

CAN POST-CHICAGO ECONOMICS SURVIVE *DAUBERT*?

by

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I. INTRODUCTION

Antitrust in the 1990s has been heavily influenced by the thinking of the Post-Chicago school of scholars. Post-Chicago Economics (PCE) relies on game-theoretic concepts, which emphasize strategic behavior among economic agents. Additionally, PCE can be characterized as stressing market outcomes that could *possibly* occur, rather than outcomes that are *likely* to occur.¹

At the same time, the courts have been developing a body of law that casts doubt on expert testimony, including economic expert testimony that is not scientifically reliable or relevant to the facts at hand. These cases, starting with *Daubert*² and continuing through *General Electric*,³ *City of Tuscaloosa*,⁴ *Kumho Tire*,⁵ and, most recently, *Concord Boat*,⁶

* The views expressed in this paper are those of the authors and do not necessarily represent the views of the Federal Trade Commission or any individual Commissioner. We would like to thank Andrew Kleit, Stan Leibowitz, William Shughart, Charissa Wellford, and Mark Williams for useful comments on previous drafts of the paper.

¹ For a core understanding of the economic foundations of Post-Chicago Economics, the interested reader can review THE HANDBOOK OF INDUSTRIAL ORGANIZATION (Richard Schmalensee & Robert D. Willig eds., 1989). For an illustration of how PCE has been applied to antitrust regulation (in settled, not in litigated, cases) one could review selected chapters in Part III (Vertical and Complementary Market Issues) of THE ANTITRUST REVOLUTION: ECONOMICS, COMPETITION AND POLICY (John Kwoka & Lawrence White eds., 1999). In the introduction to their book, Kwoka and White assert that Chicago analysis is too reliant on theory, while PCE analysis is based empirical evidence. THE ANTITRUST REVOLUTION, *supra*, at 4 As we show below, they have it backwards.

² *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579 (1993).

³ *General Elec. Co. v. Joiner*, 522 U.S. 136 (1997).

⁴ *City of Tuscaloosa v. Harcros Chem., Inc.*, 877 F. Supp. 1504 (N.D. Ala. 1995).

⁵ *Kumho Tire Co. v. Carmichael*, 526 U.S. 137 (1999).

⁶ *Concord Boat Corp. v. Brunswick Corp.*, 207 F.3d 1039 (8th Cir. 2000).

emphasize the district court judges' responsibility to act as a "gatekeeper" for expert testimony. These opinions direct courts to bar testimony that fails to meet the standard.

Post-Chicago economists may have difficulty meeting this standard. These economists emphasize theory, while the courts emphasize facts. These economists specialize in showing possible outcomes, under stylized assumptions, without concern for testing whether those assumptions can be matched to the facts at hand. The courts are showing a preference for expert testimony that integrates a broad set of market-specific facts into the competitive analysis. In the eyes of the courts, facts trump theory.

The game-theoretic focus of PCE has the virtue of providing examples that illustrate how strategic actions may generate more complex firm behavior than a simple model would predict. This is certainly useful for an academic understanding of the complexities of competitive interaction, and can be a useful insight into the development of market-based models. At the same time, this emphasis on the possible, rather than the probable, provides little conceptual guidance for either the analyst or the court. When a class of theories shows that almost any outcome is a possible result from any type of action under general market conditions, the model is of little practical use. A more useful approach would allow a broad understanding of market behavior to guide the decision-making process; this technique is less mathematically complex, but it has the virtue of allowing a court to sort out likely from unlikely outcomes based on the facts of a particular case.

The Chicago school, which represented antitrust's "controlling legal authority" at the start of the 1990s, provides such a general guide to firm behavior. Traditionally, Chicago-style economists make two points, first that antitrust is primarily a question of economics; and second that economics *is* neoclassical price theory. In general, Chicago analysts offer explanations for

how a general set of facts is compatible (or incompatible) with competition. Antitrust concerns do arise, but they are usually limited to agreements among competitors or mergers resulting in high degrees of industry concentration.⁷ In addition, the Chicago approach is grounded in general observations about the way markets actually work and how firms actually behave.⁸ While Chicago school models frequently make a number of simplifying assumptions that attempt to capture the way markets behave rather than modeling the mechanisms of firm behavior, these models often lend themselves to testable hypotheses.

Can Post-Chicago theory find empirical support and thereby gain relevance to post-*Daubert* courts? We suggest the answer is likely to be no. In many situations, eliminating one assumption will create a theoretically ambiguous outcome, while replacing one assumption with another will reverse the result of the model. While this would not cause a problem if the crucial facts were readily verifiable, often the key fact is linked to some unobservable competitive characteristic.⁹ In effect, PCE models are often based on “virtual facts,” facts that exist only in theory; in practice, they cannot be verified or quantified.¹⁰ For example, the outcome of a PCE model often depends on whether customers or competitors can undertake strategies to counter the alleged anticompetitive behavior.¹¹ In other cases, the order in which the parties execute

⁷ Richard A. Posner, *The Chicago School of Antitrust Analysis*, 127 U. PA. L. REV. 925 (1979). See also ROBERT H. BORK, *THE ANTITRUST PARADOX: A POLICY AT WAR WITH ITSELF* (1st ed. 1978) and RICHARD A. POSNER, *ANTITRUST LAW: AN ECONOMIC PERSPECTIVE* (1976) [hereinafter POSNER, ANTITRUST LAW].

⁸ Franklin M. Fisher, *Organizing Industrial Organization: Reflections on The Handbook of Industrial Organization*, in BROOKINGS PAPERS: MICROECONOMICS 201 (1991).

⁹ On occasion, an analyst will attempt to apply a PCE model with an assumption that is clearly incorrect for the case at hand (i.e., the model might assume the incumbent faces only one competitor, while a market analysis identifies a number of important rivals), and the generalization of that assumption to fit the facts will lead to an entirely different set of conclusions. In this situation, the PCE testimony should be rejected as flat-out wrong.

¹⁰ Just as a “virtual network” is one that has no physical connection among its members – for example, the network of Microsoft Windows users – a “virtual fact” is a metaphysical construct that aids the modeler but cannot be observed.

¹¹ See, e.g., Christodoulos Stefanadis, *Selective Contracts, Foreclosure, and the Chicago School View*, 41 J.L. & ECON. 429 (1998).

strategies is important.¹² Similarly, the information structure of the market may drive the result.¹³ Therefore, as long as a key variable is not verifiable in the trial record, the court will be left with one PCE model that predicts an anticompetitive outcome, and another, equally viable, PCE model that predicts a competitive outcome. Moreover, the court will have no way to distinguish between the models.¹⁴ Attempts to construct more detailed models also fail as general game-theoretic models favored by Post-Chicago analysts suffer from an embarrassment of potential equilibria.¹⁵ A theoretical approach to sorting out the possibilities, by artificially restricting the actions of market participants, is not a promising way of meeting the *Daubert* standard because the selection process implicit in the methodology lacks an objective basis.

In Section II of this Article, we review the Supreme Court’s standard for allowing expert testimony as explained in *Daubert* and related opinions, and discuss in detail the *City of Tuscaloosa* and *Concord Boat* decisions that, following *Daubert*, excluded the economic expert testimony on which the plaintiffs relied. Section III presents an overview of the Chicago School of Economics, which sets a foundation for our commentary on the Post-Chicago school and serves as a basis for the evaluation of Chicago-based testimony in Section V. Section IV discusses the Post-Chicago School approach to antitrust analysis as a refinement of the Chicago school that trades the ability to make fact-based generalizations for mathematical elegance. Section V approaches economic expert testimony in light of the *Daubert* standard, focusing on whether either approach to expert testimony is consistent with the standard that the Court has

¹² *Id.*

¹³ JOHN R. LOTT, JR., ARE PREDATORY COMMITMENTS CREDIBLE?: WHO SHOULD THE COURTS BELIEVE? (1999).

¹⁴ PCE models offer real insight only when the various parties to the game can commit to specific strategies for all possible states of the world. It is rare when institutional realities preclude “recontracting” during the game. For a discussion of commitment (among other factors), see Carl Shapiro, *The Theory of Business Strategy*, 20 RAND J. ECON. 125 (1989).

laid out. Section VI provides a set of examples based on various high-profile antitrust litigations. One of the examples focuses on an actual *Daubert* ruling (*Brand Name Prescription Drug Litigation*¹⁶), while the others describe simulated *Daubert* analyses that could have taken place had the *Daubert* arguments been presented challenging actual (*Microsoft*¹⁷) or hypothetical (*Kodak*¹⁸) testimony. We conclude by observing that, as courts continue to take their “gatekeeping” responsibilities seriously, the scope for Post-Chicago economic testimony will likely be increasingly limited.

II. THE STANDARD FOR THE ADMISSIBILITY OF EXPERT TESTIMONY

Prior to the *Daubert* decision in the early 1990s, the legal standard for admitting expert testimony was based on the 1923 *Frye* opinion,¹⁹ which held that scientific expert testimony was admissible if it had “general acceptance” in the field.²⁰ In *Daubert*, the Supreme Court held that Federal Rule of Evidence 702 superseded *Frye*, and that the correct standard was whether “scientific, technical, or other specialized knowledge” is “not only relevant, but reliable.”²¹ This distinction broadened the scope of what could be admissible in some dimensions, but narrowed the scope in other, even more important dimensions.²²

¹⁵ Jeffrey Banks et al., *An Experimental Analysis of Nash Refinements in Signaling Games*, 6 GAMES & ECON. BEHAVIOR 1 (1994).

¹⁶ *In re Brand Name Prescription Drugs Antitrust Litig.*, 186 F.3d 781 (7th Cir. 1999).

¹⁷ *United States v. Microsoft, Inc.*, 97 F. Supp. 2d 59 (D.D.C. 2000). The Findings of Facts are located at <<http://www.usdoj.gov/atr/cases/f3800/msjudgex.htm>>; the Conclusions of Law are located at <<http://www.usdoj.gov/atr/cases/f4400/4469.htm>>.

¹⁸ *Eastman Kodak Co. v. Image Tech. Serv., Inc.*, 504 U.S. 451 (1992).

¹⁹ *Frye v. United States*, 293 F. 1013 (1923).

²⁰ See generally Christopher B. Hockett & Frank M. Hinman, *Does Daubert Raise a New Barrier to Entry for Economists?*, 11 ANTITRUST 40 (1996).

²¹ *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579, 590-91 (1993).

²² Of course, the expert still has to be qualified to proffer the testimony. For example, in *Virginia Vermiculite*, the plaintiff’s expert, Seth Schwartz, a geological engineer, was excluded from testifying because he lacked the requisite

For example, the *Daubert* case itself reversed a lower court ruling that the plaintiffs' experts' testimony was inadmissible under the "general acceptance" standard. The issue of the case was whether Bendectin, a prescription anti-nausea drug, was responsible for the birth defects in two children whose mothers had taken the drug. The expert for the defense had reviewed more than 30 published studies involving the use of Bendectin, none of which found a connection between the use of the drug and birth defects. The plaintiffs countered with eight experts who used evidence based on test tube and animal studies that did find a link between Bendectin and malformations, an analysis of the chemical properties of the drug, and "re-analyses" of the statistical studies on humans. Because of the weight of the published studies on humans, the District Court refused to admit the evidence based on test tube and animal studies. The Court also rejected the use of the recalculated statistical studies because they had not been subject to peer review, and hence were not "generally accepted" in the field.

In reassessing the lower court's role as a "gatekeeper" for expert testimony, in light of the language of the Federal Rules of Evidence, the Supreme Court found that the "general acceptance" standard was too restrictive. The Supreme Court focused on the word "relevant" in Rule 402, which states, "[a]ll relevant evidence is admissible," Neither this rule nor Rule 702, which directly addresses expert testimony, states that the evidence needs to be "generally accepted." However, the Supreme Court acknowledged that widespread acceptance was a factor in assessing the relevance of the testimony. As a result, the Supreme Court ruled that the lower court could not use the *Frye* test to preclude the jury from hearing the plaintiffs' experts'

knowledge to be qualified as an antitrust expert. *See* *Virginia Vermiculite, Ltd. v. W. R. Grace & Co. – Conn.*, 98 F. Supp. 2d 729 (W.D. Va. 2000).

testimony. On remand, the Ninth Circuit applied the broad *Daubert* standard to reject the expert testimony and dismiss the case.²³

If this were the extent of *Daubert*, it would clearly expand, rather than contract, the opportunities for scientific testimony.²⁴ However, the Supreme Court also required the expert testimony to be “not only relevant, but reliable.” This phrase reduces the scope for scientific testimony because “reliable” testimony is scientifically valid, while “relevant” testimony must be related to the facts in the matter at hand.²⁵ Thus, perfectly well-reasoned scientific testimony about the chemical properties of a product may have nothing to do with the disagreement between the litigants and, therefore, would be excluded. Under *Daubert*, the court must ensure that all scientific testimony actually aids in the dispute resolution process. In the Supreme Court’s words, the “standard requires a valid scientific connection to the pertinent inquiry as a precondition to admissibility.”²⁶

Conversely, even an expert’s opinion that goes to the heart of the disagreement may not be good science, such as an opinion that relies on manipulating data in an arbitrary way. This testimony is also inadmissible. The Supreme Court discussed several criteria under which one could assess the admissibility of expert testimony. Of particular importance is whether the expert’s theory has been tested, a point to which we will return in Section V. Expert testimony tends to be about causality: Bendectin caused birth defects or, in an antitrust context, a firm’s actions caused harm to competition. Unless the expert articulates a hypothesis that can be tested

²³ *Daubert v. Merrell Dow Pharm., Inc.*, 43 F.3d 1311 (9th Cir. 1995). The Ninth Circuit questioned the scientific validity of the plaintiff’s evidence, but completely rejected the factual relevance for the proffered studies, noting the failure to show that Bendectin caused the birth defects at issue.

²⁴ As the Supreme Court noted in *General Electric v. Joiner*, “the Federal Rules of Evidence allow district courts to admit a somewhat broader range of scientific testimony than would have been admissible under *Frye*.” *General Elec. Co. v. Joiner*, 522 U.S. 136 (1997).

²⁵ *Daubert*, 509 U.S. at 587-92.

and distinguished from other observationally equivalent hypotheses, the theory cannot establish the necessary causation. Other criteria that the Supreme Court identified as potentially relevant to the admissibility of scientific evidence are the error rate associated with a particular technique and the existence of standards controlling the technique's operations.²⁷ Finally, the Supreme Court advanced peer review and general acceptance of an idea as factors that could be used in the analysis.²⁸ Overall, the Supreme Court noted that the approach to science must be flexible with respect to the facts at issue in any particular case.

Subsequent opinions refined the basic analysis laid forth in *Daubert*. In *General Electric*, the Supreme Court, in reversing the Eleventh Circuit, agreed that the District Court properly excluded expert testimony that attempted to draw a causal relationship between the plaintiff's exposure to certain chemicals and the specific type of cancer from which the plaintiff was suffering. In *Kumho Tire*, the Supreme Court again reversed the Eleventh Circuit, agreeing that the District Court could exclude expert testimony claiming that a tire blowout occurred as a result of a manufacturing defect in the tire.²⁹ The expert needed to distinguish between two hypotheses: (1) that the tire was defective; and (2) that the tire failed because it was worn and improperly inflated. There was no direct evidence that the tire was defective. Instead, the expert needed to show that the condition of the tire was more consistent with a manufacturing defect than it was with the alternative hypothesis. Because the plaintiffs purchased the tire used, there was no evidence regarding the number of miles put on the tire before it failed. Additionally, the plaintiffs' expert agreed that the tire had little tread remaining and had signs of wear that were

²⁶ *Id.* at 592.

²⁷ *Id.* at 594.

²⁸ *Id.*

consistent with improper inflation.³⁰ Under this set of facts, it was reasonable for the District Court to have concluded that the expert could not have inferred that the tire was defective.

The same “gatekeeping” function that courts have used to exclude scientific and engineering expert testimony has been used to exclude expert antitrust testimony as well.³¹ In *City of Tuscaloosa*, the plaintiffs attempted to show that re-packagers of water treatment chlorine engaged in bid rigging. Without direct evidence of collusion, however, plaintiffs had to rely on their experts to present economic evidence sufficient to infer collusion. The various experts pointed to factors such as the small number of firms in the market, the apparent similarity of costs facing these firms, and the homogeneity of the product as elements that suggested the market was conducive to collusion. In addition, the experts relied on other evidence, such as the attempts by firms to uncover each others’ price lists; a firm’s production of chlorine for competitors in the event of a plant failure; a firm’s distribution of advance information on proposed price increases that were implemented only if rivals went along; and the observation that the market exhibited “price leadership.”³² As Roger Blair notes, these elements are all consistent with economic models of tacit coordination and, therefore, do not support the inference of a cartel.³³ In oligopolies, a limited number of firms compete, often with similar costs and products. Moreover, these firms may collect competitive information on prices, enter

²⁹ The Court also made explicit that the language of Rule 702 applies to all expert testimony, not merely that of “scientists.” Thus, the issue of whether economics, for example, can properly be classified as “science” in this context does not arise. *Kumho Tire Co. v. Carmichael*, 526 U.S. 137 (1999).

³⁰ *Id.* at 144.

