," and (2) "that the competitor had a reasonable prospect, or, under § 2 of the Sherman Act, a dangerous probability, of recouping its investment in below-cost prices."[25]

The Supreme Court in *Brooke Group* did not explicitly identify the defendant's counterfactual conduct. However, the court's second prong asks whether the defendant would likely be able to recoup its "investment in below-cost prices." The Supreme Court may have had in mind that the defendant's counterfactual conduct was to price *at cost*, as the Court seems to have used that benchmark to measure the defendant's "investment in below-cost prices." Pricing at cost makes some sense as counterfactual conduct, as that is the most aggressive pricing that does not violate the court's first prong.[26] To an economist, at least, the more natural approach is to take the defendant's *profit-maximizing* price as the counterfactual conduct.[27] That would involve greater profit sacrifice but necessitate estimating that price, no mean feat.

A further complication arises when the pricing conduct at issue involves multiple products. When a monopolist sets a price for a bundle containing its monopoly product and a competitive product that is less than the sum of the prices for the two products purchased separately, that conduct may be viewed as predatory pricing (as in PeaceHealth[28]), as conditional dealing (as in LePage's[29]), or perhaps as tying, possibly leading to different counterfactual conduct.

In practice, the most straightforward counterfactual conduct in predatory pricing cases is simply for the monopolist to price at cost, but workable alternatives may be available in some cases.[30]

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[25] *Brooke Group v. Brown & Williamson Tobacco Corp*. 509 U.S. 209 223-224 (1993). The peculiar feature of *Brooke Group* is that the Supreme Court required the plaintiff to show that this investment was profitable rather than assuming that the investment is profitable (we routinely assume in antitrust that firms maximize profits) and putting the burden on the defendant to provide convincing non-exclusionary reasons *why* it was profitable.

[26] In the case of quantity discounts, pricing at cost means pricing *incremental units* at cost rather than below cost. That approach is sometimes referred to as using the "as-efficient competitor" test.

[27] In this exercise, the profit-maximizing price is calculated under the assumption that the price selected by the monopolist does not affect rivals' exit decisions. See Janusz Ordover and Robert Willig, "An Economic Definition of Predation: Pricing and Product Innovation," 91 *Yale Law Journal* 8 (No. 1, 1981).

[28] Cascade Health, et al v. PeaceHealth, 515 F.3d 883 (9th Cir. 2008).

[29] LePage's Inc. v. 3M, 324 F.3d 141, (3d Cir. 2003).

[30] We are just scratching the surface here, because the counterfactual conduct must be legally permissible and thus depends on the liability standard one is applying. In the literature on predatory pricing, some authors propose a "dynamic" liability standard, based on how the defendant's prices *change* over time in response to entry and exit, rather than a "static" standard based on the price level. As a notable example, Aaron Edlin, in "Stopping Above-Cost

4. *Unconditional Refusals to Deal*

Specifying the defendant's counterfactual conduct is fraught in cases involving unconditional refusals to deal.[31] Presumably, the counterfactual conduct in such cases involves the monopolist dealing with the counterparties at issue, but on what terms? Well, that depends on the liability rule for these cases.

Economists are fond of pointing out that imposing a duty to deal is meaningless unless one specifies the *terms* on which dealing must take place. Suppose, just as a placeholder, that the liability rule is that the monopolist is obligated to deal with the counterparties at issue on certain "reasonable" terms. Naturally, then, the corresponding counterfactual conduct is for the monopolist to have dealt with those counterparties on those same "reasonable" terms.

Antitrust courts have struggled with identifying the "reasonable" terms to apply in cases involving unilateral, unconditional refusals to deal. In large part this is because the Supreme Court has long instructed the lower courts to refrain from getting involved in regulating prices in antitrust cases, and for good reason.[32] The *Trinko* case made this crystal clear. Expressing deep skepticism about imposing duties to deal on monopolists, Justice Scalia wrote: "Enforced sharing also requires antitrust courts to act as central planners, identifying the proper price, quantity, and other terms of dealing – a role for which they are ill-suited."[33]

The chief resolution to this thorny problem in refusal-to-deal cases has been to define the "reasonable" terms as the same terms on which the monopolist voluntarily dealt with the specified counterparties *in the past*. That approach worked in *Aspen Ski*, where the defendant was found to have violated Section 2 by terminating a long-standing arrangement with a rival.[34] "Aspen Skiing is at or near the outer boundary of § 2 liability. The Court there found significance in the defendant's decision to cease participation in a cooperative venture. The unilateral termination of a voluntary (*and thus presumably profitable*) course of dealing suggested a willingness to forsake short-term profits to achieve an anticompetitive end. Similarly, the defendant's unwillingness to renew the ticket even if compensated at retail price revealed a distinctly anticompetitive bent."[35] In *Aspen Ski*, the challenged conduct was to *terminate* a cooperative venture with a rival, so refraining from that conduct corresponds to *continuing* in that venture. One must be quite careful, however, when applying this approach in markets with changing conditions, as real-world prices and terms typically change over time.

Predatory Pricing," 111 *Yale Law Journal* 941, favors liability for a monopolist that substantially lowers its price in response to entry. Under that standard, the natural counterfactual conduct would be for the monopoly to set and keep in place its profit-maximizing price, as determined under the assumption that the monopolist cannot lower its price significantly in response to entry. Edlin argues that this rule may result in permanently lower prices to deter entry rather than temporarily lower prices to induce exit.

[31] Here, the term "unconditional" means *not* a form of "conditional dealing," as that term is defined above.

[32] The Supreme Court has long made clear that "merely" charging monopoly prices is not a violation. Indeed, in *NYNEX v. Discon* 525 U.S. 128 (1998) the Court ruled that a secure monopolist did not violate the Sherman Act even by engaging in deceptive conduct that elevated the monopoly price it could profitably charge.

[33] *Verizon v. Trinko* 540 U.S. 398, 408 (2004).

[34] *Aspen Skiing Co. v. Aspen Highlands Skiing Corp.* 427 U.S. 575 (1985).

[35] *Verizon v. Trinko* at 409, emphasis in original (citations omitted).

What about cases in which the monopolist has *not* engaged in a prior course of dealing with the counterparties at issue? Based on *Trinko*, liability in such cases seems extremely unlikely, in part because imposing a duty to deal may stifle innovation: "Firms may acquire monopoly power by establishing an infrastructure that renders them uniquely suited to serve their customers. Compelling such firms to share the source of their advantage is in some tension with the underlying purpose of antitrust law, since it may lessen the incentive for the monopolist, the rival, or both to invest in those economically beneficial facilities."[36]

If such unconditional refusals-to-deal are not treated as a form of competition on the merits and thus immune from challenge, antitrust courts will need to identify the "reasonable" terms in cases where no historical benchmark is available. One approach would be to allow the monopolist to earn a "reasonable" rate of return on its applicable investments, accounting for risk. This is inherently a complex exercise, as we know from extensive experience with rate-of-return regulation. A more aggressive approach would require dealing at a price equal to incremental cost, but that would often fail to provide a reasonable return on investment and thus risk stifling investments by being confiscatory. A third approach would set the "reasonable" terms based on some benchmark(s). That too is an inherently complex exercise, both in selecting the benchmark(s) and in adjusting them to reflect counterparty or temporal differences. Moreover, the antitrust courts would need to specify when the mandated dealing should have begun, the non-price terms of such dealing, and which counterparties are eligible.[37] Any of these approaches would require antitrust courts to act much like regulatory agencies. The root of the problem is that the monopolist's counterfactual conduct in such cases is unspecified. In the end, determining liability in such cases would be quite fraught if the antitrust courts were to move in this direction despite clear Supreme Court precedent and warnings to the contrary.

In summary, in unilateral, unconditional refusal-to-deal cases, liability is most likely to arise as a result of the defendant terminating a voluntary course of dealing. With that fact pattern, the natural counterfactual conduct is for the defendant to have continued with that course of dealing, perhaps with some adjustments based on changing market conditions.

C. NEXUS WITH THE UNKNOWABLE COUNTERFACTUAL OUTCOME

We are now ready to take the next step in the causation analysis: to ask whether the counterfactual world would likely involve significantly more competition in the allegedly monopolized market. In other words, we are ready to move from the defendant's counterfactual conduct to the counterfactual *outcome*.

In markets subject to technological change, we immediately run smack into the "underlying proof problem" identified in *Microsoft*: "neither plaintiffs nor the court can confidently reconstruct a product's hypothetical technological development in a world absent the defendant's exclusionary conduct." Plus this zinger: "To require that § 2 liability turn on a plaintiff's ability or inability to reconstruct the hypothetical marketplace absent a defendant's anticompetitive

[36] *Verizon v. Trinko* at 408.

[37] Very similar problems arise in cases where the plaintiff alleges that the monopolist engages in self-preferencing, in part because internal transfer prices function very differently from prices set in arms-length transactions and thus cannot reliably serve as benchmarks.

conduct would only encourage monopolists to take more and earlier anticompetitive action." [*Microsoft* 79]

So, following *Microsoft*, we lower our sights, recognizing that in many cases the counterfactual outcome will be unknowable. But we still need to determine whether the challenged conduct "is reasonably capable of contributing significantly to a defendant's continued monopoly power." To answer that question, we must develop at least some general sense of how competition might reasonably have evolved if the defendant had instead engaged in the counterfactual conduct.

That inquiry is best broken into two steps. Evidence of significant causal effects at the first step is a predicate for proceeding to the second step.

1. **Counterparty Responses**: What does the evidence show regarding how the counterparties directly affected by the defendant's challenged conduct would most likely have responded if the defendant had instead engaged in the counterfactual conduct?
2. **Effect on Competition in the Monopolized Market**: What would the consequences of those counterparty responses have been for competition in the monopolized market?

Specific probative evidence can be developed to inform the first step of this analysis. One can examine contemporaneous evidence from the negotiations between the monopolist and its counterparties, from rivals that sought to win more of their business, and from the monopolist itself regarding the reasons it adopted its challenged policies and the alternatives it considered.

Developing evidence to inform the second step of this analysis can be much harder, especially in markets subject to rapid technological change. This is where one faces the "underlying proof problem" identified in Microsoft – the difficulty of reconstructing the counterfactual outcome. Under Microsoft, one applies the forgiving "reasonably capable" standard at this step.

I now discuss how to perform this two-step exercise in various types of Section 2 cases.

1. *Deception*

At the first step, it is reasonable to infer that when a monopolist affirmatively deceives a counterparty it did so to alter the behavior of that counterparty. In the Microsoft case, the evidence showed that Microsoft deceived many Java developers with the explicit goal of luring them into using Microsoft's software development tools, thereby undermining cross-platform Java. Intent evidence here was highly relevant for the usual reason: because it was informative about the likely effects of the deception. Moreover, since the deception was widespread, it is reasonable to infer that it had a substantial effect on the tools used by Java developers overall. These inferences are justified notwithstanding that Microsoft pursued other closely related strategies toward Java that were determined in *Microsoft* to be legal – developing an incompatible JVM and offering valuable consideration to developers to induce them to use it.[38]

What about the second step, the nexus between the increased use of cross-platform Java and the maintenance of Microsoft's monopoly power in the operating system market? The Findings of Fact made by the District Court establish a clear mechanism by which cross-platform middleware can reduce the applications barrier to entry, and then rely heavily on evidence from

[38] "In exchange for costly technical support and other blandishments, Microsoft induced dozens of important ISVs to make their Java applications reliant on Windows-specific technologies… Again we reject the District Court's condemnation of low but non-predatory pricing by Microsoft." [*Microsoft* 75]

Microsoft expressing grave fears about the threat to Windows posed by Sun's cross-platform JVM. Under the *Microsoft* causation standard for liability, that was sufficient, even though the extinguished threat was "nascent" and there was no showing that it would more likely than not have ended Microsoft's monopoly. Extinguishing a meaningful *risk* of additional competition was enough.

