

Just Like Rube Goldberg

How Courts Assess Model-Based Arguments in Antitrust Cases

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Abstract

Despite its wide use by expert witnesses, it is not clear to what extent economic theory influences final decisions in the courts. Here the performance of industrial organization models in antitrust courts is examined and some reasons are given to explain why courts often find model-based arguments either irrelevant or not credible.

Keywords: antitrust law, industrial organization, game theory, expert witness, merger review

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1. Two views of economics as a tool in antitrust litigation

Jorge Padilla (2022) recently summarized the job of the court in antitrust litigation: to make a decision by assessing the Plaintiff's narrative or "theory of harm", and the Defendant's efficiency defense considering the available evidence (which may include factual evidence, documentary evidence, and economic evidence). Economic theory informs each stage of litigation. The theory of harm relies on economic theory to define the relevant market based on patterns of consumer substitution, barriers to entry, and other factors. It also uses economic theory to demonstrate the anticompetitive effects of the defendant's conduct in

* Contact: edoardoperuzzi96@gmail.com. This paper is a preliminary draft that aims to extend my previous work on the application of models in antitrust courts, which was limited to the analysis of the *Daubert* standard against model-based arguments. Feedback is warmly welcome.

that market. By the same token, the defendant criticizes the plaintiff's market definition and argues that the conduct has a pro-competitive justification such as a decrease in marginal costs that will benefit consumers. The court, therefore, invariably finds itself involved in the analysis of economic arguments.¹

Most economists support the use of economic theory in antitrust courts. While some may be motivated by the lucrative source of income that comes from counseling parties and serving as expert witnesses on their behalf, many are also presumably motivated by the idea that proper science can help courts make better decisions. Carl Shapiro made a strong case for the beneficial impact that economics has had on antitrust enforcement:

Economics provides an indispensable way to sift through a mountain of evidence to better understand the likely economic effects of various business practices in comparison with some suitable counterfactual. Economics is not “pro-defense” or “pro-plaintiff.” Properly used, economics instructs us *what to look for* in a given case to assess effects. (Shapiro 2021a, p. 39, original emphasis)

Economics provides a neutral tool that, in the hands of experts, helps decision-makers understand the effects of firms' conduct in a variety of markets. To be sure, many other factors beyond economic reasoning, such as how the courts apportion burdens of proof and set the legal standards, routinely influence judicial decision-making. However, in Shapiro's optimistic view, economics (and, therefore, the economist *qua* economics expert) ideally helps the court take correct decisions, that is, convict the guilty firms and acquit the innocent ones.²

¹ Recent empirical research confirmed the rise in economic reasoning and language in antitrust judicial decisions (Ash, Chen, and Naidu 2022; Baker and Bresnahan 2006; Cao 2022).

² See also: Hovenkamp and Shapiro (2018), Hovenkamp (2021), and Shapiro (2021a).

A few economists and antitrust practitioners, however, have taken a more pessimistic view on the relationship between courts and economic analysis. Their pessimism is rooted in two key concerns. First, do judges really assess complex economic arguments in practice? Second, are they capable of understanding such arguments? Baye and Wright (2011) found that decisions involving the evaluation of complex economic arguments are more likely to be appealed. If the fact that a party is willing to bear the cost of appealing a judge's opinion signals that a judge made a potentially reversible error, then the evidence supports the hypothesis that some antitrust cases are too complicated for generalist judges.

Lopatka (2016) similarly pointed out that to win in the court a party must now employ complex economic analysis which both judges and jurors are typically unable to understand.³ The likely result of this state of affairs, he warned, is that fact-finders will make a decision regardless of the economic analysis proposed by the parties, thus undermining the very purpose of its use in court. Eventually, a concern about the increased economic complexity of antitrust cases came from scholars who advocated greater use of the court-appointed experts in civil cases. The more frequent use of court-appointed experts, a position pioneered by Richard Posner (1999), aims precisely to reduce the gap between conflicting arguments by expert witnesses and decision-makers in areas of law that rely on scientific and technical evidence such as antitrust, employment discrimination, and intellectual property.⁴

³ Judges can screen out unreliable expert testimony through the *Daubert* test but they cannot exclude testimony just because it is too complex for jurors. See below, Sec. 3. On application of the *Daubert* to antitrust economics, see e.g. Giocoli (2020) and Peruzzi (2022).

⁴ For an analysis of the benefits of court-appointed experts see Rubinfeld and Cecil (2018), and Sidak (2013).

The debate on the role of economics in antitrust litigation hit the headlines in the aftermath of the 2018 *AT&T/Time Warner*⁵ merger lawsuit where Judge Richard Leon ridiculed the bargaining model offered by the Justice Department’s economic expert Carl Shapiro as a Rube Goldberg machine deprived of any factual content.⁶ The parallel between Shapiro’s economic model and a Rube Goldberg machine – a contraption intentionally designed to perform a simple task in an indirect and overly complicated way – sounds almost insulting for a science that makes models its main theoretical tool. As a result, a number of leading antitrust economists seized on the *AT&T/Warner* case to reopen the discussion on the perks and perils of using complex economic arguments in antitrust cases (Carlton and Israel, 2021; Katz 2021; Salop 2021; Shapiro 2021a, 2021b).