³¹ For an interesting discussion of *Daubert* with a broad range of citations to areas outside antitrust, see Andrew I. Gavil, *After Daubert: Discerning the Increasingly Fine Line Between the Admissibility and Sufficiency of Expert Testimony in Antitrust Litigation*, 65 ANTITRUST L.J. 663 (1997). Gavil advances the idea of separating the evaluation of the theory from the evaluation of the facts. Such a methodology would be extremely difficult to apply because theories are of little aid in the dispute resolution process without applicable facts. Questions of both science and relevance are crucial gatekeeping issues and little is gained by separating them.

³² *City of Tuscaloosa v. Harcross Chem., Inc.*, 877 F. Supp. 1504, 1513-16 (N.D. Ala. 1995).

³³ Roger D. Blair, *Lessons from City of Tuscaloosa*, 10 ANTITRUST 43, 43 (1996).

into supply contracts and, by definition, some firms must lead price increases. The District Court recognized that the evidence on which the plaintiffs' experts relied did not allow the District Court to distinguish collusive activity from its observationally equivalent, but legal, counterpart, consciously parallel behavior.³⁴ The District Court rejected one expert out of hand, excluded the testimony of another expert under the *Daubert* standard, and minimized the consideration given to the third expert.³⁵ With the expert testimony effectively thrown out, the District Court granted summary judgment for the defendants.

In partially reversing the District Court, the Eleventh Circuit wrote that the courts should accept expert testimony under *Daubert* as long as “the methodology by which the expert reaches his conclusions is sufficiently reliable,” and “the testimony assists the trier of fact . . . to understand the evidence or to determine a fact in issue.”³⁶ This standard led the Eleventh Circuit to reinstate a significant portion of the excluded testimony and, once this information was added to the record, to reverse the summary judgment.³⁷ Because the economist was not excluded under *Daubert* and because the defendant did not appeal that decision, the Court of Appeals did not reach a decision on the inadmissibility of this subset of the economic evidence.³⁸

³⁴ *Harcros Chem.*, 877 F. Supp. at 1526. For an academic discussion of this general problem, see Jonathan B. Baker, *Two Sherman Act Section 1 Dilemmas: Parallel Pricing, the Oligopoly Problem and Contemporary Economic Theory*, 38 ANTITRUST BULL. 143 (1993).

³⁵ *Harcros Chem.*, 877 F. Supp. at 1526. Perry Garner, a certified public accountant, was excluded as unqualified; James McClave, a statistician, was excluded on *Daubert* grounds; and Robert Lanzillotti, an economist, was harshly criticized. *Id.* at 1526. The Court's analysis comes close to excluding Lanzillotti under *Daubert*, but no actual finding exists in the opinion. *Id.*

³⁶ *City of Tuscaloosa v. Harcros Chem., Inc.*, 158 F.3d 548, 562 (11th Cir. 1998).

³⁷ *Id.* at 574. The tone of the decision suggested that the Eleventh Circuit was uneasy with the District Court's exclusion of factual evidence. However, the Eleventh Circuit upheld the exclusion of the statistician's conclusions on economic theory, suggesting a tighter standard for theoretical evidence. As an aside, the court upheld on other grounds the summary judgment in favor of two defendants, and reversed on the other three.

³⁸ In a lengthy footnote, the Eleventh Circuit roundly criticized the economist Lanzillotti's testimony. *Id.* at 567 n.27. However, the footnote clearly observes that the testimony was not excluded by the District Court. *Id.* This implies that Phillip Areeda and Herbert Hovenkamp are incorrect when they note that the [district] judge “excluded” Lanzillotti's testimony, which posited that unilateral behavior that took into account the reactions of rival suppliers could be conspiratorial, and, therefore, that conscious parallelism is conspiratorial. See PHILLIP E. AREEDA &

In March of 2000, the Eighth Circuit reversed the lower court's *Concord Boat* verdict in favor of the plaintiffs primarily on *Daubert*-related grounds. In this matter, several boat builders sued Brunswick Corporation, the leading manufacturer of stern drive engines, claiming that Brunswick's engine pricing schedule was designed to limit sales of rival engine brands in an anticompetitive manner.³⁹ The discounts were cumulative, so that a builder that purchased 70 percent of its engines from Brunswick received an additional one percent discount on *all* Brunswick engines purchased during the year.⁴⁰ The plaintiffs asserted that the discounts were so large that no builder could economically compete if it did not receive the discounts while rival builders did. As a result, the builders claimed that all builders were compelled to buy enough engines from Brunswick to reach the discount threshold. This left too little of the market available for Volvo, Brunswick's principal rival,⁴¹ to achieve minimum efficient scale.⁴² As a

HERBERT HOVENKAMP, ANTITRUST LAW: AN ANALYSIS OF ANTITRUST PRINCIPLES AND THEIR APPLICATION 60 (Supp. 2000). Moreover, Areeda and Hovenkamp also err when they note that this exclusion, had it occurred, would have been "quite inconsistent with the Supreme Court's own admonition in *Daubert* that the decision to exclude must be based on the methodologies the expert employs and not the conclusions he draws." *Id.* The methodology of oligopoly theory employed by Lanzillotti is quite incapable of distinguishing between unilateral behavior and illegal cartel behavior. Because the methodology fails to aid the dispute resolution process, it should have been excluded. *Id.*

³⁹ The plaintiffs also alleged that Brunswick's 1986 acquisition of two large boat builders was anticompetitive. *Concord Boat Corp. v. Brunswick Corp.*, 207 F.3d 1039 (8th Cir. 2000). While the analysis of the vertical integration is somewhat different than the analysis of Brunswick's engine discounts, the same criticisms of the economic evidence apply to both antitrust claims. *Id.* at 1045.

⁴⁰ *Id.* at 1044. Buyers also received one percent discounts at the 60 percent and 65 percent levels; the same analysis applies to these discounts. In earlier years, the discount thresholds were at 60 percent, 70 percent, and 80 percent.

⁴¹ At present, Volvo produces stern drive engines in a joint venture with OMC, a major boat builder. *Id.* at 1045. Prior to the formation of the joint venture, OMC also built engines. *Id.* "Volvo" refers to the joint venture, as well as to OMC and Volvo separately before the formation of the joint venture. *Id.*

⁴² The Eighth Circuit's opinion does not address whether the production of stern drive engines is subject to significant economies of scale such that minimum viable scale is in excess of the 30 percent or so market share that was clearly available to Volvo under Brunswick's discount program. The Court's opinion also failed to address why OMC's own boat divisions did not realize increased sales as a result of Brunswick's discount program if indeed the prices independent boat builders paid were supracompetitive, as the plaintiffs argued. Because the Court recognized that Brunswick's discount program did not place effective constraints on Volvo's ability to gain market share *Concord Boat Corp.*, 207 F.3d at 1056-58, it was not necessary for the Court to reach the issues of scale economies and constraints on internal expansion.

result, Volvo's costs were higher than Brunswick's costs, allowing Brunswick to charge engine prices higher than in the absence of this discount mechanism.

The boat builders relied on their economic expert, Stanford professor Robert Hall, to argue three main points: (1) that the discount mechanism was anticompetitive in theory; (2) that the discounts led to actual anticompetitive effects; and (3) that Hall's methodology was a reasonable way to calculate the resulting damages.⁴³ The appellate court ultimately rejected all three parts of Hall's testimony.

First, even if the plaintiffs' theory of harm was correct, it was indistinguishable from a procompetitive discount. In particular, the antitrust laws are intended to encourage competition that leads to lower prices. Therefore, the standard for concluding that a discount is actually anticompetitive should be high.⁴⁴ In effect, the proposed economic theory was unacceptable to the Court.

Second, market facts were clearly inconsistent with a predicted result of Hall's theory; instead of all firms purchasing almost exactly 70 percent of their engines from Brunswick, some purchased less than that amount (foregoing this "critical" discount), while others purchased substantially more than this amount (foregoing profits, if the builders actually preferred Volvo engines at current prices, but for the effect of the cumulative discount).⁴⁵ Thus, even if the Court

⁴³ *Id.* at 1046-47. Hall's overall testimony has a PCE flavor, as it focuses on unilateral strategic actions a leading firm can take to monopolize a market.

⁴⁴ As the Eighth Circuit wrote: "[C]utting prices in order to increase business often is the very essence of competition, which antitrust laws were designed to encourage . . ." *Id.* at 1061.

⁴⁵ *Id.* at 1055-57. Under this discount mechanism, the marginal cost of a Brunswick engine drops sharply just at the discount threshold. For example, a builder who purchases 100 engines annually might pay \$5000 per Brunswick engine for numbers 61 through 69, but would pay only \$1500 for engine number 70 (\$5000 less a one percent (\$50) discount multiplied by all 70 engines), which may be below both Brunswick's and Volvo's production cost. The cost for engines 71 and above stays at \$4950, however. Thus, while it is clear that Volvo cannot compete effectively for engine 70, Volvo is at no disadvantage in competing for any other sales.

had accepted Hall's theory, the counterfactual evidence would have required the exclusion of the testimony.

Third, Hall's damages calculations relied on an assumption of what Brunswick would have charged but for the non-linear discount mechanism. Hall assumed that Brunswick and Volvo would have had the same costs and the same engine quality, and that competition between the two firms would have been characterized by the Cournot model, yielding market shares of 50 percent each. However, Hall had no basis for assuming the market would have operated this way. Further, Hall's assumption ignored the inconvenient fact that Brunswick's share reached 75 percent before Brunswick adopted its discount program.⁴⁶ He also ignored evidence that Volvo's sales suffered their sharpest decline during a period when Volvo's engine quality was perceived to be inferior to that of Brunswick, a fact that runs counter to Hall's "but-for" assumption of equal quality.⁴⁷ As a result, the Eighth Circuit held that 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 thus it did not separate lawful from unlawful conduct.⁴⁸ Therefore, in the view of the Court, the expert's conclusions were "mere speculation."⁴⁹

The lesson from this series of decisions is that the courts are becoming more skeptical about economists' claims of anticompetitive effects from conduct without evidence that relates that conduct to actual market facts, *and* where those facts are distinguishable from the results of

⁴⁶ *Id.* at 1056. The Court also noted that smaller rival engine manufacturers used the same types of discount programs, suggesting to us that the discounts had a purpose beyond the alleged anticompetitive one. *Id.* at 1045.

⁴⁷ *Id.* at 1056-57.

⁴⁸ *Concord Boat Corp.*, 207 F.3d at 1057.

⁴⁹ See also Willard K. Tom et al., *Anticompetitive Aspects of Market Share Discounts and Other Incentives to Exclusive Dealing*, 67 ANTITRUST L.J. 615 (2000). The authors discuss some highly stylized conditions under which *Brunswick*-style discounts could create entry barriers. These conditions were not what the Eighth Circuit found in the stern drive engine market. In any event, it is straightforward to show the example that Tom et al. provide at page 628 is not profit-maximizing for the would-be monopolist. (Proof available from the authors upon request).

pro-competitive behavior.⁵⁰ A theoretical result that points to a *possible* anticompetitive outcome of conduct is insufficient to persuade the courts to accept the theory.⁵¹ We agree with the courts' reasoning in these cases because, to do otherwise – to accept an expert's opinion based on the theoretical possibility of anticompetitive effects arising from some conduct without evidence that ties the theory to market-specific facts – would be to shift the burden of proof from the plaintiffs to the defendants.⁵²

Any policy on the burden of proof of anticompetitive effects must take into account the fact that firms are continually looking for ways to increase profits. Profits are both a reward to successful firms and a signal to the market about where to allocate additional resources. Thus, the mere pursuit or attainment of profits cannot be an antitrust violation in a free market economy. By its very nature, the competitive process harms rivals. The essence of competition is that there are both winners and losers; anticompetitive conduct often has the same effect. If

⁵⁰ The *Daubert* case is also impacting the analysis of damages. For example, in both *In re Aluminum Phosphide Antitrust Litig.*, 893 F. Supp. 1497 (D. Kan. 1995), and *Blue Dane Simmental Corp. v. American Simmental Ass'n*, 178 F.3d 1035 (8th Cir. 1999), expert testimony on damages was excluded because the experts did not isolate the anticompetitive activity from the broader market behavior. On the other hand, expert testimony survived *Daubert* in *Allapattah Serv., Inc. v. Exxon Corp.*, 61 F. Supp. 2d 1335 (S.D. Fla. 1999), *Sportmart, Inc. v. No Fear, Inc.*, 1996-2 Trade Cas. (CCH) ¶ 71,513 (N.D. Ill. June 3, 1996), and *In re Indus. Silicon Antitrust Litig.*, 1998-2 Trade Cas. (CCH) ¶ 72,349 (W.D. Pa. Oct. 20, 1998). This is because the expert had some type of analytical method to identify the impact of the anticompetitive effect.

⁵¹ The *Daubert* standard seems to require a hearing on expert testimony prior to a motion for summary judgment because a plaintiff whose economist fails to survive a *Daubert* motion is unlikely to avoid an adverse summary judgment on the affected theory. On the other hand, it is possible that an economic analysis could survive a *Daubert* motion, but the other party would still be entitled to summary judgment as a matter of law. Note here that the court holds the economist to a standard of aiding in the dispute resolution process, although this assistance is not related to the exact specification of the case law that might moot the economist's testimony. See *Rebel Oil Co., Inc. v. Atlantic Richfield Co.*, 146 F.3d 1088 (9th Cir. 1998). Areeda and Hovenkamp note that a motion for summary judgment would succeed in the face of admissible economic testimony if "the conclusions do not follow, are not appropriate to the facts of the case, demonstrate that there is no "issue of material fact or draw a factual conclusion that is impermissible as a matter of law." AREEDA & HOVENKAMP, *supra* note 38, at 51.

⁵² For an analysis of how the government may be trying to change the burden of proof, see Timothy J. Muris, *The FTC and the Law of Monopolization*, 67 ANTITRUST L.J. 693 (2000); John Lopatka & William Page, *Monopolization, Innovation and Consumer Welfare*, 69 GEO. WASH. L. REV. (forthcoming 2001). See also Wayne D. Collins, *California Dental Association and the Future of Rule of Reason Analysis*, 14 ANTITRUST 54 (1999); David Balto, *Some Observations on California Dental Association v. FTC*, 14 ANTITRUST 64 (1999); and William J. Kolasky, *California Dental Association v. FTC: The New Antitrust Empiricism*, 14 ANTITRUST 68 (1999).

Congress or the courts were to permit testimony that fails to rise above “mere speculation” in order to infer that a particular market outcome was the result of anticompetitive conduct, rather than the natural result of the competitive process, the result would be a chilling effect on the competitive process.

III. CHICAGO SCHOOL ECONOMICS

The Chicago school of antitrust economics is based on the insight that neoclassical economic theory is required to understand market competition and, therefore, controls optimal antitrust enforcement. The theory evolved from the work of various economists and lawyers associated with the University of Chicago Law School.⁵³ Chicago analysis can be summarized in two statements, one that is normative – economic efficiency should be the goal of business regulation – and one that is positive – that neoclassical economic theory defines microeconomic science.

The fundamental Chicago idea that economic efficiency controls antitrust policy has been widely accepted across the intellectual spectrum. This represents a dramatic revolution in antitrust thinking because other goals for antitrust – such as ensuring diversity or maintaining small businesses – were considered important in the past.⁵⁴ It was this lack of focus that appears to be directly responsible for some of the absurd decisions that Bork describes in *The Antitrust*

⁵³ POSNER, ANTITRUST LAW, *supra* note 7. Posner lists Director as the founder and Bowman, Bork, McGee, and Telser as students and colleagues. Countless others (including Posner and Easterbrook) deserve credit for popularizing the theory. Other Chicago economists (perhaps most notably Milton Friedman) have applied similar analytical tools to other government regulations.

⁵⁴ Robert H. Lande, *The Rise and Coming Fall of Efficiency as the Ruler of Antitrust*, 33 ANTITRUST BULL. 429 (1988). For an alternative interpretation, see Andrew N. Kleit, *Common Law, Statute Law and the Theory of Legislative Choice: An Inquiry into the Goal of the Sherman Act*, 31 ECON. INQUIRY 647 (1993); and, of course, BORK, *supra* note 7.

Paradox.⁵⁵ Currently, even PCE scholars use this Chicago proposition to motivate their mathematical models of strategic behavior affecting classical antitrust concerns such as tying, vertical integration, and predation.⁵⁶

The Chicago style is to apply neoclassical economic models to underlying fact situations associated with any antitrust concern to understand why the potentially problematic behavior has occurred or why it will occur. This analysis uses a few general and readily testable market models – such as monopoly, double marginalization, price discrimination, and vertical competition – to generate an understanding of business behavior.⁵⁷ Therefore, a Chicago analysis assumes that buyers and sellers are price takers, unless some structural characteristic of the market allows a business entity to set the price of its product.⁵⁸ One notable Chicago model postulates a reduced-form model of competition in which the firm’s long-run elasticity of demand interacts with costs and the market structure (market elasticity, rival supply elasticity,

⁵⁵ BORK, *supra* note 7. See also, ROBERT H. BORK, THE ANTITRUST PARADOX: A POLICY AT WAR WITH ITSELF (2d ed. 1992) [hereinafter, BORK, ANTITRUST PARADOX, 2d ed.]. This second edition has a new prologue and conclusion.