Looking beyond the Microsoft case, one cannot discuss deception without addressing the CADC's subsequent decision in *Rambus*.[39] In that case, Rambus had deceptively failed to disclose its patents to a standard-setting body, giving it subsequent monopoly power once those patents became essential to the standard that was adopted. The FTC held that Rambus had violated §5 of the Federal Trade Commission Act, but the CADC reversed, on this logic:

> "We grant the petition, holding that the Commission failed to sustain its allegation of monopolization. Its factual conclusion was that Rambus's alleged deception enabled it either to acquire a monopoly through the standardization of its patented technologies rather than possible alternatives, or to avoid limits on its patent licensing fees that the SSO would have imposed as part of its normal process of standardizing patented technologies. But the latter – deceit merely enabling a monopolist to charge higher prices than it otherwise could have charged – would not in itself constitute monopolization."[40]

Regarding causation, *Rambus* is very hard to reconcile with *Microsoft*. According to *Rambus*, the deficiency in the FTC's case was that the effect of Rambus's conduct *might* have been to gain a monopoly through deception, but it might instead "merely" have enabled Rambus to charge monopoly prices rather than competitive prices. So what? Under *Microsoft*, liability should still be found because there was a significant chance that the deception had led to a monopoly. Sadly, the *Rambus* court fell into the very trap that the *Microsoft* court warned about by asking the impossible of the plaintiff, namely to "reconstruct a product's hypothetical technological development in a world absent the defendant's exclusionary conduct."[41]

2. *Conditional Dealing*

In exclusive dealing cases like *Lorain Journal* and *Dentsply*, where the conduct is widespread and targeted at direct rivals in the monopolized market, the *Microsoft* causation standard is typically quite easy for the government to satisfy so long as rivals cannot easily circumvent the counterparties subject to the conduct. Put simply, when a monopolist prohibits an important group of customers from purchasing from its rivals, that prohibition is typically at least reasonably capable of making a significant contribution to maintaining the monopoly power.

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[39] *Rambus v. Federal Trade Commission* 522 F.3d 456 (DC Circuit 2008).

[40] *Rambus v. Federal Trade Commission* 522 F.3d 456, 459 (DC Circuit 2008).

[41] Francis, op. cit. p. 810 argues that *Rambus* is consistent with *Microsoft* if *Rambus* is viewed as a case that turned on the plaintiff's failure to show *exclusion* rather than a failure relating to causation. Maybe so, but even with this charitable reading, *Rambus* was still wrongly decided because the deceptive conduct by Rambus *undermined the competitive process* by which other non-deceptive patent owners vied with Rambus to have their technologies selected by the standard-setting body. Moreover, that harm to competition allowed Rambus to win at a higher price than it would have obtained without the deception. Surely Section 5 of the FTC Act can reach deceptive conduct that undermines the competitive process and as a result harms customers by enabling the defendant to charge monopoly prices rather than competitive prices.

The Microsoft case itself was more challenging because Microsoft's conditional dealing was not targeted at Microsoft's direct rivals in the monopolized market for desktop operating systems. As noted above, Microsoft prohibited OEMs from "removing any desktop icons, folders, or 'Start' menu entries." The District Court found that this restriction "thwarts the distribution of a rival browser by preventing OEMs from removing visible means of user access to IE," because "OEMs cannot practically install a second browser in addition to IE." [*Microsoft* 61] Regarding the effect of this conduct on Microsoft's operating system monopoly, the Court stated: "By preventing OEMs from removing visible means of user access to IE, the license restriction prevents many OEMs from pre-installing a rival browser and, therefore, protects Microsoft's monopoly from the competition that middleware might otherwise present. Therefore, we conclude that the license restriction at issue is anticompetitive." [*Microsoft* 61]

In the Microsoft case, the effect of Microsoft's conduct on rival browsers was clear and substantial. Critically, the CADC found enough of a nexus between cross-platform browsers and competition in the operating system market to satisfy its causation standard. Evidence that Microsoft's leaders feared that a highly popular Netscape Navigator would threaten Windows by lowering the applications barrier to entry was critical to this finding. Liability did not require the government to show that a highly popular Navigator would very likely have ended Microsoft's monopoly. A meaningful risk of that happening was sufficient.

The CADC treated Microsoft's "First Wave" agreements with ISVs very similarly. "Because Microsoft's agreements foreclosed a substantial portion of the field for JVM distribution and because, in so doing, they protected Microsoft's monopoly from a middleware threat, they are anticompetitive." [*Microsoft* 76] Here, again, evidence showing that Microsoft's leaders feared that Sun's Java technologies, if widely used, would threaten Windows by lowering the applications barrier to entry was critical to the CADC's causation finding.

The *McWane* case illustrates how subsequent courts have dealt with causation in more straightforward cases where exclusive dealing provisions or loyalty discounts are targeted at direct rivals.[42] McWane had monopoly power in the market for ductile iron pipe fittings. The FTC challenged McWane's "Full Support" program under which "distributors who bought domestic fittings from other companies (such as Star) might lose their rebates or be cut off from purchasing McWane's domestic fittings for up to three months."[43] The counterfactual conduct the court appears to have used was straightforward: McWane simply *not* introducing the "Full Support" program in response to the Star's entry into the monopolized market. The court did not find it necessary to further specify McWane's counterfactual pricing levels or structure.

The *McWane* court used this causation standard: "The governing Supreme Court precedent speaks not of 'clear evidence' or definitive proof of anticompetitive harm, but of 'probable effect.' *Tampa Elec*., 365 U.S. at 329 (instructing courts to weigh the '*probable effect* of the [exclusive dealing] contract on the relevant area of effective competition' (emphasis added))."[44] If "probable" means "more likely than not," this is a stricter causation standard than *Microsoft*.

[42] *McWane v. Federal Trade Commission*, 783 F.3d 814 (11th Circuit 2015).

[43] *McWane* 783 F.3d 814, 820

[44] *McWane* 783 F.3d 814, 836

As in *Microsoft*, causation in *McWane* was supported by evidence that the defendant expected its conduct to weaken its rivals: "Internal documents reveal that McWane's express purpose was to raise Star's costs and impede it from becoming a viable competitor."[45] Plus, in the face of McWane's Full Support program, its chief rival, Star Pipe Products, lacked sufficient sales volume to justify running its own foundry, which would have significantly lowered its costs.[46] Moreover, "after the Full Support Program was implemented, McWane raised domestic fittings prices and increased its gross profits despite flat production costs."[47] That evidence satisfied the "probable effect" causation standard, which is stricter than the *Microsoft* causation standard.

3. *Predatory Pricing*

Under *Brooke Group*, the plaintiff in a predatory pricing case must show that the defendant had "a reasonable prospect of recouping its investment in below-cost prices." Evidently, the plaintiff must engage in a quantitative exercise to satisfy this prong of the *Brooke Group* test.

The *Brooke Group* causation standard for liability is far more stringent than the *Microsoft* standard because it requires the plaintiff to make a specific, quantitative showing regarding the defendant's return on its investment in below-cost prices. The *Microsoft* standard suggests a very different approach under which otherwise unexplained below-cost pricing by a monopolist would be sufficient to establish causation, at least in markets with meaningful barriers to entry. Why? Because in that context such conduct provides an inference that the monopolist was pricing to drive rivals out of the market and thus reasonably appears capable of making a significant contribution to maintaining monopoly power. *Actavis* also points in that direction.

4. *Unconditional Refusals to Deal*

There are very few cases in recent decades in which liability has been found for a defendant based on its unconditional refusal to deal. Under *Trinko*, almost all such refusals to deal seem to be regarded as a form of competition on the merits and thus permissible, even if they exclude rivals. But we can look back forty years to see how causation was handled in the *Aspen Ski* case. In that case, there was overwhelming evidence not only that the defendant aimed to weaken its smaller rival by ceasing to offer the joint ticket, but also that the termination of the joint ticket had that effect while also harming consumers. Put simply, the plaintiff was able to present clear evidence of the effects of the challenged termination by showing how the market changed following that termination. That is a far cry from the Microsoft case, in which the counterfactual world was vastly more difficult to discern.

D. APPLICATION TO THE GOOGLE SEARCH CASE

The most significant monopolization case brought by the United States in the 25 years since *Microsoft* is the Google Search case.[48] As soon as the government filed its complaint against Google in 2020, it was clear that the Microsoft case would have a profound effect on how the Google Search case would be litigated and ultimately decided. That proved true: the District

[45] *McWane* 783 F.3d 814, 821

[46] *McWane* 783 F.3d 814, 822

[47] *McWane* 783 F.3d 814, 824

[48] *United States et. al. v. Google*, Case No. 20-cv-3010 (APM), District Court for the District of Columbia.

Court's liability decision closely followed *Microsoft*.[49] I now discuss how the *Microsoft* causation standard influenced the liability determination in the Google Search case.

1. *The District Court's Causation Analysis*

The District Court found that Google had monopoly power in the market for general search services in the United States. [*Google Search,* 73] The District Court succinctly summarized Google's challenged conduct this way: "The bulk of Plaintiffs' case focuses on the search distribution contracts—the browser agreements (primarily with Apple and Mozilla) and the Android agreements (the MADAs and RSAs) – which Google allegedly uses to maintain its monopoly in the relevant markets." [*Google Search*, 86] Here, the MADAs are Google's Mobile Application Distribution Agreements with Android OEMs, and the RSAs are Google's Revenue Sharing Agreements with the major wireless carriers, AT&T, Verizon, and T-Mobile.

In what follows, I illustrate using Google's search distribution agreement with Apple, which was the centerpiece of the government's case. "The Internet Services Agreement (ISA) is an agreement between Google and Apple, wherein Google pays Apple a share of its search ads revenue in exchange for Apple preloading Google as the exclusive, out-of-the-box default GSE [General Search Engine] on its mobile and desktop browser, Safari." [*Google Search*, 47, ¶290] "The ISA requires Apple to set Google as the default search engine on Safari for all its devices." [*Google Search* 48, ¶294] Importantly, the ISA governs Apple's default settings for Safari on a *portfolio-wide* basis – all Apple devices – as distinct from a device-by-device basis.

To evaluate Google's search distribution agreements, the District Court explicitly adopted the *Microsoft* exclusive dealing framework. [*Google Search* 88] Applying that framework, the District Court determined that those agreements were exclusive in practice.[50] [*Google Search* 88-92] The Microsoft case was central in this determination.[51]

The District Court determined that Google's portfolio-wide search distribution agreement with Apple was exclusive in practice: "Google's browser agreements are exclusive insofar as they establish Google as the out-of-the-box default search engine. The Apple ISA requires that Google be preloaded as the exclusive default search engine on all Safari search access points in exchange for [redacted]% revenue share." [*Google Search* 88] This squares with the government's allegations: "Plaintiffs are challenging Google's exclusionary contracts that require counterparties to set Google as the exclusive search default." [*Google Search* 106] Here, the term "exclusive" reflects the portfolio-wide scope of the ISA: Apple was required to set Google as the default search engine for all Safari search access points on all of its devices.

The District Court found clear evidence that Bing was not a viable choice for the portfolio-wide Safari default on Apple devices. "The market reality is that Google is the only real choice as the default GSE [General Search Engine]." [*Google Search* 87] And this piece of evidence is telling:

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[49] *United States et. al. v. Google*, 747 F. Supp. 3d 1 (2023) (henceforth, *Google Search*).

[50] The District Court also relied here on *ZF Meritor v. Eaton* 696 F. 3d 254, 270 (3d Circuit, 2012), stating: "Exclusivity need be neither express nor complete to render an agreement 'exclusive' for Section 2 purposes. *De facto* and partial exclusivity may suffice, depending on the circumstances." [*Google Search* 88]

[51] "To illustrate, in *Microsoft*, the D.C. Circuit upheld the trial court's determination that 'although not literally exclusive, the deals were exclusive *in practice* because they required developers to make Microsoft's [Java Virtual Machine] the default in the software they developed.' 253 F.3d at 75-76 (emphasis added)." [*Google Search* 88]

"Microsoft *did* offer Apple 100% of revenue share plus guarantees, but Apple's executives testified that Bing was never a realistic option to replace Google." [*Google Search* 107]

Summarizing, Google's search distribution agreement with Apple crossed the line by requiring Apple to make Google the out-of-the-box default search service for all Safari search access points on all Apple devices. That prevented Apple from experimenting by setting another search service as the default on some Safari search access points on some Apple devices.

Using a very similar logic, the District Court also found that Google's MADAs with Android OEMs were exclusive in practice:

> "With the benefit of a full trial, the court can now conclude that the MADA is exclusive in practice. Its exclusivity arises from two contractual requirements and two market realities. The two contractual requirements are that all MADA signatories must: (1) feature the Google Search Widget in the center of the home screen and (2) place Chrome on the home screen with Google as the default GSE. FOF ¶¶ 351, 356. The two market realities are that: (1) the Google Play Store is a must-have on all Android devices, FOF ¶¶ 352-354, and (2) the industry-wide practice is to avoid excessive preloading of applications, or 'bloatware,' FOF ¶¶ 359-361. This combination of factors has resulted in all Android OEMs and carriers entering into MADAs, with all Android devices featuring the Google Search Widget and Chrome on the home screen to the exclusion of rivals as a practical matter." [*Google Search* 91]

Because the MADA had these effects on all Android devices, the Court found that in practice it prevented an Android OEM from experimenting by placing a non-Google search widget or non-Google browser set to a non-Google search default on the home screen of some of its devices.

