An Interdisciplinary Perspective on Economic Models in Complex Litigation

Jeff Todd
AN INTERDISCIPLINARY PERSPECTIVE ON ECONOMIC MODELS IN COMPLEX LITIGATION

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I. INTRODUCTION

The Supreme Court issued the last case of the Daubert trilogy almost twenty years ago,¹ but courts continue to struggle with questions of admissibility versus weight of scientific expert testimony.² Consider the confusion surrounding economics experts in suits involving antitrust violations, securities fraud, or business torts.³ Determining damages can overwhelm the fact-finder because of the volume of financial evidence and the number of potential causal factors, so plaintiffs proffer expert testimony based on economic models that analyze vast amounts of data through sophisticated techniques like regression analysis.⁴ Defendants respond by filing a motion in limine to exclude the testimony as unreliable under Daubert.⁵ Many judges lack a sufficient grasp of what models are and how economists use them, so they often give weak,...
vague, or even no reasons for their admissibility rulings.⁶ Accordingly, they sometimes limit or exclude model-based testimony that should be assessed by the jury, they admit testimony related to models with dubious assumptions and let the jury sort it out, or they differ from each other on the admissibility of similar economics experts.⁷ The outcomes of multimillion-dollar cases can hinge upon whether and the extent to which courts admit this expert evidence,⁸ yet admissibility rulings lack coherence and consistency.⁹

Although commentators have articulated guidelines,¹⁰ those guidelines contradict each other making them unlikely to alleviate the confusion.¹¹ For example, some academic authority would support the argument that models are not facts; that assessing them does not trigger the jury role; and that the judge should not distinguish between methodology, inputs, and results but should instead make a straight up-or-down ruling on admissibility.¹² The court should therefore decline to admit this testimony if the expert has chosen to exclude important variables from the regression analysis, assumed that companies, products, or markets are similar to others, predicted how parties or markets would have acted or will act in the future, or relied on imperfect data.¹³ Scholarship also supports plaintiff's position, however: expert valuation is nothing more than traditional fact-finding, with questions about assumptions and variables going to credibility, so the judge must admit the testimony if the model offers even minimal assistance in calculating damages.¹⁴ Every model relies on questionable choices,

⁶. Rebecca Haw Allensworth, Law and the Art of Modeling: Are Models Facts?, 103 GEO. L.J. 825, 862-65 (2015) (writing that judges "are asked to evaluate models rigorously without the intellectual or doctrinal tools for the task"); see id. at 859 (noting the danger of "less informed, less coherent decisionmaking" when courts stray away from the ideal treatment of models).
⁸. See infra Part III.A (discussing cases in which the exclusion or limitation of economics expert testimony was outcome determinative).
⁹. Allensworth, supra note 6, at 859, 871-73; Hill et al., supra note 3, at 310-15.
¹⁰. See, e.g., Allensworth, supra note 6, at 875-77 (advocating for greater economics education of judges); Hill et al., supra note 3, at 371-81 (suggesting an approach to bifurcate the process for choosing and then applying an economic model to calculate damages). See generally Robert M. Lloyd, Proving Lost Profits After Daubert: Five Questions Every Court Should Ask Before Admitting Expert Testimony, 41 U. RICH. L. REV. 379 (2007) (providing and discussing five questions that courts should ask prior to admitting expert testimony about damages).
¹¹. See John E. Lopatka & William H. Page, Economic Authority and the Limits of Expertise in Antitrust Cases, 90 CORNELL L. REV. 617, 695-96 (2005) (identifying the need “to create a coherent system of law, embodying both economic and institutional considerations, to guide business conduct and future cases”).
¹². Allensworth, supra note 6, at 859-62.
¹⁴. Casey & Simon-Kerr, supra note 4, at 1184-85; see Malcolm B. Coate & Jeffrey H.
simplifying assumptions, and imperfect data, so these issues go to weight rather than admissibility. The conscientious judge could draw on authority to chart a middle course, such as evaluating the reliability of the model by distinguishing between legislative and adjudicative facts, or by separating the economist’s choice of methodology from the model’s inputs and results. The most recent authority dismisses these distinctions as theoretically unsound—though of course that authority disagrees over whether models are law or fact. Besides, even if the court makes such a distinction, where, precisely, is the line—is methodology limited to the choice of appropriate valuation method and statistical technique, or must the court evaluate the reasonableness of the economist’s assumptions and arguments?

Evidence law points us toward the standards of the field of economics to answer these questions, so it is surprising that legal commentators have yet to consider scholarship from economics methodologists on the status and function of models in assessing where economic models fall on the law-fact divide. Although economics


Casey & Simon-Kerr, supra note 4, at 1201-06 (equating questions about methodology and variables in competing expert valuation models with assessing the credibility of different eyewitnesses to an auto accident); Todd & Jewell, supra note 4 (manuscript at 19).

Kaye, supra note 7, at 1974-75.

Hill et al., supra note 3, at 372-80.

Compare Allensworth, supra note 6, at 846-62 (writing that modeling presents mixed questions of law and fact with almost all decisions left to the judge), with Casey & Simon-Kerr, supra note 4, at 1182, 1198-206 (calling complex valuation nothing more than “run-of-the-mill fact-finding”).

Allensworth, supra note 6, at 863-64 (writing that some courts will admit testimony if it is based upon an accepted technique like regression analysis without examining further); see Michele Molyneaux, Comment, Quality Control of Economic Expert Testimony: The Fundamental Methods of Proving Antitrust Damages, 35 Ariz. St. L.J. 1049, 1052-53 (2003) (listing four common types of antitrust damage measures).