This paper studies whether antitrust courts engage with complex economic arguments and how they do so in practice. Specifically, I will study courts' reactions to the use of economic models by litigating parties in a body of antitrust cases in which federal courts have issued decisions over the past two decades. The analysis that follows rests on the hypothesis that courts' attitudes toward the use of economic theory can be observed (or proxied) by studying how they react to the use of model-based arguments by expert witnesses in their written opinions and oral testimonies. Arguably, model-based arguments are difficult for a generalist judge to understand, and assessing their

⁵ *United States vs. AT&T Inc.*, 310 F. Supp. 3d 161 (DC District Court, June 2018). The case has been somewhat emphatically described as the “antitrust trial of the century.” <https://www.hollywoodreporter.com/news/politics-news/trump-time-warner-at-t-how-win-antitrust-trial-century-1092542/>.

⁶ ‘After hearing Professor Shapiro's bargaining model described in open Court, I wondered on the record whether its complexity made it seem like a Rube Goldberg contraption. [...] The evidence at trial showed that Professor Shapiro’s model lacks both “reliability and factual credibility,” and thus fails to generate probative predictions of future harm.’ (*AT&T/Warner*, 2018, p. 149)

adequacy to the case at hand requires a high level of cognitive effort by the court. Therefore, model-based arguments can be considered complex economic arguments, and their study can shed light on the relationship between economic theory and antitrust enforcement and the related debate.

2. Economic models make their entry into the federal courts

The *Handbook of Industrial Organization* (Schmalensee and Willig, 1989) – the *summa* of the 1980s “game-theoretic turn” in industrial organization (IO) – came to life with two notable shortcomings: very little empirical work and no immediate application to its most natural field, antitrust policy.⁷ The *Handbook* was mainly a theoretical enterprise to use the tools of game theory to study various forms of business strategies adopted by firms to create and maintain market power. Historians of economics have highlighted that academic consensus quickly emerged around the new methodology so much so that, after its appearance in the early 1980s, “by the end of the decade, [the game-theoretic approach] had already conquered the discipline.” (Giocoli, 2015, p. 102)⁸

Academic consensus notwithstanding, however, even the staunchest advocates of the game-theoretic turn in IO acknowledged that an imbalance existed in favor of theory over empirical work and hoped in the following years to bridge the gap between the two. Carl Shapiro (1989) ended his apologetic survey of the new game-theoretic wave in IO by saying that “for the theory of business strategy ultimately to demonstrate its utility and stand the test of time, it must prove helpful in analyzing particular industries or identifying behavioral regularities that apply across industries.” (p. 134)

⁷ On the history of the game-theoretic approach to economics see e.g. Crane 2009, and Yoo (2020).

⁸ To be sure, a number of leading IO economists bitterly objected to the new status quo, especially in relation to the usefulness of game theory for oligopoly theory and antitrust policy. See Fisher (1989), Peltzman (1991), and Sutton (1991).

Similarly, Tim Bresnahan (1992) contended that “recent theoretical work on entry and entry barriers [...] has not emphasized links to observables. To use theory in a direct way, it seems, we must draw dozens of analytical distinctions about strategy, information, and irreversibility – very hard concepts to make operational. This makes it difficult to use the new theory for the study of entry in the world. This has limited its utility in policy analysis.” (pp. 137-138)

Even worse, the first edition of the *Handbook* had no separate chapter on the application of the new techniques and results to antitrust policy. This disappointed those scholars such as MIT economist and antitrust expert witness Franklin Fisher (1991) for whom “much of the practical use of industrial organization comes in antitrust cases.” (p. 205)⁹ In a review article for the *Journal of Political Economy*, Chicago economist Sam Peltzman (1991) echoed Fisher’s complaint and lamented that “some of the chapters do have some discussion of antitrust policy, but in none is this the central theme.” (p. 203)¹⁰ The two criticisms were connected since without empirical work that would guide the application of game-theoretic models to real-world cases, there was no possibility of using such models for antitrust enforcement. Admittedly, the game-

⁹ “At least one principal aim of industrial organization”, Fisher (1991) claimed, should be to inform public policy toward, and court decisions about, competition or the lack thereof. In this respect progress – at least as revealed by the *Handbook* – has not been remarkably rapid (nor has it been absent).” (p. 223)

¹⁰ Incidentally, Peltzman also regretted the *Handbook* overlooked the Chicago approach to antitrust policy with its skepticism about claims of predatory pricing and greater tolerance of vertical restraints. “The *Handbook*”, he said, “is also virtually silent on recent developments in antitrust policy. [...] An academic literature straddling the boundary of law and economics parallels each of these developments. But both the profound policy changes and the associated literature are essentially ignored in the *Handbook*.” (p. 215) Medema (2011) provides an overview of the Chicago law and economics movement.

