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Joshua D. Wright

Murat C. Mungan

Texas A&M University School of Law, mmungan@gmu.edu

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Recommended Citation

Joshua D. Wright & Murat C. Mungan, *The Easterbrook Theorem: An Application to Digital Markets*, 130 Yale L.J.F. 622 (2021).

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The Easterbrook Theorem: An Application to Digital Markets

Joshua D. Wright & Murat C. Mungan

ABSTRACT. The rise of large firms in the digital economy, including Amazon, Apple, Facebook, and Google, has rekindled the debate about monopolization law. There are proposals to make finding liability easier against alleged digital monopolists by relaxing substantive standards; to flip burdens of proof; and to overturn broad swaths of existing Supreme Court precedent, and even to condemn a law review article. Frank Easterbrook's seminal 1984 article, *The Limits of Antitrust*, theorizes that Type I error costs are greater than Type II error costs in the antitrust context, a proposition that has been woven deeply into antitrust law by the Supreme Court. We consider the implications of this assumption on the standard of proof. We find that, taking variants of the Easterbrook assumption as given, the optimal standard of proof is stronger than the preponderance of the evidence standard. Our conclusion is robust to how one specifies the preponderance of the evidence standard and stands in stark contrast to contemporary proposals to reduce or eliminate the burden of proof facing antitrust plaintiffs in digital markets.

INTRODUCTION

No area of modern antitrust has attracted greater debate than monopolization law—the body of antitrust law applied to a single firm's conduct alleged to harm competition.¹ These debates have been rekindled in recent years with the rise of large firms in the digital economy, including Amazon, Apple,

1. See, e.g., Einer Elhauge, *Defining Better Monopolization Standards*, 56 STAN. L. REV. 253 (2003); Steven C. Salop & R. Craig Romaine, *Preserving Monopoly: Economic Analysis, Legal Standards, and Microsoft*, 7 GEO. MASON L. REV. 617 (1999); Joshua D. Wright, *Abandoning Antitrust's Chicago Obsession: The Case for Evidence-Based Antitrust*, 78 ANTITRUST L.J. 241 (2012); Gregory J. Werden, *Textualism and Section 2 of the Sherman Act: A Clear Path the Supreme Court Did Not Take* (Sept. 9, 2017), <https://ssrn.com/abstract=3098836> [<https://perma.cc/F7U2-W6G5>].

Facebook, and Google, among others. Antitrust scholars, institutions, and politicians have offered a variety of proposals to change substantive antitrust rules applied to the digital economy.² The proposals almost uniformly³ recommend changes that would make a finding of liability easier against alleged digital monopolists by relaxing substantive standards;⁴ flipping burdens of proof so that conduct is presumed unlawful;⁵ or overturning broad swaths of existing Supreme Court precedent.⁶

The tradeoff between Type I and Type II errors lies at the heart of analyses of monopolization rules and standards for digital markets. Type I errors, or “false positives,” refer to false convictions; Type II errors refer to “false acquittals.” In the antitrust context, a Type I error refers to a finding that conduct that is actually procompetitive violates the antitrust laws. A Type II error in the antitrust context refers to a failure to find antitrust liability for anticompetitive conduct. The opportunity for Type I and Type II error is especially high in a dynamic competitive environment, where it is very difficult to discern the

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2. See, e.g., Marshall Steinbaum & Maurice E. Stucke, *The Effective Competition Standard—A New Standard for Antitrust*, 86 U. CHI. L. REV. 595 (2020); Sandeep Vaheesan, *The Twilight of the Technocrats’ Monopoly on Antitrust?*, 4 YALE L.J.F. 980 (2018); Tim Wu, *After Consumer Welfare, Now What? The “Protection of Competition” in Practice*, CPI ANTITRUST CHRON., April 2018; Elizabeth Warren, *Here’s How We Can Break Up Big Tech*, MEDIUM (Mar. 8, 2019), <https://medium.com/@teamwarren/heres-how-we-can-break-up-big-tech-9ad9eoda324c> [<https://perma.cc/7KAS-CYHT>]; Jonathan B. Baker, Joseph Farrell, Andrew I. Gavil, Martin S. Gaynor, Michael Kades, Michael L. Katz, Gene Kimmelman, A. Douglas Melmead, Nancy L. Rose, Steven C. Salop, Fiona M. Scott Morton & Carl Shapiro, *Joint Response to the House Judiciary Committee on the State of Antitrust Law and Implications for Protecting Competition in Digital Markets*, WASH. CTR. FOR EQUITABLE GROWTH (2020), <https://equitablegrowth.org/wp-content/uploads/2020/04/Joint-Response-to-the-House-Judiciary-Committee-on-the-State-of-Antitrust-Law-and-Implications-for-Protecting-Competition-in-Digital-Markets.pdf> [<https://perma.cc/P35F-9TRM>] [hereinafter Equitable Growth Letter]; Stigler Comm. on Dig. Platforms, *Final Report* 18 (2019), <https://www.chicagobooth.edu/-/media/research/stigler/pdfs/digital-platforms---committee-report---stigler-center.pdf> [<https://perma.cc/U7CJ-REWG>].
 3. *But see* Keith N. Hylton, *The Law and Economics of Monopolization Standards*, in ANTITRUST LAW AND ECONOMICS 82 (2010); Geoffrey A. Manne & Joshua D. Wright, *Innovation and the Limits of Antitrust*, 6 J. COMPETITION L. & ECON. 153 (2010); James C. Cooper, Luke M. Froeb, Daniel P. O’Brien, & Michael Vita, *A Comparative Study of United States and European Union Approaches to Vertical Policy* (Vanderbilt Law and Econ. Research Paper No. 05-11, 2005).
 4. See, e.g., Lina M. Khan, *Amazon’s Antitrust Paradox*, 126 YALE L.J. 710, 791 (2017) (arguing for a “presumption of predation for dominant platforms found to be pricing products below cost”); Stigler Comm. on Dig. Platforms, *supra* note 2, at 105 (advocating for a “bottleneck power” standard for dominant tech platforms).
 5. Anticompetitive Exclusionary Conduct Prevention Act of 2020, S. 3426, 116th Cong. § 4 (2020); Stigler Comm. on Dig. Platforms, *supra* note 2, at 98.
 6. See Baker et al., *supra* note 2, at 5-11 (advocating for the repeal of *Trinko*, *Brooke Group Ltd.*, and *Amex*, among others).

competitive effects of a firm's conduct from observing a business practice alone. As the D.C. Circuit put it in the landmark Sherman Act section 2 case applied to digital markets:

Whether any particular act of a monopolist is exclusionary, rather than merely a form of vigorous competition, can be difficult to discern: the means of illicit exclusion, like the means of legitimate competition, are myriad. The challenge for an antitrust court lies in stating a general rule for distinguishing between exclusionary acts, which reduce social welfare, and competitive acts, which increase it.⁷

The design of antitrust rules to minimize costs of judicial error in digital markets is our focus.⁸ While economic and decision-theoretic analyses have been applied to substantive antitrust rules and sanctions, they have rarely been deployed to consider antitrust process and procedure. We take a novel approach, turning instead to considering the standard of proof used in antitrust trials as an instrument to minimize the costs associated with the two possible types of judicial error.⁹

Our analysis takes as given a presumption about the relative incidence of Type I and Type II error in markets, introduced by Frank Easterbrook in his seminal 1984 article *The Limits of Antitrust*.¹⁰ Easterbrook famously reasoned that preventing procompetitive behavior is more harmful than allowing anticompetitive behavior. Easterbrook argued not that markets were perfectly self-correcting, but that incentives to enter and compete for the monopoly profits in markets impacted by anticompetitive behavior would constrain the social costs

7. United States v. Microsoft Corp., 253 F.3d 34, 58 (D.C. Cir. 2001) (en banc) (per curiam).

8. We take a complementary approach to prior work, where we identify the standard of proof that optimally trades off deterrence benefits and the chilling of procompetitive behavior. Here, we take as given the supply of both types of behavior and focus instead on the costs and benefits associated with preventing each. See Murat C. Mungan & Joshua D. Wright, *Optimal Standards of Proof in Antitrust*, CPI (Aug. 1, 2019), <https://www.competitionpolicyinternational.com/optimal-standards-of-proof-in-antitrust> [<https://perma.cc/AJ3F-VD8C>]. Thus, while our previous analysis focuses on optimal deterrence related trade-offs, our current approach focuses on optimal prevention of harms. For a more thorough explanation of the differences between these two settings, see Tim Friehe & Avraham Tabbach, *Preventive Enforcement*, 35 INT'L REV. L. & ECON. 1 (2013); and Murat C. Mungan, *Optimal Preventive Law Enforcement and Stopping Standards*, 20 AM. L. & ECON. REV. 289 (2013).