Faced with Google's exclusive search distribution agreements, which covered both Apple and Android devices, the Court concluded that it was very difficult for Google's rivals to obtain search defaults on even a modest number of mobile devices in the United States.

The District Court next turned to the critical question of whether Google's exclusive search distribution agreements had anticompetitive effects in the general search services market. For this purpose, the District Court explicitly cited and then applied the *Microsoft* causation standard. Here is an instructive summary passage from the District Court's opinion [*Google Search* 93]:

> "The key question then is this: Do Google's exclusive distribution contracts reasonably appear capable of significantly contributing to maintaining Google's monopoly power in the general search services market? The answer is 'yes.' Google's distribution agreements are exclusionary contracts that violate Section 2 because they ensure that half of all GSE users in the United States will receive Google as the preloaded default on all Apple and Android devices, as well as cause additional anticompetitive harm."

The District Court reached this conclusion based on its finding that Google's exclusive distribution contracts foreclosed a substantial share of the market, thereby depriving Google's rivals of scale and reducing their incentives to invest and innovate. [*Google Search*, 93-106]

The District Court's analysis of foreclosure relied on expert testimony "that 50% of all queries in the United States are run through the default search access points covered by the challenged distribution agreements." [*Google Search* 93] Based on that evidence, the District Court concluded: "Plaintiffs have proven that Google's exclusive distribution agreements foreclose

50% of the general search services market by query volume." [*Google Search* 96] That 50% figure met the District Court's legal threshold for significant foreclosure. [*Google Search* 96-97]

Notably, the District Court rejected Google's argument "that the proper measure of foreclosure is not market coverage but the percentage of queries available to rivals in a 'but-for world' in which the challenged contracts do not exist. In such a world, the foreclosure number would be far lower because users in large numbers still would use Google." [*Google Search* 94] The District Court ruled that substantial foreclosure was established based on the *coverage* of the exclusive agreements, without the need to measure how much actual usage those agreements shifted toward Google. The District Court also noted that when Google's counterparties had sought greater flexibility to distribute rival general search services to their users, Google had not agreed to their requests.[52]

The approach to foreclosure taken by the District Court relies heavily on inference, which is the core of the *Microsoft* causation standard.[53] The anticompetitive effects alleged by the government arose from Google's exclusive search-distribution agreements, based on the argument that they steered search traffic toward Google. Critically, the government had to show only that these agreements were reasonably capable of shifting significant search traffic toward Google, not that they in fact did so when compared to a counterfactual in which Google competed for search distribution but without the use of *exclusive* distribution agreements.

2. *Looking More Closely at the Effects of Google's Exclusive Agreements*

Yet inquiring minds wonder: what did the evidence show about the volume of search traffic that Google's exclusive search distribution agreements shifted toward Google? Exploring that question will be important below for remedy. Probing in this way also allows us to better understand the significance and power of the *Microsoft* causation standard in a case where (unlike *Microsoft*) the exclusionary conduct was targeted at the monopolist's direct rivals.

As always, any coherent analysis of causation must begin by identifying the defendant's counterfactual conduct. As explained above, in exclusive dealing cases the natural and common counterfactual conduct is for the defendant to have offered to deal with the same counterparties but without the requirement of exclusivity. Without exclusivity, these counterparties (typically customers) can give a *portion* of their business to the monopolist's rivals, which over time may allow those rivals to gain scale and grow into stronger competitors to the monopolist.

What counterfactual conduct does that imply in the Google Search case? Illustrating with Apple, the District Court identified the source of the exclusivity in Google's ISA with Apple: the requirement that Apple set Google as the out-of-the-box default search engine for all Safari search access points on all Apple devices, i.e., that the ISA was a portfolio-wide contract for default. Therefore, one natural form of counterfactual conduct vis-à-vis Apple was for Google to offer to share revenue with Apple in exchange for being made the Safari default on a device-by-

[52] *Google Search* 51, ¶319-320 (Apple in 2009 and 2012) and 57-58 (Verizon and AT&T).

[53] *Google Search Remedy* (p. 119) makes this clear: "As discussed above, the court's liability findings support a strong inference that Google's exclusive distribution agreements significantly contributed to maintaining its monopoly power. COL §II. But the record also contains ample evidence that lawful conduct played an important role in Google's maintenance of its monopoly. That includes its best-in-class search quality, consistent innovations, investment in human capital, strategic foresight, and brand recognition. See *Google*, 747 F. Supp. 3d at 31. The contribution to Google's success of these factors is not disputed."

device basis, i.e. to offer a device-by-device contract for default for each search access point. This is indeed what the District Court ordered in its remedy.

A stricter approach to liability would prohibit Google from using even a device-by-device contract for default for the Safari search access point. In that case, Google's natural counterfactual conduct would be to offer to share its search revenue with Apple without any requirement that Apple set Google as the search default on any search access points on any Apple device. In its purest form, Google would not place any restriction at all on how Apple configures its devices or interacts with users. In that case, Google's payments to Apple for an Apple device depend only on the revenue generated by Google Search on that device. That counterfactual conduct involves Google offering Apple an *unconditional revenue sharing agreement* ("URSA").

In what follows, I focus on the URSA counterfactual as it applies the stricter liability rule and thus potentially a greater difference in how much search traffic Google's challenged conduct shifted in comparison with its counterfactual conduct. The likely effect on search traffic if Google could offer a device-by-device contract for the Safari default is addressed below when I discuss remedy, because that is the remedy actually ordered by the District Court.

An unconditional revenue sharing agreement meets the two requirements for valid counterfactual conduct: (1) it is consistent with Google's incentives and business strategy, and (2) it is permissible under antitrust law. Prong (1) is met because search traffic is very valuable to Google, and Apple can control how much search traffic Google receives from Apple devices, so it makes business sense for Google to offer Apple a URSA if Google is not permitted to offer a contract for default. Prong (2) is met because a URSA does not include the provision that the District Court found made the ISA exclusive in practice. More fundamentally, a URSA must be permissible because it imposes no restrictions at all on Apple. Even a monopolist is permitted to compete on the basis of price to encourage distributors to carry and promote its product, so long as its prices are not predatory.[54]

We are now ready to ask what the evidence showed about how much additional search traffic Google acquired by using exclusive agreements instead of URSAs. As explained above, one first asks how Google's counterparties would likely have responded to URSAs, and then one assesses the implications for competition in the monopolized market. Given the theory of harm in the Google Search case, the key factual issue is very well-defined and quite specific: how much search traffic would have shifted away from Google if Google had used URSAs rather than exclusive search distribution agreements?[55] We are *not* trying to predict how the monopolized market would have evolved in the counterfactual world. That is a far more difficult task. We are simply asking about the necessary first step in the government's theory of harm: that the challenged conduct shifted a significant amount of search traffic to Google.

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[54] The flow of money in the Google Search case may be unfamiliar, but the underlying economics here are the same as when a manufacturer sets a wholesale price that it charges retailers. The wholesale price determines how the manufacturer and the retailer split the total available profits. The revenue split between Google and Apple does the same thing.

[55] This exercise can be performed at any point in time when Google had monopoly power and was employing exclusive search distribution agreements. The best time to conduct this exercise is when the government alleges that Google first engaged in exclusionary conduct, because at that point in time Google's rivals could not yet have been weakened by the conduct due to their lack of scale and diminished incentive to innovate.

Using Apple to illustrate, we ask how Apple would likely have responded if Google had not *required*, as a condition for revenue sharing, that Apple make Google the default search service on Safari on any, much less all, Apple devices. The evidence indicates that Apple would still have *chosen* to make Google the default search engine for Safari on all, or nearly all, iPhones.[56]

There are three major reasons for this. First, there is evidence that Apple generally prefers to use the same out-of-the-box configuration for all iPhones. Second, throughout the entire period, Apple viewed Google as offering a far superior search service to Bing on the iPhone, and Apple did not want to set an inferior search service as the Safari default on iPhones.[57] Third, Google was superior to Bing at monetizing search queries on the iPhone, giving Apple an incentive to pick Google over Bing simply to get more money in the form of revenue sharing.[58] Convincing evidence was presented about Google's overall superiority to Bing. "Microsoft *did* offer Apple 100% of revenue share plus guarantees, but Apple's executives testified that Bing was never a realistic option to replace Google." [*Google Search* 107] Plus, when Google analyzed what Microsoft would need to offer Apple to win the Safari default, the "analysis concluded that in order for Microsoft to match Google's financial contribution it would have to pay Apple 122% of Bing's revenue share just to equal Google's then-33.75% revenue share." [*Google Search* 52, ¶328] As shown in the Appendix, that implies that Google monetized search queries on mobile devices roughly *twice* as effectively as Bing.

Given Google's substantial advantages in search quality and monetization, even if Apple was open to setting different Safari search defaults for different individuals, Apple would only have an incentive to set the Safari search default to a non-Google search engine for an individual user if Apple had reason to believe that user strongly preferred that search engine to Google but would nonetheless use Google if Apple sets Google as the default search service for Safari. Of course, that is possible, but there was no evidence such a situation would be at all common.

The evidence regarding Mozilla likewise indicated that Mozilla would very likely have chosen Google as the default search service for its Firefox browser if Google had offered Mozilla a URSA. Mozilla made Yahoo! its default search engine for Firefox from 2014 to 2017, but that led to a poor user experience and Mozilla changed the Firefox default back to Google. [*Google Search* ¶337, 339] Moreover, in 2022 Mozilla concluded from experiments it ran that making Bing the default search engine on Firefox would substantially reduce Mozilla's revenue.[59]

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[56] The evidence also did not indicate that Apple would have offered its users a choice screen, allowing them to pick the Safari search default rather setting Google as the default. Moreover, there was real-world evidence from Europe showing that almost all search traffic stayed with Google when users were presented with a choice screen.

[57] "According [Apple's Senior Vice President of Services, Eddy] Cue, there was 'no price that Microsoft would ever offer [Apple]' to make the switch, because of Bing's inferior quality and the associated business risk of making a change." [*Google Search* 52, ¶327] Moreover, in 2009 when Apple had sought more flexibility, "Google rejected those terms in large part because Apple 'could decide to work with an alternate provider for the desktop/Safari search solution,'" not because Apple might pick Bing on the iPhone. [*Google Search* 93]

[58] The District Court found as a factual matter that Google monetized search on mobile devices at higher rates than Bing and Yahoo! [*Google Search* 25, ¶126]

[59] "Mozilla found: (1) '35.5% of clients who had their default search engine switched to Bing changed their default to another search engine (26% changed to Google, 9% changed to a search engine other than Bing or Google and the remaining kept Bing);' (2) the '64.5% of clients who did not switch away from Bing contributed a much lower

Notwithstanding this evidence, the District Court inferred that Google's search distribution agreements significantly contributed to maintaining its monopoly power. The District Court noted that in 2009, and again in 2012, Apple sought greater flexibility to distribute rival search engines to its users, but Google did not agree to those requests [*Google Search* 51, ¶319-320] The District Court inferred that, in 2009 and 2012 and perhaps later, Apple might have set another search engine as the default for some Safari search access points on some Apple devices if not bound by a portfolio-wide contract for default. For example, Apple might have set DuckDuckGo as the default search engine on Safari for users especially concerned about privacy, or Apple might have prompted them to consider changing their default search service.[60] Alternatively, Apple might have handled more queries using its own search services.[61] The possibility that Apple was blocked by the ISA from steering even a modest amount of search traffic away from Google was enough for liability under the *Microsoft* causation standard. However, as explained above, given Google's superiority in search quality and monetization, the likelihood that Apple, having signed a URSA with Google, would have set a search engine other than Google as the Safari default on a substantial number of iPhones seems low.

The conclusion that Apple would most likely have set Google as the default search service for the vast majority of iPhones even if Google had used a URSA is further supported by an economic analysis of competition between Google and Microsoft for search traffic on Apple devices. That analysis is presented in some detail in the Appendix.

The Appendix builds a model of competition between Google and Bing and then calibrates that model using evidence from the trial record. The model confirms what we observe: that Google will win the competition for the Safari search default if Google can offer Apple a portfolio-wide contract for default (CFD). There are two fundamental reasons why Google wins: (1) Google's superiority in search quality; and (2) Google's monetization advantage. On (1), the trial record establishes that Google's superiority in search quality was quite substantial. On (2), the evidence showed that Google monetized roughly twice as well as Bing on mobile devices.