theoretic approach did not immediately influence antitrust courts, where the only Supreme Court’s decision inspired by the new IO literature was *Kodak*.¹¹

Thirty years later the situation looks very different. Empirical studies, most of them tightly related to antitrust and competition policy issues, are a very active field in contemporary IO. The 2021 volume of the *Handbook*, for instance, hosted a series of chapters that delve into the analysis of specific industries (including financial markets, health care, energy, and environmental markets) and one chapter that explicitly examines the developments in economic research relating to antitrust (Asker and Nocke, 2021). “The body of research we discuss”, they argue, “illustrates the highly productive complementarity of theory and the various modes of empirical work in advancing knowledge in the area of antitrust economics” (p. 179). Merger simulation represents the epitome of this synergy between theoretical models and empirical work: post-merger prices are predicted by positing a formal model of competition in the pre-merger market and estimating demand elasticities based on available data. As the *Handbook* editors proudly stated in the 2021 volume's preface, “the results of these many papers have had measurable effects on the real world, for example on antitrust policy and enforcement” (Ho, Hortaçsu, and Lizzeri, 2021, p. xv) In this sense, IO economists seem to have learned Fisher’s and Peltzman’s lessons. But is this true in practice? Is such complement between theoretical and empirical work reflected in antitrust courts?

3. An overview of industrial organization models in antitrust litigation

To provide an overview of the use of IO models and the court’s reception of model-based arguments in antitrust litigation, I surveyed legal databases to find all judicial

¹¹ *Eastman Kodak Co. v. Image Technical Services Inc.*, 504 U.S. 451 (1992). See Goldfine and Vorrasi (2004) for an analysis of *Kodak*’s decision and its relatively small impact on subsequent case law.

opinions that refer to economic models employed by expert witnesses in their written reports and oral testimonies (see Table 2, Appendix). The relevant cases span from March 2000 to November 2022 and include some of the most important antitrust litigation of recent years such as *AT&T/Werner's* successful vertical merger and Penguin Random House's proposed acquisition of its rival Simon & Schuster.¹² Among the 22 cases, 13 were litigated by federal authorities – Federal Trade Commission (FTC) and Department of Justice (DOJ) – to halt mergers under violation of Section 7 of the Clayton Act, thereby confirming the idea that federal authorities seem more ready to apply modern game-theoretic analysis in antitrust enforcement (Crane, 2011; Giocoli, 2015). The 9 remaining cases are private lawsuits that concern various exclusionary practices illegal under Sections 1 and 2 of the Sherman Act.

In seven instances, judges had to determine whether model-based arguments of expert witnesses were admissible under the *Daubert* standard.¹³ Economic experts were excluded three times, including the very first time a Cournot model was employed in a federal antitrust case.¹⁴ Elsewhere I have looked at *Daubert* challenges to model-based arguments in antitrust litigation (Peruzzi, 2022). Here I want to focus on the fifteen

¹² *United States v. Bertelsmann SE & Co. KGAA, et al.* WL 16949715 (D.D.C. Oct. 31, 2022). (“Penguin Random House”)

¹³ *Daubert v. Merrell Dow Pharm. Inc.*, 509 US 579 (1993). The *Daubert* standard and the ensuing Federal Rules of Evidence have assigned courts the role of *gatekeepers* for the admission of scientific experts – a role they must perform by ensuring that “any and all scientific testimony or evidence admitted is not only relevant, but reliable” (*Daubert*, 1993, p. 589).

¹⁴ Stanford economist Robert Hall saw his testimony excluded in *Concord Boat Corp. v. Brunswick* (207 F.3d 1039, 8th Cir., 2000) because the Cournot model proposed to describe the relevant market did not fit the economic realities of the case (see Werden, Froeb, and Scheffman, 2004, p. 89 ff.)

cases where model-based arguments were admitted at trial and discussed in detail in cross-examination and written opinions by federal courts.¹⁵

3.1. Some features of economic models employed in antitrust courts

Economic experts have employed IO models to quantify damages from anti-competitive behavior; predict the effects of mergers and other exclusionary practices on prices, output, and market concentration; and define the relevant antitrust markets. These models present two main characteristics. First, they are *narrowly targeted*, that is, they are built to describe the very specific market which is under scrutiny in the court case. Second, they are *empirical models* because they are the product of a series of activities that provide inputs, modify, and tailor theoretical models in order to obtain numerical results in connection to the party's goals.¹⁶ As a result, model-building for antitrust litigation is a very different practice from model-building in the academic context both in terms of aims and audience. While the former often aims at generality and addresses colleagues of comparable expertise, the latter strives to adhere to the facts of the case and addresses an audience of non-specialists.

In general, the outcome of empirical models cannot be directly tested against real-world evidence. Merger review, for instance, constitutes a predictive exercise where agencies try to show the competitive effects of a merger that has not happened yet. Federal agencies routinely employ economic models to predict those

¹⁵ I have looked only at the economic models used by the plaintiff's expert. In a few cases, the defendant's expert offered an alternative model. In most cases, however, the defendant's expert merely pointed out the limitations and weaknesses of the plaintiff's model.