9. See Michelle M. Burtis, Jonah B. Gelbach & Bruce H. Kobayashi, *Error Costs, Legal Standards of Proof, and Statistical Significance*, 25 S. CT. ECON. REV. 1 (2017); Dominique Demougin & Claude Fluet, *Deterrence Versus Judicial Error: A Comparative View of Standards of Proof*, 161 J. INSTITUTIONAL & THEORETICAL ECON. 193 (2005); see also Murat C. Mungan, *The Optimal Standard of Proof with Adjudication Avoidance*, 16 REV. L. & ECON. 1 (2019) (describing the optimality of using stronger standards of proof to balance avoidance and deterrence costs).

10. Frank H. Easterbrook, *The Limits of Antitrust*, 63 TEX. L. REV. 1 (1984).

of Type II errors more than the legal system could successfully limit the social costs of Type I errors. Easterbrook contended that “[i]f the court errs by condemning a beneficial practice [committing Type I error], the benefits may be lost for good. Any other firm that uses the condemned practice faces sanctions in the name of stare decisis, no matter the benefits. If the court errs by permitting a deleterious practice [committing Type II error], though, the welfare loss decreases over time.”¹¹

Easterbrook’s assumption that Type I error costs are greater than Type II error costs in the antitrust context is not without controversy among academics. Undoubtedly this is at least in part because it is very difficult to test the proposition empirically. We do believe the assumption is appropriate and sound, based upon available economic theory and evidence, and offer a brief justification for it in Part II. The purpose of our analysis, however, is not to substantiate the Easterbrook assumption. After all, there is no debate that Easterbrook’s view of the relative social cost of Type I and Type II errors has been fully incorporated into antitrust law – and in particular, monopolization law under section 2 of the Sherman Act.¹² We take that assumption – that the beneficial impact of procompetitive behavior is greater than the harmful impact of anticompetitive behavior – and provide a novel analysis to show that the optimal standard of proof in the antitrust context is greater than “preponderance of evidence.” These findings are counterintuitive and certainly an outlier among the dozens of proposals to lower liability standards and reduce the evidentiary burdens facing plaintiffs in monopolization cases in digital markets and elsewhere.

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11. *Id.* at 2. For example, the Supreme Court took nearly a century to abandon its holding that minimum resale price maintenance – a practice well understood to be generally competitively benign, if not procompetitive – was per se illegal. See *Leegin Creative Leather Prods., Inc. v. PSKS, Inc.*, 551 U.S. 877, 879–80 (2007) (overruling *Dr. Miles Med. Co. v. John D. Park & Sons Co.*, 220 U.S. 373 (1911)). For analyses of the competitive effects of resale price maintenance, see Kenneth G. Elzinga & David E. Mills, *The Economics of Resale Price Maintenance*, in 3 *ISSUES IN COMPETITION LAW AND POLICY* 1841, 1842–50, 1855–56 (2008); Benjamin Klein, *Competitive Resale Price Maintenance in the Absence of Free Riding*, 76 *ANTITRUST L.J.* 431 (2009); Benjamin Klein & Kevin M. Murphy, *Vertical Restraints as Contract Enforcement Mechanisms*, 31 *J.L. & ECON.* 265 (1988); and Wright, *supra* note 1.
 12. Easterbrook’s argument about error costs has had significant impact on both legal doctrine and academic analysis. See *Credit Suisse Sec. (USA) LLC v. Billing*, 551 U.S. 264, 281 (2007) (“In light of the nuanced nature of the evidentiary evaluations necessary to separate the permissible from the impermissible, it will prove difficult for those many different courts to reach consistent results [in this context].”); *Verizon Commc’ns Inc. v. Law Offices of Curtis V. Trinko, LLP*, 540 U.S. 398, 414 (2004) (“The cost of false positives counsels against an undue expansion of [section] 2 liability.”); *Matsushita Elec. Indus. Co. v. Zenith Radio Corp.*, 475 U.S. 574, 594 (1986) (“Mistaken inferences in cases such as this one are especially costly, because they chill the very conduct the antitrust laws are designed to protect.”); *infra* Parts I & II.

We describe the role of the Easterbrook assumption in modern antitrust law in Part I. Part II offers a brief and partial defense of the Easterbrook assumption on economic and empirical grounds. Part III presents our analysis of optimal antitrust standards of proof for monopolization and its application to digital platforms. Part IV concludes.

I. THE EASTERBROOK ASSUMPTION AND ANTITRUST LAW

Thirty-six years after Judge Easterbrook's seminal article, the Supreme Court has effectively written Easterbrook's principal conclusion about error costs into antitrust jurisprudence. Less ideological campaign, more convergent evolution, this process has spanned decades, over a series of opinions, and includes the votes of at least fourteen different Justices. Time and again, when confronted with deep questions in antitrust law, those Justices, have reached the same conclusion: false positives are more harmful than false negatives in antitrust.¹³

This proposition has appeared in a variety of antitrust contexts, both substantive and procedural. A couple of years after Easterbrook's article was published, the Court invoked systemic-error costs to justify its intervention in *Brooke Group Ltd. v. Brown & Williamson Tobacco Corp.*, which raised the burden for plaintiffs alleging predatory pricing.¹⁴ Noting how rarely the Supreme Court reviewed the sufficiency of the evidence, Justice Kennedy, writing for six Justices, found the effort justified by "the benefits of providing guidance concerning the proper application of a legal standard and avoiding the systemic costs associated

13. Easterbrook's assumption regarding the incidence of Type I and Type II error has also been widely adopted in the lower courts, and his article has been directly cited in five different Circuit Courts of Appeal. See *Saint Alphonsus Med. Ctr.-Nampa Inc. v. St. Luke's Health Sys., Ltd.*, 778 F.3d 775, 790 (9th Cir. 2015) ("[N]either judges nor juries are particularly good at handling complex economic arguments" (quoting Easterbrook, *supra* note 10, at 39)); *SCFC ILC, Inc. v. Visa USA, Inc.*, 36 F.3d 958, 965 n.9 (10th Cir. 1994) (explaining that the market power requirement "help[s] to screen out cases in which the risk of loss to consumers and the economy is sufficiently small that there is no need of extended inquiry and significant risk that inquiry would lead to wrongful condemnation or to the deterrence of competitive activity as firms try to steer clear of the danger zone." (quoting Easterbrook, *supra* note 10, at 17)); *Town Sound & Custom Tops, Inc. v. Chrysler Motors Corp.*, 959 F.2d 468, 485 n.23 (3d Cir. 1992) (quoting Easterbrook, *supra* note 10, at 20-21); *Brunswick Corp. v. Riegel Textile Corp.*, 752 F.2d 261, 267 (7th Cir. 1984) (quoting Easterbrook, *supra* note 10, at 33-39); *RDK Truck Sales & Serv. Inc. v. Mack Trucks, Inc.*, 2009 WL 1441578, at *14 (E.D. Pa. May 19, 2009) ("[I]f a court in an antitrust suit 'errs by condemning a beneficial practice, the benefits may be lost for good. Any other firm that uses the condemned practice faces sanctions in the name of stare decisis, no matter the benefits. If the court errs by permitting a deleterious practice, though, the welfare loss decreases over time. Monopoly is self-destructive. Monopoly prices eventually attract entry.'" (quoting Easterbrook, *supra* note 10, at 2)).

14. 509 U.S. 209 (1993).

with further proceedings.”¹⁵ The Court placed paramount importance on the “realities of the market”¹⁶ – like the likelihood of a breakdown in oligopoly discipline – which animated the Court’s skepticism about the odds of recovery from predatory pricing schemes.¹⁷ The Court’s answer, with the odds of a “real” case of predatory pricing so slim, was to tighten the legal standards to better filter false positives, in accordance with the economic balancing of error costs. The Court concluded the better course was not to assign liability to companies cutting prices because “[t]he antitrust laws then would be an obstacle to the chain of events most conducive to a breakdown of oligopoly pricing and the onset of competition.”¹⁸

So too in *Verizon Communications Inc. v. Law Offices of Curtis V. Trinko, LLP*,¹⁹ a case about the scope of a monopolist’s duty to deal under section 2 of the Sherman Act. There, in the context of a discussion about whether the Telecommunications Act of 1996 supplanted the antitrust laws, Justice Scalia explicitly balanced the marginal costs and benefits of enforcement: “Against the slight benefits of antitrust intervention here, we must weigh a realistic assessment of its costs.”²⁰ The Court emphasized the perverse irony inherent in antitrust’s false positives: “Mistaken inferences and the resulting false condemnations ‘are especially costly, because they chill the very conduct the antitrust laws are designed to protect.’”²¹

The Court again invoked that logic in a pair of cases in 2007, *Credit Suisse Securities (USA) LLC v. Billing*²² and *Leegin Creative Leather Products, Inc. v. PSKS, Inc.*²³ *Credit Suisse*, like *Trinko* before it, arose out of a conflict between antitrust and another regulatory scheme – here, the securities laws.²⁴ Faced with the question of whether the securities and antitrust laws were “clearly incompatible,” Justice Breyer first noted that the securities industry relied on the filigree

15. *Id.* at 230.