⁵⁶ Antitrust analysts can still differ on the economic goal of antitrust. The two dominant contenders are consumer welfare (the net welfare captured by consumers in the marketplace) and social welfare (the net welfare retained by both consumers and producers in the marketplace). Because both rules rely on pure economic analysis, the choice is a policy question and hence it is implicitly a legal issue. Of course, economists can offer interesting insights such as the observations: (1) that corporate earnings accrue to consumers, Gary L. Roberts & Steven C. Salop, *Efficiencies in Dynamic Merger Analysis*, 12 WORLD COMPETITION 5, 7 (1996); and (2) that corporate taxes enrich the government, Malcolm B. Coate & A. E. Rodriguez, *Pitfalls in Merger Analysis: The Dirty Dozen*, 30 N.M. L.REV. 227, 249 (2000). Thus, even a pure consumer welfare standard should include some social welfare benefits.

⁵⁷ This clearly does not mean that special case situations never play a role in the Chicago analysis. The second edition of Bork’s *The Antitrust Paradox* explains how the AT&T divestiture was required to prevent the firm from evading regulation of its local (monopoly) service by tying high-priced long distance service to low-priced, regulated local service. BORK, ANTITRUST PARADOX, 2d ed., *supra* note 55, at 431. Assertions that Chicago school analysis places general theory over fact are simply incorrect. Facts control Chicago analysis, although the understanding of the facts is organized by theory.

⁵⁸ Chicago analyses of the oligopoly question were hampered by the general lack of tractability (i.e., no stable equilibria exist) associated with oligopoly pricing. To make a long story short, oligopolists profit if they all price above the competitive level, but one firm will profit even more if it reduces price towards the competitive level. Posner lists a number of factors that should be considered in a competitive analysis. POSNER, ANTITRUST LAW, *supra* note 7, at 47-70. In practice, Chicago theory considers oligopoly behavior to be an empirical question. An interesting study of FTC merger investigations has suggested that (pre-merger) markets are generally competitive,

and share) to determine price.⁵⁹ Because elasticity is exogenous to the firm, strategy does not affect the equilibrium conditions of the model. Instead, the equilibrium is defined by the empirically estimated values of the model's parameters. Finally, in all situations, Chicago analysis searches for efficiency justifications for the problematic behavior, and then attempts to balance the two considerations.⁶⁰

Posner believes that examples best illustrate Chicago theory.⁶¹ The issue of tying was addressed by observing that the tying firm only controlled one monopoly profit. If the firm raised the price of a related product – by requiring the customer to pay the premium price on the tied good as a condition for purchasing the monopolized good – consumers would respond by reducing their purchases of the monopolized good. Thus, tying could not increase the profits of the monopolist. On the other hand, with an added complication – such as the idea that there are consumers who differ in their values of the monopolized good – tying becomes a logical policy for the firm. As long as the demand for the complementary product is correlated with the differentiation in values of the monopolized product, tying allows the monopolist to price discriminate by charging those customers who highly value the monopolized product more than those customers who value the product a little. Output is increased because the monopolist no longer needs to set a high monopoly price to extract the value of its monopoly. The overall welfare effects are ambiguous because some customers face higher implicit prices, while other

especially if the product is differentiated. David Scheffman, *Ten Years of Merger Guidelines: A Retrospective, Critique and Prediction*, 8 REV. INDUS. ORG. 173 (1993).

⁵⁹ See William M. Landes & Richard A. Posner, *Market Power in Antitrust Cases*, 94 HARV. L. REV. 937 (1981). In Clayton Act and monopolization cases, a long-run elasticity would be appropriate, while shorter-run elasticities could be relevant for some other types of cases. *Id.* at 959.

⁶⁰ An analysis can use a social welfare standard and trade off the deadweight loss of monopoly with the real resource savings, or a price standard and balance the price enhancement effects of market power against the downward pressure of cost efficiencies.

⁶¹ POSNER, ANTITRUST LAW, *supra* note 7, at 926.

customers face lower implicit prices. However, tying does not usually allow the monopolist to leverage monopoly from one market to another. Special case situations, such as regulatory evasion, are recognized as examples in which the general Chicago theory does not fit, and aggressive enforcement of the prohibitions on tying may be justified.

The analysis on resale price maintenance (RPM) is even easier to understand. Under RPM, a manufacturer agreed with its retailers to set a price, thereby effectively foreclosing price competition for that retail brand.⁶² Historical antitrust policy condemned these agreements as restraints on trade, pointing to the higher prices that reduce output and welfare.⁶³ The Chicago insight suggested that manufacturers would have no incentive to participate in a retail agreement that reduced their output and profits. Moreover, the supranormal profits accruing to retailers would trigger vertically integrated entry (or fringe expansion) and further undercut the manufacturer's position in the market. The vertical story was not intellectually consistent with economic theory and thus could not be the explanation for RPM. Absent a horizontal cartel, an RPM policy had to be efficient to survive in the market.

Telser highlighted the vertical efficiencies associated with customer services and observed that, free riding would undercut the provision of these services by retailers.⁶⁴ Under the Telser theory, manufacturers would need to maintain retail prices to guarantee that the high margins required to finance these retail services would not be undercut by “free-riding”

⁶² The vertical cartel could disguise a horizontal manufacturer cartel, but then the core theory would not be vertical.

⁶³ Andrew N. Kleit, *Efficiencies without Economists: The Early Years of Resale Price Maintenance*, 59 S. ECON. J. 597, 597 (1993).

⁶⁴ Lester Telser, *Why Should Manufacturers Want Fair Trade*, 3 J.L. & ECON. 86 (1960). The concept of “free riding” involves the willingness of economic agents (such as retailers) to exploit investments of others for their own profit. Free riding occurs when one set of retailers cuts prices to obtain customers who would otherwise have purchased from another retailer offering the same product supplemented with costly special services. The free ride is represented by the fact that customers obtain services from high-priced retailers and buy from discount retailers who do not offer the services. Special services often involve some type of information the retailer must supply to the customer to induce purchase.

discounters.⁶⁵ The higher prices generated by RPM were associated with a superior good because the consumer obtains both the product and the customer services necessary to fully exploit the product. Competition serves to ensure that the manufacturers make the correct decisions. Otherwise, manufacturers that implement unnecessary RPM programs lose sales to other firms with looser distribution policies.

Another Chicago insight questions the profitability and, therefore, the incidence of predation. Predation is seen as any other investment, with revenues foregone today in the hope of higher profits tomorrow. If the investment in predation cannot be recouped, it will not occur. Thus, the two economic issues that must be evaluated are: (1) how much it will cost to eliminate competition; and (2) how long it will take to recover the investment in predation. With minimal analysis, it can be shown that predation is very costly to the predator because it holds the dominant share and incurs most of the opportunity cost of the low prices, while the victim can reduce output to minimal levels and wait. Once the predator raises the price, the victim can expand output and defeat the anticompetitive effect. To force the victim out of business, the predator must have access to a lower cost of capital. Even if the victim is forced from the market, recoupment is far from assured. Other firms could enter when the price increases and eliminate the supranormal profits. Moreover, the underlying technology of the market itself may change, thus eliminating the predator's market power. This argument is particularly telling in a dynamic business in which changes in technology dramatically change industry structure on a regular basis. Of course, efficiency theories exist to provide logical explanations for a firm's pricing policies. For example, low pricing may be associated with declining cost structures, with

⁶⁵ The theory has been further developed to suggest the RPM premium bonds the performance of the retailer, with retailers who fail to provide the special services terminated by the manufacturer. *See* Benjamin Klein & Kevin M. Murphy, *Vertical Restraints as Contract Enforcement Mechanisms*, 31 J.L. & ECON. 265 (1988).

the alleged predator simply passing on the future cost savings to consumers, or with introductory pricing to induce consumers of rival products to change their usual consumption patterns.

Posner notes that these theories easily generalize, with the tying analysis suggesting that vertical integration is usually efficient, while the RPM discussion implies that non-price vertical restraints are likely to be efficient.⁶⁶ Moreover, the “free rider” problem, implicit in the RPM literature, generates implications for collusion and mutual forbearance. Without a complex agreement to organize a cartel, firms are very likely to free ride on the output-restricting effects of others, and thus undercut any tacit cartel. Predation arguments can also be generalized to address various non-price predation schemes.

The controlling insight of all Chicago economics is that a firm cannot unilaterally create market power. Firms may possess market power linked to some institutional rigidity; firms may enter into explicit agreements that enhance market power, and firms also may rarely leverage market power into areas where the structural conditions support a noncompetitive outcome. However, to suggest a truly general approach to the creation of market power is to advocate economic alchemy. It is not economic science.

Chicago analysis has insights into both the questions of what the law should be and how society should resolve legal disputes. Chicago theory generally supports a broad rule that approximates *per se* legality for vertical relationships and unilateral behavior, while at the same time observing that exceptions to the general case will exist. Cartels are considered anticompetitive, while mergers should be judged under the rule of reason. Under the Chicago model, microeconomic theory provides the road map to prove potentially anticompetitive behavior (i.e., a merger between horizontal competitors) either has injured or would likely injure

⁶⁶ POSNER, ANTITRUST LAW, *supra* note 7, at 927.

competition, along with an approach to address efficiency concerns. Even in those areas of antitrust that have not yet adopted the Chicago insights, Chicago analysis can provide appropriate guidance. For example, a Chicago-based approach to tying would study the evidence to answer the key legal question of whether the tying firm has sufficient market power to trigger liability.

Because the criticisms of the Chicago school comprise PCE, we will not attempt to detail these alleged shortcomings of the Chicago model in this Article. In the next section, we flesh out the Post-Chicago reactions to the limitations of the Chicago theories, as well as describe the limitations of the Post-Chicago analysis.

IV. POST-CHICAGO ECONOMICS

Post-Chicago Economics (PCE) stems from the proposition that mathematical modeling, in the form of game theory, would provide a useful underpinning for antitrust analysis.⁶⁷ This school generally focuses on strategic behavior of firms. Instead of focusing on the basic competitive interactions of the market, these models show how firms can enhance or protect their market power by incorporating specific strategies, and the reactions of their rivals, into a complex equilibrium analysis.⁶⁸ Although there are notable exceptions,⁶⁹ the mathematical models underpinning these theories tended to be developed in the economics departments of

⁶⁷ Jonathan B. Baker, *Recent Developments in Economics that Challenge Chicago School Views*, 58 ANTITRUST L.J. 645, 646 (1989).

⁶⁸ Examples include: using price or capital investments to signal rivals about future actions; taking actions to raise rivals' costs; or credibly committing to an apparently irrational course of action to influence the pricing or entry decisions of rivals.

⁶⁹ For example, two Department of Justice economists have advanced the idea of using a logit market structure to simulate the effects of mergers. See Gregory J. Werden & Luke M. Froeb, *The Effects of Mergers in Differentiated Products Industries: Logit Demand and Merger Policy*, 10 J.L. ECON. & ORG. 407 (1994).

academic institutions before they were adopted by antitrust practitioners.⁷⁰ The models start with the Chicago school's proposition that economics controls antitrust, but then they add complexity to the microeconomic analysis that seeks to generate a collection of special case results. These results are then linked to traditional antitrust doctrine as examples of anticompetitive conduct. The insights can be considered almost normative because of the special nature of the assumptions. If you believe that the world follows a particular mathematical model, then certain antitrust policies should be followed. Many PCE adherents appear to distrust market outcomes and believe instead that government regulation is necessary to rein in the natural tendency of firms to acquire and exploit market power.⁷¹ Proponents of PCE take a broad view of PCE theories, suggesting that they describe how the world can really function.⁷² The only thing the PCE theorists must do is check the assumptions. This, of course, will turn out to be the real trick.

PCE methodology creates mathematical models to describe the dynamics of various antitrust issues. These theories present stylized models for use in defining when particular actions under study are profitable for the firm. To quote Lawrence Sullivan from the Proceedings of the 1995 Federal Trade Commission conference on Post-Chicago Economics:⁷³ "Post-Chicago

⁷⁰ Two other schools of thought exist somewhat independently of the two principal movements discussed in the text. The Austrian school (linked to the theories of Von Mises and Hayek) would focus on economics as a dynamic process much broader than that described by neoclassical economics. It tends to reject the need for all antitrust enforcement. *See, e.g.*, DOMINICK T. ARMENTATO, *ANTITRUST AND MONOPOLY: ANATOMY OF A POLICY FAILURE* (1982) and Jerome Ellig, *Untwisting the Strands of Chicago Antitrust*, 37 *ANTITRUST BULL.* 863 (1992). The New Empirical Economics movement focuses more on empirical testing than theory, although the tests are based on neoclassical economic principles. This school is associated with some of the most elite universities, such as MIT and Stanford. *See* Timothy F. Bresnahan, *Empirical Studies of Industries with Market Power*, in 2 *THE HANDBOOK OF INDUSTRIAL ORGANIZATION* 1011, 1011 (Richard Schmalensee & Robert D. Willig eds., 1989).

⁷¹ *See, e.g.*, Baker, *supra* note 67, at 653. He interpreted various empirical studies to suggest that "a kinder, gentler nation needs a tougher, meaner antitrust law." *Id.*

⁷² *See* THE ANTITRUST REVOLUTION, *supra* note 1.

⁷³ *See* Lawrence A. Sullivan, *Post-Chicago Economics: Economists, Lawyers, Judges, and Enforcement Officials in a Less Determinate Theoretical World*, 63 *ANTITRUST L.J.* 669, 669 (1995). The conference was distinguished by its general lack of Chicago scholars. In general, the discussions involved one set of PCE experts taking the interventionist view and another set of PCE experts claiming the particular theories do not apply in the situation at issue.

antitrust economics is a world of imagination.” Because Professor Sullivan appears to support PCE, it is clear he did not grasp the full impact of his insight. In PCE, anything can happen. Given only rough details of the behavior, the economist creates a theory that will generate the proposed conclusions. While PCE adherents will claim that they review facts, their models are not designed to accept a realistic set of facts. When there are limited facts, the models collapse into multiple equilibria; if there are too many facts, the models descend into intractability. To set a foundation for a more detailed discussion of these problems, we first present an overview of PCE theory taken from the writings of a leading proponent, and then offer a Chicago school response.

In the late 1980s, Jonathan Baker detailed, for the Antitrust Section of the American Bar Association, five theoretical challenges that later came to form the school of Post-Chicago economics.⁷⁴ First, vertical foreclosure, linked to some form of raising rivals’ cost analysis, was presented as providing an anticompetitive explanation for various vertical relationships. Because anticompetitive effects could now occur, the Chicago belief in the almost *per se* legality of vertical contracts was undermined. Second, Baker described sophisticated theories of price predation that illustrate how a predator could build a reputation for irrationality and thus maintain monopoly prices without a vast expenditure of resources; hence, striking down the Chicago presumption against predation. Third, various game-theoretic models were advanced to rehabilitate the concept of collusion. Chicago analysis had highlighted the various difficulties associated with a collusive outcome and predicted that collusion would be a rare occurrence (outside of the context of an explicit agreement), while these new game theories suggest that collusion could coexist with outbreaks of competition. Fourth, Baker discussed models that

⁷⁴ Baker, *supra* note 67.

repackage the theory of conglomerate forbearance under which firms competing in many markets tend to accommodate each other and compete less intensely.

Again, the Chicago conclusions on the inherent difficulty of collusion, and the concept that a monopolist only controls one monopoly profit, had led to the demise of this line of antitrust concern. PCE economists could make the issue relevant again by constructing models in which forbearance could occur. Fifth, theories of strategic entry deterrence were offered to make entry analysis endogenous and thus much more complex.⁷⁵ These models involved game-theoretic presentations in which an incumbent commits to actions designed to make entry unprofitable. The models suggest that the Chicago focus on exogenous factors that differentiate entrants from incumbents could be ill-advised. The frequent use of the word “could” reflects the Post-Chicago emphasis on the possible, rather than on the likely.

In a 1991 review of the (then) recently published *Handbook of Industrial Organization*, Sam Peltzman highlighted the applicability problems with game-theoretic models by presenting the following, non-exhaustive list of 20 questions, the answers to which may critically affect the results of a non-cooperative game.⁷⁶ In general, these considerations apply to any game-theoretic

⁷⁵ Baker also describes a new understanding of how the interaction between scale economies and sunk costs would negate the Chicago position that the government was the only source of barriers to entry. *Id.* at 651. This criticism is really different from the others because it asserts the general principle that scale and sunk costs interact to form an entry barrier, instead of presenting examples of anticompetitive effects generated by game theoretic models. *Id.* at 651 n.30. The “new” entry analysis relies on scale to suggest that the market is not (currently) large enough to support a new firm and sunk costs to preclude the new firm from engaging in “hit and run” entry. *Id.* at 652. By impeding entry (at a point in time), the model suggests that a window of opportunity exists for monopoly pricing. In Chicago analysis, this is simply an entry impediment; an observation that suggests new competition will arrive slowly as the entrant waits for the market to grow. Thus, this PCE concept is simply an implementation of Posner’s concern with the time of entry. POSNER, *ANTITRUST LAW*, *supra* note 7, at 37-39. Chicago economists have flipped this result by showing how coalitions of buyers can guarantee sales to the entrant and induce entry in the face of sunk costs and economies of scale. See Andrew N. Kleit & Malcolm B. Coate, *Are Judges Leading Economic Theory?: Sunk Costs, the Threat of Entry and the Competitive Process*, 60 S. ECON. J. 103 (1993); David T. Scheffman & Pablo T. Spiller, *Buyers’ Strategies, Entry Barriers and Competition*, 30 ECON. INQUIRY 418 (1992).