The Appendix then derives a formula predicting the share of search revenue that Google will offer Apple to win the portfolio-wide Safari default. In addition to (1) and (2), Google's winning bid depends upon (3) the share of search traffic Bing will get without the Safari default, (4) the share of search traffic driven by the Safari default, and (5) the value Microsoft places on getting more data from search traffic to improve Bing. The trial record shows that (3) is tiny and that (4)

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percentage to total search volume and ad clicks than clients who switched back to Google;' and (3) '65% of users who did not retain Bing as their default engine made the change within the first day.'" [*Google Search* 54, ¶344]

[60] "DDG, because of its brand emphasis on privacy, on multiple occasions has attempted to convince Apple to switch to DDG as the default GSE on Safari's 'private browsing mode,' a feature in Safari that provides some additional privacy protections beyond the baseline." [*Google Search* 52, ¶330] However: "Upper-level Apple executives never genuinely considered using DDG as the default in Safari's private browsing mode…This is in part because DDG operates as 'a veneer on top of other search engines,' as it syndicates its results from Bing. … Apple's senior leadership also views DDG's search quality as inferior to Google's." [*Google Search* 53, ¶332]

[61] "Apple has taken steps to grow its capacity in search." [*Google Search* 48, ¶301] "Notwithstanding these investments, Apple has decided not to enter general search at this time." [*Google Search* 48, ¶302] "Though it has not launched a full-blown GSE, Apple has introduced and integrated search functionality into its devices." [Google Search 49, ¶303] However: "At present, Apple does not view the ISA as a limitation on its ability to respond to user queries on Suggestions or Siri." [*Google Search* 50, ¶307]

is quite large, roughly 60%. We do not observe (5), but we can make some inferences about it from Microsoft's bidding behavior.

The Appendix then shows that Apple will still choose Google as the Safari default for the vast majority of iPhones in the counterfactual world in which Google can only offer Apple a URSA.[62] The basic reason is that picking Google as the Safari default gives the vast majority of iPhone users a superior search experience while generating more revenue for Apple than would picking Bing. This result depends on two facts from the trial record noted above: (a) the Safari search default affects roughly 60% of the search traffic on Apple devices, and (b) Google monetizes search traffic roughly twice as effectively as Bing on the iPhone. The result is strengthened by Google's advantage over Bing in search quality, but we cannot quantify that variable.

Oddly, the District Court did not explore what Apple and Mozilla would have done if Google had offered them an unconditional revenue sharing agreement. This omission appears to have resulted from the litigation strategies adopted by the two sides. The government emphasized the power of defaults and the coverage of Google's exclusive search distribution agreements in the market. That strategy proved sufficient to establish liability under *Microsoft*. Google, for its part, did not put URSAs forward as valid counterfactual conduct. Instead, "Google disputes the power of the default to drive query volume." [*Google Search* 98] But that claim was plainly not sustainable given the enormous amount of money Google was paying to Apple for the Safari default. The Appendix shows that Google's payments to Apple create a strong inference that the Safari default moved at least 35% of search traffic. Google's claim also was inconsistent with its own internal documents estimating that it would lose a great deal of search traffic if a rival search service were made the Safari default on iPhones. [*Google Search* 98-99].

In addition to Google's browser deals with Apple and Mozilla, the District Court also found that Google had entered into anticompetitive exclusive deals with Android OEMs by requiring that they place the Google search widget on the default home screen as a condition for getting Google Play. Google's counterfactual conduct vis-á-vis Android OEMs was to unbundle the MADA barter deal by charging OEMs for Google Play and offering them compensation for placing the Google Search Widget on the home screen or unconditionally offering them a share of Google's revenue from searches that use the Google Search Widget. The experience in Europe strongly suggests that Android OEMs would take both parts of the unbundled deal, in which case there would be no change in how they configure their devices and thus no change in search traffic.[63]

The District Court also found that Google had entered into anticompetitive exclusive deals with the major wireless carriers (AT&T, Verizon, and T-Mobile). Here again, Google's counterfactual conduct was to refrain from offering revenue sharing in exchange for exclusivity and instead to employ a URSA. The District Court again inferred that some search traffic would have shifted

[62] Google's URSA in this analysis is not predatory because Google makes profits on the Apple search traffic it wins. Put differently, Google would find it profitable to outbid Bing, taking as given Bing's future search quality. Google could and would win on the merits with a URSA based on its superior search quality and monetization.

[63] As a remedy in the European Commission's Android case, for devices sold in Europe Google unbundled the MADA barter as follows: (1) Google offered OEMs the EMADA, under which they paid Google per-device fees for the same suite of Google Mobile Services as the MADA, but without a license to Search or Chrome; and (2) Google offered OEMs per-device placement payments for the Google Search Widget and for Chrome. By design, OEMs were broadly left whole if they entered into both the EMADA and the placement agreement for Google Search and Chrome. OEMs selling Android devices in Europe overwhelmingly chose to accept both unbundled components for all, or nearly all, of their devices.

away from Google if Google had not required exclusivity. This was a reasonable inference given the payments Google made in exchange for explicit exclusivity.

In summary, under *Microsoft*, the government did not have to establish that Google's exclusive search distribution contracts actually shifted a meaningful volume of search traffic toward Google and away from its rivals in comparison with a permissible alternative. Liability was established because these contracts reasonably appeared to be capable of causing enough search traffic to shift to Google so as to make a significant contribution to maintaining Google's monopoly power. The weakness of the evidence that Google's exclusive agreements actually did shift significant search volume to Google, when properly compared with Google's counterfactual conduct, becomes more important at the remedy phase of the case, which is discussed below.

II. CAUSATION AND REMEDY

I addressed the remedy in the Microsoft case itself some 15 years ago in "Microsoft: A Remedial Failure," 75 *Antitrust Law Journal* 739 (No. 3, 2009) (henceforth *Remedial Failure*). My discussion here builds upon that analysis and shows how the CADC's treatment of remedy in *Microsoft* affected the District Court's remedy in the Google Search case.

A. GENERAL PRINCIPLES

Any discussion of remedy in Section 2 cases should start by identifying the remedial goals.[64]

Decades ago, the Supreme Court established that the goal of a remedial order in a monopolization case is to restore the competition that was lost in the monopolized market as a result of the illegal conduct. "The key to the whole question of an antitrust remedy is of course the discovery of measures effective to restore competition."[65] The District Court in *Microsoft Remedy* summarized two of the key Supreme Court precedents this way: "With these two rulings, the Supreme Court confirmed that a remedy in an antitrust case seeks not only to eliminate illegal conduct, but to address the effects of that conduct upon the marketplace."[66]

The Microsoft case was not a major advance beyond the Supreme Court's precedents in the law or economics of antitrust remedies. However, the CADC did clarify that its "edentulous" causation standard for liability was not applicable at the remedy phase. "Microsoft's concerns over causation have more purchase in connection with the appropriate remedy issue, i.e., whether the court should impose a structural remedy or merely enjoin the offensive conduct at issue."[67] [*Microsoft* 79] Most important, *Microsoft* emphasized that structural relief "'requires a significant causal connection between the conduct and creation or maintenance of the market

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[64] For a nice introduction, see A. Douglas Melamed, "Afterword: The Purposes of Antitrust Remedies," 76 *Antitrust Law* Journal 359 (2009), which is part of an entire symposium on "Remedies for Dominant Firm Misconduct."

[65] *United States vs. Du Pont* 366 U.S. 316, 326 (1961). See also *Ford Motor Co. vs. United States* 405 U.S. 562, 572 (1972).

[66] *Microsoft Remedy* at 107, citing *International Salt Co. v. United States*, 332 U.S. 392 (1947) and *United States v. Paramount Pictures*, 334 U.S. 131 (1948).

[67] Unfortunately, this passage from *Microsoft* neglects to acknowledge the critical role of intermediate remedies. It only contemplates the polar extremes: a structural remedy (breaking up the monopolist) and merely enjoining the illegal conduct (a sin-no-more remedy). That omission seems to simply have been a lack of precision in this passage. Subsequently (see below), the CADC affirmed an intermediate remedy imposed by the District Court.

power.' Absent such causation, the antitrust defendant's unlawful behavior should be remedied by 'an injunction against continuation of that conduct.'"[68] [*Microsoft* 106, quoting Areeda and Hovenkamp (1996)] Applying that principle to the Microsoft case, the CADC sent the District Court a strong warning that structural relief was unlikely to be warranted on remand.

Microsoft also reiterated the central role of the District Court in crafting a remedy. "As a general matter, a district court is afforded broad discretion to enter that relief it calculates will best remedy the conduct it has found to be unlawful." [*Microsoft* 105] "While we do not undertake to dictate to the District Court the precise form that relief should take on remand, we note again that it should be tailored to fit the wrong creating the occasion for the remedy." [*Microsoft* 107]

How does one restore competition when one is uncertain about what competition was lost?

In *Remedial Failure* I explained that in cases like Microsoft, where technology is changing rapidly, the goal is not to resurrect the but-for world that would have unfolded if not for the defendant's illegal conduct. That may well be impossible, both because one cannot know for sure how the market would have evolved if the monopolist had not engaged in that illegal conduct, and because time has passed since the illegal conduct took place, during which market and technological conditions have changed, perhaps dramatically so. Instead, the most natural and direct way to restore the competition lost as a result of defendant's exclusionary conduct is to lower the barriers to entry and expansion in the monopolized market in the years ahead.

Moreover, as I emphasized in *Remedial Failure*, the strength of the remedy in monopoly maintenance cases should be proportionate to the strength of the causation evidence. The District Court in *Microsoft Remedy*, reached this same conclusion based on its reading of *Microsoft*: "In effect, the appellate court appears to have identified a proportionality between the strength of the evidence of the causal connection and the severity of the remedy." *Microsoft Remedy* at 100.

At one extreme, if the monopoly power would certainly have ended if not for the illegal conduct, then the remedy should promptly terminate the illegal monopoly, very possibly by breaking up the monopolist if that is feasible. At the other extreme, if the illegal conduct did not actually harm competition (despite appearing reasonably *capable* of making a significant contribution to maintaining the monopoly power), then a "sin-no-more" remedy that merely enjoins the offensive conduct may well be sufficient. If the causation evidence falls between these two polar extremes, as it typically will, an intermediate remedy will be appropriate.

Intermediate remedies place restrictions on the monopolist's conduct that go beyond merely enjoining the illegal conduct. They also may impose affirmative duties on the monopolist. Intermediate remedies have the virtue that the District Court can dial them up or down based on the strength of the causation evidence. Plus, they can be tailored to market realities in a forward-looking way. Fortunately, the Supreme Court established decades ago that the District Court has ample discretion in antitrust cases to impose a remedial order that goes beyond merely enjoining the illegal conduct, so long as the order is designed to restore the competition that was lost as a result of the illegal conduct.[69]

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[68] Here, again, the CADC neglected to note the critical role of intermediate remedies.

[69] Here is one example of many: "The standard against which the order must be judged is whether the relief represents a reasonable method of eliminating the consequences of the illegal conduct. We agree with the Court of Appeals that the injunction, as modified, meets this standard. While it goes beyond a simple proscription against the

A very useful way to think about the strength of the causation evidence is to ask oneself this question: Based on all of the evidence, what is the *probability* that the defendant's monopoly would have ended by now if the defendant had engaged in the counterfactual conduct instead of the illegal conduct? The probability here necessarily is a *subjective* probability (one's best estimate), not an objective probability (such as the 25% probability that a single card drawn from a deck of cards will be a spade).[70] The remedy can then aim to terminate the illegal monopoly not with certainty but with a similar probability, by entering a remedial order that suitably reduces the barriers to entry. One can think of this approach as imposing a remedy that makes the monopolist's customers whole in a probabilistic sense, assuming they benefit from greater competition. That is the methodology I applied to the Microsoft case in *Remedial Failure*.

What types of remedies can the courts design to probabilistically restore competition? The core principle is that the remedy should strengthen the monopolist's actual and potential rivals by lowering the barriers to entry or expansion in the monopolized market. The remedy should *not* seek to raise the monopolist's costs, restrict its ability to compete on the merits, or undermine its incentives to innovate.[71] Provisions with those effects lessen competition, harm consumers, and work contrary to the fundamental objectives of antitrust law.

The best way to restore the lost competition will depend heavily on the facts of the case, and specifically on the forward-looking barriers to entry and expansion in the monopolized market. In practice, the court will already have seen extensive evidence on those barriers at the liability phase as part of its determination that the defendant had monopoly power. However, that evidence will need to be updated during the remedy phase so the court understands what the barriers to entry and entry routes will likely be in the years *ahead*, not just those in the past. As technology and market conditions evolve, so too can the barriers to entry, along with the most promising business strategies to overcome them. The Microsoft case exemplifies these issues.