See Todd & Jewell, supra note 4 (manuscript at 5) (recognizing that a better understanding of assumptions in economic models will “permit courts to make more sound rulings about admissibility”).

See FED. R. EVID. 702 advisory committee’s note to 2000 amendment ("[W]hether the testimony concerns economic principles, accounting standards, property valuation or other nonscientific subjects, it should be evaluated by reference to the ‘knowledge and experience’ of that particular field." (quoting AM. COLL. OF TRIAL LAW., STANDARDS AND PROCEDURES FOR DETERMINING THE ADMISSIBILITY OF EXPERT TESTIMONY AFTER DAUBERT 9 (1994))); Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579, 591-94 (1993) (listing as admissibility factors: whether there are standards that control the operation of a particular technique and whether a theory or technique enjoys acceptance within a “relevant scientific community”).

See Todd & Jewell, supra note 4 (manuscript at 50) (calling for more interdisciplinarity in scholarship about economic expert testimony); see also Lawsky, supra note 15, at 1658, 1668-83
since the 1950s has been a field dominated by mathematical models,24 methodologists evoke literature and rhetoric by characterizing models tropologically, calling them analogies, metaphors, caricatures, mediating instruments, surrogate systems, and credible worlds.25 They push the literary terminology farther, arguing that economists use models as devices to construct a narrative and ultimately tell a story about economic phenomena.26 Over the last quarter-century, economics scholars have shifted away from defining what models are and instead “analyse how economic scientists build models and what they do with models: how they use them, how they argue with them, and what they learn from using them.”27 Because the status of models cannot be separated from their function,28 evaluating their effectiveness necessitates considering their broader rhetorical context,29 (stating that “legal scholarship includes little or no discussion of what models mean” and “how they are connected to the real world of law and policy”).

24. Mary S. Morgan & Tarja Knuuttila, Models and Modelling in Economics, in PHILOSOPHY OF ECONOMICS 49, 50-55, 76 (Uskali Mäki ed., 2012); see Wassily Leontief, Theoretical Assumptions and Nonobserved Facts, AM. ECON. REV., 1971, at 1, 2 (“The mathematical model-building industry has grown into one of the most prestigious, possibly the most prestigious branch of economics.”); Robert M. Solow, How Did Economics Get that Way and What Way Did It Get?, DAEDALUS, Winter 1997, at 39, 43-47 (writing that, since the 1940s, the response of a “mainstream economist” to an economic problem is to model ... [it] and see what happens”).


27. Morgan & Knuuttila, supra note 24, at 81.

28. See id. at 73-77.

29. See Cyril Hédoin, Models in Economics Are Not (Always) Nomological Machines: A Pragmatic Approach to Economists’ Modeling Practices, 44 PHIL. SOC. SCI. 424, 426 (2014) (“The understanding of the model-based strategy in economics necessitates taking into account not only the models (their characteristics) and their target systems but also the abilities and the aims of the modeler, the state of theoretical knowledge in the discipline, and the norms that establish what inferences can be made from a given model.”); Mäki, supra note 25, at 40 (discussing persuasiveness as a “rhetorical version” of the credibility of a model). See generally MCCLOSKEY,
including how economists use models as part of telling stories to a particular audience. 30

These insights offer a means to delimit more clearly the extent to which economic models are law or fact and thus the extent of the roles of gatekeeper and fact-finder regarding economics expert testimony. First, attempting to distinguish between the methodology and its inputs and conclusions—in other words, between the model and its data and results—is theoretically unsound. 31 Second, while admissibility is a high-threshold decision, courts should make it by evaluating models in their broader context, which includes the jury as the primary audience for the economist’s story. 32 Opponents typically do not challenge the accuracy of the statistical calculations but instead the realism of the expert’s artistic choices: whether the underlying studies are similar enough to the current case; whether necessary variables were omitted from the model; and whether simplifying assumptions make the model too unlike the real world. 33 Questions like these go to the credibility of the model and the economist’s story about it, so they are primarily for the jury as fact-finder. 34 The economist’s role as storyteller also gives a rationale for determining when the judge as gatekeeper should exclude the testimony of economics experts: if the expert has no story to explain a contested assumption or if uncontested evidence controverts some aspect of the expert’s narrative. 35

Part II provides an overview of the legal scholarship on what economic models are, their importance in complex litigation, and the law governing expert testimony in federal court. 36 Part III turns to the lack of consistency and rationale that currently exists in the admissibility decisions of courts and the range of proposals that scholars have offered in response. 37 Part IV surveys the economics literature on the role and

supra note 25 (devoting entire book to the rhetoric of economics).

30. Uskali Mäki, Contested Modeling: The Case of Economics, in MODELS, SIMULATIONS, AND THE REDUCTION OF COMPLEXITY 87, 91-93 (Ulrich Gähde et al. eds., 2013); see Sugden, supra note 25, at 19-20 (writing that the reader must make the inferential leap from model world to real world).

31. See infra Part III.A.

32. See infra Part V.B; see also Jennifer L. Mnookin, Atomism, Holism, and the Judicial Assessment of Evidence, 60 UCLA L. REV. 1524, 1574-82 (2013) (arguing against evaluating expert testimony in isolation and instead advocating a holistic view toward expert testimony because such testimony forms but a part of the overall story of the case that the jury constructs).