¹⁶ Philosophical discussions of economic models have focused on theoretical models. Notable exceptions are Boumans (2005), Finestone (2022), and Hoover (2019). For an overview of the philosophy of economic models, see Juhn (2021).

anticompetitive effects but there is no way in which these predictions can be tested against real-world evidence at the trial.¹⁷ A similar scenario occurs in all those cases where economists must model what would have happened in the absence of certain alleged exclusionary practices. When consumer plaintiffs brought Google to trial in November 2022 for illegally monopolizing the Android app market with anticompetitive practices in the Google Play Store, they hired an economic expert to quantify the damages caused by Google's violations of federal antitrust laws.¹⁸ The plaintiffs' expert had to figure out the prices consumers would have paid for apps on the Play Store in a counterfactual world absent the challenged conduct.

Given the limitation in assessing the model's output against evidence, two types of methodological challenges can be distinguished: that of *model applicability* (whether the specific model proposed by the expert can be legitimately and usefully applied to the target domain), and that of the *expected success* of the model-based analysis (whether the application of the model to the case is sufficiently robust, based on input data of sufficiently high quality). Courts enjoy a high degree of discretion in assigning some weight to model-based arguments, but they generally evaluate both the applicability of the model and the expected success of the model-based analysis. The next section will provide an example of such an evaluation.

¹⁷ A growing literature on merger retrospectives examined the impact of consummated mergers and investigated their impact on markets. However, merger retrospectives are *ex-post* exercises with little applicability in legal proceedings. See Asker and Nocke (2021) for an overview of this literature.

¹⁸ *In re Google Play Store Antitrust Litig.*, 2022 U.S. Dist. LEXIS 213670, 2022 WL 17252587 (United States District Court for the Northern District of California November 28, 2022, Filed).

3.2. AT&T/Werner: a methodological analysis

In November 2017, the Justice Department (DOJ) filed a complaint to block a proposed vertical merger between the distributor of video content AT&T and the content provider Time Warner.¹⁹ According to the legal standard for vertical mergers, the plaintiff must introduce evidence sufficient to show that the challenged merger is likely to substantially lessen competition in the relevant market. DOJ's theory of harm relied heavily on the model-based analysis of its main economic expert witness, Berkeley professor Carl Shapiro. Both in his expert's report and deposition at trial he advanced the theory that the merged firm would raise the costs of rival distributors by charging them more for the Turner content. Given that content providers and distributors usually engaged in bilateral negotiations, Shapiro employed a Nash bargaining model to quantify how much the merger would raise rivals' costs.²⁰ His model predicted that the merger would give AT&T increased bargaining leverage in negotiations with rival distributors and, as a result, AT&T's rivals would experience an aggregate cost increase of \$731 million per year.²¹

At trial, AT&T lawyers – aided by their own economic expert, Chicago economist Dennis Carlton – attacked Shapiro's expert testimony in two distinct ways. First, they argued that the Nash bargaining model assumed away some relevant facts about the industry and, therefore, it rests on improper assumptions. In other words,

¹⁹ This case is suitable for a methodological analysis because, in addition to the court's written judgment, we also have the viewpoints of the plaintiff's expert Carl Shapiro and the defendant's expert Dennis Carlton (see Carlton and Israel 2021, p. 219 ff.; Shapiro 2021b). Both experts' credentials are hardly disputable.

²⁰ A certain ratio of the cost increase will be passed on from distributors to Pay TV households through higher prices. To estimate the impact of the merger on consumers Shapiro built a further model of downstream competition. See Shapiro (2021b, p. 328 ff.)

²¹ See Shapiro (2021b, p. 328).

AT&T argued that Shapiro's bargaining model did not share the relevant properties of the market under scrutiny and therefore it was not applicable. Second, the defendants maintained that even assuming that the empirical model is applicable, Shapiro did not use the correct inputs, and therefore the model's outcomes were not reliable.

[Defendants] asserted that the theory, as applied here, rests on improper assumptions including the notion that Turner could gain increased leverage from threatening a long-term blackout – that negates its usefulness in evaluating the real-world effects of the proposed merger. [...] defendants, both through their own experts and their examinations of industry witnesses, argue that Professor Shapiro's inputs are faulty, and note further that use of the proper inputs would cause the model to predict that the merger will have a net benefit to consumers rather than a net harm. (*AT&T/Werner*, 2018, p. 110)

The district court's ruling against the government relied heavily on the defendant's critique of Shapiro's model. First, Judge Leon agreed with the defendant's that the Nash bargaining model did not take into account the existing long-term contracts between Turner and distributors. These contracts were strategically signed before the trial and limited the ability of the merged firm to raise the price that it charged for the input to its downstream rivals. While every scientific model assumes away certain features of reality, both the district court and the appeals court held that ignoring such contracts undermined the applicability of Shapiro's model.²² Second, the district court sided with the defendants who argued that the DOJ's expert obtained the inputs of the Nash Bargaining model using unreliable methodologies. For instance, the Nash bargaining model requires as input the diversion rate, that is, the number of customers that AT&T