⁷⁶ Sam Peltzman, *The Handbook of Industrial Organization: A Review Article*, 99 J. POL. ECON. 201 (1991).

model addressing other PCE issues of vertical relationships, predation, collusion, mutual forbearance or entry deterrence. The list includes:

- (1) How many players are there?
- (2) Who moves first?
- (3) Who remembers what (e.g., are there information lags)?
- (4) Who knows what (e.g., is knowledge common or private)?
- (5) When do they know it? (See also question (3))
- (6) Who can communicate with whom and when?
- (7) What is the probability of any outcome?
- (8) How reasonable are the players?
- (9) Is a choice once and for all or subject to change over time?
- (10) How long is each period?
- (11) What is the discount rate?
- (12) How long do the players live?
- (13) How do players today respond to past play (e.g., do players develop reputations)?
- (14) Does an equilibrium exist?
- (15) Is an equilibrium coalition proof? (See question (1))
- (16) Is an equilibrium robust to changes in assumptions?
- (17) How are deviations punished?
- (18) Is there a continuum of reactions or a discrete number?
- (19) Are players' reaction functions smooth or discontinuous?
- (20) What does player A believe about player B's objective function and vice versa?⁷⁷

⁷⁷ *Id.* at 207. Peltzman notes "a particular game-theoretic model will not have to answer all of these questions, but it will typically have to answer a nontrivial subset. By suitably permuting and combining the problems and

While the list may not prove fatal for a purely theoretical analysis, many of the questions are likely to have implications for the general applicability of the models. Question (1) offers an example of the difficulty of applying the models. Because game-theoretic results often change as the number of players increases from two to three to N, a game involving two firms is unlikely to offer many insights into the competitive process. In addition, many games exclude entry, and therefore, the analyses abstract from an entire class of rivals. Because entry can often change the ramifications of a game, the relevance of the model is further reduced. Efficiency considerations appear to be omitted from the Peltzman list. As efficiency explanations play a crucial role in Chicago theories, it is hard to see how any game-theoretic model could be taken seriously if the very cost savings that may cause the problematic behavior are excluded from the analysis. In any case in which efficiencies are potentially relevant, many PCE models appear to be of little value.⁷⁸ Overall, it seems that some game-theoretic models are simply inapplicable to various real world situations.

Other questions address issues that are difficult to measure even with empirical evidence. To structure a model, the PCE analyst makes a number of virtual assumptions, existing primarily as constructs, to aid the modeling process. In reality, these virtual assumptions are difficult, if not impossible, to quantify because they address relatively unobservable aspects of market behavior.⁷⁹ While this approach to modeling does not necessarily cause complications for the

assumptions, new models can be produced almost ad libitum.” *Id.* While the specific structure of any model may abstract from some of these questions, it is less clear that the model cannot be readily generalized to address the omitted questions and thus all the issues discussed above (and others omitted to bound the list) are relevant.

⁷⁸ Coate and Rodriguez observe that the same standard should be applied to the study of efficiencies as the anticompetitive effects. Coate & Rodriguez, *supra* note 56, at 234. Efficiency claims should not be dismissed merely because the evidence to support the claims is weak because the evidence to support the predicted anticompetitive effects may also be weak.

⁷⁹ For example, the firm’s general plan to address competition in the market (its strategy) will not be readily observable. Instead, the analyst may only see various marketing tactics (price promotions or marketing efforts) that may be compatible with a multitude of strategies. While the Chief Operating Officer may have an idea as to his/her

analyst, in PCE models it is often fatal to the broad applicability of the analysis because changes in the virtual assumptions lead to major changes in the predictions of the model. Hence, evaluating the virtual assumption is crucial, but often impossible.

Numerous examples of these virtual assumptions are implicit in the Peltzman list. For example, question (1), on number of players, requires an assumption on the number of competitors, along with a virtual assumption on the number of firms that can undertake strategies. Fringe firms may be considered to be price takers. Customers affected by the game may be assumed unable to formulate defensive strategies. On the other hand, a case can be made that the models should always be generalized to address the possibility that fringe firms will expand – thus becoming strategic players – and to allow customers to respond directly (if they are large) or indirectly through their implicit agents (if they are small). Because most PCE models do not allow for fringe firms or customer responses and because their implications rely on this assumption, their underlying merit is cast into doubt.⁸⁰

Question (2) focuses on the order of movement in the game. For example, the game may assume simultaneous movements or sequential movements of firms, along with an assumption about the order in which choices are executed. Moreover, the exact definition of a movement must also be specified. Can a firm respond to a price strategy with a non-price action, and if so, what type of non-price action is possible? Alternatively, can a firm meet a non-price strategy with a price move? Again, even if it is possible to determine how rivals really interact (maybe

plan, it appears extraordinarily naïve to assume, without evidence, that this plan is actually carried out by the modern corporation. Real world corporate strategy depends on the interaction of multiple personalities, incentive plans, market structure, and so on, and need not be fully understood by any one individual. Of course, a keenly insightful manager may be able to figure out how the company works, but would have no incentive to reveal this information in an antitrust investigation.

⁸⁰ This point becomes all the more important in vertical PCE models, in which the number of suppliers and customers is often small. While the transactions costs involved with coordinating the actions of many buyers to respond to strategic behavior on the part of a supplier may be large, the task becomes significantly less daunting when there is but a handful of customers.

one firm is accepted as the leader), it is less clear how one could possibly allow for all the potential strategies and counterstrategies.⁸¹ As long as the structure of the assumptions critically affects the outcome of the game, PCE models may simply assume their conclusions and thus may be of no use.

Another area of concern is the assumptions that the analyst may make about the information that each agent in the game possesses. For example, question (4) focuses on the initial state of knowledge, while question (6) addresses the structure of communications. Question (3) incorporates the ability of the players to retain information.⁸² While it is possible to define specific assumptions to allow rivals to strategically manipulate data, other assumptions would render the use of a communication strategy worthless. Again, because different assumptions generate different results, the assumptions control the results. As long as the assumptions exist only in the virtual world of the analyst, PCE models offer no generalized insights.

A final area in which PCE theories are not well-suited to explaining real-world phenomena involves the concept of equilibrium, listed as question (14). Game-theoretic concepts often yield many potential equilibrium outcomes, with no clear way to choose one over the others. In applied analysis, this is a serious problem. Indeed, as Howard Marvel notes, even the most basic antitrust issue – that of determining whether two firms that choose prices over an extended period and routinely observe each other’s actions will reach a collusive agreement –

⁸¹ It is often under-appreciated that, at its core, game theory involves an “understanding” or agreement among the empowered players as to the rules of the game. For example, if some of the firms in a market decide not to play a Cournot game, the standard Cournot equilibrium will not evolve. Thus, overlying the entire analysis is some implicit assumption that all firms are behaving under a standard structure.

⁸² For example, John Lott, Jr., notes that the game-theoretic literature typically assumes incumbents to be the ones with the asymmetric informational advantages, but that this assumption is not necessarily appropriate. Lott notes that potential entrants “obviously enjoy the advantage of knowing whether and when they might enter the market.” LOTT, *supra* note 13, at 2. Lott later notes that this creates the possibility that the entrant can profit by trading on this information in the stock market. *Id.* at 96-106.

has no clear outcome in the game-theoretic world.⁸³ In what is known as the “folk theorem” of game theory, “competition and monopoly, as well as everything in between, is sustainable as an equilibrium” in the game between these two firms, as long as the firms value future income sufficiently.⁸⁴ A substantial cottage industry has developed over the years to devise ways to limit the number of equilibria in a logical way, although thus far there has been no generally accepted consensus on how to do so.⁸⁵ Applying these insights to real-world situations is difficult. For example, a particular business practice might be alleged to facilitate collusion, although the same practice may also generate a competitive outcome. An analyst could claim that the collusive outcome is the most likely a result of the game, but that claim has no scientific basis, absent direct evidence.

As a bottom line, it should be clear that anything may happen in a PCE model. It is sufficiently clear to at least one academic who studies these models that a term-of-art has been coined to describe the result. This economist refers to “finding the rabbit(s)” in the model as identifying the key assumption(s) that drives the result, a very interesting reflection on the “magic” that goes into constructing these models.⁸⁶ Classic “rabbits” include the assumption of a single competitor, a prohibition on entry, the sequencing of moves, limitations on the ability of other economic actors to play in the game, and the ability of the incumbent to commit to a particular strategy. In fact, with sufficient imagination, a broad set of assumptions should be able

⁸³ Howard P. Marvel, *Antitrust Policy and the Republican Congress: Vertical Integration and Vertical Restraints*, 41 ANTITRUST BULL. 15, 24-25 (1996).

⁸⁴ *Id.* at 25.

⁸⁵ See DAVID M. KREPS, A COURSE IN MICROECONOMIC THEORY (1990). Chapter 12 discusses basic equilibrium concepts in games with perfect information, while Chapter 13 extends the discussion to games with imperfect information. Of course, if firms could commit to specific strategies under all possible states of the world, the multiple equilibrium problem would be resolved. However, ex post facto commitment is difficult to model because optimal strategies generally change as the game is played out.

⁸⁶ The characterization comes from lecture commentary on economic theory at a well -- known economics graduate program. This description is a little too colorful for an academic to use in an economic publication.

to generate almost any desired equilibrium. Of course, if the model loses one key “rabbit” assumption, the results often are no longer clear-cut. Even if the analyst can appeal to a factual basis for that one assumption, other assumptions are often equally crucial. Thus, it is a rare situation indeed in which a PCE model can be applied to any real market situation.⁸⁷ The PCE theory exists in the imagination of economists, but not necessarily in the real world.⁸⁸

PCE has played a valuable role in identifying sets of behavioral assumptions under which anticompetitive outcomes may occur. These special cases clearly merit further study to see if the assumptions impact the analysis of real-world markets.⁸⁹ Policy-makers must address the difficult question of whether this extra complexity is worth the legal transactions costs. In resolving legal disputes, PCE is much less helpful. Its models rely on very specific, often unquantifiable, assumptions to generate very narrow results. Efficiencies are rarely addressed. In the next section, we turn to evaluating whether PCE testimony should even be admissible in an antitrust proceeding.

⁸⁷ Lott observes:

[A]lternative game-theory scenarios are so numerous that straightforward applications by the courts are essentially impossible. Yet, the implications and key assumptions underlying the models must be examined and validated before they can serve as a guide for policy purposes.

As is well recognized, though seldom discussed, the implications of game-theory models are extremely sensitive to their assumptions. Furthermore, many of the most widely adopted assumptions are questionable in and of themselves. For example, the game-theoretic literature typically assumes incumbents to be the ones with the asymmetric informational advantages.

LOTT, *supra* note 13, at 2.

⁸⁸ In case the text does not make this point clear, we want to emphasize that our objections to PCE theorizing are limited to the use of these models in antitrust enforcement, rather than to the use of these models to illustrate the limitations of alternative modes of analysis. A model that provides a counter-example to a general proposition can be valuable in drawing out the conditions under which the general proposition is correct. Such a model is of limited value for a court, however, because counter-examples are not general observations about the way the real world works.

⁸⁹ As some of these special case situations predate PCE, these insights are not always novel.

V. ECONOMISTS AND *DAUBERT*

Under the *Daubert* standard, the expert economist is expected to present the court with testimony that: (1) provides a scientific theory to distinguish between the anticompetitive and procompetitive explanations for the behavior under review; and (2) applies the theory to the facts of the case.⁹⁰ If the proposed testimony is personal opinion and not science, it is not admissible. Moreover, if the proposed testimony does not help explain the behavior under review with the facts in the record, it is also inadmissible under *Daubert*.⁹¹ Thus, to determine the fate of PCE under *Daubert*, we must examine these two questions of science and general applicability.⁹²

Science is defined by the specification and testing of logical hypotheses.⁹³ If a hypothesis cannot be falsified, it is, by construction, not science. Implicit in this definition of science is the ability to replicate the result. Thus, a valid scientific result or finding must be reproducible. In *Essays in Positive Economics*, Milton Friedman wrote the classic commentary on economics as a science.⁹⁴ Friedman noted “the ultimate goal of a positive science is the development of a ‘theory’ or ‘hypothesis’ that yields valid and meaningful (i.e., not truistic) predictions about

⁹⁰ Under the *NYNEX* decision, the plaintiff must allege and prove harm, not just to a single competitor, but to the competitive process, i.e., to competition itself. See *NYNEX Corp. v. Discon, Inc.*, 525 U.S. 128, 133 (1998).

⁹¹ For a general analysis that suggests that *Daubert* dooms the *Philadelphia National Bank* presumption (i.e., using an increase in concentration to conclude that competition has diminished) as unreliable, see generally Charles D. Weller, *Current American Antitrust Analysis is Mortally Wounded, and an Alternative is Already Well-Developed*, *ANTITRUST REP.*, Mar. 2000, at 2. For Weller’s general commentary on the applicability of *Daubert* to economics, see Charles D. Weller, *Antitrust Economics as Science after Daubert*, 42 *ANTITRUST BULL.* 871 (1997). As discussed in the text, we believe Chicago-based economics can survive a *Daubert* challenge.

⁹² One could also conduct a two-part analysis by first asking if the testimony represents scientific analysis and then by evaluating whether the testimony is both theoretically and empirically linked to the legal dispute. Either approach requires the court to entertain the same questions, while not needing to focus on deciding whether the testimony represents the best interpretation for the relevant facts.

⁹³ See *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579 (1993). Alternatively, Webster’s Unabridged Dictionary of the English Language defines “scientific method” as “a method of research in which a problem is identified, relevant data are gathered, a hypothesis is formulated from these data, and the hypothesis is empirically tested.”

⁹⁴ Milton Friedman, *The Methodology of Positive Economics*, in *ESSAYS IN POSITIVE ECONOMICS* 3-43 (1953). Friedman’s work is based on an earlier book by another well-known economist. See JOHN M. KEYNES, *THE SCOPE AND METHOD OF POLITICAL ECONOMY* (1891).

phenomena not yet observed.”⁹⁵ Theory is to be judged by its predictive power for the class of phenomena it is intended to explain.⁹⁶ Because controlled experiments are rare – some would say impossible – in economics, theories are tested by observing actual market behavior and comparing the results with the predictions of the theory. Theories can be accepted when they accurately predict market behavior, even if the assumptions do not appear to be strictly valid. For example, standard microeconomic theory assumes that firms undertake a detailed profit maximization analysis by equating costs and revenues at the margin. As long as this theory predicts how firms will behave in response to changes in market conditions, it can be accepted even if evidence of actual marginal cost pricing is missing.⁹⁷ Friedman cautions that the validity of a hypothesis is not sufficient for scientific acceptance because many other hypotheses may also be valid.⁹⁸ To resolve this problem, scientists prefer theories that are both “simple” and “fruitful.” Simple theories require less initial knowledge to make relevant predictions, while fruitful theories generate more precise predictions over a broad range of outcomes.⁹⁹ This

⁹⁵ Friedman, *supra* note 94, at 7. Friedman observes that theory is a set of tautologies. Theory is initially structured with logic and facts. However, theories must go beyond tautologies to generate testable implications for a wide range of factual situations. In fact, the power of a theory can be defined by its ability to predict many real outcomes based on relatively few factual observations.

⁹⁶ *Id.* at 8. Technically, factual evidence does not prove a hypothesis; facts just fail to disprove a hypothesis. Thus, scientists should state (if true) that the theory is compatible with the facts. Statements that the theory is confirmed by the facts should be read with this understanding. *See id.* at 9.

⁹⁷ *Id.* at 21-22.

⁹⁸ *Id.* at 9. Friedman notes observed facts are finite, while hypotheses are infinite and therefore, many theories will “fit” a set of facts.

⁹⁹ *Id.* at 10. Friedman also notes the theories must be logically complete, and consistency is required in the theory specification. These factors eliminate inappropriate theories from consideration as illogical or special case scenarios. *Id.* Because inappropriate theories are excluded from consideration by this test, Friedman’s position on science is compatible with the two-question approach (logically consistent and empirically verifiable), that Weller ascribed to Albert Einstein. *See Weller, Antitrust Economics as Science After Daubert, supra* note 91.

structure for choosing among theories is crucial in evaluating the real world applicability or usefulness of the theory.¹⁰⁰

A. *Economics as Science*

Economists are generally constrained to test their theories behavior observed in the marketplace.¹⁰¹ The observations may be: (1) an aggregation of specific market occurrences; (2) a particular occurrence; or (3) somewhere between total aggregation and a single case study. Different theories often require testing with different types of data.

Franklin Fisher has classified economic theories into two broad categories: generalizing or exemplifying. A generalizing theory “proceeds from wide assumptions to inevitable consequences.”¹⁰² This type of theory gives rise to very broad scientific hypotheses that can be readily tested with the data. While the theory may not explain all the possible outcomes (i.e., the error rate will be non-zero), the theory can be accepted as economic science if it offers a strong ability to predict market behavior. Errors can be addressed with clarifications to the generalizing theory, which explain when the model is not applicable.

On the other hand, an exemplifying theory focuses on determining what might happen. In an exemplifying theory, the model presents a detailed set of assumptions and derives a specific

¹⁰⁰ It is important to note that our objection to PCE models is not related to the overall simplification of the real world implicit in the PCE assumptions. Instead, our problems are linked to the applicability of a PCE model to an antitrust dispute. When the outcome of a PCE model logically depends on certain factual assumptions, it is crucial that these assumptions be validated by evidence before the model is accepted in a legal proceeding. By construction, the PCE model will generate different implications when it is applied in other fact situations, hence the insights of the PCE model are not helpful to the court if they are not grounded in fact. In contrast, the Chicago models offer robust predictions and hence are relevant to a legal dispute.