16. *Id.*

17. *Id.* at 240.

18. *Id.* at 224. For a survey of the continuing vitality of *Brooke Group*’s conclusions, see generally Bruce H. Kobayashi, *The Law and Economics of Predatory Pricing*, in *ANTITRUST LAW AND ECONOMICS* 116 (Keith N. Hylton ed., 2010).

19. 540 U.S. 398 (2004).

20. *Id.* at 412-14.

21. *Id.* at 414 (quoting *Matsushita Elec. Indus. Co. v. Zenith Radio Corp.*, 475 U.S. 574, 594 (1986)).

22. 551 U.S. 264 (2007).

23. 551 U.S. 877 (2007).

24. *Credit Suisse*, 551 U.S. at 267; see Bruce H. Kobayashi & Joshua D. Wright, *Federalism, Substantive Preemption, and Limits on Antitrust: An Application to Patent Holdup*, 5 J. COMPETITION L. & ECON. 469 (2009).

detail of Securities and Exchange Commission regulation to guide its conduct; antitrust would be unable to match that level of precision.²⁵ That factor, coupled with the likelihood of contradictory inferences from the probable evidence and the risk of inconsistent judgments, was too much for the Court to bear—with false positives “unusually likely,” the Court declined to apply the antitrust laws in the securities context.²⁶

The other case from 2007, *Leegin*, saw the Court confront one of the last holdovers of a bygone era of antitrust, the per se prohibition against resale price maintenance (RPM) established in *Dr. Miles Medical Co. v. John D. Park & Sons Co.*²⁷ Here, the Court cited Easterbrook directly (albeit from a different paper): “[R]ules can be counterproductive. They can increase the total cost of the antitrust system by prohibiting procompetitive conduct the antitrust laws should encourage.”²⁸ On that logic, the outdated per se prohibition against RPM condemns itself under the weight of the procompetitive conduct it forbids—in particular, the use of RPM to align incentives of manufacturers and retailers to engage in promotional services that increase demand—and the Court ruled accordingly.

The Court also cited Easterbrook in *Ohio v. American Express Co.*²⁹ While laying out the importance of defining markets in a rule-of-reason analysis—on the way to holding that competitive effects must be considered on both sides of a two-sided platform—the Court cites Easterbrook for the proposition that “[t]he possibly anticompetitive manifestations of vertical arrangements can occur only if there is market power.”³⁰ More broadly, *Amex*’s rule, tailored to the realities of transaction-platform markets, is animated by a concern about the inherent errors and likelihood of false positives with less sophisticated analysis.³¹

25. *Credit Suisse*, 551 U.S. at 279–81.

26. *Id.* at 282.

27. *Leegin*, 551 U.S. at 887; *Dr. Miles Med. Co. v. John D. Park & Sons Co.*, 220 U.S. 373 (1911)

28. *Id.* at 895 (citing Frank H. Easterbrook, *Vertical Arrangements and the Rule of Reason*, 53 ANTI-TRUST L.J. 135, 158 (1984)).

29. 138 S. Ct. 2274 (2018). See generally Joshua D. Wright & John M. Yun, *Burdens and Balancing in Multisided Markets: The First Principles Approach of Ohio v. American Express*, 54 REV. INDUS. ORG. 717 (2019).

30. *Amex*, 138 S. Ct. at 2285 n.7 (quoting Easterbrook, *supra* note 28, at 160).

31. See *Ohio v. Am. Express Co.*, 138 S. Ct. at 2287 (2018) (“[F]ocusing on one dimension of . . . competition tends to distort the competition that actually exists among [two-sided platforms]. . . . Any other analysis would lead to ‘mistaken inferences’ of the kind that could ‘chill the very conduct the antitrust laws are designed to protect.’” (first quoting David S. Evans & Michael Noel, *Defining Antitrust Markets When Firms Operate Two-Sided Platforms*, 2005 COLUM. BUS. L. REV. 667, 671; and then quoting *Brooke Grp. Ltd. v. Brown & Williamson Tobacco Corp.*, 509 U.S. 209, 226 (1993)).

Easterbrook's central tenet is deeply embedded not only in the substantive antitrust doctrines outlined above, but also in antitrust law's procedural logic. *Matsushita Electric Industrial Co. v. Zenith Radio Corp.*,³² decided in 1986 on the heels of Easterbrook's article, offers a pure error-cost analysis to arrive at its well-known articulation of the summary-judgment standard. In *Matsushita*, two U.S. television manufacturers alleged a group of twenty-one Japanese manufacturers conspired to raise prices in Japan, in order to fund a below-cost pricing campaign in the United States. The Court granted summary judgment for the Japanese defendants. The Court began with a discussion of the inherently speculative nature of predatory pricing generally and, notably, by relying upon Easterbrook's work on the topic.³³ The opinion followed the economic analysis to find predatory pricing schemes generally implausible, and especially prone to Type I error, concluding on a now-familiar refrain: "Thus, mistaken inferences in cases such as this one are especially costly, because they chill the very conduct the antitrust laws are designed to protect."³⁴ The Court's conclusion based upon that logic was self-evident—the summary judgment standard had to be tightened, lest false positives incur tremendous costs needlessly and tax the system's scarce resources in the process.³⁵

It eventually became clear to the Court, however, that *Matsushita* did not solve the problem it had set out to address. Most of the cost of an antitrust lawsuit is in discovery, and thus already has been incurred by the summary-judgment stage. The Court described this accounting explicitly in *Bell Atlantic Corp. v. Twombly*.³⁶ The Court found it "self-evident that the problem of discovery abuse cannot be solved by 'careful scrutiny of evidence at the summary judgment stage,' much less 'lucid instructions to juries'; the threat of discovery expense will push cost-conscious defendants to settle even anemic cases before reaching those proceedings."³⁷ *Twombly* is now famous for its change to pleading standards, but

32. *Matsushita Elec. Indus. Co. v. Zenith Radio Corp.*, 475 U.S. 574 (1986).

33. *Id.* at 589 (citing Frank Easterbrook, *Predatory Strategies and Counterstrategies*, 48 U. CHI. L. REV. 263, 268 (1981)).

34. *Id.* at 594.

35. *Id.* at 597-98; *see id.* at 576-77 ("Stating the facts of this case is a daunting task. The opinion of the Court of Appeals for the Third Circuit runs to 69 pages; the primary opinion of the District Court is more than three times as long. Two respected District Judges each have authored a number of opinions in this case; the published ones alone would fill an entire volume of the Federal Supplement. In addition, the parties have filed a 40-volume appendix in this Court that is said to contain the essence of the evidence on which the District Court and the Court of Appeals based their respective decisions." (internal citation omitted)).

36. *Bell Atl. Corp. v. Twombly*, 550 U.S. 544 (2007).

37. *Id.* at 559 (quoting *id.* at 573 (Stevens, J., dissenting)).

the case is also an example of the Court simply taking Easterbrook's proposition as a given, and crafting rules accordingly.

The assumption that Type I errors are more harmful to society than Type II errors in the antitrust context is well accepted in modern antitrust law. As a descriptive matter, that much appears to be beyond dispute. Nonetheless, we turn in Part II to offer a brief justification for that assumption.

II. A BRIEF EMPIRICAL DEFENSE OF THE EASTERBROOK ASSUMPTION

An empirical corollary of Easterbrook's proposition is that the expected social cost of antitrust error—that is, the likelihood of error multiplied by the cost of that error—is greater for false positives than for false negatives. In addition to effectively being the law, the proposition is also empirically justified. This is best demonstrated by examining Easterbrook's theorem reduced to its constituent parts: How common are Type I and Type II antitrust errors? And how costly are they when they happen? While empirical evidence shedding direct light on the relative social costs of Type I and Type II antitrust errors is scarce,³⁸ the existing data are consistent with the Easterbrook assumption.

Just how common are Type I and Type II antitrust errors? It is best to evaluate the question by type of business arrangement. We focus primarily upon the conduct at the heart of most allegations of monopolization in digital markets—that is, “vertical” arrangements by a single firm. As far as vertical arrangements are concerned, the empirical evidence suggests anticompetitive conduct is exceedingly rare; on the other hand, there is no shortage of uncontroversial evidence of procompetitive benefits arising from vertical integration and contractual arrangements.³⁹ If the probability is low that vertical conduct is

38. See Michael A. Salinger, *Section 2 Symposium: Michael Salinger on Framing the Debate*, TRUTH MARKET (May 4, 2009), <https://truthonthemarket.com/2009/05/04/section-2-symposium-michael-salinger-on-framing-the-debate> [<https://perma.cc/W6S6-HDBY>] (“One of the challenges in finding ‘false positives’ is that, because they include actions firms do not take for fear of antitrust liability, they are inherently hard to observe.”).