34. See infra Part V.B.

35. See infra Part V.B.

36. See infra Part II.

37. See infra Part III.
function of models. Part V synthesizes the common themes from the survey to argue that courts should have a lower threshold than for other scientific evidence when ruling on the admissibility of expert testimony based upon economics models. The Article concludes in Part VI.

II. ECONOMISTS AND THEIR MODELS IN COMPLEX LITIGATION: FACT-FINDERS AND GATEKEEPERS

Proving causation and damages in complex litigation frequently “requires” expert testimony based on sophisticated economic models. Before the jury can consider that testimony, however, the court must first admit it. This Part summarizes the legal scholarship on what economic models are, discusses their importance for proving damages in complex litigation, and traces the relevant federal law on expert testimony.

A. An Overview of Economic Models: Science and Art

Econometrics is the application of statistics to analyze economic data, and econometricians accomplish this task through models. Models are “mathematic abstractions used to predict or describe natural or market processes.” This definition points to both purpose and function. “[A] model is always used for some purpose”; it has no value, nor can it be evaluated, outside of its ability to achieve its purpose. Models aim to generate understanding—such as prediction or

38. See infra Part IV.
39. See infra Part V.
40. See infra Part VI.
41. Casey & Simon-Kerr, supra note 4, at 1188-91; see Allensworth, supra note 6, at 835-36 (calling testimony based upon economic models “ubiquitous”); Frederick C. Dunbar & Arun Sen, Counterfactual Keys to Causation and Damages in Shareholder Class-Action Lawsuits, 2009 Wis. L. REV. 199, 208 (writing that evidence from financial economics rather than common sense is needed to prove causation in shareholder lawsuits).
42. See infra Part II.A-C. Most complex litigation involves either federal questions such as antitrust and securities fraud or diversity jurisdiction when the claim is based in state law like tortious interference. Todd & Jewell, supra note 4 (manuscript at 7-8, 21). Further, many states have evidence laws that mirror the Federal Rules of Evidence. Id. (manuscript at 21). Even in those that do not, courts often decide admissibility of expert testimony on rationales similar to that in the Daubert trilogy. Faigman et al., supra note 2, at 882; Todd & Jewell, supra note 4 (manuscript at 7-8, 21).
44. See Todd & Jewell, supra note 4 (manuscript at 11, 15-16).
45. Allensworth, supra note 6, at 828.
46. Id. at 832.
measurement—of the important aspects of a given data set. 47 Models help achieve this understanding by simplifying reality, 48 by distilling the "patterns and implications" of a "chaotic reality." 49 This distillation requires both science and art 50; the use of mathematical techniques like regression analysis to perform complex calculations, 51 but also numerous "choices and assumptions" based upon the economist's "intuition or inspiration" to determine how to apply that regression. 52

Regression analysis is a powerful statistical technique because it can help an economist make sense of vast amounts of data and numerous variables. 53 Regression aims to show a correlation among a dependent variable—the one of interest to the modeler—with one or more independent variables in a way that is more than chance. 54 From this correlation, the expert can infer a causal relationship—that the independent variables cause changes in the dependent variable. 55 This technique is thus "well suited to the analysis of data about competing theories for which there are several possible explanations for the relationships among a number of explanatory variables." 56

Mathematical analyses are types of science that are especially relevant when controlled experiments are not possible for the object of study. 57 As with other approaches to scientific inquiry, regression tests

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47. Coate & Fischer, supra note 14, at 139-40; Todd & Jewell, supra note 4 (manuscript at 11-12).
48. Coate & Fischer, supra note 14, at 139-40 ("[T]he fundamental goal of an economic model is to simplify reality . . . ."); see Allensworth, supra note 6, at 832 (writing that a model "can be thought of as a simplification of a more complex system").
49. Allensworth, supra note 6, at 862.
50. Id. at 831-34; Hill et al., supra note 3, at 335-39; Mark Klock, Contrasting the Art of Economic Science with Pseudo-Economic Nonsense: The Distinction Between Reasonable Assumptions and Ridiculous Assumptions, 37 PEPP. L. REV. 153, 194-97 (2010).
51. Blair & Esquibel, supra note 43, at 120-21 ("A basic tool of econometrics is multiple regression analysis, a statistical technique . . . ."); Lopatka & Page, supra note 11, at 687-88.
52. Allensworth, supra note 6, at 829; see David H. Kaye & David A. Freedman, Reference Guide on Statistics, in FED. JUDICIAL CTR., REFERENCE MANUAL ON SCIENTIFIC EVIDENCE 211, app. at 281 (3d ed. 2011) (ebook) (writing that assumptions are made going into a model).
53. Todd & Jewell, supra note 4 (manuscript at 9).
54. Daniel L. Rubinfeld, Reference Guide on Multiple Regression, in FED. JUDICIAL CTR., supra note 52, at 303, 311-17; Todd & Jewell, supra note 4 (manuscript at 9); see Kaye & Freedman, supra note 52, app. at 294 ("A regression model attempts to combine the values of certain variables (the independent or explanatory variables) in order to get expected values for another variable (the dependent variable)").
56. Rubinfeld, supra note 54, at 305 (footnote omitted).
57. See id. at 312; see also Coate & Fischer, supra note 14, at 151 (contrasting economics with "hard" sciences because the former relies upon observations of reality rather than "controlled experiments").
hypotheses. The hypothesis is an assumption, "a prejudice" based upon "having some reason to choose what is and is not worth observing." The assumptions do not end with the hypothesis because models are a "set of assumptions." For example, economists construct their models from prior studies, which involves choosing those that are relevant—and perhaps distinguishing those that seem relevant but are not. Economists also confront choices related to mathematics and statistics: while regression analysis is a well-known and accepted technique, it is not the only type of statistics and may not be appropriate for a particular problem.