²² Indeed, the Appeals Court, while affirming the district court's decision, observed that "neither Professor's Shapiro opinion testimony nor his quantitative model considered the effect of the post-litigation offer or arbitration agreements, something he acknowledged would require a new model." *United States vs. AT&T, Inc.*, 916 F.3d 1029 (DC Circuit Court, February 2019), p. 1031.

would gain if it stopped selling the Turner content to rival distributors. As you might expect, the DOJ and AT&T have different opinions about the appropriate value for the diversion rate. Judge Richard Leon concluded that “the Government has also failed to provide adequate support for Professor Shapiro's diversion rate estimate and thus the model's predicted net harm.” (*AT&T*, 2018, p. 142)

3.3. The performance of model-based arguments

How have IO models employed by economic experts performed in antitrust courts? I broke down the result of the model-based arguments into three categories: (i) strengthen, corroborate; (ii) inapplicable or based on faulty inputs; (iii) consistent, but of limited relevance (see Table 1). Let us examine them in order.

In five cases the results obtained from the models strengthened the theory of harm put forward by the plaintiffs and help them win the litigation. A case in point was the attempted merger between book publisher Penguin Random House and rival Simon & Schuster. The court enjoined the merger relying upon, among other things, the prediction of the likely harm to book authors arising from the merger obtained using empirical models. Despite the fact that “models are imprecise and do not perfectly reflect the way books are acquired in the publishing industry”, the court concluded that “economic models generally corroborate the other evidence in the record that author advances would decrease in the wake of the merger.” (*Penguin Random House*, 2022, p. 77) At the other extreme, three courts have found model-based arguments to be detrimental for plaintiff's litigation strategy (the best example being *AT&T/Werner*).²³

²³ See above, Section 3.2. The other two cases are *United States v. Oracle Corp.*, 331 F. Supp. 2D 1098 (N.D. Cal. 2004) and *FTC v. Rag-Stiftung et al.*, 436 F. Supp. 3d 278 (D.D.C. 2020).

Table 1

Results	Cases	Total
Corroborate, strengthen	<i>Penguin Random House</i> (2021), <i>Optronic</i> (2021), <i>Wihlmsen</i> (2018), <i>Sysco</i> (2013), <i>In Re Universal</i> (2008)	5
Consistent, Hi limited relevance	<i>Peabody</i> (2020), <i>Tronox</i> (2018), <i>Advocate Health</i> (2017), <i>Anthem</i> (2017), <i>Aetna</i> (2017), <i>H&R Block</i> (2011), <i>CCC Holdings</i> (2009)	7
Inapplicable or based on faulty inputs	<i>Rag-Stiftung</i> (2020), <i>AT&T/Werner</i> (2018), <i>Oracle</i> (2004)	3
Admissible (Daubert)	<i>In Re Google Play Store</i> (2022), <i>In Re Namenda</i> (2021), <i>Castro</i> (2014), <i>Ticketmaster</i> (2003)	4
Not admissible (Daubert)	<i>Food Lion</i> (2012), <i>Heary Bros</i> (2003), <i>Concord Boat</i> (2000)	3

Being moot, however, is only slightly better than being irrelevant to the court’s decision. In seven cases the court found that the model-based argument was consistent with the theory of harm and the evidence proposed by the plaintiff at trial, but of limited relevance to its decision. A notable example of consistency and limited relevance was *Peabody*²⁴, where the FTC wanted to block a proposed joint venture by Peabody Energy and Arch Resources, arguing it would crush competition in a region that supplies 40% of America’s coal. The court was persuaded by the market definition offered by the FTC: while the merging parties argued that they competed with natural gas and renewables in a broader energy market, the FTC’s economic expert convinced the court that a smaller relevant market exists for Powder River Basin coal.

Having established the relevant antitrust market, the FTC had to establish a presumption of anticompetitive effects. The FTC’s expert witness employed both market-share arguments – showing a significant variation in the Herfindahl–Hirschman

²⁴ *FTC v. Peabody Energy Corp.*, 492 F. Supp. 3D 865 (E.d. Mo. 2020).

Index (HHI) after a merger – and model-based arguments.²⁵ Market-share arguments and model-based arguments serve different purposes. While the former is employed to create the presumption that the merger would substantially lessen competition, the latter tries to quantify the likely competitive effects on some variables of interest. The court might give discretionary weights to the two arguments. *Peabody* exemplifies a case where the court attributed far greater weight to the market-share argument than the model-based argument.