The most appropriate intermediate remedy to bolster the monopolist's actual and potential rivals in the monopolized market will depend heavily on the strength of the causation evidence regarding the lost competition in that market, how the monopolized market has evolved since the violation began, and the most likely future sources of actual and potential competition. The guiding principle in going beyond a sin-no-more remedy is to empower the monopolist's rivals without impairing the monopolist's ability and incentive to compete on the merits. In many high-tech markets involving software, this can be accomplished most efficiently by requiring the monopolist (a) to license some intellectual property, preferably that it has already created, (b) to share data, preferably that it has already obtained, and/or (c) to interconnect with suppliers of complements or with rivals. These obligations can lower the barriers to entry and expansion without undermining the ability or incentive of the monopolist to compete.

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precise conduct previously pursued, that is entirely appropriate." *National Society of Professional Engineers vs. United States* 433 U.S. 679, 698 (1978).

[70] We often think we just do not know some probability, like the probability the Dodgers will win the World Series next year. But one of the results in decision theory is that our subjective probabilities can be *elicited* by asking us to choose between different lotteries. Would you rather get $1 million with a 10% probability or if the Dodgers win?

[71] Moreover, the remedy should not be punitive. "In an equity suit, the end to be served is not punishment of past transgression." *International Salt v. United States* 332 U.S. 292, 400. "Courts are not authorized in civil proceedings to punish antitrust violators, and relief must not be punitive." *United States v. Du Pont* 366 U.S. 316, 326. If necessary to ensure the monopolist is denied the fruits of its statutory violation, the remedy can further strengthen the monopolist's rivals. Private treble damage awards can also serve to deny the monopoly the fruits of its violation.

Hopefully, with a well-designed remedial order, the lost competition can be restored without requiring the court to engage in detailed, day-to-day oversight of the industry. After all, the Supreme Court recently warned judges entering remedial orders in antitrust cases to apply a "healthy dose of judicial humility" because "they are neither economic nor industry experts."[72]

B. THE GOOGLE PLAY STORE CASE

The Google Play Store case provides a good illustration of how these principles of remedy design can be applied in a high-tech market. The jury found that Google had monopolized the market for the distribution of apps on Android devices by imposing restraints on the distribution of Android apps and competing app stores and through other means. Indirect network effects created barriers to entry for rival Android app stores: Android users get their apps via Google's Play Store because it carries essentially all Android apps, and Android app developers make their apps available on Play Store because it allows them to reach essentially all Android users.

In that setting, the key to restoring competition from rival Android app stores was to enable them to overcome the chicken-and-egg problem of attracting both users and Android app developers. The District Court explained the challenge this way: "Even a corporate behemoth like Amazon could not compete with the Google Play Store due to network effects. Consequently, the injunction must overcome the effects by providing access to the catalog of Play Store apps for a period of time sufficient to give rival stores a fair opportunity to establish themselves. This will be three years on the terms stated in the injunction."[73]

That catalog access provision in the District Court's remedial order reads as follows: "For a period of three years, Google will permit third-party Android app stores to access the Google Play Store's catalog of apps so that they may offer the Play Store apps to users."[74] This provision is an excellent example of a targeted remedial provision that goes beyond merely enjoining the illegal conduct in order to lower barriers to entry and expansion and thus restore competition.

The catalog access requirement wisely avoids being punitive and protects app developers with the following provisions: "For apps available only in the Google Play Store (i.e., that are not independently available through the third-party Android app store), Google will permit users to complete the download of the app through the Google Play Store on the same terms as any other download that is made directly through the Google Play Store. Google may keep all revenues associated with such downloads. Google will provide developers with a mechanism for opting out of inclusion in catalog access for any particular third-party Android app store."[75]

The catalog access provision is further supported by this requirement: "For a period of three years, Google may not prohibit the distribution of third-party Android app distribution platforms

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[72] *National Collegiate Athletic Association v. Alston*, 594 U.S. 69 (2021).

[73] *In re Google Play Store Antitrust Litigation*, Order re UCL Claim an Injunctive Relief, p. 10, Case No. 21-md-02981-JD, October 7, 2024.

[74] *In re Google Play Store Antitrust Litigation*, Permanent Injunction, ¶11, Case No. 21-md-02981-JD, October 7, 2024. The Ninth Circuit subsequently upheld the District Court's injunction in full, *In re Google Play Store Antitrust Litigation* and *Epic Games v. Google,* Case No. 24-6256, July 31, 2025.

[75] *In re Google Play Store Antitrust Litigation*, Permanent Injunction, ¶11, Case No. 21-md-02981-JD, October 7, 2024. This is a good example of how an opt-out provision can have very different effects from an opt-in provision.

or stores through the Google Play Store."[76] This provision is a good example of how a remedial order in a monopoly maintenance case can prohibit the monopolist from engaging in conduct (in this case, refusing to assist rivals) that would otherwise be permissible under antitrust law.[77]

The provisions noted above are well designed to significantly reduce the barriers to entry in the monopolized market for the distribution of Android apps without impairing Google's ability to compete in that market. The District Court evidently believed that the causation evidence was strong enough to warrant such powerful measures under the proportionality principle described above. With the District Court's remedial order in effect, market forces will determine which rival Android app stores, if any, thrive.[78] As of this writing, the District Court is considering whether to accept an alternative remedial order proposed jointly by Epic and Google.[79]

C. THE MICROSOFT CASE ITSELF

The remedial goal of restoring the competition lost due to the illegal conduct was accepted in principle by all parties in the Microsoft case.[80] Nonetheless, as shown in detail in *Remedial Failure*, the remedy in the Microsoft case failed to restore the competition lost due to Microsoft's illegal conduct.

During the remedial phase, the Microsoft case split into two tracks: the Tunney Act track, under which the District Court reviewed the settlement reached between the United States and Microsoft under a public interest standard, and the Litigating States track, under which the District Court considered the stronger remedial provisions sought by the Litigating States. I focus here on the latter track, because that is where the District Court engaged directly with the stronger remedial provisions proposed by the Litigating States, and because the Tunney Act is quite deferential to the United States.

As always, the starting point for remedy in a monopoly maintenance case is the strength of the causation evidence. As discussed above, there was very strong evidence that Microsoft's illegal conduct slowed the growth of Navigator and Java. There also was clear evidence that Microsoft *feared* that Navigator and Java, as cross-platform middleware, would lower the applications barrier to entry. Those fears were fueled by Microsoft's recognition that in the late 1990s Windows was especially vulnerable to disruption from the "Internet Tidal Wave." However, the

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[76] *In re Google Play Store Antitrust Litigation*, Permanent Injunction, ¶12, Case No. 21-md-02981-JD, October 7, 2024.

[77] Indeed, the jury instructions in this case included the following: "It is not unlawful for Google to prohibit the distribution of other app stores through the Google Play Store, and you should not infer or conclude that doing so is unlawful in any way." *In re Google Play Store Antitrust Litigation*, Final Jury Instructions for Epic Trial, Jury Instruction No. 24, Case No. 21-md-02981-JD, December 6, 2023.

[78] Hopefully, the remedial order can be put into effect without enmeshing the District Court in the day-to-day issues of Android app distribution. The District Court was keenly aware of this danger. The District Court rejected some of Epic's proposed injunction terms on that basis, and then stated: "Even so, important remedial measures can be imposed that do not demand excessive judicial oversight." *In re Google Play Store Antitrust Litigation*, Order re UCL Claim and Injunctive Relief," p. 8, Case No. 21-md-02981-JD, October 7, 2024.

[79] In 2025, Epic and Google proposed an alternative to the District Court's remedial order that did not include the catalog access provision. After the District Court expressed deep skepticism about the efficacy of that alternative, Epic and Google proposed a different alternative.

[80] See *Remedial Failure* at p. 744.

evidence did not by any means establish that these nascent threats would actually have matured in the foreseeable future into real threats if not for Microsoft's illegal conduct.

In *Remedial Failure*, I developed a simple economic model to implement the proportionality principle of remedy in this setting. I showed (p. 749) that if there was a 20% probability that Navigator and Java would have matured sufficiently to end the Windows monopoly, and if the expected duration of Microsoft's monopoly was 20 years, then the remedy would need to increase the likelihood of successful entry by 50% to restore the lost competition. Based on that analysis, I wrote (pp. 752-53): "The inescapable conclusion is that affirmative steps were needed to restore competition. Merely proscribing the illegal conduct would not be nearly sufficient."

The Final Judgment entered by the District Court contained only one provision that went beyond merely enjoining the illegal conduct and had any prospect of affirmatively lowering entry barriers. That provision (see Sections III.D and III.E of the Final Judgment) involved the disclosure and licensing of certain Microsoft intellectual property to interconnect with Windows. That provision was useful and fits well with the principles of remedy articulated above, but it was not nearly enough to substantially increase the likelihood of successful entry into the monopolized market.

The District Court's fundamental error was to hold that "the proper objective of the remedy in this case is termination of the exclusionary acts and practices related thereto which served to illegally maintain the monopoly." [*Microsoft Remedy* 101] From that perspective, there was little if any need to go beyond a sin-no-more remedy. Sure enough, the District Court rejected all of the stronger provisions urged by the Litigating States because they involved behavior that was not in the "same type or class" as Microsoft's illegal conduct. [*Microsoft Remedy* 109] That way of viewing remedy is manifestly unhelpful in markets subject to rapid technological change.

The District Court failed to understand or accept that restoring competition in the monopolized market required lowering the barriers to entry and expansion by rival operating systems on a forward-looking basis. The depth of the District Court's confusion on this basic point can be seen in the following passage, where the District Court explains why it is rejecting the Litigating States' proposal to significantly boost cross-platform middleware by requiring Microsoft to provide an open-source license to its browser software and to auction off the right to port Microsoft Office to operating systems other than Windows and Macintosh:

> "First and most striking, the theory pursuant to which Plaintiffs propose these provisions ignores the theory of liability in this case. The divestiture provisions serve to directly benefit non-Microsoft operating systems, in particular Linux and Apple. It is well recognized that the theory of liability in this case concerns Microsoft's response to cross-platform applications, not operating systems… Given these facts, it is difficult to understand what role the bolstering of particular operating systems will play in redressing anticompetitive conduct directed at middleware. … Rather than rectify injury to consumers caused by diminished competition, Plaintiffs' proposed divestitures of IE [Internet Explorer] and Office merely serve to shield Microsoft's competitors from the rigors of the marketplace." [*Microsoft Remedy* 185]

Contrary to the District Court, restoring competition by lowering barriers to entry will naturally and usefully "serve to directly benefit non-Microsoft operating systems, in particular Linux and Apple." That is a plus, not a minus! Moreover, in a market subject to rapid innovation, a remedy targeted at historical conduct is unlikely to be effective if the technological routes and business

strategies by which rivals are likely to enter the monopolized market have changed. The District Court fell into this trap in the Microsoft case.

When a single state, Massachusetts, appealed the *Microsoft Remedy* decision, the CADC reviewed the District Court's decision to grant equitable relief for abuse of discretion. The CADC affirmed the District Court's decision in its entirety.[81] As explained in *Remedial Failure*, by 2001 even the Department of Justice recognized that future threats to Windows would likely come from directions other than cross-platform middleware. Sure enough, no middleware product emerged in the years after the Final Judgement went into effect that posed a serious platform threat to Windows. As predicted, the Microsoft remedy was a failure.

The remedy principles articulated in the Microsoft case are unobjectionable. Nonetheless, the weak remedial order is the enduring tragedy of the Microsoft case. If one evaluates the remedy in the Microsoft case based on whether it restored the potential competition that Microsoft stifled, one is forced to conclude that it was inadequate. Looking back, I attribute the remedial failure in the Microsoft case to the Department of Justice, for settling the case on the cheap, and to the District Court on remand, which was empowered with broad discretion to fashion a remedy yet rejected all of the stronger remedial provisions proposed by the Litigating States.

D. THE GOOGLE SEARCH CASE

I now analyze the remedy ordered by the District Court in the Google Search case. This analysis combines the causation evidence in the Google Search case with the proportionality principle relating the strength of the remedy to the causation evidence in monopoly maintenance cases.

The District Court in the Google Search case found itself on the horns of a dilemma at the remedy phase. Any remedy that failed to shift significant search traffic away from Google quickly could well be seen as ineffective, given the District Court's liability ruling. However, any remedy that forcibly shifted a large share of search traffic away from Google in the near term would harm users by sticking them with an inferior search service. This dilemma reflected the weak causation evidence emphasized above in the discussion of liability: Google would have won the lion's share of the search traffic on mobile devices just based on competition on the merits. In the end, the District Court was unwilling to dictate market outcomes that would harm users in the short term by driving them toward non-Google search services, based on the hope that search competition in the long run would be enhanced. The government argued that the long-term gain would justify the short-term pain, but the District Court did not agree.