¹⁰¹ Experimental economics tests economic theories in academic laboratories that re-create key market structures and observe the outcomes of simulated markets. The field is relatively young and has not received widespread support in the profession. For a general discussion, see *THE HANDBOOK OF EXPERIMENTAL ECONOMICS* (John H. Kagel & Alvin E. Roth eds., 1995).

¹⁰² Franklin M. Fisher, *Games Economists Play: A Noncooperative View*, 20 *RAND J. ECON.* 113, 117 (1989).

result. As long as the assumptions are valid, the result will occur. However, these theories are highly sensitive to the assumptions used. It is this structure that detaches the theories from reality. Empirically, exemplifying theories can be put to the test, although their very nature appears to mandate something that approximates case-by-case evaluation. Again, errors could be used to further refine the model, although the exemplifying nature of the theory limits the feasibility of this approach.¹⁰³

It should be obvious that Chicago analysis represents an example of generalizing theory, while PCE defines various types of exemplifying theories.¹⁰⁴ Chicago theories are all readily testable in the marketplace. For example, the theory of monopoly predicts that the market price will rise (or quality will fall) when one firm gains market power. Moreover, quality-adjusted output will necessarily fall as the market is monopolized. Under a broad range of market characteristics, the failure of a monopolist to raise the price (lower the quality), *ceteris paribus*, would tend to falsify a theory of monopoly. More specific Chicago theories address other business practices. For example, Chicago theory predicts that resale price maintenance is generally used to capture efficiency benefits and only rarely, if ever, does it lead to cartelization. This hypothesis has been tested through a review of a large sample of resale price maintenance (RPM) cases. Many of the industries using RPM involved products for which RPM could give rise to vertical efficiencies, while few cases were brought in industries in which market structure was compatible with a cartelization hypothesis.¹⁰⁵ Evidence of cartel pricing was generally

¹⁰³ As exemplifying theories are qualified with additional assumptions, one runs the risk of transforming them into tautologies.

¹⁰⁴ Fisher advanced his structure in a comment on game-theoretic (PCE) analyses.

¹⁰⁵ Pauline M. Ippolito, *Resale Price Maintenance: Empirical Evidence from Litigation*, 34 J.L. & ECON. 263 (1991); Stanley I. Ornstein, *Resale Price Maintenance and Cartels*, 30 ANTITRUST BULL. 401 (1985).

missing, even in the sub-sample of cases, with the structure conducive to collusion.¹⁰⁶ Thus, the Chicago theory on vertical price agreements has empirical support, while the cartelization theory remains a special case footnote to the Chicago generalization.

Similarly, Chicago theory suggests predation is rarely, if ever, a profitable strategy. A case study approach has been used to test this proposition.¹⁰⁷ McGee re-evaluated the predatory evidence in the *Standard Oil* case¹⁰⁸ and found no support for systematic price predation. Evidence of geographic price differences was better explained by differences in the elasticities of demand. Mergers, not predation, were considered the source of *Standard Oil's* market power. As discussed below, a number of other case studies exist that generally support Chicago reasoning. Because Chicago theories are subject to scientific verification, they clearly pass the first prong of the *Daubert* test. Chicago economics is economic science.

Post-Chicago theories generate a different set of hypotheses than do Chicago economics. Instead of concluding that a broad set of behavior is competitive, PCE models generally show that a narrow set of actions generates competitive concerns.¹⁰⁹ As one might expect, the relatively specialized PCE theories are difficult to test because the real world offers few clear demarcations.¹¹⁰ Slade offers one test of tying theory.¹¹¹ By focusing on the highly concentrated

¹⁰⁶ Ippolito, *supra* note 105; Ornstein, *supra* note 105, at 431.

¹⁰⁷ John S. McGee, *Predatory Price Cutting: The Standard Oil (N.J.) Case*, 1 J.L. & ECON. 137 (1958).

¹⁰⁸ *Standard Oil v. United States*, 221 U.S. 1 (1911).

¹⁰⁹ For example, Paul Joskow noted that “[t]he models developed so far show that anticompetitive ‘foreclosure’ is theoretically possible under certain circumstances (contrary to the Chicago view), but the assumptions embedded in these models do not fit real markets very well.” Paul L. Joskow, *The Role of Transaction Cost Economics in Antitrust and Public Utility Regulatory Policies*, J.L. ECON. & ORG. 53, 58 n.4 (1991).

¹¹⁰ As Bruce Kobayashi noted, “game theoretic models of IO have not been empirically verified in any meaningful sense.” He questions whether PCE models should actually pass the scientific method prong of the *Daubert* standard. Bruce H. Kobayashi, *Game Theory and Antitrust: A Post Mortem*, 5 GEO. MASON L. REV. 411, 414 n.18 (1997). While Kobayashi’s scientific concerns are certainly reasonable, the Supreme Court’s algorithm for evaluating scientific testimony may allow a court to admit PCE models as science. However, for the reasons discussed in the text, these models generally do not aid the dispute resolution process.

newspaper market and delineating two related businesses, newspaper advertising and creative services of advertising professionals, Slade finds that newspaper monopolists are more likely to tie the provision of the two products together than are newspaper competitors. This evidence appears to support the hypothesis that the tie allows a newspaper monopolist to leverage its market power in newspaper advertising into ad creation.

Although this paper represents an ingenious attempt to test a PCE model, the analysis is unable to come to grips with an alternative hypothesis, that the newspaper is engaging in price discrimination.¹¹² A customer that uses an outside advertising agency is signaling that it values advertisement more, and thus naturally would be charged a higher price by a monopolist. Specifically, the customer would be forced to pay full price to the paper and the commission to the agency. As the cost structure of newspapers leads to robust competition, it is not surprising that publishers do not discriminate when they face competition.¹¹³ Another example is Burns' test for predation theory. His work linked predatory acts to later reductions in the acquisition price of firms in the cigarette industry around the end of the 19th century.¹¹⁴ This result suggests that a predator could recoup the investment in predation through lower buy-out prices. Of course, it remains unclear whether predation would still be profitable in the face of an active, horizontal merger-enforcement policy.¹¹⁵

¹¹¹ Margaret Slade, *The Leverage Theory of Tying Revisited: Evidence from Newspaper Advertising*, 65 S. ECON. J. 204 (1998).

¹¹² Slade observed that newspapers do price discriminate with respect to the type of advertisement. For example, color advertisements were more expensive (even after adjusting for cost), a result compatible with price discrimination. *Id.* at 208.

¹¹³ Our argument does not even address the question of the advertising agency choosing which paper the advertisement will appear in, an argument likely to be compatible with newspaper-paid commissions.

¹¹⁴ Malcolm Burns, *Predatory Pricing and the Acquisition Cost of Competitors*, 94 J. POL. ECON. 266 (1986).

¹¹⁵ Lott observes how even Burns notes that his results could be compatible with efficiency. *See* LOTT *supra* note 13, at 6.

Most PCE models appeal to case studies for their empirical support. This approach is best developed in raising rivals' cost (RRC) literature.¹¹⁶ Cases such as *Klor's*, *Alcoa*, and *Pennington Coal* have been advanced as supportive of core RRC concepts.¹¹⁷ However, on closer review, each of these cases fails to offer much support for the RRC theory. Coate and Kleit note that the *Klor's* case could raise real exclusionary concerns only if the relevant market was measured "in terms of feet" along Mission Street in San Francisco.¹¹⁸ Within the same neighborhood, 43 other retailers sold the brands to which *Klor's* was "excluded."

Similarly, Lopatka and Godek reviewed the record in *Alcoa* and found no evidence of exclusion because Alcoa controlled a very small percentage of the available electric power and less than 50 percent of the available bauxite, the key physical input into aluminum.¹¹⁹ Only *Pennington Coal* appears to have some theoretical merit, but again, the case has no real empirical support.¹²⁰ In *Pennington Coal*, large coal mining companies had the technical ability to substitute capital for labor, while the small coal companies could not. Thus, the large coal companies actually could raise their rivals' costs by colluding with the union to raise industry-wide wages.¹²¹ However, the court record suggests that the union may have unilaterally enforced

¹¹⁶ See, e.g., Thomas G. Krattenmaker & Steven C. Salop, *Anticompetitive Exclusion: Raising Rivals' Costs to Achieve Power Over Price*, 96 YALE L.J. 209 (1986).

¹¹⁷ *Pennington v. United Mine Workers*, 325 F.2d 804 (6th Cir. 1963), *rev'd*, 381 U.S. 657 (1965); *Klor's, Inc. v. Broadway-Hale Stores, Inc.*, 255 F.2d 214 (9th Cir. 1958), *rev'd*, 359 U.S. 207 (1959); *United States v. Aluminum Co. of Am.*, 44 F. Supp. 97 (S.D.N.Y. 1941), *rev'd*, 148 F.2d 416 (2d Cir. 1945).

¹¹⁸ Malcolm B. Coate & Andrew N. Kleit, *Exclusion, Collusion and Confusion? The Underpinnings of Raising Rivals' Costs*, in 16 RESEARCH IN LAW AND ECONOMICS 73, 87 (1994).

¹¹⁹ John E. Lopatka & Paul E. Godek, *Another Look at Alcoa: Raising Rivals' Costs Does Not Improve the View*, 35 J.L. & ECON. 311 (1992).

¹²⁰ Coate & Kleit, *supra* note 118, at 88. See also Oliver Williamson, *Wage Rates as a Barrier to Entry: The Pennington Case*, 82 Q.J. ECON. 85 (1968). Coate and Kleit note that the evidence of an agreement between the large coal companies and the union was weak and therefore the exclusion may have stemmed from the union bargaining position.

¹²¹ The asymmetry that drives the raising rivals' cost result (the size of the coal seam) is empirical and, therefore, the result is better considered as a generalization of standard Chicago theory. If cost asymmetries can be exploited, anticompetitive concerns could occur. Of course, the reader should not disregard the crucial role of the government

the exclusionary policy. Other writers have linked PCE foreclosure theories to cases such as *Terminal Railroad*,¹²² *United Shoe*,¹²³ and *Lorain Journal*,¹²⁴ as well as *Klor's* and *Alcoa*. In each of these cases, a dominant firm was accused of taking actions to harm its rivals. However, further research has found alternative – and sometimes efficiency – explanations for all of these cases. For example, in *Terminal Railroad*, Kleit and Reiffen have shown that any market power maintained in Saint Louis stemmed from a series of mergers that allowed Terminal Railroad to control all of the Mississippi crossings in the area.¹²⁵ Similarly, in *United Shoe*, the number of manufacturers under exclusive contract fell far short of the level needed to foreclose competition.¹²⁶

These studies leave only *Lorain Journal*, a case endorsed even by Robert Bork, to support the exclusionary theory.¹²⁷ However, on closer inspection, even *Lorain Journal* fails to support exclusion, as indicated by Lopatka and Kleit, who have offered an innovative tying explanation for the alleged anticompetitive behavior.¹²⁸ The case focused on the refusal of the *Lorain Journal*, a small-town newspaper, to sell advertising space to local merchants who contemporaneously advertised on the new radio station in the county. Lopatka and Kleit observe that advertising can convey information on what a firm has to sell, or simply place the consumer

in protecting the union as being necessary to this result. Without the union's monopoly power, the small coal companies would not agree to the higher wages that doomed them to extinction.

¹²² *United States v. Terminal R.R. Ass'n of St. Louis*, 224 U.S. 383 (1912).

¹²³ *United States v. United Shoe Mach. Corp.*, 110 F. Supp. 295 (D. Mass. 1953), *aff'd per curiam*, 347 U.S. 521 (1954).

¹²⁴ *Lorain Journal Co. v. United States*, 342 U.S. 143 (1951).

¹²⁵ David Reiffen & Andrew N. Kleit, *Terminal Railroad Revisited: Foreclosure of an Essential Facility or Simple Horizontal Monopoly?*, 33 J.L. & ECON. 419, 437 (1990).

¹²⁶ Scott E. Masten & Edward Snyder, *United States v. United Shoe Machinery Corporation: On the Merits*, 36 J.L. & ECON. 33 (1993).

¹²⁷ BORK, *supra* note 7, at 346.

¹²⁸ John E. Lopatka & Andrew N. Kleit, *The Mystery of Lorain Journal and the Quest for Foreclosure in Antitrust*, 73 TEX. L. REV. 1255 (1995).

on notice that the retailer exists.¹²⁹ They label advertisements that list products and prices as “informational advertising,” and they observe that this business is dominated by newspapers. Further, they tag advertisements that inform consumers of general opportunities to purchase goods and services as notice advertising, and assume that this type of advertising can be provided by both newspaper and radio. The “foreclosure” litigated in *Lorain Journal* should simply be considered a tie between informational advertising that is monopolized by the paper, and notice advertising that is competitively supplied.¹³⁰ Standard Chicago analysis would conclude that, under some conditions, this tie will be both privately and socially efficient, and under other conditions, the tie will reduce welfare. However, the strategy was not designed to force the radio station out of the market, and indeed, the station has prospered.

While the PCE theorists certainly have problems with scientific verification of their theories, the *Daubert* standard is probably flexible enough to accept the characterization of the model as science. The research is certainly published in peer-reviewed journals and it is accepted as scientific by a significant number of economists. Because these considerations were noted by the Supreme Court in the original *Daubert* decision, it would appear that the Court did not want to hold scientists to a tight standard on verification. As the next section will show, the difficulty arises in showing that a PCE theory can generate fact-based results.

¹²⁹ *Id.* at 1287.

¹³⁰ Lopatka and Kleit’s analysis is of small comfort to firms considering *Lorain*-like behavior because tying is per se illegal under the antitrust laws.

B. *Linking Economic Theory to Facts*

The second strand of the *Daubert* standard requires the expert to link the scientific testimony to facts that aid in the dispute resolution process. Testimony that fails this test, while possibly correct on its face, is not relevant to the case and thus must be excluded from the record.

In an antitrust case, expert economic testimony generally attempts to infer actual or prospective market effects from potentially problematic behavior, as well as from evidence on the structure and performance of the market.¹³¹ While it is possible for one expert to look at a particular market outcome and call it competitive, and for another expert to look at the same market outcome and define it as anticompetitive, the dispute can be resolved by the court (or by the jury) charged with the task of weighing the evidence. However, this dispute resolution process can be simplified if a “gatekeeping” structure, such as the one defined in *Daubert*, is applied to ensure that the economic testimony is relevant to the dispute at issue. The *Daubert* hearing must focus on the ability of the scientific testimony to support the anticompetitive or procompetitive inference from the data available in the record. If an inference cannot be logically drawn, the testimony should be excluded from the trial record. The outcome of this hearing is likely to be heavily influenced by the style of the testimony. Therefore, a Chicago analysis will tend to survive, a *Daubert* hearing, whereas PCE testimony will tend to fail. We present our reasoning below.

¹³¹ Expert economic testimony can also address other issues. For example, an expert can evaluate the damages caused by anticompetitive actions. A *Daubert* hearing is relevant to this testimony, although distinctions between Chicago and PCE analyses are not as relevant. Moreover, an economic expert can present evidence to support the inference of a price-fixing agreement. While performance evidence can show an anticompetitive effect, neither a Chicago nor a PCE economist should expect to survive a *Daubert* hearing in an oligopolistic industry because the poor performance may be caused by unilateral pricing behavior, and not by a price-fixing agreement. The problem is particularly acute for the PCE economist as the formal model of unilateral oligopoly pricing may match the cartel outcome. For a detailed discussion on this point from a theoretical point of view, see Baker, *supra* note 34.

In general, Chicago analyses are particularly helpful in aiding judicial inquiry because the Chicago model is both simple (requiring few assumptions to yield predictions) and fruitful (able to explain a broad set of market behaviors). Chicago theories focus on facts available to the court. While different Chicago economists can use the same facts to reach different conclusions, the plausibility of the two stories can be judged by a jury or by the court because both analyses rely on expert interpretations of real facts in the record to reach a conclusion. Both analyses aid in the dispute resolution process although, under the definition of dispute resolution, one analysis must be rejected, at least in part, to resolve each individual dispute.¹³²

A mainstream Chicago analysis should be able to address simultaneously both the efficiency-enhancing and the anticompetitive effects to generate an overall analysis of the alleged anticompetitive behavior. The court can use this analysis to resolve the legal dispute. Courts have no need to accept the normative implications of the Chicago testimony when it conflicts with the case law (for example, tying is illegal even when it is used for price discrimination), but the explanation of how the tying represents price discrimination, as well as the Chicago structure for studying the welfare effects of pure price discrimination, remain useful insights. In other cases, the Chicago testimony could be accepted completely. For example, an analysis of alleged predatory behavior could show whether the investment in predation can be recouped, and thus, give the court cause to accept or reject the monopolization hypothesis on the basis of the analysis. Similarly, an analysis of a non-price vertical constraint could explain whether market power is likely to be a reasonable explanation for the constraint. At the same time, the Chicago testimony would highlight the efficiency theory.

¹³² The court or the jury may pick and choose among the various findings of the experts to resolve the each dispute that comprises the litigation. However, on each issue resolved, the decision must tend to side with one party or the other.