The artistry of the economist may face the greatest challenge with simplifying assumptions, the choices about how to abstract the relevant features of the real world for a sound analysis of the problem while also sufficiently approximating the real world. Some commentators compare economic models to roadmaps: while more detail makes the map more realistic, it also renders the map less useful because the whole purpose is to preserve only the "salient features of the roads" for easier navigation. "The goal is to abstract the salient features of reality without becoming mired in minutiae." But if the map abstracts or omits too much, then it may "distort reality to the point that the conclusions bear no resemblance to what actually happens in our universe." Constructing a model, like drawing a map, includes dozens of choices, tradeoffs between the costs and benefits of accuracy, simplicity, and usefulness.

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59. David Goodstein, How Science Works, in FED. JUDICIAL CTR, supra note 52, at 37, 40.
60. See Kaye & Freedman, supra note 52, at 272.
61. Todd & Jewell, supra note 4 (manuscript at 11-16).
62. Kaye & Freedman, supra note 52, at 214 (recognizing that regression analysis is a well-known technique covered in many textbooks but that the method chosen by the expert "may be inappropriate for the problem at hand"); Zohn, supra note 43, at 727-28 (writing that courts have long recognized regression analysis as a reliable technique but that "courts should be open to the use of other techniques").
63. Todd & Jewell, supra note 4 (manuscript at 25-31, 40-41); see Klock, supra note 50, at 196-97 (noting the challenge of "choosing assumptions that make for an aesthetically pleasing trade-off between reality and abstraction" (footnote omitted) (citing Kenneth G. Dau-Schmidt, Economics and Sociology: The Prospects for an Interdisciplinary Disclosure on Law, 1997 Wis. L. REV. 389, 397)).
64. Klock, supra note 50, at 196; see Allensworth, supra note 6, at 832-33.
65. Klock, supra note 50, at 196 (footnote omitted) (citing Dau-Schmidt, supra note 63, at 397).
66. Id. at 197 (footnote omitted) (citing EUGENE SILBERBERG, THE STRUCTURE OF ECONOMICS: A MATHEMATICAL ANALYSIS 7 (1978)).
67. Allensworth, supra note 6, at 840-41.
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Economists construct models with mathematical parameters that use data samples from the population. The number and type of variables are not predetermined, nor is all available information necessarily data that is relevant to the analysis. Statistical models are fact-specific, so the realism of a model depends upon the circumstances of its use. Economists construct models to predict or explain what is not yet known about some phenomenon, so if the assumptions within the model mirror what is known about that phenomenon, then the model’s conclusions about the unknown are realistic. Economic analysis therefore includes an element of argumentation because the economist must demonstrate and defend the logic and realism of the assumptions.

B. The Need for Economic Models to Prove Damages in Complex Litigation

Each party has a theory of the case, “a simple, plausible, coherent, legally sufficient narrative.” The narrative is rhetorical because it conceptualizes a reality with which it invites the audience to share. That audience is often the jury, as guaranteed by the Seventh Amendment to the Constitution for civil cases where the amount in controversy is over twenty dollars. The jury acts as the fact-finder with the power to determine how much weight to give to evidence, including assessing the credibility of witnesses, determining whether an injury occurred, and the amount of damages. Indeed, courts distinguish between claims in law versus claims in equity by looking to the relief requested. The plaintiff’s demand for money damages triggers the Seventh Amendment right to a jury, whether the claim sounds in common law or statute.

68. Rubinfeld, supra note 54, at 312.
69. See Todd & Jewell, supra note 4 (manuscript at 26-27) (writing that the economist can ignore nonessential conditions in constructing a model); Zohn, supra note 43, at 725-26 (discussing the relationship of data and variables in regression analysis).
70. Todd & Jewell, supra note 4 (manuscript at 11-12).
71. Id. (manuscript at 12).
72. See Blair & Esquibel, supra note 43, at 134-35; Todd & Jewell, supra note 4 (manuscript at 12, 41); see also JONATHAN SCHLEFER, THE ASSUMPTIONS ECONOMISTS MAKE 278 (2012) (writing that an economist needs “a sound argument for why [her] assumption is generally realistic”).
73. ROBERT P. BURNS, A THEORY OF THE TRIAL 37 (1999) (citing WILLIAM TWINING, RETHINKING EVIDENCE: EXPLORATORY ESSAYS 239 (1990)).
74. Id. at 36-37; Lopatka & Page, supra note 11, at 622-23.
75. U.S. CONST. amend. VII.
77. Sward, supra note 76, at 589-90.
The party’s attorney may initiate the narrative, but the jury completes the story. The Supreme Court has written that “as [the] pieces of evidence come together a narrative gains momentum, with power not only to support conclusions but to sustain the willingness of jurors to draw the inferences, whatever they may be, necessary to reach an honest verdict.” According to the story model of jury fact-finding, “the jury looks for coherence across items of evidence in order to build a plausible, interconnected story.” Jurors draw part of their story from outside the trial by assessing the evidence in light of their own experiences with how the world works. This experience often underpins the constitutional guarantee for a jury in civil trials. For example, many decisions require a common-sense inference, and the collective knowledge of a group of jurors increases the chances that the jury will have superior information compared to a judge. Such common-sense inferences include credibility issues like demeanor and context. Also, juries often “estimate social norms or calibrate judgments about fairness,” such as calculating the monetary value of pain and suffering. Jurors draw the remainder of their story from inside the trial by assessing the evidence, not just the individual pieces but also the relation of each piece to the whole.