The court's decision to rely on market-share arguments may be the result of two mechanisms. First, the court did not put much confidence in model-based arguments and found that the HHI's variation was enough to justify a presumption of anticompetitive effects. Second, the judge believed in the usefulness of model-based arguments but she did not want to enter into the details of model-based arguments. When the court is already convinced by the market share argument, it might find no need to make a thorough evaluation of the pros and cons of the particular model-based argument. In *Peabody*, the latter mechanism seems to have been at work. Defendants objected to the FTC's expert application of the Cournot model on a number of grounds, most notably that it failed to incorporate dynamic risks such as coal plant closures and the growth of renewables. Facing a battle of experts on the appropriate modeling choices, the court washed its hands of the matter:

Ultimately, this Court need not decisively sift through various models and theories. [...] The FTC's HHI analysis created a “presumption that [the joint venture] will substantially lessen competition” by “showing that the [joint venture] will result in a significant market share and an undue increase in concentration.” (*Peabody*, 2020, p. 907)

²⁵ The Herfindahl-Hirschman Index (HHI) is a common measure of market concentration that varies from 0 to 10000. It is calculated squaring the market share of each firm competing in the market and then summing the resulting number.

Peabody's pattern was followed in six other cases, where the court relied almost entirely on variation in the HHI as evidence of the anticompetitive effect of a merger. Despite the effort of economic experts, in these cases model-based arguments were of little help to plaintiffs' theories of harm.²⁶

4. Conclusion: looking for an explanation

In 10 of the 15 cases in which model-based arguments were used in antitrust lawsuits, the court found such arguments either irrelevant or not credible. Here I will explore briefly three explanations of such outcome.

The first explanation draws upon the reasoning we have seen in Sec. 1 about how difficult it is for judges to understand complex economic arguments. Model-based arguments of the sort reviewed here require judges to master both the theoretical analysis of the strategic interaction between competitors in the relevant market and the econometric machinery involved in estimating model parameters using real-world data. Moreover, the adversarial nature of the US legal system usually brings before the court dual experts with diametrically opposed views of the same phenomenon. As the stakes are high, parties in antitrust litigation tend to hire economic experts whose credentials and academic standing are beyond question. In this setting, a generalist judge might have an incentive to simply resort to simpler rules of thumb and choose not to take sides in the battle of experts.

The second explanation also builds on ideas we have already seen, that is, the distrust among some economists and antitrust scholars about the game-theoretic turn in industrial organization. The absence of robust empirical generalizations that apply across various industries, the second explanation goes, would leave courts without bright-line rules that they could use in different cases with some degree of confidence.

²⁶ See Table 2, Appendix, Summary Statement.

Giocoli (2015) explored such a line of reasoning as a possible explanation for the persistence of Chicago School reasoning in US courts. “Judges”, he argued, “are called to decide on the specific case under scrutiny, so they must rely upon broad generalizations, robust enough to withstand the inevitable incompleteness of the trial record.” (p. 112)²⁷ This may help us understand why, while recognizing that the results of economic models are consistent with the party's proffered theory of harm, the court does not give them much weight in its ruling.

Finally, my analysis shows that defining the relevant market and demonstrating a substantial variation in the market shares is still critical to win antitrust litigation, especially in merger lawsuits. This result is interesting because it shows the mismatch between the practices of economists and judges. Since the 1980s, academic economists have attached little importance to antitrust market definition and measures of market concentration as a way to infer the potentially harmful consequences of firms' behavior. On the contrary, courts today still rely on market definition and increasing market concentration when making their decisions. The third explanation for the performance of model-based arguments, therefore, is that courts need the clear-cut rules which are offered by market concentration measures (e.g. if the HHI's variation in the relevant market pre and post-merger is above a given threshold, then the defendant's behavior presumably violated antitrust law). Since economic models do not offer such widely applicable rules and they must be assessed on a case-by-case basis, antitrust courts might tend to view them suspiciously.

²⁷ Coate and Fischer (2012) expressed a consonant position in connection to merger simulations. “[Game-theoretic] modeling structure has been used to define a general theory of firm behavior without any real empirical evidence. [...] Applied to mergers, generic unilateral effects game theory is mathematics, not validated economic science” (p. 152)

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Appendix

The search for cases was performed on *NexisUni* by looking for five different families of IO models: Cournot (or quantity-setting), Bertrand (or price-setting), bargaining models, auction models, and two-sided market models. An example of a string search is the following: “cournot near/3 model (narrow by: Antitrust & Trade Law)”. From the total output of the string search, I only selected cases with identifiable discussion about industrial organization models and, most of the time, identifiable experts. The output of the survey consists of 22 antitrust court cases spanning from March 2000 to November 2022 where model-based arguments have been presented before a judge or jurors by expert witnesses hired by the parties in litigation (see Table 1 below). Table 1 collects the date of the case, the alleged violation/topic, the model(s) employed, the purpose of the model(s), and the court which adjudicate the case. More importantly, I quote a short extract from the judicial opinion to represent the clearest expression of the court’s reception of the model-based arguments.