While Chicago theory predicts that unilateral and vertical behavior is generally efficient, exceptions to the rule exist such that Chicago economists may customize their presentations to the facts under review.¹³³ A number of examples can be readily cited. *AT&T*¹³⁴ stands for the principle that regulated firms can exploit vertical relationships to shift profits out of the regulated sector and into an unregulated market. A vertical break-up or a ban on certain vertical relationships would tend to resolve the problem. *Otter Tail*¹³⁵ is compatible with the proposition that a firm can undertake unilateral actions to protect its monopoly position through the exploitation of the regulatory process. Enforcement of anti-monopoly laws would improve competition. *Pennington* offers a similar idea with a group of potentially capital-intensive firms colluding with a government-protected union to disproportionately raise the costs of small, labor-intensive firms, thus placing upward pressure on price. Enforcing a ban on anticompetitive vertical agreements would enhance market performance. Finally, predation theories could be viable in certain markets. For example, in cable television markets, the structure of the market, combined with regulatory factors, could allow a very focused response to competitive entry. If the incumbent can, at least partially, protect its monopoly, predation may turn out to be a profitable strategy.¹³⁶ All of these examples depend on government action, leading some to argue

¹³³ On occasion, a PCE theory can be simplified and converted into a fact-based Chicago analysis. It is debatable whether these considerations offer novel insights. Many of the core exceptions to Chicago analysis have been well known since the early days of the school. See BORK, *supra* note 7. Even network effects, sometimes viewed as a Post-Chicago analytical innovation, are covered to some extent in the early work on natural monopolies. See STAN J. LIEBOWITZ & STEPHEN E. MARGOLIS, *WINNERS, LOSERS & MICROSOFT: COMPETITION AND ANTITRUST IN HIGH TECHNOLOGY MARKETS* (1999).

¹³⁴ *United States v. American Tel. and Tel. Co.*, 552 F. Supp. 131 (D.D.C. 1982).

¹³⁵ *United States v. Otter Tail*, 410 U.S. 366 (1973). *But see* Andrew N. Kleit & Robert J. Michaels, *Antitrust Rent Seeking and Regulation: The Past and Future of Otter Tail*, 39 ANTITRUST BULL. 689 (1989). Kleit and Michaels take a close look at the facts and question the traditional interpretation of this case, describing the refusal to wheel electric power for local communities as a response to opportunistic rent-seeking behavior.

¹³⁶ See Thomas W. Hazlett, *Duopolistic Competition in Cable Television: Implications for Public Policy*, 7 YALE J. ONREG. 65 (1990), Historically, the cable monopolist could target price discounts to areas facing overbuilder competition, while charging the monopoly price in the bulk of its market. This pricing strategy significantly reduced

that the only Chicago exceptions are related to the abuse of the government process.¹³⁷ As discussed below, this appears to be a slight overgeneralization.

Another set of more controversial issues focus on the ability of a single firm to exploit the ability to make an “all-or-nothing” offer. In *Lorain Journal*, the local newspaper monopolist appeared to have imposed on the market an all-or-nothing requirement that adversely affected the local radio station. Like Lopatka and Kleit did, let us assume that advertising can transmit information (i.e., data on prices) or notice (i.e., Mr. Wilson is a pharmacist).¹³⁸ Newspapers provide both information and notice, while radio can only offer notice. Next, let us suppose that marginal customers require only informational advertising, while inframarginal customers desire both informational and notice advertisement. Marginal customers deal only with the paper, while inframarginal customers may purchase from either the newspaper or the radio.

Lorain’s policy would present the inframarginal customers with an “all-or-nothing” offer, but it would have no impact on the marginal advertisers. Thus, it would allow Lorain to extract surplus from the inframarginal customers without having to reduce its price to the marginal customers (this price reduction occurs in the standard Chicago tying analysis). Because this mechanism forces the inframarginal customers to pay a higher price for notice advertising, it creates a consumer welfare loss. This argument could be extended to support a predation theory because the policy appears to be profitable in the current period.

the cost of predation in cable markets (and was viable because cable service could not be resold by the consumer). Cable reform has made this strategy more difficult to implement in the 1990’s.

¹³⁷ Other exceptions suggest the vertical relationship may cover up a horizontal concern. Telser alleged that General Electric used resale price maintenance to further a horizontal cartel in light bulbs. Telser, *supra* note 64, at 99-104. Similarly, exclusive vertical contracts may be used to preclude rivals from obtaining minimum viable scale.

¹³⁸ Lopatka & Kleit, *supra* note 128. The Lopatka and Kleit analysis, discussed earlier in the text, presents a more traditional price discrimination hypothesis for the behavior.

A second example of a potential monopolization strategy involves network industries.¹³⁹ Competition in a network market is often best described as a one-shot contest for control of the standard. Thus, if a would-be monopolist can exploit some existing market power to construct an “all-or-nothing” offer linked to a related market, it could set the standard. No procompetitive response is likely until a regime shift undermines the standard. Technological exclusion, in which competitors are physically excluded from the market by a purposeful adjustment in the leading firm’s technology, represents one potential strategy. For example, the leading firm in a related market can write its software to block a competitor’s products in the relevant market. Customers would therefore face an “all-or-nothing” offer from the would-be monopolist. Hypothetical examples include Microsoft’s reprogramming of the Windows operating system in order to reject competitive browser software, or America Online’s reprogramming of its Internet service to prevent its customers from using other instant message software.¹⁴⁰ In either case, the technical exclusion, combined with the network effects in the downstream market, would tend to tip control of the new network to the monopolizing company.

Contractual exclusion, in which competitors are blocked from the market by the existence of a monopolist’s “all-or-nothing” contracts with upstream suppliers, downstream distributors, or related providers of complements, could raise similar concerns. It has been alleged that, in the early 1990s, Nintendo protected its position in the game market with two-year exclusive contracts on games developed by software houses and marketed through Nintendo.¹⁴¹ This type

¹³⁹ For a useful discussion of network effects, see LIEBOWITZ & MARGOLIS, *supra* note 133. It is important to note that competition for the network may be quite robust.

¹⁴⁰ Neither fact situation appears to have occurred as described in the text and thus, the examples are for expository purposes only. Although allegations of monopolistic behavior affecting the browser and instant messenger markets exist, a full discussion of these issues is beyond the scope of this Article.

¹⁴¹ An important feature of this claim is that game software is obsolete within two years. See Carl Shapiro, *Exclusivity in Network Industries*, 7 GEO. MASON L. REV. 673, 676 (1999).

of contract could serve to deter entry into new hardware markets because the contract would require a new firm to enter with both game players and games.

In contrast to Chicago theory, PCE offers little, if any, real assistance with which to structure the competitive analysis. PCE theories are anything but simple because they require a broad set of assumptions, some that are explicitly listed by the researcher, while others are tacitly maintained. At the same time, PCE offers little if any empirical fruitfulness because the mathematical result of the model applies only when the assumptions are met. Thus, detailed PCE models simply will not apply to many, if any, factual situations. As such, the PCE models are not relevant to most, if any, dispute resolution processes. More fundamentally, the models simply cannot be applied to evaluate real world situations because the models tend to be based on virtual facts that cannot be revealed in a court hearing. In almost all cases, the models will require assumptions that cannot be validated in the trial record because the facts in question exist primarily as theoretical constructs to aid the modeling process.

Therefore, the courts cannot resolve disputes between PCE models by interpreting the facts in the record. Two conflicting PCE theories may generate entirely different competitive implications not because they judge some facts in the record as important and others as trivial, but because they are based on different virtual fact scenarios. Because these theories are not helpful in resolving the antitrust dispute, they should not be admissible under the *Daubert* standard. We discuss these shortcomings of the PCE models in more detail below.

As detailed by Peltzman, PCE theories depend critically on a rather large set of assumptions. To simplify the analysis, we will focus on the four categories of structural assumptions – introduced in our commentary on PCE models – that affect the applicability of a PCE model. For each category, we will discuss the possibility of actually obtaining real world

information on the assumptions, and then we will illustrate the problem with actual PCE theories. While a PCE model may survive a challenge on some of these considerations, the PCE model must survive all of these challenges to be admissible. None of the mainstream PCE models we have reviewed comes close to passing this type of *Daubert* challenge. Of course, this is unlikely to stop PCE economists from creating a veneer of facts to use to disguise the theoretical nature of their applied analysis. Underneath the alleged facts, there is almost always a set of assumptions that are sorely lacking in empirical content. Unless these core assumptions can be validated, the PCE economists' facts are as illusory as their theory.

All PCE models begin with a specific structure for the market. For example, the model may postulate a pre-existing monopolist, a dominant firm, or a duopoly. In this model, entry conditions are also usually specified as blocked, and there are some assumptions precluding efficiencies. These facts are all readily verifiable for the market under study. If this market offers a different structure, the PCE model should be rejected without further review, as long as generalizations of the model tailored to match the business environment under study generate a range of competitive implications.¹⁴²

A number of PCE models would be inapplicable to most legal disputes based solely on their structure. For example, the classic Ordoover, Salop, and Saloner (OSS) study of the effects of vertical mergers assumes a merger between two vertically-related duopolists.¹⁴³ Because their result appears to be generated by the fact that the independent, upstream firm is a monopolist with respect to the independent downstream firm, the generalization of the model to an industry with more than two viable upstream competitors, or one with ease of entry, is completely

¹⁴² To prevail, the opposing counsel should provide evidence that the admitted assumptions of the model are not valid and solicit economic testimony that relaxing a key assumption generates a different result.

¹⁴³ Janusz A. Ordoover, et al., *Equilibrium Vertical Foreclosure*, 80 AM. ECON. REV. 127, 127 (1990). For an alternative view, see David Reiffen, *Equilibrium Vertical Foreclosure: Comment*, 82 AM. ECON. REV. 694 (1992).

inappropriate. Moreover, the OSS model does not consider the effect of efficiencies that could be caused by the vertical change in structure. Thus, the OSS model would not aid the court in resolving any vertical disputes that involve efficiency claims.

Even with a particular structure, PCE models often generate predictions by assuming that some parties can behave strategically, while other parties cannot undertake effective counterstrategies (i.e., counterstrategies are prohibitively expensive or are ineffectual at responding to the anticompetitive behavior).¹⁴⁴ Alternatively, one party may be given a first-mover advantage in the game.¹⁴⁵ If counterstrategies were undertaken or moves were simultaneous, the anticompetitive effect could disappear.¹⁴⁶ While some cases may exist in which the PCE economist can justify the assumption as being valid, it is extremely difficult to look at a market situation and determine if a specific set of strategic restrictions is appropriate. Unlike a simple count of the number of competitors, or even a qualitative analysis of barriers to entry, the search for the asymmetries necessary to justify a particular strategic structure is extremely complicated because it affects the core of the competitive process. Because asymmetries generate profits for the advantaged firms, rivals are always searching for competitive responses to offset the effect. To claim that the industry analyst can fully detail these responses is a heroic assumption. Moreover, assumptions on the order of play in the strategic game are even more problematic because the very notion of a first-mover advantage is at odds with the competitive process, unless it is linked to an exogenous institutional factor. Without any

¹⁴⁴ For an example, see Eric B. Rasmusen, et al., *Naked Exclusion*, 81 AM. ECON. REV. 1137, 1137 (1991).

¹⁴⁵ Any model that allows the incumbent to commit to a strategy before the entrant considers competing in the market implicitly includes a first-mover advantage. See, e.g., Eric B. Rasmusen, *Entry for Buyout*, 36 J. INDUS. ECON 281 (1988).

¹⁴⁶ For an illustration noting how results change when assumptions are relaxed, see Michael H. Riordan, *Anticompetitive Vertical Integration by a Dominant Firm*, 88 AM. ECON. REV. 1232, 1246 (1998).

strong institutional support for the crucial assumptions, PCE models offer no insight into the dispute resolution process, and therefore, should be excluded from the trial record.

Raising rivals' cost (RRC) models represent a solid example of this problem because the victims of the RRC strategies are not allowed to respond to the attempted predation. As Coate and Kleit illustrate, allowing victims to respond to RRC exclusion will affect the market because "exclusionary rights" take on an explicit value.¹⁴⁷ In addition to having to pay existing suppliers the full opportunity cost associated with not selling to the prey, the RRC predator must compensate potential entrants for not entering to restore competition. However, it is not clear whether the predator could afford the cost of this exclusion. As the strategic response takes place in the market, affected victims are almost certainly in contact with suppliers, day in and day out, negotiating future sales contracts. Defining strategic asymmetries is extremely difficult, because competitors are usually able to operate independently of their rivals. While select suppliers certainly may have signed exclusive supply contracts, it is always unclear if these contracts were efficient or anticompetitive. Moreover, the scope of the contract may be very difficult to define because contracts often entail general agreements to do business that may mean different things to the two parties. As long as the PCE economist cannot fully substantiate the crucial assumptions underlying the model, courts are faced with the problem that other equally valid PCE models exist and will generate different conclusions.

If the factual and strategic asymmetry problems were not enough, many game-theoretic models also require a specific series of beliefs with which to generate their results. First, there are the researcher's beliefs about what economic agents believe, including the structure of the game being played. The model must also specify each agent's beliefs about other agents'

strategies, as well as these agents' beliefs about beliefs. Of course, to make the model tractable, the researcher must simplify this structure. However, the outcome of the model is generally dependent on beliefs, which are, by definition, unobservable. An empirical application of this type of model is simply hopeless, and thus this type of PCE testimony fails the *Daubert* standard.

As an example of how a PCE theory can degenerate into mere opinion, Bolton, Brodley, and Riordan's recent paper discusses what they refer to as the "new analysis" of predation.¹⁴⁸ The authors describe how "[u]nder this analysis the predator seeks to influence the expectations of an existing rival, a potential rival, or . . . the prey's creditors, to convince the rival that continued competition or future entry into the market will be unprofitable." The predator "mislead[s] its rival into believing that market conditions are unfavorable, even when they are not."¹⁴⁹ As a matter of theory, the authors may be correct that firms seek to manipulate expectations of rivals and to mislead them. As a practical matter, however, it is not clear how one would show this, particularly because the main facts (i.e., that entry was deterred or that a rival exited) are consistent with other hypotheses, such as the hypothesis that market participants' genuine beliefs that market conditions are unfavorable.¹⁵⁰

¹⁴⁷ Coate & Kleit, *supra* note 118, at 77-80. Raising rivals' cost theory also includes a cartel ringmaster theory. However, this simply describes the organization of an upstream horizontal cartel and thus is illegal independent of any predatory effects.

¹⁴⁸ Patrick Bolton, et al., *Predatory Pricing: Strategic Theory & Legal Policy*, 88 GEO. L.J. 2239 (2000).

¹⁴⁹ *Id.* at 2247.

¹⁵⁰ Furthermore, while Bolton and his co-authors note that critics of this "new analysis" of predation point out that rivals can employ counterstrategies that may still render the predatory behavior unprofitable, they dismiss these critiques by saying that any proposed counterstrategies "are not considered an exhaustive -- or equilibrium -- analysis that works out *all possible moves and countermoves* of the parties . . ." *Id.* at 2249) (emphasis added). As exemplifying theory, predation based on strategic manipulation of expectations is worthwhile to consider. As a theory proposed by a plaintiff's economic expert in a predation case, however, it seems inappropriate to require the defendant to show that the theory fails under all possible moves and countermoves by all parties. Bolton and his co-authors would appear to advocate shifting the burden of proof to the defendant, thus relieving plaintiffs of the obligation to show that the particular predation theory advanced is at work in the market at issue.

A final concern with PCE analysis is that it is based on game-theoretic models that generally contain multiple equilibria. Such a model might show that both low prices and high prices are equilibria of the game, thereby leaving the economic expert to opine about why the low-price equilibrium is more likely to occur.

The problem is particularly acute in models of imperfect information, which requires some structure on the beliefs of market participants. As Howard Marvel notes:

. . . [O]nce such imperfections [in the knowledge of market participants] are admitted to the analysis, the range of possible consequences is breathtakingly wide. The analyst gains an embarrassment of riches as too many possible outcomes result in too little guidance for policy

Since in theory, virtually anything can happen, the analyst can provide a “story” to fit the facts of a particular case with confidence that an underlying equilibrium model can be constructed to fit that story¹⁵¹

By opening an infinite realm of possibilities, dynamic game-theoretic analysis is immensely liberating to aggressive antitrust enforcers.

Attempts to refine the basic equilibrium concepts in order to reduce the number of possible outcomes are equally unsatisfactory for the testifying expert. Because the model’s additional structure is imposed by the economist, rather than by empirically verifiable facts, the approach is necessarily *ad hoc*. The *Daubert* standard suggests that courts should reject this kind of opining in favor of conclusions that are based on an objective analysis of the facts contained in the trial record of the case. Without this proof, the PCE testimony dissolves into opinion and is not admissible.

The OSS vertical paper also represents a textbook example of this problem.¹⁵² As Reiffen notes, it is the commitment not to sell to the other downstream firm, not the vertical integration,

¹⁵¹ Marvel, *supra* note 83, at 24-25.