39. See Daniel P. O'Brien, *The Antitrust Treatment of Vertical Restraints: Beyond the Possibility Theorems*, in THE PROS AND CONS OF VERTICAL RESTRAINTS 40, 76-81 (Konkurrensverket Swedish Competition Authority, ed., 2008); Tad Lipsky, Joshua D. Wright, Douglas H. Ginsburg & John M. Yun, *The Federal Trade Commission's Hearings on Competition and Consumer Protection in the 21st Century, Vertical Mergers* 8, GLOBAL ANTITRUST INST. (George Mason L. & Econ. Research Paper No. 18-27, 2018), <https://ssrn.com/abstract=3245940> [<https://perma.cc/U9SR-UHK5>] (discussing the bulk of the recent empirical papers on vertical mergers since 2008 and finding that they “continue to support the conclusion[] . . . that consumers mostly benefit from vertical integration”); see also James C. Cooper, Luke M. Froeb, Dan O'Brien & Michael G. Vita, *Vertical Antitrust Policy as a Problem of Inference*, 23 INT'L J. INDUS. ORG. 639,

anticompetitive, and it is more likely that vertical arrangements are procompetitive, this would suggest (but not prove) that Type I errors are much more common than Type II errors. It is, of course, possible that Type II error could be more likely than Type I error even as vertical arrangements are far more likely to be procompetitive than anticompetitive. For example, Type II error could be more likely than Type I error if private plaintiffs are extremely accurate in targeting anticompetitive conduct and courts systematically err in favor of defendants in cases involving truly anticompetitive conduct. However, we are not aware of any evidence of the latter.⁴⁰ Given the incentives facing private plaintiffs seeking treble damages—which, all else equal, reduce the quality of claim required for it to make economic sense to file a claim—and the history of using antitrust to target the procompetitive conduct of rivals,⁴¹ this would be a surprising result.

The best critics can muster is to argue that such conduct “may be rare because antitrust rules have deterred firms from using vertical restraints to harm competition,” and, without ruling out deterrence, the conclusion cannot be supported;⁴² or that many studies simply “cannot determine the net effect of the vertical integration on welfare.”⁴³ But to put it simply, evidence of prevalent and systemic anticompetitive vertical behavior throughout the economy just does not exist. Methodological defects in any individual study aside, when one struggles to find evidence of anticompetitive effect in the work product of a nation’s worth of economists, Bayesian updating suggests it is pretty safe to conclude vertical conduct is predominantly procompetitive or competitively neutral. So too with

648-58 (2005) (summarizing the existing empirical studies of vertical integration and vertical constraints). *But see* Marissa Beck & Fiona Scott Morton, *Evaluating the Evidence on Vertical Mergers* 2 (Apr. 8, 2020), <https://ssrn.com/abstract=3554073> [<https://perma.cc/N4GD-MMGZ>] (“[M]any vertical mergers are harmless or procompetitive, but that is a far weaker statement than presuming every or even most vertical mergers benefit competition regardless of market structure.” (emphasis omitted)).

40. To the contrary, private plaintiffs are quite successful. *See* Joshua P. Davis & Robert H. Lande, *Toward an Empirical and Theoretical Assessment of Private Antitrust Enforcement*, 36 SEATTLE U. L. REV. 1269, 1272 (2013) (“[P]rivate antitrust litigation has provided a substantial amount of compensation for victims of anticompetitive behavior. . . . In fact . . . private enforcement probably deters more anticompetitive behavior than even the appropriately acclaimed anti-cartel program of the DOJ Antitrust Division.”).
41. *See* William J. Baumol & Janusz A. Ordover, *Use of Antitrust to Subvert Competition*, 28 J.L. & ECON. 247, 247-59 (1985); R. Preston McAfee & Nicholas V. Vakkur, *The Strategic Abuse of the Antitrust Laws*, 2 J. STRATEGIC MGMT. EDU. 37 (2005) (recounting numerous examples of strategic antitrust litigation by competitors in a variety of contexts).
42. *See* Jonathan B. Baker, *Taking the Error Out of “Error Cost” Analysis: What’s Wrong with Antitrust’s Right*, 80 ANTITRUST L.J. 1, 19-20 (2015).
43. Beck & Scott Morton, *supra* note 39, at 3 (emphasis omitted).

the data on predation; while possible, it is also very rare.⁴⁴ While outside of our current scope, the data on modern horizontal mergers tell the same story.⁴⁵

So how costly are these errors when they happen? Reliable estimates of the magnitudes of errors are even more difficult to come by than estimates of their frequency.⁴⁶ Economic theory guides the Easterbrook assumption. It tells us that Type II error costs are bounded by eventual entry or greater competition in the pursuit of monopoly profits, but Type I costs are bounded only by legal correction.⁴⁷ Type I error costs are also systemic: they apply across markets within the

44. See Kobayashi, *supra* note 18, at 150.

45. Kwoka is often cited to support the proposition that “modern antitrust enforcement has failed to prohibit mergers that reduce consumer welfare.” See Joshua D. Wright, *Towards a Better Understanding of Concentration: Measuring Merger Policy Effectiveness*, OECD COMPETITION COMMITTEE (2018), [https://one.oecd.org/document/DAF/COMP/WD\(2018\)69/en/pdf](https://one.oecd.org/document/DAF/COMP/WD(2018)69/en/pdf) [<https://perma.cc/RFF5-Y8FW>] (citing JOHN KWOKA, *MERGERS, MERGER CONTROL, AND REMEDIES* (2015)). Vita and Osinski do a commendable job pointing out the methodological defects in Kwoka’s approach. See *id.* at 16; Michael Vita & F. David Osinski, *John Kwoka’s Mergers, Merger Control, and Remedies: A Critical Review*, 82 ANTITRUST L.J. 361, (2018); see also David Autor, David Dorn, Lawrence F. Katz, Christina Patterson & John Van Reenen, *The Fall of the Labor Share and the Rise of Superstar Firms*, 135 Q.J. ECON. 645 (2020) (finding evidence that increases in market concentration will result in labor share decline but faster productivity growth); Sharat Ganapati, *Growing Oligopolies, Prices, Output, and Productivity*, AM. ECON. J. (forthcoming) (manuscript at 13) (on file with author) (finding that increasing industry concentration is correlated to growth in productivity and real output); Esteban Rossi-Hansberg, Pierre-Daniel Sarte & Nicholas Trachter, *Diverging Trends in National and Local Concentration*, in 35 NBER MACROECONOMICS ANNUAL 2020 (Martin Eichenbaum & Erik Hurst eds., forthcoming 2020) (reconciling the increase in national product-market concentration with falling local concentration); Robert E. Hall, *New Evidence on the Markup of Prices over Marginal Costs and the Role of Mega-Firms in the US Economy* 16 (Nat’l Bureau of Econ. Research, Working Paper No. 24574, 2018) (finding no relation between labor-market concentration and the markup ratio); Chang-Tai Hsieh & Esteban Rossi-Hansberg, *The Industrial Revolution in Services* (Becker Friedman Inst., Working Paper No. 2019-87, 2019) (considering how new technologies enable the ability to scale production in manufacturing); Sam Peltzman, *Productivity and Prices in Manufacturing During an Era of Rising Concentration* (2018), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3168877 [<https://perma.cc/2YMA-ME6Y>] (showing no significant price changes in concentrated sectors).

46. There are a handful of exceptions. Bittlingmayer and Hazlett found “compelling” evidence that antitrust actions against Microsoft in the 1990s dragged down the entire sector and were consistent with a “false positive.” George Bittlingmayer & Thomas W. Hazlett, *DOS Kapital: Has Antitrust Action Against Microsoft Created Value in the Computer Industry?*, 55 J. FIN. ECON. 329, 329 (2000); see also Joshua D. Wright, *Does Antitrust Enforcement in High Tech Markets Benefit Consumers? Stock Price Evidence from FTC v. Intel*, 38 REV. INDUS. ORG. 387 (2011) (finding that Intel’s business practices—which were the subject of antitrust challenges—were not harming consumers).

47. Critics of this argument point to examples of how long entry can take, see Baker, *supra* note 42, at 8-11, but the question is whether markets or legal institutions have a comparative advantage in error correction. The assertion that markets must be perfectly self-correcting for

jurisdiction that made the error. Legal precedent condemning procompetitive behavior is likely to chill the same procompetitive behavior across product markets. Type II error is more likely limited to a single firm or market. For example, an ultimately unsuccessful challenge of an anticompetitive merger is not likely to result in a wave of anticompetitive mergers. Further, because rule-of-reason analysis requires case-by-case adjudication, erroneously permitting anticompetitive conduct does not prohibit future plaintiffs—whether federal or state enforcement agencies or private plaintiffs—from bringing suits against others to challenge their conduct.