As explained above, there was very little evidence that Google would have received significantly less search traffic on mobile devices in the counterfactual world in which Google offered URSAs or device-by-device contracts for default to Apple, Mozilla, and the wireless carriers, and in which Google unbundled the MADA in dealing with Android OEMs. That conclusion is consistent with the District Court's liability finding under the *Microsoft* causation standard. Recall that the District Court explicitly stated that liability did not require the government to show that Google's illegal conduct actually shifted a significant volume of search traffic toward Google, only that it was reasonably capable of doing so.

Under the proportionality principle, if Google's illegal conduct most likely shifted very little search traffic on mobile devices toward Google, then it had a correspondingly small effect on

[81] *Massachusetts v. Microsoft* 373 F. 3d 1199 (2004) (henceforth *Microsoft Remedy Appeal*).

competition among general search services. After all, the linchpin of the government's case was that Google deprived its rivals of search traffic on mobile devices and thereby denied them critical data to improve their search engines and reduced their incentive to innovate.

In September 2025, the District Court in the Google Search issued its *Google Search Remedy Decision*, which explained in general terms the remedial order it intended to issue and why it was rejecting many of the provisions proposed by the Plaintiffs.[82] Three months later, the District Court issued its *Google Search Remedy Specifics*, which described in detail the remedial order it was issuing, including a 44-page Appendix comparing the Plaintiffs' Proposal, Google's Proposal, and the Final Judgment on a long list of items.[83] Simultaneously, the District Court issued the *Google Search Final Judgment*.[84] These three documents come to 360 pages in total.

As a starting point, the *Google Search Final Judgment* prohibits Google from entering into the exclusive agreements that were the basis of the court's liability finding. In particular, regarding Apple, Sections III.H and III.I prohibit Google from entering into any contract for default that covers multiple devices or multiple search access points for Google Search and Chrome respectively. The court thus enjoined Google from entering into a portfolio-wide contract for default with Apple, but Google is still permitted to pay Apple in exchange for Google being the default search service on specific devices and search access points.

The Appendix shows that this provision may induce Google to pay a higher share of its search advertising revenue to Apple, and it may enable Google's rivals to win the competition to be the default search service on some search access points on some Apple devices, but it is unlikely that this provision will shift significant search traffic away from Google. Precisely because the causation evidence was weak when properly evaluated using Google's counterfactual conduct, this provision will most likely have only a modest effect on Google's share of search traffic. That does not reflect a remedial failure. Rather, it represents the proportionality principle in action.

Regarding Android OEMs, Sections III.A and III.B prohibit Google from conditioning the licensing of Google Play on the distribution of Google Search and Chrome respectively. Sections III.E and III.F further prohibit Google from conditioning either consideration or the license of any Google software application on a device manufacturer or wireless carrier refraining from distributing a rival search service or browser respectively. Furthermore, Section III.K limits any contracts for default by Google to no more than one year in duration. Section III.L imposes similar restrictions on Google's agreements with Browser Developers. All of these provisions apply to any device sold in the United States.

The District Court explained why it did not go further and restrict Google to making only unconditional revenue sharing payments to Apple, Mozilla, and other counterparties:

> "One possibility is allowing Google to make payments for distribution but not for default distribution, also referred to as 'unconditional revenue share.' … Plaintiffs have not proposed that remedy as an alternative to a payment ban, and the court did not hear fulsome testimony from an expert economist about the incentives such a regime might

[82] Memorandum Opinion, Case No. 20-cv-3010 (APM), September 2, 2025.

[83] Memorandum Opinion, Case No. 20-cv-3010 (APM), December 5, 2025.

[84] Final Judgment, Case No. 20-cv-3010 (APM), December 5, 2025.

> create. Without a more substantial record on such a remedy, the court is presently ill-equipped to consider it." [*Google Search Remedy* 128]

I strongly suspect that if the Plaintiffs had proposed to limit Google to unconditional revenue sharing, the District Court would have done so. Instead, the government badly over-reached by proposing that Google be prohibited from making *any* payments for search distribution (see below). That ill-conceived and anticompetitive proposal displaced a far better one that Plaintiffs most likely could have obtained.

OK, that was the easy part: enjoining the conduct already found to be illegal. Now we are ready to address the critical question of what *additional* provisions to include in the Final Judgment. The Plaintiffs proposed a breathtaking slate of remedial provisions. In sharp contrast, Google argued that a narrow sin-no-more remedy would be sufficient. In *Google Search Remedy*, the District Court concluded that Google's proposal was inadequate.

> "Google's proposed prohibitory injunctive relief provides an appropriate starting point, so the court begins there. Those remedies are important insofar as they afford distributors greater flexibility to partner with Google's rivals than they had under the agreements the court found to be anticompetitive. That class of remedies is not, however, sufficient to restore competition in the monopolized markets, so the court then will proceed to consider the extensive slate of relief sought by Plaintiffs." [*Google Search Remedy* 104]

How far should the court go to inject competition into the monopolized market for general search services, and what is the best way to do that? To properly answer those questions would require another whole article. Instead, I confine myself here to some central points that follow from the remedial principles developed above.

First, the strength of any provisions that go beyond enjoining Google's illegal conduct should be proportional to the strength of the evidence that Google's illegal conduct perpetuated its monopoly. As I read *Google Search* and *Google Search Remedy,* the District Court was well aware that the evidence did not establish that Google's illegal conduct had actually shifted a large amount of search traffic toward Google. Nonetheless, the District Court concluded that remedial provisions going significantly beyond merely enjoining the illegal conduct were warranted because "the general search market has been 'frozen' for ten years," because "Google's distribution agreements have caused substantial market foreclosure," and ultimately because "Google simply retains too many advantages that are derived in part from its decade-long vice grip on default distribution, including its quality, data volume, and capacity to monetize search queries." [*Google Search Remedy* 107-108] Still, the causation inquiry asks about the extent to which Google's "many advantages" derived from its illegal conduct.

Second, the remedial order ensures that Google is prohibited from engaging in exclusionary conduct vis-à-vis third parties that are using artificial intelligence to provide services that are substitutes for Google Search. This provision is consistent with the principle articulated above that the remedy should be forward-looking. Here, any effective forward-looking remedy must pay close attention to Generative Artificial Intelligence ("GenAI"), which shows real promise of disrupting the market for general search services. In *Google Search Remedy*, the District Court emphasized that GenAI is rapidly changing the products in the general search services market and that the remedial order would include GenAI products. To that end, Sections III.C, III.D, III.G, and III.J in the *Google Search Final Judgment* extend the restrictions on Google Search and Chrome to the Google Assistant Application and to any Google GenAI Product.

The Microsoft case guided the District Court on this critical issue of how to handle GenAI. The District Court wisely rejected Google's argument that GenAI products should not be included in the remedial order because they were not in the relevant market and were not part of the government's theory of liability. In doing so, the District Court cited *Microsoft Remedy*, which included servers and network computing in the remedy even though they were neither in the relevant market nor "middleware," the focus at the liability stage. [*Google Search Remedy* 101]

Third, Section IV of the Final Judgment requires Google to disclose certain data to Qualified Competitors. This, too, is a promising remedial provision that fits well with the principles articulated above (a) because the theory of liability was that Google's illegal conduct deprived its rivals of search traffic and thus of the data they needed to improve their search services, impeding their ability and incentive to compete effectively, and (b) because a properly designed data-sharing provision need not undermine Google's own incentive to invest and compete. However, the details of the data sharing provision quickly become quite complex and technical, as the District Court soon came to appreciate. In *Google Search Remedy*, the District Court devoted 40 pages to analyzing data sharing remedies and explaining the basis for the one it imposed. The Technical Committee will play a major role here, but the District Court may still need to revisit these provisions over time to ensure that they are both workable and effective.

Fourth, Section V of the Final Judgment requires Google to syndicate its search results with Qualified Competitors. "'Syndication' in this context means an arrangement whereby one GSE provides another GSE the results and content for its SERP [search engine results page]." [*Google Search Remedy* 168] Syndication is an established business arrangement in this industry: Bing syndicates its search results to Yahoo and DuckDuckGo, and Google syndicates its search results with various partners including Amazon. The District Court explains that syndication "would enable Qualified Competitors to compete in the short term as they work towards developing a GSE that can independently compete against Google." [*Google Search Remedy* 171]

Mandatory syndication can usefully lower the barriers to entry and expansion, but risks creating faux rivals that are dependent on Google. The District Court, citing *Alston*, wisely rejected the Plaintiffs' broad and punitive mandatory syndication, primarily by requiring that "Google's syndication obligations … shall be consistent with its current syndication agreements." [*Google Search Remedy* 173] The District Court also limited the mandatory syndication to five years and placed a cap on the share of queries for which a Qualified Competitor can use Google's syndication services, starting at 40% in the first year. The Technical Committee will assist the court in designing a tapering provision to reduce rivals' reliance on Google over time.

Fifth, following *Microsoft*, the District Court rejected Plaintiffs' proposal that Google be required to divest Chrome as unwarranted based on the causation evidence. "Plaintiffs do not satisfy this Circuit's 'clearer indication of a significant causal connection' test for structural remedies." [*Google Search Remedy* 114] Moreover, as the District Court recognized that a Chrome divestiture "would be incredibly messy and highly risky," adding that "the court is highly skeptical that a Chrome divestiture would not come at the expense of substantial product degradation and a loss of consumer welfare." [*Google Search Remedy* 116-117] Worse yet, the government paired the Chrome divestiture with a provision prohibiting Google from offering any browser for ten years. "Google may not release any other Google Browser during the term of this

Final Judgment absent approval by the Court."[85] The District Court wisely rejected this anticompetitive line-of-business restriction, which the Antitrust Division should never have proposed in the first place.

Sixth, the District Court also roundly rejected Plaintiff's proposal that Google be prohibited from making *any* payments for search distribution to browser developers, OEMs, and wireless carriers. The District Court recognized that such a payment ban would have sharply limited Google's ability to compete on the merits in the relevant market. Such a payment ban would violate the basic principle that a remedial order should lower the barriers to entry and expansion facing the monopolist's rivals in the relevant market, not prevent the monopolist from competing on the merits. Put differently, the direct effect of the remedy should be to increase, not decrease, competition in the monopolized market.

The District Court recognized that the Plaintiff's proposed payment ban would lessen competition and greatly harm Google's counterparties: "First, if adopted, the remedy [payment ban] would pose a substantial risk of harm to OEMs, carriers, and browser developers."[86] [*Google Search Remedy* 121] "The complete loss or reduction of payments to distributors is likely to have significant downstream effects on multiple fronts, some possibly dire." [*Google Search Remedy* 123] Those effects included: less competition and innovation from smaller developers in the browser market; few products and less product innovation from Apple; less investment in the U.S. market by Android OEMs; and higher mobile phone prices and less innovative phone features. [*Google Search Remedy* 123-135] The basic economics here are straightforward and were acknowledged by the government's economic expert. The Antitrust Division should have known better than to propose this anticompetitive payment ban.

III. Conclusion

The lasting legacy of the Microsoft case is the causation standard that the appeals court applied to Microsoft's conduct. For a monopolist that has engaged in exclusionary conduct that does not qualify as competition on the merits, the government need not show that the challenged conduct actually strengthened the defendant's monopoly power, only that it was reasonably capable of doing so. By requiring the government to clear only this rather low causation bar, the Microsoft case emboldens antitrust enforcement in markets subject to rapid technological change. Like the ancient sea monster Dunkleosteus, the *Microsoft* causation standard is toothless but has real bite.

The first step to assessing causation in a monopoly maintenance case is to identify the monopolist's counterfactual conduct. In some cases, like the Microsoft case, this step is relatively straightforward: the monopolist should simply not have engaged in the challenged conduct. In other cases, this step requires more analysis and can be fraught. Identifying the monopolist's counterfactual conduct is logically necessary to evaluate causation, regardless of the causation standard one is using and even in cases where it is impossible to know the

[85] Executive Summary of Plaintiffs' Revised Proposed Final Judgment, Section V.A, p. 12 (March 7, 2025).

[86] The District Court also recognized that, faced with a payment ban, distributors like Apple might well continue to make Google the default search service, in which case the payment ban "would not promote competition and in fact would likely advantage Google, at least in the short term." [*Google Search Remedy* 121] Plus, if a distributor later selects a different GSE to provide search functionality, "with Google sidelined from competition, rivals would pay less than Google did to secure default or preferential placement. Both sides' economic experts agreed that such an outcome was likely." [*Google Search Remedy* 122]

counterfactual outcome, i.e., how the market would have evolved if the monopolist had engaged in the counterfactual conduct.