¹⁵² See Ordoover, *supra* note 143.

that drives the result.¹⁵³ In theory, two equilibria exist: one that is competitive, in which the vertically integrated upstream firm sells to the remaining downstream firm, and one that is noncompetitive, in which the integrated upstream firm refuses to make profitable sales to the independent downstream firm, thus allowing the independent upstream firm to price as a monopolist. To distinguish between these equilibria, the analyst would need to point to some institutional rigidity in the market that allows the upstream firm to commit not to sell. Evidence that the integrated firm does not sell to the downstream firm could be compatible with numerous other hypotheses and thus does not, in and of itself, aid in the dispute resolution process.¹⁵⁴

VI. APPLICATIONS OF THE *DAUBERT* STANDARD

The courts, along with the private bar, are still in the process of learning how to apply the *Daubert* standard. In some cases, the parties do not make the appropriate *Daubert* challenges, allowing what appears to be technically inadmissible evidence into the record. In other cases, the *Daubert* challenges are directly on point, allowing courts to implement the “gatekeeper” role and thus facilitate an efficient case-resolution process. And in other cases, no *Daubert* motions are made, and potentially excludable evidence is accepted for the record. In the following subsections, we discuss three selected cases; we note the outcome of the *Daubert* motion, if applicable; and we suggest some alternative scenarios that could have developed. These commentaries serve to flesh out the arguments we have already made above.

¹⁵³ Reiffen, *supra* note 143, at 694.

¹⁵⁴ The failure to sell to the independent downstream firm could be indicative of a market division cartel, but this analysis is purely horizontal.

A. Eastman Kodak v. Image Technical Services, et al.

One of the best known antitrust cases of the 1990s involved a challenge by a group of independent service organizations (ISOs) to Kodak's business practices in the copier and micrographics markets.¹⁵⁵ The core facts seemed to be relatively simple:¹⁵⁶ Kodak initially sold copiers and made repair parts available to the ISOs that specialized in servicing Kodak equipment. Thus, Kodak customers had three choices for service: repair and maintain the copiers themselves, hire Kodak to service the machines, or retain an ISO to keep their equipment functional. In 1985, Kodak changed its open policy and refused to sell to ISOs. Kodak also pressured original equipment manufacturers, parts distributors, and equipment owners not to make Kodak parts available to ISOs. Without access to parts, ISOs had difficulty competing and thus lost share. The ISOs charged that Kodak's behavior amounted to actual and/or attempted monopolization. In particular, conditioning the purchase of Kodak parts on the use of Kodak services was alleged to be tying. In contrast, Kodak claimed that its behavior simply amounted to competition in the copier market.

At trial, Kodak argued that its demonstrated lack of market power in the copier equipment market precluded, as a matter of law, the ISOs from prevailing and therefore, mandated summary judgment. The trial judge granted Kodak's motion, but the Court of Appeals

¹⁵⁵ Without loss of generality, the commentary will focus on the effects of the challenged policy on competition in markets related to the copier industry. Similar analyses could be undertaken for the adversely affected markets in the micrographics industry.

¹⁵⁶ As described by Klein, Kodak maintained the restrictive policy on parts from their entry into the copier business in 1975. However, enforcement of the policy may not have occurred until 1985. Thus, it is possible to argue the policy changed in 1985. See Benjamin Klein, *Market Power in Antitrust: Economic Analysis after Kodak*, 3 SUP. CT. ECON. REV. 43, 55 (1993). In follow-on decisions, district courts have held that evidence that the policy changed is crucial for liability. See Lopatka & Page, *supra* note 52 (manuscript at n.82, on file with authors).

reversed the decision. Kodak appealed to the Supreme Court, which affirmed the Court of Appeals, thus sending the case to trial.¹⁵⁷ The ISOs prevailed in the ensuing litigation.¹⁵⁸

Although the Court did not reject expert testimony under *Daubert*, it is possible to illustrate how the standard could have been applied based on arguments made at trial.¹⁵⁹ First, consider what might have happened had the core Kodak defense been presented by an economist. In our hypothetical, Dr. Kodak could have advanced a very simple analysis grounded on an assumption of a perfectly competitive copier market. Based on this theory, any attempt by Kodak to raise service prices would have led to an increase in the system price (equipment plus lifetime repair and service). In a competitive, homogeneous market with perfect information, that price increase would immediately induce customers to switch to rival copying systems (i.e., Xerox) and eliminate Kodak from the market.¹⁶⁰

If Kodak attempted to retain its customers by lowering the copier price, it would find that the increase in service costs would change the optimal life of the Kodak copier because customers would now expect to replace a Kodak copier before it was economically worn out. To induce customers to buy the now inefficient copier system, Kodak would have to lower prices by more than the present value of the increase in service profits. As price just covers costs in a competitive market, Kodak could not afford to reduce the price sufficiently to sell any copiers. Thus, the expert's testimony would conclude that Kodak had not materially changed its service

¹⁵⁷ Eastman Kodak Co. v. Image Tech. Serv., Inc., 504 U.S. 451 (1992).

¹⁵⁸ Image Tech. Serv., Inc. v. Eastman Kodak Co., 125 F.3d 1195 (9th Cir. 1997).

¹⁵⁹ The summary judgment litigation actually predates the *Daubert* standard and thus any expert challenges would have been reviewed under the *Frye* standard. Although the full trial on the merits occurred after the *Daubert* decision, the Supreme Court record included a significant discussion of the economics of the matter, which would have colored the later presentations.

¹⁶⁰ See Klein, *supra* note 156. In addition to rejecting the standard hold-up (opportunism) argument for Kodak's behavior, Klein adds a price discrimination explanation. As long as Kodak did not hold market power in the equipment market, the behavior should not be challenged as illegal tying.

policy because any such change would render the firm unable to sell any new copiers, an observation at odds with the record.

Based on the Supreme Court's decision, this theory would be rejected at a hypothetical *Daubert* hearing because it fails to fit with the facts in the record. For example, a perfectly competitive market requires perfect information, while the record evidence suggests imperfect information about the systems cost of operating a copier. Because this information was not known with certainty to all copier buyers, Kodak could opportunistically change its policy and still sell copiers in the market. In fact, this is exactly what the plaintiffs allege happened. The perfectly competitive model envisioned by Dr. Kodak does not adequately reflect market realities, and would fail the *Daubert* test.

A more sophisticated model – one that attempts to incorporate the reality of the imperfect information in the market but nonetheless argues that such imperfect information is unimportant in this market – could survive a *Daubert* challenge if the trial record could support the assumptions of the model. This would entail showing that copier buyers are sophisticated enough to be able to compare the estimated systems costs across copier brands, and that the buyers have the ability and economic incentive to estimate those costs with reasonable accuracy. Without such information in the trial record, the court would be unable to differentiate between the competitive and noncompetitive theories of copier industry performance, and hence Dr. Kodak's testimony would not aid in the dispute resolution process and should be rejected.¹⁶¹

In contrast, the plaintiff's economist would have survived a *Daubert* hearing. For example, Dr. ISO would have argued that information and switching costs could allow Kodak to

¹⁶¹ This observation highlights the importance of presenting factual evidence to underpin theories so that, ultimately, the analysis will aid in the dispute resolution process.

profit from raising the price of service.¹⁶² Under this theory of imperfect information, Kodak could raise service prices and continue to sell to poorly informed customers.¹⁶³ Because this theory is compatible with the facts in the record, the relevant testimony would be admitted. To illustrate the economic effect, the plaintiffs were forced to advance, and the court accepted as a relevant issue for trial, the concept of a market for parts and service of Kodak copiers. While this market construct is troubling, the descriptive structure serves to focus the analysis on the harm alleged by the parties. This extremely narrow market would allow the plaintiffs to provide evidence of anticompetitive behavior, while at the same time allowing Kodak to rebut the inference.¹⁶⁴ Moreover, Kodak could provide alternative theories, such as efficiencies or intellectual property arguments, which would allow the court to reject the information-cost monopoly theory as tangential to an efficiency analysis.¹⁶⁵ The trial court would be expected to resolve the disagreements between the two valid theories.

¹⁶² *Id.* at 473. The discussion of switching costs is a bit confusing because the durable nature of the product ensures the firm cannot easily switch away from Kodak when service prices increase. Because the price of the equipment in the used market depends on future service costs, an increase in service fees will reduce the value of the equipment and thus all owners will be affected by the Kodak policy.

¹⁶³ In effect, the information theory seems to amount to a charge of post-contractual opportunism because Kodak sold copiers to customers with the expectation of competitive service and then changed its policy once it obtained a sufficient installed base. One should note that this opportunism result may even be derived from the competitive model with heterogeneous products because product differentiation ensures that some customers will continue to buy the machine even in the face of service price increases. If the firm is following a harvest strategy, it may prefer to earn high profits on service business, while allowing its share of new installations to shrink over time. As Klein notes, the fit is not perfect, as an opportunistic firm could simply raise the price of parts without the need to exclude ISOs from the market. *See* Klein, *supra* note 156, at 56-57.

¹⁶⁴ Kodak could produce evidence to show that: (1) other manufacturers could supply parts for Kodak equipment; (2) an active underground market exists for Kodak parts; or (3) Kodak's commitment to sell parts to customers ensured a competitive parts market.

¹⁶⁵ The Court did not speak favorably of the efficiency theories, an observation more related to the difficulty of using an efficiency argument to rebut a viable anticompetitive theory at the summary judgment stage than to the efficacy of the efficiency theories. Intellectual property (IP) arguments were not featured in the motion for summary judgment. In a similar case, the Federal Circuit ruled that IP arguments are sufficient for summary judgment unless the plaintiff can question the legality of the IP or explain how the defendant's actions serve to extend the monopoly. For example, using control of IP to capture a monopoly in the service market for all copier equipment would extend the monopoly and create an issue for trial. Moreover, actions beyond enforcing IP could create an issue for trial. For instance, Kodak was accused of entering into agreements to prevent ISOs from obtaining used equipment to break-down for parts. *In re Independent Serv. Org. Antitrust Litig.*, 203 F.3d 1322 (Fed. Cir. 2000).

Another simulated *Daubert* analysis could be undertaken for hypothetical plaintiff testimony based on a paper by Borenstein, MacKie-Mason, and Netz (BMN).¹⁶⁶ In their model, the long-run increase in service prices is alleged to be an equilibrium, even with a perfectly competitive market structure. BMN asserts that manufacturers cannot commit to maintain competitive prices in the long run, and thus, will find it profitable to raise service prices. Because this opportunistic behavior reduces welfare by forcing consumers to replace their durable goods more quickly in the face of monopolistic aftermarket prices, an active antitrust enforcement policy is required.

The BMN analysis suffers from a number of classic PCE shortcomings. First, the entire result is driven by the implicit PCE assumption on commitment. Numerous commitment mechanisms exist; some are easy to observe, while others are much more subtle.¹⁶⁷ It appears next to impossible to incorporate all of the possible mechanisms in the trial record. Second, the model assumes customers are passive. Customer counterstrategies are limited only by their imagination and, again, may not all be quantifiable.¹⁶⁸ Third, the model assumes that customers purchase their initial machines with no expectations. However, if manufacturers do not commit to competitive service, why would customers pay full price for the copiers? The initial discount

¹⁶⁶ Severin Borenstein et al., *Antitrust Policy in Aftermarkets*, 63 ANTITRUST L.J. 455 (1995). For an alternative view, see Carl Shapiro, *Aftermarkets and Consumer Welfare: Making Sense of Kodak*, 63 ANTITRUST L.J. 483 (1995).

¹⁶⁷ For example, the manufacturer could license parts to a number of producers, thus ensuring that the parts are readily available. Alternatively, a manufacturer could invest in a brand name over multiple markets the value of which would be lost if it behaved opportunistically. Or, a manufacturer could form partnership relationships with various customers to serve to bond competitive behavior. It is optimistic to believe that a trial record could fully include all the various commitment mechanisms.

¹⁶⁸ For example, customers may be able to shift business towards firms with the most competitive service policies. Because this response could take years, the evidence may not make it into a court record. Moreover, the social loss in the BMN model is linked to the inefficiency of the opportunistic behavior. If the customers were able to negotiate a deal with one manufacturer for competitive service, that manufacturer would have an immediate system price advantage over its rivals and would tend to gain share. While this is not necessarily sufficient to drive the opportunistic firms out of business, a competitive supplier would certainly change the dynamics of the game.

required to sell the copiers is clearly a virtual fact because, while it exists for the economist, it cannot be readily computed for the trial record. When the core assumptions needed for the BMN model to be relevant cannot be incorporated into the record, the model will be rejected under *Daubert* because it does not help in the case-resolution process. A court would be better off relying on simpler models that aid in the dispute resolution process.

B. Brand Name Prescription Drug Antitrust Litigation

The *Brand Name Prescription Drug Antitrust Litigation* involved allegations of a price fixing conspiracy related to the complex pattern of price discrimination that characterizes the competitive environment in the prescription drug industry.¹⁶⁹ Although drug manufacturers and wholesalers maintained list prices, Pharmacy Benefit Managers (PBMs) who work with Health Maintenance Organizations (HMOs), hospitals, and nursing homes, negotiated with drug companies complex drug formulary discount schemes. As a part of these schemes, the PBM made specific purchase commitments to the manufacturer in exchange for discounts on covered drugs.¹⁷⁰ In theory, wholesalers could undermine this distribution scheme by making these discounts available to everyone in the market.

To preclude this opportunistic response, drug companies negotiated with wholesalers “chargeback” systems in which drugs would be sold to the wholesaler at the high list price and then resold to favored entities at the contractually discounted price. Then, the wholesaler would “charge back” to the manufacturer for all the discounted sales. The pharmacies claimed that this

¹⁶⁹ For an interesting overview of the economics of the case, see F. M. Scherer, *How U.S. Antitrust Can Go Astray: The Brand Name Prescriptions Drug Litigation*, 4 INT’L J. ECON. BUS. 239 (1997).

¹⁷⁰ PBMs have extended this concept to private insurance plans. If the insurer implements a drug formulary – or subcontracts with the PBM for a drug formulary – the PBM is able to offer to the plan a discount on drug expenditure. An insurer may also obtain discounts by signing up with a specific network of pharmacies coordinated by a PBM.

business arrangement involved an agreement among manufacturers to use the same pricing structure. Because the agreement raised prices for pharmacies, the plaintiffs argued it should be condemned as price fixing. The drug manufacturers maintained that the “chargeback” systems were implemented unilaterally and, even if they were collusive, their overall effect was not anticompetitive. To be admissible, economic evidence would need to offer a scientific explanation for the “chargeback” system and must highlight the link to an anticompetitive effect.

After a complex history of summary judgment and appeal, the case landed in the Seventh Circuit on an appeal from a summary judgment decision dismissing the complaint and excluding under *Daubert* the expert testimony of the plaintiff’s witnesses.¹⁷¹ Writing for the panel, Chief Judge Posner upheld the core of the summary judgment motion, but reversed on one count related to an agreement that held price increases at a level associated with the Consumer Price Index. The Court also found that the district judge erred in excluding a portion of the expert testimony of Professors Robert Lucas and Jeffrey Perloff. However, the Court upheld the exclusion of Lucas’ testimony on the elasticity of demand for pharmaceuticals in hospitals and pharmacies, and suggested that the testimony allowed on market power was not relevant to the question at issue.

Lucas’ fundamental testimony involved a conclusion that drug manufacturers held market power and thus could price discriminate. The District Court excluded this conclusion because Lucas had failed to study the industry – other testimony revealed only forty hours of work to prepare the analysis. In effect, the District Court was suggesting that a scientist should think in depth about a problem before offering a conclusion. Judge Posner reversed, noting that the core conclusion – that it was obvious that brand name pharmaceutical manufacturers possess market

¹⁷¹ *In re Brand Name Prescription Drugs Antitrust Litig.*, 186 F.3d 781 (7th Cir. 1999).

power with respect to their own products – was obvious and that a credentialed economist could easily testify to that fact.¹⁷² However, Judge Posner’s commentary raised other more serious issues, such as suggesting that Lucas’ testimony should have been excluded because it was immaterial to the case at hand. Because market power is a likely and lawful outcome of competition in the drug industry, the plaintiffs must go well beyond this finding and show that prices were affected by collusion.¹⁷³ Because Lucas’ core testimony was silent on this point, Judge Posner found that the exclusion of the testimony was irrelevant to the outcome of the case. In terms of the *Daubert* standard, if the District Court had accepted Lucas’ testimony as science, it would also have been required to exclude it as irrelevant to the plaintiff’s case had it not been supported with a detailed explanation of the actual anticompetitive effect.¹⁷⁴

Lucas’ testimony, which was designed to support the core collusion charge, suffered a more embarrassing rejection because the District Court found – and the Appeals Court upheld this finding – that the testimony lacked merit. Lucas claimed that the demand for drugs by pharmacies was no less elastic than the demand for drugs by hospitals, HMOs, and nursing homes. Then he used this assertion, along with the observation that the drug companies lack market power with respect to hospitals, HMOs, and nursing homes, to conclude that the manufacturers held collusive-based market power with respect to pharmacies because pharmacies face high prices, while other drug distributors do not. Of course, the analysis lacked any consideration of the importance of drug formularies to market competition. Lucas succeeded in proving his lack of familiarity with the market by testifying that a pharmacy could create a

¹⁷² *Id.* at 786.

¹⁷³ *Id.* at 787.