The caution Easterbrook’s theorem counsels is not merely, as some have argued, “skepticism about the competence of courts to make factual assessments.”⁴⁸ Properly framed, the question is how best to design antitrust substantive rules and procedure to minimize the cost of errors, which are inevitable because antitrust analysis is difficult in a world where, as the D.C. Circuit describes, “the means of illicit exclusion, like the means of legitimate competition, are myriad.”⁴⁹

The Easterbrook assumption is perhaps most appropriate in digital markets where innovation is an important dimension of competition. This is because innovative business practices and product designs that courts and agencies do not understand are more likely to be condemned. Qualcomm’s recent litigation with the FTC concerning its licensing practices is one recent example of a district court finding unlawful the innovative and novel business models and contracts that underlie modern technology.⁵⁰ The Ninth Circuit reversed unanimously, explaining that the district court had “incorrectly conflate[d] antitrust liability and patent law liability,”⁵¹ describing the record as one “where a company’s novel

Easterbrook’s analysis to hold is false and based upon a caricature of Easterbrook’s core insight. *Leegin* took on the order of a century to overturn *Dr. Miles*, despite its shaky economic foundations. See *supra* note 39. There is no small amount of irony in the fact that critics of modern antitrust law conclude simultaneously that: (1) markets do not self-correct faster than the law, thus the need for large scale changes to antitrust doctrine; and (2) the law has failed to “correct” what they perceive as clearly erroneous decisions—such as *Brooke Group*, *Trinko*, and *Twombly*—over the last few decades.

48. Baker, *supra* note 42, at 30. Indeed, there is evidence that neither courts nor expert antitrust agencies perform particularly well in antitrust disputes involving sophisticated economics. See Michael R. Baye & Joshua D. Wright, *Is Antitrust Too Complicated for Generalist Judges? The Impact of Economic Complexity and Judicial Training on Appeals*, 54 J.L. & ECON. 1 (2011); Joshua D. Wright & Angela M. Diveley, *Do Expert Agencies Outperform Generalist Judges? Some Preliminary Evidence from the Federal Trade Commission*, 1 J. ANTITRUST ENFORCEMENT 82 (2013).

49. *United States v. Microsoft Corp.*, 253 F.3d 34, 58 (D.C. Cir. 2001).

50. *Fed. Trade Comm’n v. Qualcomm Inc.*, 411 F. Supp. 3d 658 (N.D. Cal. 2019).

51. *Fed. Trade Comm’n v. Qualcomm Inc.*, 969 F.3d 974, 998 (9th Cir. 2020).

business practice at first appeared to be anticompetitive, but in fact was disruptive in a manner that was beneficial to consumers.”⁵² The court emphasized that “novel business practices – especially in technology markets – should not be ‘conclusively presumed to be unreasonable and therefore illegal without elaborate inquiry as to the precise harm they have caused or the business excuse for their use.’”⁵³

Antitrust’s history is also replete with Type I errors from courts succumbing to the intuition to condemn what they do not understand. Nobel Laureate Ronald Coase decades ago described this phenomenon among economists while lamenting the state of the industrial-organization literature: “[I]f an economist finds something . . . that he does not understand, he looks for a monopoly explanation. And as in this field we are very ignorant, the number of understandable practices tends to be rather large, and the reliance on a monopoly explanation, frequent.”⁵⁴ That tendency has, if anything, increased since Coase’s initial observation. Antitrust economists were not alone in tending toward monopoly explanations of new or persistently misunderstood practices. Courts relying upon the model of perfect competition, years after it had been disregarded by most economists as a model of individual firm behavior, were quick to condemn real-world market arrangements that did not match the model.⁵⁵ Courts have been especially prone to Type I error in cases involving novel business practices and innovation – a tendency sufficiently ingrained in antitrust institutions to earn its own label – the “inhospitality tradition.”⁵⁶ Resale price maintenance, franchise tying, exclusive dealing, exclusive territories, block booking, shelf-space contracts, and other nonstandard contractual forms have each been subjected to harsh antitrust treatment before an increase in our understanding of their competitive effects resulted in scrutiny being relaxed.⁵⁷

And indeed, the stakes of these errors are considerably greater in digital markets. There is clear empirical evidence of the massive welfare gains consumers realize from business innovation in the digital sector. Economists have estimated the impact of Uber on consumers in ride-sharing markets, finding customers

52. *Id.* at 1003.

53. *Id.* at 990-91 (quoting *United States v. Microsoft Corp.*, 253 F.3d 34, 91 (D.C. Cir. 2001)).

54. R.H. Coase, *Industrial Organization: A Proposal for Research*, in 3 POLICY ISSUES AND RESEARCH OPPORTUNITIES IN INDUSTRIAL ORGANIZATION 59, 67 (Victor R. Fuchs ed., 1972).

55. See Harold Demsetz, *How Many Cheers for Antitrust’s 100 Years?*, 30 ECON. INQUIRY 207 (1992); Alan J. Meese, *Market Failure and Non-Standard Contracting: How the Ghost of Perfect Competition Still Haunts Antitrust*, 1 J. COMPETITION L. & ECON. 21 (2005).

56. See Elyse Dorsey, *Anything You Can Do, I Can Do Better—Except in Big Tech?: Antitrust’s New Inhospitality Tradition*, 68 KAN. L. REV. 975 (2020); Geoffrey A. Manne & Joshua D. Wright, *Innovation and the Limits of Antitrust*, 6 J. COMPETITION L. & ECON. 153, 164-78 (2010).

57. See Manne & Wright, *supra* note 56, at 183-86.

enjoy billions of dollars of consumer surplus.⁵⁸ Other studies show the median consumer gains at about \$17,500 a year in surplus from search engines alone and other significant surplus gains from using other social media.⁵⁹ The costs of Type I error are especially heightened when they invite condemning altogether, or tinkering with, business-design decisions that generate massive amounts of consumer surplus. These consumer-surplus figures attempt to estimate the gains to consumers from interacting with digital platforms and products as a whole. The stakes are high. And while proponents of greater antitrust intervention in digital markets usually do not go so far as to promote banning these products – though some do⁶⁰ – they seek antitrust action to fundamentally alter the structure and performance of these products and firms. Recent examples include proposals to ban outright acquisitions by corporations with market capitalizations above a certain size threshold or otherwise impose arbitrary market-share tests to determine the legality of mergers;⁶¹ overturn unanimous and supermajority judicial precedents that are foundational to modern antitrust law;⁶² shift the burden of proof from plaintiffs to defendants to render large swaths of business behavior presumptively unlawful, including vertical integration by digital platforms;⁶³ and even break up major tech companies or their products without evidence of antitrust harm or that the remedy would make consumers better off.⁶⁴ These proposals have come from individuals of both parties. For example, Senator Josh Hawley (R-MO) has proposed a bill that would ban infinite scrolling and autoplay on apps and websites, and limit time on a platform to thirty minutes.⁶⁵

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58. Peter Cohen, Robert W. Hahn, Jonathan Hall, Steven D. Levitt & Robert Metcalfe, *Using Big Data to Estimate Consumer Surplus: The Case of Uber* 21 (Nat'l Bureau of Econ. Research, Working Paper No. 22627, 2016), <https://ssrn.com/abstract=2837639> [<https://perma.cc/9LDP-Q4DD>] (finding that the overall consumer surplus generated by UberX in the United States in 2015 was \$6.76 billion).
59. Erik Brynjolfsson, Avinash Collis & Felix Eggers, *Using Massive Online Choice Experiments to Measure Changes in Well-Being*, 116 PROC. NAT'L ACAD. SCI. U.S. 7250, 7253 (2019).
60. See, e.g., Social Media Addiction Reduction Technology Act, S. 2314, 116th Cong. (2019).
61. See, e.g., Merger Enforcement Improvement Act, S. 306, 116th Cong. (2019); see also Frank Pasquale & Maurice E. Stucke, *The Federal Trade Commission and the Department of Justice Should Abandon the Proposed Vertical Merger Guidelines and Embrace the Framework of the 1968 Guidelines*, OPEN MARKETS INST. (Feb. 26, 2020), <https://static1.squarespace.com/static/5e449c8c3ef68d752f3e70dc/t/5ed15a1eed759012fc383c55/1590778404820/Comment-to-FTC-DOJ-re-Vertical-Merger-Guidelines.pdf> [<https://perma.cc/7FXL-6UEJ>].
62. See, e.g., Anticompetitive Exclusionary Conduct Prevention Act of 2020, S. 3426, 116th Cong. § 4 (2020); Equitable Growth Letter, *supra* note 2.
63. See, e.g., S. 3426, 116th Cong. (2020).
64. Warren, *supra* note 2.
65. Social Media Addiction Reduction Technology Act, S. 2314, 116th Cong. (2019).