The central goal of a remedy in a monopolization case brought by the government is to restore the competition lost due to the illegal conduct. That requires that the remedy be forward-looking. In a monopoly maintenance case, the proportionality principle of remedy states that the remedy should be stronger, the stronger is the evidence that the illegal conduct actually perpetuated the monopoly. The Microsoft case emphasized that a strong causal connection between the illegal conduct and the perpetuation of the monopoly is required to warrant a structural remedy. While a structural remedy was not warranted in the Microsoft case, the remedial order ultimately put in place in the Microsoft case was inadequate for two reasons: because it violated the proportionality principle of remedy and because it was almost entirely backward-looking. That remedial failure is the tragedy of the Microsoft case.

The recent Google Search case faithfully applied the *Microsoft* causation standard at the liability phase in the presence of rather weak causation evidence. Moreover, the remedy ordered by the District Court is consistent with the proportionality principle for remedy, although the District Court could reasonably have gone further by restricting Google to using unconditional revenue sharing agreements with browser developers and/or by requiring Google to share more data with Qualified Competitors. The District Court wisely rejected a number of anticompetitive remedial provisions proposed by the Plaintiffs. The District Court clearly appreciated that an effective remedy must be forward-looking, especially with regard to search services based on GenAI. Once the *Google Search Final Judgment* goes into effect, the resulting market forces will determine how long Google's monopoly over general search services persists before it is toppled.

Appendix: Competition Between Google and Microsoft for Search Traffic on Apple iPhones

This Appendix presents a series of models in which Google and Microsoft are competing for search traffic on Apple iPhones. First, we study bidding competition between Google and Microsoft to sign a portfolio-wide contract for default (CFD) with Apple. Under a portfolio-wide CFD, Apple agrees to make the winner the out-of-the-box default search engine for Safari for all Apple devices in exchange for a share of the search advertising revenue generated by the winner on those Apple devices. Second, we study bidding competition between Google and Microsoft assuming that Google can only offer an Unconditional Revenue Sharing Agreement (URSA) under which Google agrees to give Apple a share of the search advertising revenue generated by Google Search on Apple devices without imposing any restrictions on how Apple configures its devices or interacts with its users. Third, we study bidding competition between Google and Microsoft assuming that Google can offer a device-by-device CFD but not a portfolio-wide CFD.

Initial Model Setup

The total number of users of Apple devices is normalized to unity.

d share of Apple users who are inert, meaning they use the Safari default that Apple selects

b share of Apple users who are loyal to Bing, meaning they will use Bing regardless of which search engine Apple sets as the out-of-the-box Safari default

g share of Apple users who are loyal to Google, meaning they will use Google regardless of which search engine Apple sets as the out-of-the-box Safari default

By definition, $d + b + g = 1$.

Bing's search advertising revenue per user is normalized at unity. All per-user variables are *averages* across users. We use the terms "user" and "device" interchangeably.

m Google's search advertising revenue per user (as a multiple of Bing's), with $m > 1$

v per-user value Apple places on a user using Google rather than Bing, with $v > 0$.

c per-user cost Apple internalizes when a user switches the Safari default

The variables *v* and *c* are measured from Apple's perspective and thus may differ from the corresponding values to the users themselves. Like *m*, *v* and *c* are measured relative to Bing's monetization per user, but unlike *m* they are not directly observable monetary values. The switching cost *c* is the average among users who actually switch.

Our initial goal is to determine how much Google pays in equilibrium to win the Safari default:

s share of search advertising revenue that Google offers to pay Apple

We assume that Apple seeks to maximize (i) the revenue sharing payments it receives, plus (ii) the value Apple places on its users using the superior search service, minus (iii) the costs Apple internalizes from users switching away from the default that Apple selects.

We initially set aside the value to a general search service of the data it gets from incremental search traffic. The value of data plays an important role in the case. We consider it below.

Evidence Regarding Parameter Values

The trial record provides estimates of most of these parameters.

Bing Loyal Users (*b*): The trial record indicates that Bing got a very small share of traffic on Apple devices with Google set as the Safari default. Bing's share on all mobile devices was 1.3% and Bing's share overall was 5.5%, which includes Windows machines with Edge as the default browser and Bing set as the default. [FOF ¶25]. At points below, we illustrate using $b = 0$.

Default (*d*): In 2016 and 2020 Google estimated that it would lose about 70% of the search traffic on iOS devices if it lost the Safari default, but it would only lose about 30% on MacOS devices. [FOF ¶72] Based on this finding, we illustrate below using $d = 0.6$. Using the identity $g = 1 - d - b$, this means that nearly 40% of users are loyal to Google, $g \approx 0.4$.

Google Monetization Advantage (*m*): When Google analyzed what Microsoft would need to offer Apple to win the Safari default, the "analysis concluded that in order for Microsoft to match Google's financial contribution it would have to pay Apple 122% of Bing's revenue share just to equal Google's then-33.75% revenue share." [*Google Search* 52, ¶328] If Microsoft pays Apple 122% of its search revenue, picking Bing would give Apple search advertising revenue equal to $1.22 * (b + d)$. If Google pays Apple 33.75% of its search revenue, picking Google would give Apple search advertising revenue equal to $0.3375 * m(1 - b)$. With $b = 0.01$ and $d = 0.6$, equating these expressions gives $m = 2.2$. We illustrate below using $m = 2$.

Google Search Quality Advantage (*v*): Google has much better search quality than all rivals on mobile devices, but Bing is comparable on the desktop. [FOF ¶127] Apple viewed Bing's search quality as far worse than Google's. [FOF¶327] However, there is nothing in the record allowing us to quantify *v*. Below, at points we set $v = 0$ and discuss what changes if *v* is sizeable.

Switching Costs (c): The trial record does not quantify this cost. The Plaintiffs emphasized that many people are inertial for behavioral reasons and simply do not change the default. For those who *do* change the default, the cost on average appears to be relatively small, but some people may incur significant time costs to learn how to change the default and then do so.

Share of Revenue Google Pays to Apple (*s*): The trial record indicates that Apple has been getting 36% of Google's search advertising revenue on Apple devices, for a total of $26.3 billion in 2021, under the Internet Services Agreement between Google and Apple, which runs from 2021 to 2026.[87]

The Power of the Search Default: Google's Revealed Preference

We start by asking what we can infer about the power of the Safari default based on observing Google's payments to Apple. This calculation is important because the observed outcome was that Google won the bidding and there was a dispute about how much the Safari default matters on Apple devices, i.e., about the value of *d*. This calculation also is a way of testing whether Google's payments to Apple made no economic sense if not for some exclusionary effect.

If Google wins, Google's payoff is $m(1 - s)(1 - b)$, because Google gets a share $(1 - b)$ of the search traffic on Apple devices and retains a share $(1 - s)$ of the search revenue generated per

[87] See Thomas Barrabi, "Google Witness Accidentally Reveals Company Pays Apple 36% of Search Ad Revenue," *New York Post*, November 13, 2023.

user, which is m. If Google loses, Google's payoff is $m(1-d-b)$, because Google gets a share $(1-d-b)$ of the search traffic on Apple devices and retains all of the revenue on those devices, which again is m per device. Google prefers winning with *s* to losing if and only if

$$m(1-s)(1-b) > m(1-d-b).$$

Simplifying, Google is better off winning than losing if and only if

$$d > s(1-b).$$

The left-hand side reflects the value to Google of the extra traffic Google gets from winning the default, and the right-hand side reflects how much Google has to pay to get that traffic.

This inequality places a lower bound on how much the Safari default must matter for Google's payments to Apple to be justified by the search traffic the default shifts to Google. As noted above, $s = 0.36$, and Bing received a very small share of the search traffic on Apple iPhones, around 1%, so $b = 0.01$. With those numbers, the inequality above indicates that $d > 0.35$. However, to the extent that Google values the data it gets from the default traffic, the amount of default traffic needed to justify Google's payments to Apple would be lower, as discussed below.

We also can use this inequality to find the maximum revenue share that Google is willing to offer Apple to win the bidding, which is $s_{max} = d/(1-b)$. Since b is very small, to a close approximation this means that Google will offer Apple no more in revenue share than the share of the traffic shifted by the default. A nice simple rule. Again, to the extent Google values the data it gets from the default traffic, it would be willing to offer a higher revenue share.

Bidding Competition: Google Wins

We now show that when Google and Bing bid to win the Safari default on all Apple devices, Google wins. We also calculate the revenue sharing rate s^* at which Google wins.

Google has three advantages over Bing in this bidding competition: (1) Google generates more search advertising revenue per user, $m > 1$; (2) Apple prefers Google because it offers a superior search service for Apple's users as a group, $v > 0$; and (3) fewer users will incur the cost of switching the Safari default if Apple picks Google as the default because $g > b$.

Microsoft's maximum revenue sharing offer can be calculated exactly as we did for Google above, which gives a maximum of $d/(1-g)$. Using the identity $b + d + g = 1$, this becomes $d/(b+d)$. With a small value of b, this is close to 100%. Evidence from the trial showed that Microsoft did indeed offer Apple 100% of its search revenue. [FOF ¶323] Below we discuss how the outcome changes if Microsoft is willing to offer Apple *more* than 100% of its search revenue because of the value to Microsoft of data.

If Microsoft bids at its maximum of $d/(b+d)$, Apple's payoff from picking Bing is equal to $d + (1-d-b)(v-c)$. The first term is the revenue Apple gets from Bing, and the second term is the value Apple attributes to the users who switch to Google based on their using the superior search service, net of the switching cost they bear. Apple's payoff from picking Google if Google offers *s* is $sm(1-b) + v(1-b) - bc$. Here, the first term is the revenue Apple gets from Google, the second term is the value Apple attributes to the users who use Google due to its superior search quality, and the third term reflects the costs users bear to switch from the default to Bing.

Comparing these two expressions, and simplifying, Apple prefers Google if and only if

$$s > \frac{d}{m}\frac{1-v}{1-b} - \frac{c}{m}\frac{g-b}{1-b}.$$

Google is willing to bid more than this to win because the first term on the right-hand side is less than Google's maximum willingness to bid $s_{max} = d/(1-b)$, and the second term is positive, because there are more loyal Google users than loyal Bing users, $g > b$.

Therefore, Google wins the bidding by offering Apple the following share of its search revenue:

$$s^* = \frac{d}{m}\frac{1-v}{1-b} - \frac{c}{m}\frac{g-b}{1-b}.$$

With $v = 0$ and $b = 0$ and $c = 0$, Google's winning bid is equal to d/m. If v is positive or c is positive, Google's winning bid s^* is smaller. If b is positive, Google winning bid is larger.

To illustrate, with $d = 0.6$ and $m = 2$ we get $s^* = 0.3$, lower but not far from the observed $s = 0.36$. As shown below, if Apple bargains with Google rather than accepting Google's take-it-or-leave-it offer, then Google will pay Apple more than its minimum winning bid.

Including the Value of Data

We now augment the model to account for the value of data. Suppose that the per-user value of data is equal to k for Microsoft and h for Google. (Note that these per-user values of data are measured in proportion to Bing's per-user search advertising revenue.) We expect $k > h$ because there are diminishing return to having more data. Microsoft is likely to value data from mobile devices especially highly, given that Microsoft has far more data from desktops (due to Windows and Edge) which presumably allows Bing's search quality and monetization on desktops to be comparable to Google's, whereas Bing is far behind Google on both metrics on mobile devices.

For simplicity, we now set $b = 0$ and $c = 0$. Above, Microsoft was willing to pay Apple a revenue share of up to 100%. Now Microsoft is willing to offer Apple a revenue share of up to $(1 + k)$. Google will thus need to bid more to win. Specifically, to win Google must bid

$$s_{data} = \frac{d}{m}(1 - v + k).$$

In fact, Microsoft bid 100% of its revenue. In that case, Google only has to bid $\frac{d}{m}(1-v)$ to win, the same as we saw above.

Repeating the logic from above but adding the value of data to Google, Google is willing to bid up to $d(m + h)/m$ (with no exclusionary motive). Google will win the bidding so long as

$$(m-1) + v > k - h.$$

This expression tells us that there are parameter values for which Microsoft will win if $k > h$, i.e., if Microsoft places significantly greater value of the data than Google does. That outcome was not observed, for three reasons: (1) with $m = 2$ this becomes $1 + v > k - h$ which requires that $k - h$ be sizeable (all scaled to how much Bing monetizes per user); (2) v could well be significant; and (3) Microsoft did not bid more than 100% of its revenue, even though $k > 0$.