Table 2

Case	Date	Topic	Model	Purpose	Court	Summary Statement	Results
<i>In re Google Play Store Antitrust Litigation</i>	2022-11	Monopolization, sec. 1-2 Sherman Act	Rochet-Tirole two-sided market model	But-for take rate	N.D. Cal.	“Google has not demonstrated that unreliability or invalidity warrant exclusion of Dr. Singer’s opinions. [...] Exclusion of Dr. Singer’s opinions under Rule 702 is denied.”	Admissible
<i>United States v. Bertelsmann SE & Co. KGAA, et al.</i>	2022-08	Merger, Sec. 7 Clayton Act	Merger simulation/Second-score auction	Predict competitive effects	D.D.C.	“The economic models generally corroborate the other evidence in the record that author advances would decrease in the wake of the merger.”	Corroborate, strengthen
<i>Optronic Techs., Inc. v. Ningbo Sunny Elec. Co.</i>	2021-08	Price fixing, Sec. 1-2 Sherman Act	Cournot	Damages	9th Cir.	“This Cournot Equilibrium corroborated the results that Dr. Zona derived from his analysis of cartels operating in markets with compositions similar to the telescope market. Dr. Zona’s expert report and testimony were sufficiently tied to the facts of this case such that the district court properly admitted this evidence.”	Corroborate, strengthen
<i>In re Namenda Indirect Purchaser Antitrust Litig.</i>	2021-02	Monopolization, Sec. 1-2 Sherman Act	Nash Bargaining	Damages	S.D.N. Y.	“This is a classic example of what this Court calls, ‘That expert’s testimony hurts our case, so let’s try to disqualify the expert’ use of Daubert. A Daubert inquiry is designed to weed out unreliable methodologies — ‘junk science’ — not to be a substitute for cross-examination about the validity of an analysis that uses established methodologies.”	Admissible
<i>FTC v. Peabody Energy Corp.</i>	2020-09	Joint Venture, Sec. 7 Clayton Act	Cournot	Predict competitive effects	E.D. Mo.	“This Court need not decisively sift through various models and theories. [...] The FTC’s HHI analysis created a “presumption...that [the merger] will substantially lessen competition” by “showing that the [merger] will result in a	Consistent, limited relevance

						<i>significant market share and an undue increase in concentration.</i> ”	
<i>FTC v. Rag-Stiftung</i>	2020-01	Merger, Sec. 7 Clayton Act	Merger simulation, Second-score procurement auction	Predict competitive effects	D.D.C.	<i>“Because the Court has found the FTC’s proposed product and geographic markets wanting, Dr. Rothman’s models are of little use to the FTC in showing likely unilateral effects of the merger.”</i>	Based on faulty inputs, not credible
<i>FTC v. Wilhelmsen Holding ASA.</i>	2018-10	Merger, Sec. 7 Clayton Act	Merger simulation	Predict competitive effects	D.D.C.	<i>“The court concludes that Dr. Nevo’s GUPPI analysis and merger simulation model strengthen the FTC’s prima facie case that the proposed merger will substantially lessen competition in the relevant antitrust market.”</i>	Corroborate, strengthen
<i>FTC v. Tronox Ltd.</i>	2018-09	Merger, Sec. 7 Clayton Act	Cournot	Predict competitive effects	D.D.C.	<i>“While the Court found them ultimately consistent with the other evidence presented, his analysis was not dispositive on either the relevant market or the likelihood that the merger will increase market concentration.”</i>	Consistent, limited relevance
<i>United States v. AT&T.</i>	2018-06	Vertical merger, Sec. 7 Clayton Act	Nash Bargaining	Predict competitive effects	D.D.C.	<i>“After hearing Professor Shapiro’s bargaining model described in open Court, I wondered on the record whether its complexity made it seem like a Rube Goldberg contraption.”</i>	Not credible
<i>FTC v. Advocate Health Care.</i>	2017-03	Merger, Sec. 7 Clayton Act	Bertrand	Predict competitive effects	N.D. Ill.	<i>“Defendants do not directly engage with and dispute Dr. Tenn’s explanation for his use of the price-setting model, and the Court will not dismiss it based only on the relatively superficial criticisms defendants have made.”</i>	Consistent, limited relevance
<i>United States v. Anthem, Inc.</i>	2017-02	Merger, Sec. 7 Clayton Act	Auction	Predict competitive effects of the merger	D.D.C.	<i>“In the Court’s view, neither economic model provides a perfect analogy. Dr. Dranove’s criticism that customers would not have the level of information assumed in Dr. Israel’s model has some force.</i>	Consistent, limited relevance
<i>United States v. Aetna Inc.</i>	2017-01	Merger, Sec. 7 Clayton Act	Merger simulation, Bertrand model	Predict competitive effects	D.D.C.	<i>“Nevo’s merger simulation predicts that the merged firm would face the incentive and ability to increase quality-adjusted premiums in the</i>	Consistent, limited relevance