In complex litigation, the plaintiff’s attorney desires to weave for the jury a narrative that concludes with an economics expert as the most important thread. Proving damages in complex litigation requires sophisticated statistical techniques like regression analysis. The record will include years of business records as well as other financial data such as market information, and the fact-finder will find it hard “to translate those raw numbers into a valuation.” Plus, the data alone are insufficient to show lost profits or diminished business value because the defendant’s unlawful conduct affected the plaintiff’s past revenues and because the plaintiff could have gained future revenues but-for

79. Mnookin, supra note 32, at 1541.
81. Faigman et al., supra note 2, at 898-99.
83. Faigman et al., supra note 2, at 898-99.
84. Allensworth, supra note 6, at 849 (footnote omitted) (citing NEIL VIDMAR & VALERIE P. HANS, AMERICAN JURIES: THE VERDICT 135-36 (2007)).
86. Hill et al., supra note 3, at 333-34.
87. Casey & Simon-Kerr, supra note 4, at 1179.
defendant’s conduct.\textsuperscript{88} The expert must determine these but-for damages by isolating the effect of the defendant’s conduct as the cause of plaintiff’s losses.\textsuperscript{89} This means accounting for variables like changing markets, emerging technologies, and new regulations over time periods of years or even decades.\textsuperscript{90} In cases like antitrust, regression analysis can isolate the effects of these other variables so that the model can explain dependent variables like profit, sales, or price.\textsuperscript{91}

But we cannot overlook the importance of the artistic element. To prove damages, the plaintiff’s attorney must construct an alternate reality—the world as it would exist but-for defendant’s wrongful conduct—against which the fact-finder can contrast plaintiff’s actual condition.\textsuperscript{92} Where would the plaintiff stand but-for the defendant’s tortious act, how would the plaintiff have fared in the market if the defendant had not engaged in anticompetitive acts, or what would be the sales price and value of the stock if defendants had not committed fraud?\textsuperscript{93} Regression analysis can help answer these questions, but it cannot ask them. Nor can it choose the type and number of variables to measure, nor can it determine the relevant time periods to include, nor can it choose the appropriate studies from which to draw. These are the choices of and decisions by the damages expert:

Experts are typically the only people in the case with the experience and the often-specialized education required to perform appraisals, interpret financial statements, find and interpret the kind of market data that goes into a valuation, and create a valuation model that will derive meaning from all of the variables.\textsuperscript{94}

Interpreting data to derive meaning necessarily entails simplification, the ability to find the pattern within the mass of complex data pulled from the chaotic and complex real world.\textsuperscript{95} It also means that both natural and mathematical language play a part in how the economist uses the model.\textsuperscript{96} The economist must describe any critical

\begin{footnotes}
\item[88] Todd \& Jewell, \textit{supra} note 4 (manuscript at 7-11).
\item[89] Lopatka \& Page, \textit{supra} note 11, at 687-88.
\item[90] Todd \& Jewell, \textit{supra} note 4 (manuscript at 7-11, 31-32).
\item[91] Lopatka \& Page, \textit{supra} note 11, at 689-90.
\item[92] Allensworth, \textit{supra} note 6, at 835; Lopatka \& Page, \textit{supra} note 11, at 684, 687; Todd \& Jewell, \textit{supra} note 4 (manuscript at 21-25).
\item[93] Todd \& Jewell, \textit{supra} note 4 (manuscript at 21-25).
\item[94] Casey \& Simon-Kerr, \textit{supra} note 4, at 1206.
\item[95] \textit{See} Allensworth, \textit{supra} note 6, at 839-46; Todd \& Jewell, \textit{supra} note 4 (manuscript at 25-31).
\item[96] \textit{See} Lopatka \& Page, \textit{supra} note 11, at 626-27; \textit{see also} Allensworth, \textit{supra} note 6, at 833 (using the metaphor of a model as tool, as something that has no meaning in itself but that the economist uses as a means to achieving some end).
\end{footnotes}
assumptions and be prepared to argue their soundness and realism: the similarity of the plaintiff, its product, or its market with the comparator; the importance of the included variables and irrelevance of the excluded; or the reasonableness of attributing certain acts to plaintiff, defendant, third parties, or entire markets in predicting the future or the counterfactual past. The goal is for the expert to construct the damages element of the party’s conceptualization of the case so that the jury can share and thereby accept that conceptualization.

C. Evidence Law on Admitting Expert Testimony

The judge might deny the attorney the narrative thread of the economics expert, however, because the law of evidence controls which “story fragments” the party can use to create the trial narrative—and by extension the evidentiary pieces the jury will see. While the jury weighs the evidence, the judge as a threshold matter determines which evidence to admit. Opponents therefore draw their battle lines at admissibility, often targeting the economist’s assumptions and choices because these fall into a “gray area” about which experts often disagree. This Subpart turns to the high threshold for admitting expert testimony established by the Federal Rules of Evidence (“FRE”) and Supreme Court cases interpreting them.