Economic theory and empirical evidence corroborate Easterbrook's assumption and substantiate its well-established role in modern antitrust law. Taking Easterbrook's assumption as given opens a window to fresh thinking about how to achieve error-cost minimization in digital markets—beyond adjusting substantive rules or calibrating fines, and toward the use of antitrust process as an instrument to improve outcomes. We turn to this analysis in Part III.

III. ANTITRUST STANDARDS OF PROOF AND THE EASTERBROOK THEOREM

Whenever courts make an antitrust decision that implicitly or explicitly weighs the two types of judicial error, Easterbrook's assumption becomes relevant. Such decisions may involve questions of law (for instance, when the implications of prior precedent on the issue at hand are ambiguous) as well as questions of fact (for instance, when the evidence at hand does not unambiguously support one verdict or another).

As we previously noted, the substantive legal implications of Easterbrook's assumption have been discussed extensively. Here, we focus upon the implications of this assumption vis-à-vis optimal procedural tools, and we operationalize these ideas through a model that formalizes the standard of proof used in trials. First, in Section III.A, we describe the economic approach to evidence and errors. In Section III.B, we formalize standards of proof, and explain the properties of the preponderance-of-the-evidence standard. Finally, in Section III.C, we introduce the expected costs associated with trial decisions and explain how they are related to the applicable standard of proof. This Section also contains a summary of our findings and presentation of the Easterbrook Theorem—that is, our finding that the optimal standards of proof are stricter than “preponderance of evidence” in the antitrust context when Type I errors are more costly than Type II errors.

A. Evidence

To formalize judicial errors, a common method used in the economics literature is to explicitly model an evidence-generating process.⁶⁶ In these processes, x , which represents evidence, is emitted by different types of defendants (e.g., guilty versus innocent), with different probabilities (e.g., in a murder case, a knife on the victim with the defendant's finger prints is more likely to be generated as evidence if the defendant is guilty versus innocent). Thus, it is natural to

66. See, e.g., Demougín & Fluet, *supra* note 9; Murat C. Mungan, *Justifications, Excuses, and Affirmative Defenses*, 36 J.L. ECON. & ORG. 343 (2020).

model x as a random variable, which takes on different values with different probabilities, and these probabilities depend on the type of the defendant.

The values that x may take lie in an interval, and are ordered according to how indicative evidence is of a certain fact.⁶⁷ In our context, we let x lie in the interval $(0,1)$, such that greater values of x are more indicative of the defendant engaging in anticompetitive conduct. Mathematically, this is formalized by letting $f_a(x)$ and $f_p(x)$ denote the probability density functions that describe the likelihood with which x takes a particular value for anticompetitive defendants and procompetitive defendants, respectively, and letting $f_a(x)/f_p(x)$ be strictly increasing in x .⁶⁸

In these settings, it is very natural to model the court's decision-making process as one which involves finding anticompetitive behavior only if the evidence is sufficiently strong, that is, only if x is sufficiently large. Formally, this corresponds to choosing a *threshold strength of evidence*, x^s , such that the defendant is found to have engaged in anticompetitive behavior, if, and only if, $x > x^s$. To get a better understanding of how this threshold affects the likelihood with which various outcomes are obtained, it is useful to start by considering two extreme cases: One where x^s is set to equal 0 and one where it is set to equal 1.

When $x^s = 0$, it follows that the court is using the lowest evidence threshold possible to condemn the defendant's behavior as anticompetitive. In fact, since $x \in (0,1)$ —that is all possible values of x are between 0 and 1—all possible evidence meets the court's threshold. Thus, if the defendant has in fact engaged in anticompetitive conduct, it follows that the court correctly finds its behavior to be anticompetitive with certainty. On the other hand, if the defendant's conduct was in fact procompetitive, it follows that the court always incorrectly condemns its behavior as being anticompetitive. This observation can be more compactly expressed by defining $\alpha(x^s)$ and $\beta(x^s)$ as the probabilities of committing Type I and Type II errors, respectively, as functions of x^s : in other words, wrongfully condemning procompetitive behavior or incorrectly finding anticompetitive behavior to be benign are functions of the threshold evidence. The previous observations then can be expressed as $\alpha(0) = 1$ and $\beta(0) = 0$. This means that when the smallest evidence threshold is used, all defendants are found liable. Therefore, the probability of Type I error is 100% whereas the probability of Type II error is 0%. Conversely, when $x^s = 1$, it follows that the court never views the

67. In the economics literature, this is formalized through the 'monotone likelihood ratio property,' often abbreviated as MLRP. Demougin & Fluet, *supra* note 9, at 198.

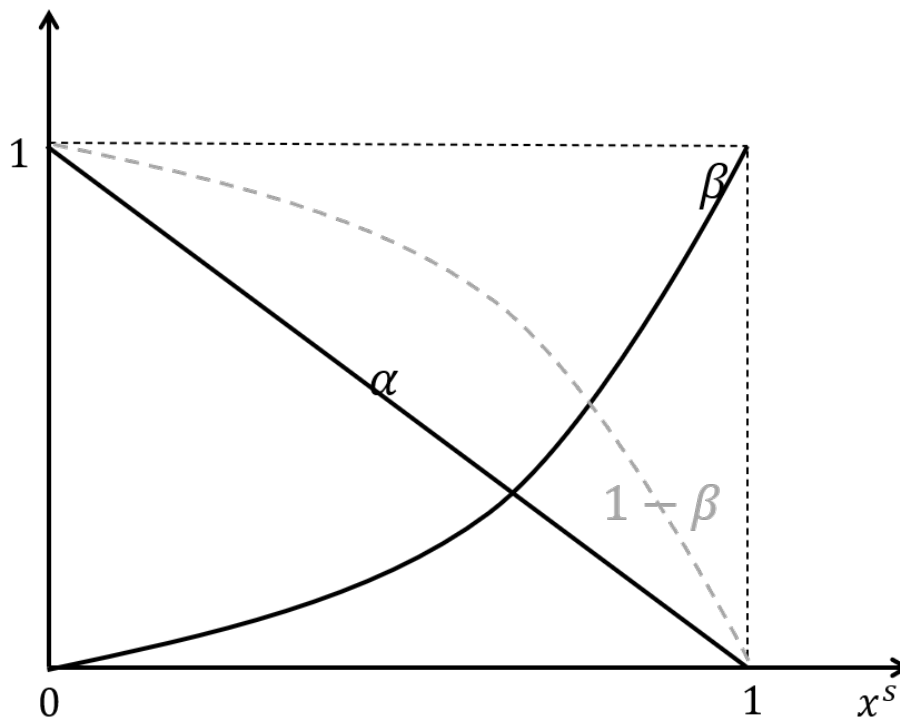
68. This is the monotone likelihood ratio property referenced in note 67, *supra*. Uses of "increasing" throughout this Essay should be understood to refer to *strictly* increasing.

evidence brought forth by defendants as sufficient to demonstrate that their behavior was anticompetitive. Thus, using our previous notation, it follows that $\alpha(1) = 0$ and $\beta(1) = 1$.

The above observations relate unrealistic cases where the court chooses extreme evidence thresholds. However, they are useful for demonstrating how the evidence threshold affects the probabilities of Type I and Type II error: as the evidence threshold is increased, the probability of Type I error is decreased, but the probability of Type II error is increased. In other words, by altering the applicable evidentiary threshold, one trades off the probability of wrongfully finding an entity's procompetitive behavior as being anticompetitive for the opposite error of finding an entity's anticompetitive behavior as being procompetitive. This tradeoff can be represented by a figure that plots possible Type I and Type II errors, as follows.⁶⁹