Bilateral Bargaining Between Apple and Google

Another way to analyze the interaction between Google and Apple is with a bargaining model in which Apple's outside option (threat point) is to turn to Bing. In the bidding model above,

Apple's payoff is equal to the payoff it could get by going to Bing, so Apple captures *none* of the gains from trade created when Apple uses Google instead. This is a common feature of bidding games, but not ideal. What happens if Google and Apple instead split those gains from trade?

How large are those gains from trade? With $c = 0$ and $h = 0$ for simplicity, the additional value created when Apple picks Google instead of Bing as the default is $d(m-1) + dv$. The first term is the extra monetization on the default traffic, and the second term is the improved search quality for the default traffic.

From above, Apple's payoff from picking Bing when Bing bids its maximum amount is equal to $d(1+k) + v(1-d-b)$. Apple's payoff if Apple gets that amount plus a share θ of the gains from trade is therefore equal to

$$[d(1+k) + v(1-d-b)] + \theta d[(m-1) + v].$$

Apple's payoff from picking Google if Google pays Apple a share *s* of Google's search revenue is equal to

$$sm(1-b) + v(1-b).$$

Equating these two expressions and solving for *s* gives

$$s_{barg} = \frac{d}{m(1-b)}[(1-v+k) + \theta(m-1+v)].$$

If Apple gets none of the gains from trade, $\theta = 0$ and this becomes

$$s_{barg} = \frac{d}{m(1-b)}(1-v+k),$$

which lines up with the expression above if we put $b = 0$. With $k = 0$ and $v = 0$, we get a simple expression comparing the revenue share Apple gets from bargaining with that derived above when Apple runs an auction. Taking ratios,

$$\frac{s_{barg}}{s^*} = 1 + \theta(m-1).$$

With $m = 2$ and if Apple gets half of the gains from trade, the amount Google negotiates with Apple is 1.5 times as much as Google pays Apple if Apple runs an auction. With $d = 0.6$ and $b = 0$, we get $s_{barg} = 0.45$ compared with the $s^* = 0.3$ calculated above. Apple's ability to capture some of the gains from trade may well explain why Google paid Apple as much as it did for the Safari search default. In the end, Apple does control how Safari is configured on iPhones.

Google Can Only Offer Apple an Unconditional Revenue Sharing Agreement

The District Court found that Google' portfolio-wide CFDs with Apple (and Mozilla) were exclusive in practice and thus violated the Sherman Act.

We now consider competition between Google and Microsoft for search traffic on Apple devices if Google can only pay Apple for search traffic by entering into an unconditional revenue sharing agreement ("URSA"). For this analysis, we assume that Apple has a policy of configuring iPhones uniformly upon sale. We consider individualized configurations below when we analyze device-by-device contracts for default.

For simplicity, we set $b = 0$, $c = 0$, and $k = 0$. That leaves three parameters, *d*, *m*, and *v*.

If $v \geq 1$, Google can win with a zero bid. To see why, suppose Google offers $s = 0$ and Bing offers 100% revenue sharing. If Apple picks Bing, Apple's payoff is $d + (1 - d)v$. The first term is the money Apple gets from Microsoft, and the second term is the value Apple attributes to the users who switch and use Google instead of Bing. This is equal to $v + d(1 - v)$. Alternatively, if Apple picks Google, Apple's payoff is v. If $v \geq 1$, Apple's payoff from picking Google is at least as large as its payoff from picking Bing. Google could win even with a negative value of *s*, meaning that Apple would pay Google for the right to set Google as the search default on Safari, but we do not explore that possibility. Our point is simply that Google easily wins using a URSA if $v \geq 1$.

We now explore what happens if $v < 1$.

First, there cannot be any equilibrium in which Microsoft wins. If Google bids a positive amount and loses, then Google would end up paying Apple a share of Google's revenue on its loyal customers and getting nothing in return, because under a URSA Google must pay Apple even if Apple does not select Google as the Safari default. Google would be better off bidding zero. So, in any equilibrium in which Microsoft wins, Google must bid zero. Next, we show that if Google bids zero, then Microsoft can win by bidding slightly more than *v*. If Microsoft bids $v + \epsilon$ for small ϵ and Apple accepts this bid, Apple's payoff will be $d(v + \varepsilon) + (1 - d)v$ which equals $v + d\varepsilon$. If Apple rejects this bid and sets Google as the default, Apple's payoff will be v. So, a bid of $v + \epsilon$ is sufficient for Microsoft to win. And it is profitable for Microsoft to bid $v + \varepsilon$ to win, because that outcome gives Microsoft a payoff of $d(1 - v - \varepsilon) > 0$ while Microsoft's payoff from losing is zero. So, in any equilibrium in which Microsoft wins, Microsoft will bid at or just above *v*. But that cannot be an equilibrium, because Google would then bid a small positive amount. Such a bid would be sufficient to win, because it would give Apple a payoff of $sm + v$ which is greater than the payoff of *v* that Apple gets from selecting Bing when Microsoft bids *v*. And Google would find it profitable to make such a bid. Google's payoff from winning at *s* is equal to $(1 - s)m$. For small values of *s* this is close to *m*, which is greater than unity. Google's payoff from losing and paying nothing is equal to $(1 - d)$, which is less than unity.

Second, if $dm > 1 - v$ there is an equilibrium in which Microsoft bids 100% and Google wins with a bid of $s^u = (1 - v)/m$. With $d = 0.6$ and $m = 2$, the condition $dm > 1 - v$ is satisfied. This is the result highlighted in the main text above. The key idea is that Google will bid enough to induce Apple to *choose* to make Google the Safari search default even if not required to do so.

Here is the proof. If Apple picks Bing, Apple's payoff is $d + (1 - d)s^u m + (1 - d)v$. The first term is the revenue Apple gets from Microsoft. The second term is the revenue Apple gets from Google, as Google must pay Apple even if Apple selects Bing as the Safari default. The third term is the value Apple attributes to the loyal Google users using Google. Plugging in our candidate $s^u = (1 - v)/m$, Apple's payoff from picking Bing is unity. Alternatively, if Apple picks Google, Apple's payoff is $s^u m + v$ which also equals unity. Therefore, Google will win. We also need to check that Google prefers winning at a bid of $s^u = (1 - v)/m$ to bidding zero and losing. Google's payoff from winning is $(1 - s^u)m$ which equals $(m - 1) + v$. If Google bids zero and loses, Google's payoff is $(1 - d)m$. Google prefers winning if $dm > 1 - v$.

We can compare this URSA equilibrium, in which Google wins with $s^u = (1 - v)/m$, to the equilibrium in which Google can offer a contract for default. In that case, we showed above that Google wins with $s^* = d(1 - v)/m$. With the URSA, Google wins with a bid that is *larger* by a factor $1/d$. Google must pay Apple more so Apple will not "double dip" by picking Bing as the

default, getting paid by Microsoft on the inert users, and *also* getting paid by Google on the users loyal to Google.

With $m = 2$ and $d = 0.6$ and $v = 0$, if Google can enter into a contract for default Google wins with a revenue share of 30%, but if Google can only use a URSA Google pays Apple 50%.

Lastly, we show that if $dm < 1 - v$ there is no equilibrium. Why? We already showed there cannot be an equilibrium in which Bing wins. Suppose there is an equilibrium in which Google wins and Microsoft bids its maximum amount. As shown above, Google must bid at least of $s^u = (1 - v)/m$ to win. That gives Google a payoff of $(m - 1) + v$. Google's payoff from bidding zero and losing is $(1 - d)m$. If $dm < 1 - v$, Google's payoff from bidding zero and losing is higher, so there can be no equilibrium in which Google wins.

Google Can Only Offer a Device-by-Device Contract for Default

We now analyze the bidding between Google and Microsoft for Apple's search traffic if Google cannot use a portfolio-wide CFD but *can* use a device-by-device CFD. This is the restriction that the District Court imposed on Google in Section III.H of the *Google Search Final Judgment*.

Google now offers Apple a share *s* of Google's search advertising revenue on any Apple device on which Apple makes Google the Safari default. Apple does not get any of Google's search advertising revenue on other Apple devices. Unlike Google, Microsoft can offer Apple a portfolio-wide CFD, but we know that Bing is not competitive if Apple is forced to pick a single default for all of its devices, so Microsoft also will offer a device-by-device CFD.

The District Court found that while Bing was a non-starter as the portfolio-wide default on Apple devices, Apple might have made Bing the default on at least some search access points on some of its devices if Google's portfolio-wide revenue sharing agreement with Apple had not precluded that. The best evidence on this point was from 2009 when Apple sought more flexibility, but Google rejected Apple's proposal "in large part because Apple 'could decide to work with an alternative provider for the desktop/Safari search solution.'" [FOF ¶319]

What counterfactual outcome would have arisen in the past if Google had offered Apple a device-by-device contract for default, and what will likely happen in the future under Section III.H of the *Google Search Final Judgment*? We focus on the iPhone, because the District Court found that Bing was comparable to Google in search quality and monetization on the desktop and because the District Court's liability finding was based on its conclusion that Bing's search quality and monetization on mobile devices were reduced by Bing's lack of search traffic on those devices.

Under certain conditions that may well apply in practice, Apple will set Google as the Safari default on all iPhones even if Google offers Apple a device-by-device CFD. Notably, this will be the case if Apple has a policy of configuring all iPhones the same way, perhaps to reduce staff training and customer support costs. There was evidence that Apple has such a policy. The same outcome arises if, when Apple sells a new iPhone, Apple cannot observe differences in users that would warrant varying the search default on Safari across users. In that case, Apple would not have any demand for variety in setting the out-of-the-box Safari default. Instead, Apple chooses to support diverse user preferences by making it easy for users to change the Safari default.

We now consider what would happen if Apple is open to setting different search defaults on Safari for different users when they purchase their iPhones, and if Apple observes differences

across users that might warrant setting Bing as the Safari default for some of them. In particular, we now suppose that when Apple is configuring a person's iPhone, Apple observes a signal that is informative regarding that individual's preference for Google vs. Bing.[88]

Denote by *w* the value Apple places on an *individual* using Google rather than Bing. Variations in *w* across individuals are based on information Apple has about them when it configures their iPhones. Individuals with $w > 0$ prefer Google and those with $w < 0$ prefer Bing. The variable *v* we have been working with is the *average* value of *w* in the population.

For simplicity and clarity, consider the case in which $b = 0$, $k = 0$, and $c = 0$. With these parameters, we showed above that when Google and Microsoft compete with portfolio-wide CFDs, Microsoft bids 100% of its revenue and Google wins the Safari default with a bid equal to $s^* = d(1 - v)/m$. To win, Google had to be more attractive from Apple's perspective for the *average* user. But now, because Apple can configure devices based on individual preferences, Google has to worry that Apple will set the Safari search default to Bing for users that are inertial but prefer Bing. That concern is of little importance if *w* is tightly distributed around its mean of $v > 0$, but it could be significant if there are a substantial number of users that Apple believes strongly prefer Bing to Google, i.e., with $w < 0$.

Apple's ability to set the Safari default on a device-by-device basis thus gives Google an incentive to increase the share of search advertising revenue it offers to Apple. The reason is that Google has to worry about an additional margin: the *share* of Apple devices for which Apple selects Google as the default. Google thus faces a classic monopoly pricing problem: offering Apple a greater portion of its advertising revenue will induce Apple to configure more iPhones with Google as the default search service, but that will also require Google to pay Apple more on all of the "inframarginal" devices, i.e., those for which Apple would make Google the default even if Google did not give Apple a greater share of its search advertising revenue.

All of this suggests that Section III.H of the *Google Search Final Judgment*, which prohibits Google from using a portfolio-wide CFD but allows Google to use a device-by-device CFD, may have two effects: (1) Google will pay Apple a higher share of search revenue, and (2) Apple will select non-Google search engines as the Safari search default for some users, namely those that Apple believes (a) have a sufficiently strong preference for non-Google search engines to overcome Google's monetization advantage, but (b) would nonetheless would use Google if it were set as the default. We are skeptical there are many such users, given Google's overall superiority in search quality and monetization, and given that these users' preference for Bing does not overcome their inertia of using Google as the default, but we do not know for sure. Now that the District Court has enjoined Google from using a portfolio-wide CFD with Apple but permitted Google to use narrower ones, we may find out.

[88] One could perform a similar analysis based on Apple observing a signal regarding Google's monetization advantage over Bing at the individual level. However, that possibility was not developed by the government, and we are not aware of evidence that Google's monetization advantage varies across individuals, much less in an observable manner.