For jurors, “[a]n intelligent evaluation of facts is often difficult or impossible without the application of some scientific, technical, or other specialized knowledge,” and expert witnesses are “[t]he most common source of this knowledge.” The purpose of expert testimony is to “help the trier of fact to understand the evidence or to determine a fact in issue.” FRE 702 through 705 permit the use of expert opinion

97. Todd & Jewell, supra note 4 (manuscript at 12, 40-41).
98. Lopatka & Page, supra note 11, at 622-24, 687-90; see Vidmar & Diamond, supra note 80, at 1138 (claiming that jurors integrate the various parts of trial evidence, including expert witness testimony, into stories).
100. See Bruce Ching, Narrative Implications of Evidentiary Rules, 29 QUINNIPIAC L. REV. 971, 973-76 (2011); Mnookin, supra note 32, at 1526, 1541-42 (“A judge’s evidentiary decisions define the jury’s informational landscape; admissibility rulings delimit the materials out of which the jury sculpts its verdict.” (footnote omitted)).
101. Faiqman et al., supra note 2, at 868-69, 875-76.
102. Lopatka & Page, supra note 11, at 628-29.
104. See infra Part II.C; see also Mnookin, supra note 32, at 1530-31.
105. FED. R. EVID. 702 advisory committee’s notes to 1972 proposed rules.
106. FED. R. EVID. 702(a); see FED. R. EVID. 702 advisory committee’s notes to 1972 proposed
testimony in federal trials.\textsuperscript{107} Under FRE 702, a qualified expert may offer opinion testimony if:

(a) the expert’s scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue;
(b) the testimony is based on sufficient facts or data;
(c) the testimony is the product of reliable principles and methods; and
(d) the expert has reliably applied the principles and methods to the facts of the case.\textsuperscript{108}

FRE 703 adds that an expert can base her opinion on facts and data not admitted into evidence, provided that “experts in the particular field would reasonably rely on those kinds of facts or data in forming an opinion on the subject.”\textsuperscript{109} FRE 705 permits an expert to testify without having to reveal underlying data, though such data may be pursued during cross-examination.\textsuperscript{110}

These rules also constrain the admission of expert testimony. Issues of law are the province of the judge, and admissibility is a legal issue.\textsuperscript{111} While judges should allow the jury to hear evidence, they need not admit irrelevant evidence; moreover, judges can deny even relevant evidence if “it is unfairly prejudicial, misleading, a waste of time, deceptive, redundant, or unreliable.”\textsuperscript{112} The Court has explored this judicial gatekeeping role as related to expert evidence in the Daubert trilogy. \textit{Daubert v. Merrell Dow Pharmaceuticals, Inc.}\textsuperscript{113} established the reliability standard: the trial judge must ensure “that an expert’s testimony both rests on a reliable foundation and is relevant to the task at hand. Pertinent evidence based on scientifically valid principles will satisfy those demands.”\textsuperscript{114} Expert testimony is reliable if it is grounded in the “methods and procedures” of the scientific method.\textsuperscript{115} Relevance is a question of “fit”: “Rule 702’s ‘helpfulness’ standard requires a valid scientific connection to the pertinent inquiry as a precondition to admissibility.”\textsuperscript{116} The Court furnished a “flexible” and non-exhaustive rules (“Whether the situation is a proper one for the use of expert testimony is to be determined on the basis of assisting the trier.”).

\textsuperscript{107} See FED. R. EVID. 702–705.
\textsuperscript{108} FED. R. EVID. 702.
\textsuperscript{109} FED. R. EVID. 703.
\textsuperscript{110} FED. R. EVID. 705.
\textsuperscript{111} Faigman et al., \textit{supra} note 2, at 875 & n.67.
\textsuperscript{112} \textit{Id.} at 875 (footnotes omitted) (citing FED. R. EVID. 402).
\textsuperscript{113} 509 U.S. 579 (1993).
\textsuperscript{114} \textit{Id.} at 597.
\textsuperscript{115} \textit{Id.} at 589-90.
\textsuperscript{116} \textit{Id.} at 591-92.
list of factors that a trial judge can consider. Of note, the Court recognized that cross-examination, opposing experts, and jury instructions would normally be sufficient to guard against dubious expert testimony.

The second case was General Electric Co. v. Joiner, where the Court rejected the assertion that Daubert limits the gatekeeping role only to the expert’s methodology. The experts relied upon animal studies to support their claims that polychlorinated biphenyl (“PCB”) exposure had enhanced the onset of plaintiff’s cancer. Respondent argued that reliance on animal studies was an accepted methodology, so the trial court’s gatekeeping function was limited to methodology. The Court disagreed, characterizing the issue not as whether animal studies can ever bolster an expert’s opinion, but as whether those particular studies sufficiently supported these particular experts’ opinions. Chief Justice Rehnquist wrote that

conclusions and methodology are not entirely distinct from one another. Trained experts commonly extrapolate from existing data. But nothing in either Daubert or the Federal Rules of Evidence requires a district court to admit opinion evidence that is connected to existing data only by the ipse dixit of the expert. A court may conclude that there is simply too great an analytical gap between the data and the opinion proffered.

The Court therefore held that the trial court did not abuse its discretion in excluding the expert testimony on the grounds that studies upon which they relied were insufficient to support their conclusions. The Court was concerned that admissibility could hinge on methodological validity in the abstract rather than application to the case at hand. The Court thus strengthened the gatekeeping role of the judge

117. Id. at 592-96 (listing, first, whether the theory or technique “can be (and has been) tested”; second, “whether the theory or technique has been subjected to peer review”; third, the error rate and other professional standards associated with the theory or technique; and fourth, the “[w]idespread acceptance” of the theory or technique, with the caveat that general acceptance does not control admissibility).
118. Lopatka & Page, supra note 11, at 627 & n.49 (citing Daubert, 509 U.S. at 596).
120. Id. at 146.
121. Id. at 143-44.
122. Id. at 144, 146.
123. Id. at 144-45.
124. Id. at 146 (citing Turpin v. Merrell Dow Pharm., Inc., 959 F.2d 1349, 1360 (1992)).
125. Id. at 146-47.
126. Faigman et al., supra note 2, at 872.
by limiting the ability of the expert to be the bridge between data and results.