						<i>complaint counties. The court considers the merger simulation as econometric evidence in support of that limited proposition, in part because its results are consistent with the other evidence regarding the likely competitive effects of the proposed merger.</i>	
<i>Castro v. Sanofi Pasteur Inc.</i>	2015-09	Sec. 2 Sherman Act	Bertrand	But-for prices	D.N.J.	<i>“Because it has previously been approved for various judicial uses and is frequently used to estimate prices in a but-for world in the merger context, the Court cannot exclude the differentiated Bertrand model as categorically unreliable. [...] Professor Elhauge also provides a factual basis for not using the proposed alternate models.”</i>	Admissible
<i>FTC v. Sysco Corp.</i>	2015-06	Merger, Sec. 7 Clayton Act	Merger simulation, Auction model	Predict competitive effects	D.D.C.	<i>“The court, therefore, concludes that Dr. Israel’s merger simulation model strengthens the FTC’s prima facie case that the merger will substantially lessen competition in the market for national customers.”</i>	Corroborate, strengthen
<i>Food Lion, LLC v. Dean Foods</i>	2012-03	Sec. 1 Sherman Act	Cournot	N/A	E.D. Tenn.	<i>“Defendants argue that Professor Froeb’s market opinions are based on the use of a theoretical model inconsistent with applicable legal standards and based on assumptions, not real world facts. [...] Professor Froeb did clearly say he was not “say[ing] anything about how are people currently behaving in the market. [...] There are fundamental reasons why Professor Froeb’s testimony does not meet the applicable standards and would be inadmissible.”</i>	Not admissible
<i>United States v. H&R Block, Inc.</i>	2011-11	Merger, Sec. 7 Clayton Act	Merger simulation, Bertrand model	Predict competitive effects	D.D.C.	<i>“The Court finds that the merger simulation model used by the government’s expert is an imprecise tool, but nonetheless has some probative value in predicting the likelihood of a potential price increase after the merger.”</i>	Consistent, limited relevance

<i>FTC v. CCC Holdings Inc.</i>	2009-03	Merger, Sec. 7 Clayton Act	Bertrand and Auction	Predict competitive effects	D.D.C.	<i>“The Court does not conclude that the predictions of Dr. Hayes’s Bertrand model are necessarily wrong or that the diversion ratios he used are necessarily incorrect. The Court merely concludes that it cannot rely upon such a limited amount of data.”</i>	Consistent, limited relevance
<i>In re Universal Fund Tel. Billing Practices Litig.</i>	2008-06	Price fixing, Sec. 1 Sherman Act	Bertrand and Cournot	N/A	D. Kan.	<i>“Professors Williams and Wilkie estimated conduct parameters for AT&T, MCI, and Sprint, and determined that those parameters were inconsistent with Bertrand and Cournot outcomes, i.e., the companies’ actions were contrary to their unilateral self-interests absent the existence of an agreement. [...] A rational trier of fact could find that their in-depth evaluation of the market and the conclusions that they derived based on econometric models and theories are valid opinions.”</i>	Corroborate, strengthen
<i>United States v. Oracle Corp.</i>	2004-09	Merger, Sec. 7 Clayton Act	Merger simulation, English auction	Predict competitive effects	N.D. Cal.	<i>“The court has already found that Elzinga’s market share statistics are not a reliable indicator of Oracle, SAP and PeopleSoft’s positions in the ERP market. Accordingly, because this merger simulation is based upon these unreliable data, the court concludes that the simulation results are likewise unreliable.”</i>	Based on faulty inputs, not credible
<i>Heary Bros. Lightning Prot. Co. v. Lightning Prot.</i>	2003-10	Sec. 1 Sherman Act	Cournot	Damages	D. Ariz.	<i>“If firms compete on price, the Cournot model does not apply. It is undisputed that LPS firms compete on the price, not quantity, because they compete by price bidding. [...] thus the Cournot model does not fit the economic reality. [...] A flaw in this one aspect of the expert report renders the testimony and report useless to assist the jury in calculating damages with any degree of accuracy. Mr Guth’s report will be excluded, and the motion for summary judgment granted.”</i>	Not admissible
<i>Ticketmaster Corp.</i>	2003-	Monopolization,	Cournot	Damages	C.D.	<i>“In reaching his opinion that TX [defendants,</i>	Admissible

<i>v. Tickets.com, Inc.</i>	01	Sec. 2 Sherman Act			Cal.	<i>ndr], in the absence of anticompetitive features, would eventually obtain about 30% of the relevant market, Professor Magee used two measures. One measure [...] was the application of the Nash-Cournot Equilibrium. Both of these methods are accepted methods of economists in attempting to fix anti-trust damages where the task is to fix damages "but for" the anti-competitive activity found to violate the anti-trust laws [Defendants] protests vigorously that all of this is inadmissible guesswork. [...] Many of these objections may have validity, but they should be used in cross-examination."</i>	
<i>Concord Boat v. Brunswick</i>	2000-03	Sec. 1-2 Sherman Act, section 7 Clayton Act	Cournot	Damages	8th Cir.	<i>"Dr. Hall used the Cournot model to construct a hypothetical market which was not grounded in the economic reality of the stern drive engine market, for it ignored inconvenient evidence. [...] Dr. Hall's expert opinion should not have been admitted because it did not incorporate all aspects of the economic reality of the stern drive engine market and because it did not separate lawful from unlawful conduct. Because of the deficiencies in the foundation of the opinion, the expert's resulting conclusions were mere speculation."</i>	Not admissible