¹⁷⁴ Judge Posner rehabilitates and dismisses Perloff’s testimony with a similar, although more technical, analysis. *Id.* at 786. The Posner opinion did not clearly uphold the more complex *Daubert* analysis, possibly because such an analysis was beyond the scope of the appeal.

formulary and thus it could be the equivalent of a hospital or HMO. While Judge Posner recognized the observation as being semantically correct, he found it to be vacuous because the fundamental point of a formulary is to switch consumers from high-priced to low-priced drugs.¹⁷⁵ The hospital or HMO is capable of controlling use patterns, while the pharmacy is not; pharmacies simply fill prescriptions. Thus, because Lucas' testimony demonstrated that he did not understand competition in the market, his analysis was not relevant and had to be excluded. Because the core support of the plaintiff's case was excluded from the record, no possible interpretation of the facts could back up a violation, and the defendants were entitled to summary judgment on the bulk of the allegations.¹⁷⁶

C. Department of Justice v. Microsoft Corp.

The central charge in the Department of Justice's (DOJ) case against Microsoft involved the use of the anticompetitive actions in the browser market to maintain the operating system monopoly.¹⁷⁷ The core facts are relatively clear, although how these facts are interpreted in an antitrust context is the subject of the appeal. In the mid-1990s, Netscape introduced a browser that became extremely successful. New versions followed up on the successes of past releases. Microsoft designed a series of competitive products (various versions of Internet Explorer (IE)) and undertook a set of strategies culminating with the inclusion of IE in the Windows operating system to ensure widespread distribution of its competitive browser. Eventually, Microsoft built

¹⁷⁵ *Id.* at 788. Here the exclusion of the testimony is tied to an error in the application of the analysis, as opposed to an error in the underlying merit of the scientific observation.

¹⁷⁶ The price-fixing allegation associated with the Consumer Price Index was supported with enough evidence to require a trial on the merits. However, the plaintiffs had little chance to collect damages because the CPI agreement, had it actually occurred, was likely to have moderated price increases so as to avoid price regulation. *Id.* at 788-89.

¹⁷⁷ *United States v. Microsoft Corp.*, 97 F. Supp. 2d 59 (D.D.C. 2000). The Department of Justice initially charged Microsoft with tying its browser to its operating system in violation of the outstanding consent agreement. For the

the leading position in the marketplace, and Netscape was acquired by America Online (AOL).¹⁷⁸

The District Court concluded that Microsoft excluded Netscape from the browser market to support its operating system monopoly. The Court used this finding to support the unprecedented break-up order against Microsoft, which is currently on appeal to the United States Supreme Court. Our review of the record suggests that no *Daubert* motions were made and therefore, the admissibility of expert testimony is beyond the scope of the appeal.¹⁷⁹ However, we can discuss a few portions of the testimony to illustrate how a *Daubert* motion could have been argued.

To support the Antitrust Division's position, the government's economic expert witness, Franklin Fisher, offered testimony that combined Chicago and Post-Chicago arguments, which makes for a useful case study.¹⁸⁰ Fisher makes three basic arguments: (1) that Microsoft has market power in the operating system market; (2) that Internet browsers have the potential to develop in ways that could challenge this market power; and (3) that Microsoft took steps to maintain its market power through a series of actions that were unprofitable but for their indirect effect on the ability of developments in the browser market to reduce operating system market power. Within this last argument, Fisher discusses three categories of behavior that he claims are

decision rejecting this line of analysis, see *United States v. Microsoft Corp.*, 1998-2 Trade Cas. (CCH) ¶ 72,261 (D.D.C. Sept. 14, 1998).

¹⁷⁸ Our discussion does not focus on the related charge that Microsoft's anticompetitive actions against Sun, the controlling force behind Java technologies, prevented Sun from challenging the Windows monopoly. While the facts differ from those affecting the browser business, the core issues are similar.

¹⁷⁹ From a review of the literature on the case, it is clear that at least one commentator would have supported a *Daubert* motion. David Evans, a member of the Microsoft team, observed that the Department of Justice case represents an "artificial world that could only exist within the four walls of a courtroom." David S. Evans, *All the Facts That Fit: Square Pegs and Round Holes in U.S. v. Microsoft*, 22 REG. 54, 62 (1999). He appeared particularly disturbed by the ideas that consumers cannot easily download software and that Microsoft Windows cannot include a browser, even though numerous other operating systems do. *Id.* at 60.

anticompetitive:¹⁸¹ (1) price predation of rival browsers; (2) non-price predation of browsers (such as exclusionary contracts); and (3) bundling Microsoft's browser with its operating system.

Professor Fisher's discussion of Microsoft's market power in operating systems is very "Chicago School-like" in its reliance on evidence from the market; principally Microsoft's persistently high share and customer statements that no commercial alternatives to Windows currently exist.¹⁸² As such, the testimony would easily survive a *Daubert* hearing.

When he moves to the heart of the antitrust argument, however, Fisher enters the PCE "world of imagination," in which facts play only a minor role. Fisher simply asserts that Netscape could develop into competition for Microsoft as a platform for applications, and that, but for Microsoft's actions, Netscape was likely to have developed that way. Every paragraph from page 35 to page 41 in Fisher's testimony describes a hypothetical world in which competition *could* evolve. Certainly, Microsoft perceived Netscape as a hypothetical threat to Windows; one that would develop if applications developers were to write applications to

¹⁸⁰ Direct Testimony of Franklin M. Fisher, *available at* <<http://www.usdoj.gov/atr/cases/f2000/2057.htm>> [hereinafter, *Fisher Testimony*].

¹⁸¹ A fourth category, allegations that Microsoft offered to divide various markets with Netscape, Apple, and Intel, does not involve much economic analysis, but is instead primarily a factual dispute between Microsoft and the Government. One could argue that Fisher's analysis here is implicitly based on the argument – which is consistent with Chicago School antitrust analysis – that naked solicitations to collude merit per se condemnation because they involve no efficiency-enhancing behavior and have a high likelihood of anticompetitive effects. For an alternative interpretation, see John E. Lopatka & William H. Page, *An Offer Netscape Couldn't Refuse?: The Antitrust Implications of Microsoft's Proposal*, 44 ANTITRUST BULL. 679 (1999).

¹⁸² This section is not an unqualified success, however. Professor Fisher defines "monopoly power" as "a substantial degree of market power." Possessing monopoly power allows a firm to profitably "charge a price significantly in excess of competitive levels . . . over a significant period of time." *Fisher Testimony, supra* note 180, at 10). Unfortunately, Fisher never analyzes either the "competitive" price in this market, or whether Microsoft is charging significantly more than this amount. This omission has consequences for his later analysis of the alleged anticompetitive effects of Microsoft's behavior. Because Fisher relies on customers who say they would not reduce their purchases of Windows in response to a price increase of 10 percent or more, *Fisher Testimony, supra* note 180, at 23), the reader is left to infer that Microsoft exercises its monopoly power not through higher prices for Windows but through its ability to induce customers to accept unfavorable non-price contract terms (for example, a prohibition on modifying the Windows display when an end user turns on the computer for the first time). Thus, Fisher implicitly expresses a preference for Microsoft to exercise any monopoly power through higher prices rather than through contract restrictions. It is not clear that consumers are better off in Fisher's world, because he would have

Netscape APIs,¹⁸³ and the entire structure of computing evolved to an Internet-centric model of operation. However, Fisher develops this theme without regard to the likelihood of this outcome. Every firm has a business plan that contemplates success, but the likelihood of that success varies substantially across industries and surely depends on the aggressiveness of the plan. Fisher does not provide examples of applications – or add-on products that then developed into a standard – that replaced the underlying operating system. One could come up with examples of paradigm shifts, such as the movement from desktop PCs to handheld PCs, in which a new firm displaced the market leader,¹⁸⁴ but many firms would have the potential to win most of the market in a paradigm shift. For the Internet, Fisher presents no evidence to support the hypothesis that Netscape was uniquely situated to win.¹⁸⁵

Turning to the actual discussion of anticompetitive conduct, the testimony does not find a stronger grounding in fact. First, Fisher claims that, by giving away Internet Explorer (IE), Microsoft's Internet browser, Microsoft engaged in predatory pricing. Fisher argues that Microsoft's marginal cost of producing and distributing IE, while low, was positive, and that the economic selling price, including the concessions Microsoft made to Internet service providers (ISPs), computer original equipment manufacturers (OEMs), and to AOL to induce them to accept restrictive contracts for IE, was negative. Therefore, Microsoft lost money on every unit of IE shipped. The effect of the predatory price was to reduce the distribution of rival browsers,

consumers pay a higher price for Windows today in return for the discounted present value of some unquantifiable probability of additional competition in the future.

¹⁸³ An API (applications programming interface) is a characteristic of a program that allows other programmers to exploit functionalities of the program in question by writing their code to utilize, or call, the API. The Windows control bar is an example of an API.

¹⁸⁴ Palm, Inc.'s operating system for handheld devices commands an 80 percent or more market share despite substantial efforts by Microsoft and other firms.

¹⁸⁵ Moreover, if the paradigm were to shift, no evidence is presented to suggest that Microsoft could maintain its world of Windows in the face of consumer demand for an Internet-based computing solution.

particularly Netscape, thereby limiting Netscape's ability to develop into an alternative applications platform that could, one day, challenge Microsoft's market power in operating systems.

This analysis suffers from several problems. First, if the purpose of giving away IE was to increase future sales of Windows, then the correct economic price to Microsoft of shipping an additional copy of IE includes the incremental competitive revenue from selling an additional copy of *Windows*, multiplied by the probability that IE created an additional sale of Windows – including sales of upgrades – appropriately discounted for future sales. Under this calculation, Microsoft's revenue is positive, and Fisher provides no way of measuring whether the incremental revenue is greater or less than the incremental cost of the strategy. Despite some inflammatory Microsoft documents suggesting that one purpose of Microsoft's strategy was to harm Netscape, it seems unlikely that Microsoft received *no* benefits to the sale of Windows from including IE, except for the harm to Netscape. Thus, when it is correctly calculated, Microsoft's price for IE is no longer clearly predatory.

Second, Fisher ignores the evidence that, despite Microsoft's actions, AOL purchased Netscape for roughly \$10 billion in 1998, suggesting that the financial markets placed substantial value on Netscape even in a world where browsers were free. Hence, Netscape, as a business, had at least \$10 billion of discounted profits from sources related to, but not directly attributable to, its browser. Netcenter.com, the Internet portal of choice for the Netscape browser, is the leading candidate for the bulk of those profits.¹⁸⁶ Thus, sales of IE must be seen as enhancing the

¹⁸⁶ The browser/portal combination would function like the circulation/advertising revenue stream of a newspaper. While many print-media businesses try to earn circulation revenue, some of them are entirely advertiser-supported. See LEIBOWITZ & MARGOLIS, *supra* note 133, at 218; Benjamin Klein, *An Economic Analysis of Microsoft's Conduct*, 15 ANTITRUST 38 (1999).

revenues of Microsoft's default portal, MSN.com.¹⁸⁷ If Netscape generates additional revenue from distributing additional copies of its browser, Microsoft has the same type of opportunities open to it. Again, whether Microsoft was actually predating is no longer clear, and Fisher offers no facts that would support his assertion.¹⁸⁸

The non-price predation theories also lack an empirical basis. The story is that Microsoft paid leading computer OEMs, ISPs, and the leading online service, AOL, to use and promote IE rather than Netscape. This, in turn, raised the cost of distribution to Netscape, because Microsoft now controlled all the low-cost distribution methods, including, most importantly, distribution through the operating system. Here, Fisher relies on the testimony and documents of Microsoft executives to show that Microsoft's goal was to increase IE's market share rather than revenue or profits. It is not clear why Fisher finds this evidence relevant. If Fisher's argument – that the browser market is subject to substantial network effects – is correct, then it makes economic sense for browser producers to incur losses while the standards war is being waged, because only the winner will remain in the market to reap whatever benefits accrue to the browser monopolist. In this case, market share is more important than short-run profits, not just to Microsoft, but also to Netscape.

¹⁸⁷ Portals profit from fees charged for advertising services and promotional fees charged for links to e-commerce sites. Because both IE and Navigator allow the consumer to customize the default "home page," no real market exclusion can occur.

¹⁸⁸ The more consumers who use Netscape's browser, the more valuable advertising on Netscape's portal becomes. Fisher also asserts without evidence that "[t]here is demand for operating systems without browsers and for operating systems with a choice of browsers." Fisher Testimony, *supra* note 180, at 31. Even if it were true that some consumers use personal computers without the need for a browser, it does not follow that it makes economic sense for an operating system manufacturer to produce a version without a browser. Indeed, if the Government's claim that Netscape has the potential to become a platform for applications, it can only be in a world where applications increasingly reside outside the PC, such as on a local network server or on an Internet server. This argument could be made for many parts of an operating system, including printer drivers (for consumers who are not connected to a printer), network drivers (for consumers not connected to a network), text editors (for consumers who prefer a more full-featured word processor), and so on.

A more serious criticism of this alleged anticompetitive effect from the perspective of the *Daubert* standard, however, is that Fisher makes no effort to quantify the effects of these predatory practices. For example, Fisher does not discuss the relative quality of IE versus Netscape. If OEMs actually want to distribute only one browser, they will distribute Netscape, but only if Netscape is significantly better than IE. On the other hand, if Netscape is of roughly comparable quality, then consumers should be indifferent to the choice between the two browsers, and the low-cost method of distribution (i.e., on the CD with Windows) should prevail. Furthermore, if Netscape were truly better than IE, Netscape could have profitably employed the same strategies Microsoft used to induce ISPs to distribute Netscape. Indeed, despite Microsoft's efforts, at least some ISPs remained "browser neutral," meaning that Microsoft's payments to ISPs could not have been so great as to make distribution of Netscape uneconomical.

Fisher also offers little discussion of the number of Netscape copies actually distributed, despite any cost disadvantages Netscape had as a result of Microsoft's actions. There also lacked any discussion of the costs associated with alternative distribution methods.¹⁸⁹ AOL, for example, distributes its software in CD form by mail, at computer stores such as CompUSA, at photocopying shops such as Kinko's, in computer magazines, with pizzas, and even in the dairy case at the supermarket. Other software manufacturers, such as Intuit, bundle IE with their software packages. Again, the allegations of non-price predation do not show true evidence of exclusion from the market that would allow the court to reject Microsoft's obvious efficiency defense of distributing a better browser through low-cost methods.

Finally, Fisher's theory does not distinguish between additions to the operating system that Microsoft can and cannot make. Because software is durable, Microsoft needs to continue

improving its products in order to generate new sales.¹⁹⁰ This innovation is good for consumers, thus any antitrust theory that would limit the dimensions over which Microsoft can innovate must clearly articulate which innovations are acceptable and which are anticompetitive. Presumably, Microsoft can do this by balancing the immediate benefit that consumers receive from the innovation with the possible foreclosure of opportunities for rival firms. For Fisher to argue, as he does, that bundling IE with Windows is anticompetitive, he must be implicitly arguing that the harm to the market for operating systems and other applications platforms outweighs the benefits consumers receive from receiving a high-quality browser along with the operating system. Without a way to quantify this tradeoff, even roughly, this argument cannot rise above mere opinion. Overall, large parts of Fisher's testimony should have been excluded under the *Daubert* standard because the testimony failed to aid the court in the dispute resolution process.¹⁹¹

VII. CONCLUSION

The Post-Chicago style of analysis focuses on the possible, rather than on the probable. As exemplifying theory, this style can provide useful insights into the economic effects of particular business strategies. As a theoretical underpinning for an anticompetitive theory in a specific antitrust litigation, however, this style provides little guidance for the court. *Daubert* and related cases instruct judges to reject expert testimony that is not relevant to the facts, or

¹⁸⁹ Robert Levy has noted that 150 million copies of Netscape Navigator were shipped. This observation, led him to conclude "on the facts, that claim [that Navigator lost distribution] is preposterous." Robert A. Levy, *Microsoft Redux: Anatomy of a Baseless Lawsuit*, CATO POLICY ANALYSIS (1999).

¹⁹⁰ During a period when PC sales are growing rapidly, Microsoft can sell to unserved segments of the market. However, this process cannot last indefinitely. Even today, sales of Windows upgrades to consumers who already use an older version are important to Microsoft.

testimony that fits the facts but cannot be distinguished from alternative theories that also fit the facts, but yield different conclusions. Because Post-Chicago theories are exemplifying, they will often not fit the facts, and because Post-Chicago theories often rely on unobservable assumptions they will often coexist with other more benign explanations for the same behavior. Therefore, these theories offer no help to the judicial process and should be rejected.

In contrast, the Chicago school presents a set of models that offer broad generalizations of market behavior, along with a set of special cases in which the models do not apply. Because these models are based on relatively simple facts, it is possible for a court to evaluate Chicago-based testimony with the set of facts likely to be in the record. Because it explains how to put the facts together, Chicago testimony is relevant to the court's decision. If the court is presented with conflicting Chicago-based conclusions, it can resolve the dispute by applying standard legal tools to the trial record or by charging the jury to resolve the disputes.

Of course, PCE analysis remains valuable in the academic policy debate on antitrust issues. In effect, PCE argues that the antitrust laws should require rule-of-reason treatment for various vertical and predation theories, while Chicago economists would be more willing to advocate *per se* legality, as long as the resource savings from deterring occasional anticompetitive conduct are smaller than the transactions costs of sorting out, on a case-by-case basis, anticompetitive from pro-competitive effects of a particular business practice. More empirical research would be useful to help understand what fact scenarios actually lead to anticompetitive concerns. Until economists can present empirical evidence of the effects, we believe the courts can do quite well applying the current Chicago understanding of economics to

¹⁹¹ Because the Department of Justice's case is broader than the economic analysis discussed in the text, this analysis does not necessarily purport to evaluate the overall merits of the Government's position. Such a task would require a discussion beyond the scope of this Article.

current antitrust law. To this end, the *Daubert* standard provides judges with a useful tool to separate economic science from economic fiction.