The third case in the trilogy, *Kumho Tire Co. v. Carmichael,* reaffirmed the gatekeeper role established in *Daubert* where the “factual basis, data, principles, methods, or their application” in expert testimony “are called sufficiently into question.” The Court clarified the judge’s “broad latitude” by holding that a trial court need only consider one or more of the *Daubert* factors to the extent “doing so will help determine that testimony’s reliability.” The expert was an engineer who engaged in visual and tactile examination of an allegedly defective tire that blew out and resulted in personal injury. In affirming that the trial court did not abuse its discretion in refusing to admit the testimony, the Court stated that the question of reliability did not relate to the reasonableness of the expert’s method. “Rather, it was the reasonableness of using such an approach, along with [the expert’s] particular method of analyzing the data thereby obtained, to draw a conclusion regarding the particular matter to which the expert testimony was directly relevant.” In requiring the admissibility analysis to focus on the case at hand rather than “on broad general principles and theories,” *Kumho* “continued to blur the methodology-conclusion distinction.”

In 2000, FRE 702 was amended to incorporate and reinforce the *Daubert* trilogy, including the trial judge’s role as gatekeeper, the flexibility of the *Daubert* factors, the blurring of methodology and conclusion from *Joiner,* and the need for the expert’s analysis and conclusions to relate to the particular case from *Kumho.* The Comments to the 2000 amendments recognize that, as the area of expertise moves away from the scientific method, the court may need to reference different principles in evaluating the expert’s testimony. “The expert’s testimony must be grounded in an accepted body of learning or experience in the expert’s field, and the expert must explain

128. Id. at 149.
129. Id. at 141-42; see Green & Sanders, supra note 2, at 1076 (“[T]he Daubert factors seem to play less and less of a role, and are supplanted by an increasing focus on fit and the existence of large analytical gaps in reasoning.” (footnote omitted)).
130. 526 U.S. at 142-45, 153.
131. Id. at 153-58.
132. Id. at 154; see Lopatka & Page, supra note 11, at 646-47 (noting that *Kumho* requires courts to scrutinize the methodology of the expert).
133. Green & Sanders, supra note 2, at 1076 (footnote omitted).
134. Kaye, supra note 7, at 1982-83.
135. FED. R. EVID. 702 advisory committee’s note to 2000 amendment; see Lopatka & Page, supra note 11, at 629-31.
136. See FED. R. EVID. 702 advisory committee’s note to 2000 amendment.
how the conclusion is so grounded." The Comments quote a report from the American College of Trial Lawyers that testimony concerning "economic principles...should be evaluated by reference to the ‘knowledge and experience’ of that particular field." In reference to Joiner, the Comments state that "when an expert purports to apply principles and methods in accordance with professional standards, and yet reaches a conclusion that other experts in the field would not reach, the trial court may fairly suspect that the principles and methods have not been faithfully applied." FRE 702 nevertheless accommodates the admission of opposing expert testimony because it "is broad enough to permit testimony that is the product of competing principles or methods in the same field of expertise." Accordingly, rejecting expert testimony should be the exception rather than the rule, and the trial judge as gatekeeper should not replace the adversary system.

A case outside the Daubert trilogy also addresses relevance and expert testimony. The trial court in Bazemore v. Friday had excluded several of an expert’s regression analyses that purported to show race discrimination. The Court noted the Court of Appeals’ reasoning that, while the regression analyses included independent variables like race, job title, education, experience, and tenure, the analyses failed to include several relevant independent variables like “across the board and percentage pay increases which varied from county to county.” Justice Brennan wrote that “failure to include variables will affect the analysis’ probativeness, not its admissibility.” Indeed, even a regression analysis with “less than ‘all measurable variables’” can help plaintiffs to prove their case. Justice Brennan noted the possibility, however, of “some regressions so incomplete as to be inadmissible as irrelevant.”

The FRE make clear that the relevance of an expert’s statistical model affects admissibility. FRE 401 defines evidence as relevant if it has “any tendency to make the existence of any fact more probable or less probable than it would be without the evidence” and “the fact is of

137. Id. (citing AM. COLL. OF TRIAL LAW., supra note 22, at 9).
138. Id. (quoting AM. COLL. OF TRIAL LAW., supra note 22, at 9).
139. Id. (citing Lust v. Merrell Dow Pharm., Inc., 89 F.3d 594, 598 (9th Cir. 1996)).
140. Id.
141. Id. (citing United States v. 14.38 Acres of Land Situated in Leflore Cnty., Miss., 80 F.3d 1074, 1077-78 (5th Cir. 1996)).
143. Id. at 398-99 (Brennan, J., concurring in part).
144. Id. at 399 (quoting Bazemore v. Friday, 751 F.2d 662, 672 (4th Cir. 1984)).
145. Id. at 400 (footnote omitted).
146. Id.
147. Id. at 400 n.10.
consequence in determining the action."\textsuperscript{148} FRE 402 allows the admission of relevant evidence, but forbids admission of irrelevant evidence.\textsuperscript{149} Courts can even rule relevant evidence inadmissible under FRE 403 because it empowers courts to exclude relevant evidence "if its probative value is substantially outweighed by a danger of one or more of the following: unfair prejudice, confusing the issues, misleading the jury, undue delay, wasting time, or needlessly presenting cumulative evidence."\textsuperscript{150}