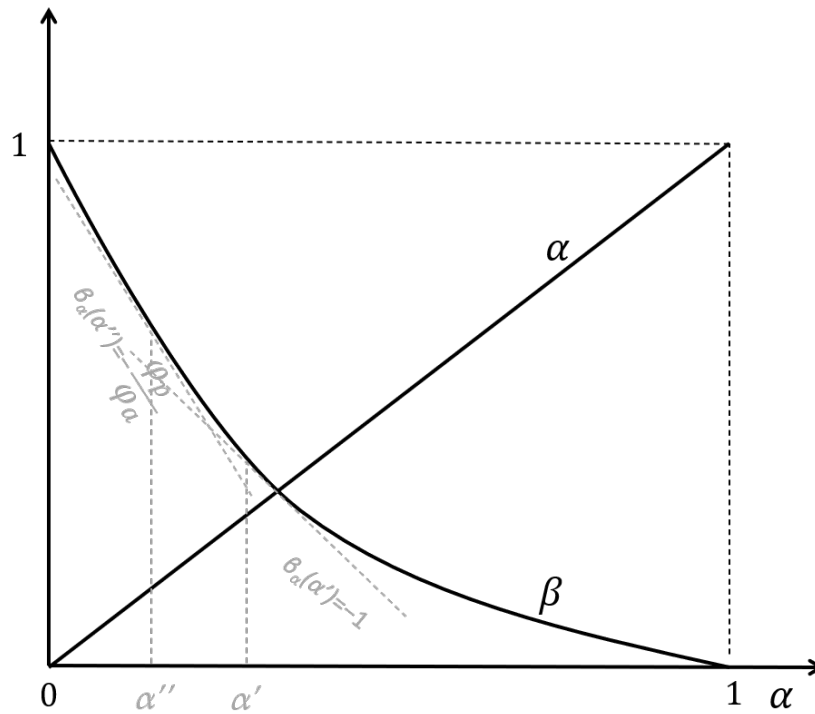
69. Figure 1 is used only to depict the directions towards which Type I and Type II errors move, that is that α is increasing and that β is decreasing in x^s . The absolute curvatures of the α and β curves carry no significance, but their relation to each other, which is captured by Figure 2, does. In fact, one can transform the signal x , into another, equivalent signal which can cause the absolute curvature of α and β to change. Here, we depict a case where the signal is such that the slope of α is constant with respect to x^s for expositional convenience.

FIGURE 1.
 PROBABILITIES OF TYPE I ERROR (α); TYPE II ERROR (β); AND CORRECT FINDING OF
 ANTICOMPETITIVE BEHAVIOR ($1 - \beta$) AS A FUNCTION OF EVIDENTIARY THRESHOLDS (x^s)



As can be inferred from Figure 1, although α and β are generated by the court's threshold evidence choice, x^s , it is possible, and also more convenient, to express β as a function of α . We illustrate the relationship between these two errors in Figure 2, which we later use to refer to the preponderance of the evidence standard, and in the remainder of the analysis, we describe β as a function of α , and write $\beta(\alpha)$.

FIGURE 2.
THE PROBABILITY OF TYPE-II ERROR (β); AS A FUNCTION OF TYPE-I ERROR (α)



We also note that the tradeoff between the two errors possesses an intuitive ‘diminishing returns’ property: the extent to which Type II errors are reduced through a unit increase in Type I errors gets smaller as more and more Type I errors are committed. This is because such changes in the two errors are obtained by relaxing the evidentiary threshold, which makes it possible for defendants to be found liable based on weaker evidence. But weaker evidence is less capable of distinguishing between procompetitive and anticompetitive defendants. This means that weak evidence is produced relatively more frequently by procompetitive defendants than anticompetitive defendants. Thus, there are diminishing marginal returns to relaxing the evidentiary threshold: relaxing the evidentiary threshold causes the probability of Type I errors to increase. But for each unit increase in the probability of Type I errors, the reduction in Type II errors gets smaller and smaller as weaker and weaker evidence is deemed acceptable for findings of liability.⁷⁰

70. A slightly more formal and compact explanation of the same dynamic is as follows. A marginal reduction in the threshold evidence causes an increase of $f_p(x^s)$ in α and a reduction of $f_a(x^s)$

This is reflected by the fact that the rate at which $\beta(\alpha)$ is decreasing is itself decreasing (more formally, by the fact that $\beta(\alpha)$ is convex). As noted in the prior literature, this property is general and follows from the fact that $f_a(x)/f_p(x)$ is increasing.⁷¹ This is an important property which is useful in identifying the optimal standard proof, both here, and in the prior literature.

B. Standards of Proof and Preponderance of the Evidence

Given our previous observations about how Type II errors can be expressed as a function of Type I error, one can characterize various standards of proof with reference to the Type I errors used by courts. One particular standard of proof, namely preponderance of the evidence, has naturally received a lot of attention in the literature.⁷² Courts have often used the phrase “more likely than not” to describe this standard.

Although this description appears quite precise at first glance, it does not unambiguously define a specific standard of proof. An important ambiguity in this definition is, for instance, whether (i) an anticompetitive firm must generate the evidence in question more frequently than a procompetitive firm; or (ii) whether the evidence must more likely be produced by an anticompetitive firm versus a procompetitive firm. These two statements define quite different standards, as we explain below, and there is disagreement among law and economics scholars about which of the two definitions actually corresponds to preponderance of the evidence.

The first of these statements defines a standard which would find anticompetitive behavior whenever the evidence, x , is such that $f_a(x) > f_p(x)$, that is when x is such that an anticompetitive firm emits it more frequently than a procompetitive firm. This is equivalent to using an evidence threshold, x' , such that

$$\frac{f_a(x')}{f_p(x')} = 1 \quad (1)$$

As noted in the prior literature, this requirement is met when a small increase in the evidentiary threshold reduces Type I errors exactly as much as it increases Type II errors.⁷³ This condition can alternatively be expressed as $\beta_\alpha(\alpha') = -1$,

in β . Due to MLRP, $f_a(x)/f_p(x)$ is increasing. Thus, β is convex in α . We also note that this property has been noted in many previous articles, and the intuition behind it is explained in further detail in Mungan, *supra* note 66.

71. See, e.g., Mungan, *supra* note 66.

72. See, e.g., Demougis & Fluet, *supra* note 9.

73. See, e.g., *id.* (making this observation and explaining the properties of the evidence threshold that is characterized by this condition). See also Mungan, *supra* note 66, at 354, and the references cited therein, which rely on the same observation.

where β_α refers to the slope of β (as depicted in Figure 2, above) and α' is the Type I error generated by the threshold, x' . This is because when $\beta_\alpha(\alpha') = -1$, a marginal increase in α reduces β by exactly the same amount, which is implied by the condition in (1).

To describe the standard of proof that corresponds to the second definition, we need to introduce the proportions of anticompetitive and procompetitive defendants, which we denote by φ_a and φ_p , respectively. With this notation, according to the second definition of preponderance of the evidence, a court would find anticompetitive behavior if

$$P(a|x) = \frac{\varphi_a f_a(x)}{\varphi_p f_p(x) + \varphi_a f_a(x)} > \frac{\varphi_p f_p(x)}{\varphi_p f_p(x) + \varphi_a f_a(x)} = P(p|x) \quad (2)$$

This is because the probability that the firm is anticompetitive, given that the evidence x was observed and the proportion of anticompetitive firms is φ_a , is calculated according to Bayes's rule which yields $P(a|x)$ as noted in expression (2), above. Similarly, $P(p|x)$ denotes the probability that the firm is procompetitive, given evidence x . Thus, we can simplify the expression in (2), to note that the second definition of preponderance of the evidence requires a finding of anticompetitive behavior whenever $\varphi_a f_a(x) > \varphi_p f_p(x)$. Thus, according to the second definition of preponderance of the evidence, a court would have to implement policies that find anticompetitive behavior when the evidence exceeds a threshold, x'' , such that

$$\frac{f_a(x'')}{f_p(x'')} = \frac{\varphi_p}{\varphi_a} \quad (3)$$

The condition expressed in (3) states that the ratio between the likelihoods with which an anticompetitive versus a procompetitive firm emits the signal evidence threshold x'' must be equal to the ratio of procompetitive to anticompetitive firms (as opposed to equaling 1 as in the former definition of preponderance of the evidence). As in the case of the first definition of preponderance of the evidence, α'' , the Type I error generated by the threshold, x'' , is such that $\beta_\alpha(\alpha'') = -\varphi_p/\varphi_a$, that is a marginal increase in α produces a reduction of φ_p/φ_a in β . When the proportion of procompetitive firms is greater than the proportion of anticompetitive firms, it follows that this standard generates a smaller Type I error compared to the standard characterized through the first definition, that is $\alpha'' < \alpha'$, as reflected in figure 2, above. Thus, in such cases, any standard of proof that is more demanding than the second definition of preponderance of the evidence is also more demanding than the first definition of preponderance of the evidence (since $\alpha < \alpha''$ implies that $\alpha < \alpha'$ when $\alpha'' < \alpha'$). We use this property in the next Section where we identify conditions, with reference to Easterbrook's assumptions, under which the optimal standard of

proof is stronger – meaning it requires stronger evidence of anticompetitive conduct, than preponderance of the evidence, and regardless of which of the two definitions of this standard is adopted.

C. Standards of Proof and Welfare

Having explained how evidence-generating processes, evidentiary thresholds, and standards of proof are related to each other, we next turn to the relationship between welfare and the standard of proof. To analyze this relationship in the simplest way, we follow a standard framework in the economics literature,⁷⁴ where the welfare objective is to minimize expected error costs. These costs, denoted $\psi(\alpha)$, equal⁷⁵

$$\psi(\alpha) = \alpha\varphi_p c_p + \beta(\alpha)\varphi_a c_a \quad (4)$$

where c_p and c_a correspond to the costs of committing a Type I error (i.e., finding procompetitive conduct to be anticompetitive) and Type II error (i.e., finding anticompetitive conduct to be procompetitive), respectively, and the other terms are as defined in Sections III.A. and III.B.

Minimizing these costs naturally requires increasing α as long as doing so reduces costs due to Type II errors (i.e., the second term above) more than it increases costs due to Type I errors (i.e., the first term above). Thus, the Type I error that minimizes $\psi(\alpha)$ is such that the marginal increase in Type I error costs, that is $\varphi_p c_p$ equals the marginal reduction in Type II error costs, that is $-\beta_\alpha(\alpha)\varphi_a c_a$. Equating these two expressions reveals that the cost minimizing Type I error, denoted α^0 , is such that

$$\beta_\alpha(\alpha^0) = -\frac{\varphi_p c_p}{\varphi_a c_a} \quad (5)$$

We conclude our analysis by comparing the standard that generates this Type I error to the two versions of the preponderance of the evidence standard defined in Section III.B. We summarize our findings through the following statement:

The Easterbrook Theorem: The optimal standard of proof is stronger than preponderance of the evidence, regardless of whether this standard is defined through (1) or (3) as long as $\varphi_p \geq \varphi_a$ and $c_p > c_a$.

Proof: *The convexity of β in α implies that $\alpha^0 < \alpha''$ if*

$$-\beta_\alpha(\alpha^0) = \frac{\varphi_p c_p}{\varphi_a c_a} > \frac{\varphi_p}{\varphi_a} = -\beta_\alpha(\alpha'')$$

74. See, e.g., Burtis et al., *supra* note 9, at 11.

75. This specification reflects the assumption made in this type of analysis that the frequencies of behavior, as well as the costs associated with each type error, are exogenously given. In Mungan & Wright, *supra* note 8, we take a complementary approach and focus on endogenously determined proportions and costs.

which follows from (3) and (5). This condition holds when $c_p > c_a$. Moreover, $\alpha'' \leq \alpha'$ when $\varphi_p \geq \varphi_a$ as explained in Section III.B. Thus, $\alpha^0 < \alpha'' \leq \alpha'$ when $\varphi_p \geq \varphi_a$ and $c_p > c_a$, which implies that the optimal standard requires more evidence than preponderance of the evidence, regardless of whether this standard is defined through (1) or (3).

Our theorem, which we name after Easterbrook, relies on Type I errors generating higher costs than Type II errors as well as the proportion of procompetitive defendants being greater than the proportion of anticompetitive defendants. When this is true, the optimal standard of proof places greater weight on reducing Type I errors than reducing Type II errors. This is accomplished by utilizing a standard of proof that is more demanding than both conceptions of preponderance of the evidence we previously discussed.

We also note some corollaries of our observations. Even when the proportion of procompetitive defendants is smaller than the proportion of anticompetitive defendants (i.e., $\varphi_p < \varphi_a$), but $c_p > c_a$, it still follows that the optimal standard of proof is more demanding than the second conception of preponderance of the evidence (i.e., that which is characterized by (3), above). If, additionally c_p exceeds $(\varphi_a/\varphi_p)c_a$, then the optimal standard of proof also exceeds the first conception of preponderance of the evidence, as well. This corresponds to a case where the cost of condemning procompetitive conduct exceeds the cost of failing to condemn anticompetitive conduct by a factor that exceeds the ratio of anticompetitive to procompetitive defendants. Thus, more general versions of our theorem can be formulated depending on the which of the two conceptions of preponderance of the evidence the optimal standard of proof is compared against.

D. Application to Digital Markets

Our findings suggest that, taking the Easterbrook assumption as given, the optimal standard of proof is stronger than the preponderance of the evidence standard. This approach stands in stark contrast to more grandiose proposals for antitrust reform in digital markets, such as calls to create a new tech-specific regulator;⁷⁶ to abandon the consumer welfare standard;⁷⁷ to adopt arbitrary market share tests for mergers;⁷⁸ or to shift the burden of proof in ways that may render

76. Stigler Comm. on Dig. Platforms, *supra* note 2, at 18 (2019).

77. See, e.g., Tim Wu, *After Consumer Welfare, Now What? The "Protection of Competition" Standard in Practice*, COMPETITION POL'Y INT'L, 2018; COLUM. PUB. L. RES. CTR. (2018); Steinbaum & Stucke, *supra* note 2; Vaheesan, *supra* note 2.

78. See, e.g., Merger Enforcement Improvement Act, S. 306, 116th Cong. (2019).

large swaths of platform activity presumptively unlawful.⁷⁹ Our analysis is consistent with the recent Ninth Circuit decision in *FTC v. Qualcomm*, which emphasizes the risk of Type I error in digital markets and high-tech industries, and “declin[e] to ascribe antitrust liability in these dynamic and rapidly changing technology markets without clearer proof of anticompetitive effect.”⁸⁰ While the Ninth Circuit applied the preponderance of evidence standard, and it made clear the FTC did not carry even that burden, the court’s reasoning is consistent with our analysis of the benefits of increasing the burden facing plaintiffs in monopolization cases in digital markets in order to avoid the social costs of Type I error.

Our findings counsel rejecting such approaches in favor of case-by-case adjudication, rather than a revolution in antitrust institutions. The economics encourage a careful analysis that would ensure monopolization is actually occurring while rejecting weak inferences and speculation about potential harm in high-tech markets in favor of evidence of actual harm.⁸¹ While elements of this approach are already present in substantive doctrine,⁸² our course explores achieving optimal deterrence through evidentiary standards—leaving substantive doctrine intact.

As compared with other proposals, adjusting evidentiary standards has the advantage of judicial experience with tighter evidentiary standards in other contexts. Higher standards of proof would offer a road-tested means by which courts could filter out attempts by competitors to game advantages through antitrust litigation,⁸³ while preserving consumers’ ability to seek redress against traditional antitrust violations. These higher standards of proof also militate against the more tenuous antitrust theories of harm—such as the monopoly-broth theory in the *Qualcomm* case—which rest on a foundation of inferences that would crumble under a tighter evidentiary standard.⁸⁴

79. Anticompetitive Exclusionary Conduct Prevention Act of 2020, S. 3426, 116th Cong. § 4 (2020).

80. *FTC v. Qualcomm Inc.*, 969 F.3d 974, 1004 (9th Cir. 2020).

81. See Manne & Wright, *supra* note 56.

82. See *Verizon Commc’ns Inc. v. Law Offices of Curtis V. Trinko, LLP*, 540 U.S. 398, 414 (2004) (“Against the slight benefits of antitrust intervention here, we must weigh a realistic assessment of its costs. Under the best of circumstances, applying the requirements of § 2 can be difficult because the means of illicit exclusion, like the means of legitimate competition, are myriad. Mistaken inferences and the resulting false condemnations are especially costly, because they chill the very conduct the antitrust laws are designed to protect.” (internal citations and quotations omitted)).

83. See McAfee & Vakkur, *supra* note 41.

84. See *Qualcomm*, 969 F.3d at 994-97.

CONCLUSION

The assumption that erroneous findings of anticompetitive behavior carry greater costs than false findings of procompetitive behavior is integrated deeply into substantive antitrust law. We believe the assumption that markets have a comparative advantage over legal systems in correcting error is well founded as a matter of economic theory and supported by empirical evidence. This should especially be the case for novel products and business methods, such as in digital markets, where platform elements add a dimension of complexity—lest we repeat the sorry history of antitrust’s inhospitality tradition. While academics have debated the assumption, there is no debate that the Supreme Court and lower federal courts have endorsed the proposition repeatedly. Antitrust scholarship has focused primarily upon the implications of this assumption for the efficiency of substantive antitrust laws. Here, we consider the implications of this assumption on the use of procedure—the standard of proof in particular—to enhance the performance of antitrust institutions with a special focus on digital markets. Our findings suggest that, taking the Easterbrook assumption as given, the optimal standard of proof is stronger than the preponderance of the evidence standard. This conclusion is robust to how one specifies the preponderance of the evidence standard. Our conclusion lies in stark contrast to contemporary proposals to reduce or eliminate the burden of proof facing antitrust plaintiffs in digital markets.

Joshua D. Wright is a University Professor and the Executive Director, Global Antitrust Institute, Scalia Law School at George Mason University. Murat C. Mungan is a Professor of Law, Scalia Law School at George Mason University. We thank Alexander Krzepicki for excellent research assistance.