The Federal Rules of Civil Procedure ("FRCP") also relate to economic models, including whether and the extent to which expert testimony reaches a jury. FRCP 26 requires the party to submit an expert report that contains "a complete statement of all opinions the witness will express and the basis and reasons for them" and "the facts or data considered by the witness in forming them."\textsuperscript{151} FRCP 26 therefore restricts the scope of expert testimony to what is contained in the report.\textsuperscript{152} As one commentator writes, "Expert testimony must be stated in the language of general coherence," but that language "must rely on formalized models" because the law of evidence requires experts to base their testimony on a theoretical construct.\textsuperscript{153}

Besides ruling evidence inadmissible, the court can also decide to withhold expert testimony from the jury by ruling it insufficient, which is a question of law.\textsuperscript{154} "The court will not submit a case to the jury unless it decides as an initial matter that the proponent has proven each of the propositions essential to the claim by sufficient evidence to justify or warrant a finding in the proponent's favor on it."\textsuperscript{155} If evidence is excluded as inadmissible, that evidence does not count in measuring sufficiency.\textsuperscript{156} Even if the evidence is admitted, the judge can still "disregard the evidence on a later motion to take the case from a jury."\textsuperscript{157} "If, for example, a witness's testimony is flatly contradicted by indisputable facts or natural laws, it will be disregarded as not capable of belief by reasonable people."\textsuperscript{158} Accordingly, the court can grant the

\textsuperscript{148} FED. R. EVID. 401.
\textsuperscript{149} FED. R. EVID. 402.
\textsuperscript{150} FED. R. EVID. 403.
\textsuperscript{151} FED. R. CIV. P. 26(a)(2)(B)(i)–(ii); see also FED. R. CIV. P. 37(c)(1) (prohibiting witnesses from testifying if the party fails to provide the report as required under FRCP 26(a)).
\textsuperscript{152} FED. R. CIV. P. 26(a)(2)(B); see Hill et al., supra note 3, at 333.
\textsuperscript{153} Lopatka & Page, supra note 11, at 626-27.
\textsuperscript{154} Id. at 626, 630-31; see GEOFFREY C. HAZARD, JR. ET AL., CIVIL PROCEDURE 478 (6th ed. 2011) ("Sufficiency of the evidence concerns the court's function, not the jury's.").
\textsuperscript{155} HAZARD ET AL., supra note 154, at 478.
\textsuperscript{156} Id. at 486.
\textsuperscript{157} Id.
\textsuperscript{158} Id. at 480 (footnote omitted) (first citing Simblest v. Maynard 427 F.2d 1 (2d Cir. 1970);
opponent’s motion for summary judgment under FRCP 56 or for judgment as a matter of law under FRCP 50 if expert testimony fails to raise a material question of fact for the jury. The standard of review for admissibility and sufficiency differ: appellate courts apply the deferential abuse of discretion standard to admissibility rulings, but conduct de novo review when evaluating sufficiency. Similarly, sufficiency differs from weight, with the latter for the jury to decide. “The weight of the evidence includes questions of credibility and choice among competing inferences.”

III. ADMISSIBILITY PROBLEMS AND PROPOSED SOLUTIONS

Because excluding a damages expert can be outcome determinative, courts want to assure that they do not set the Daubert threshold too high and thereby substitute their judgment for the jury’s. At the same time, courts want to avoid setting the Daubert threshold too low and thereby risk confusing the jury with too much unreliable and irrelevant “junk science.” Rather than finding this balanced sweet spot, however, courts likely admit some damages expert testimony of dubious quality while excluding others that deserve to reach the jury. Though many, if not most, courts take their gatekeeping duties seriously, they may lack the “intellectual or doctrinal tools” to evaluate economic models. Courts therefore reach inconsistent results and often rely upon shaky reasoning—or none at all. Scholars have responded with theory-based

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159. FED. R. CIV. P. 56(c)(1)(B) (allowing parties to show “that an adverse party cannot produce admissible evidence to support the fact”); Lopatka & Page, supra note 11, at 630-31, 650; see FED. R. CIV. P. 56(a) (“[A] court shall grant summary judgment if the movant shows that there is no genuine dispute as to any material fact.”); see also FED. R. CIV. P. 50(a) (allowing a motion for judgment as a matter of law “at any time before the case is submitted to the jury” which the court can grant if it “finds that a reasonable jury would not have a legally sufficient evidentiary basis to find for the party on that issue”).

160. Lopatka & Page, supra note 11, at 631.

161. HAZARD ET AL., supra note 154, at 485.

162. Id.


164. Id. at 1570; see Smithkline Beecham Corp. v. Apotex Corp., 247 F. Supp. 2d 1011, 1042 (N.D. Ill. 2003) (calling the purpose of Daubert “to protect juries from being bamboozled by technical evidence of dubious merit” (citing Seaboard Lumber Co. v. United States, 308 F.3d 1283, 1301-02 (Fed. Cir. 2002))).

165. See Allensworth, supra note 6, at 863.

166. Id. at 862, 865 (writing that “many [courts] engage in thoughtful, detailed analysis of modeling choices” (footnote omitted) (citing In re Live Concert Antitrust Litig., 863 F. Supp. 2d 966 (C.D. Cal. 2012))).

167. Id. at 864-65.
guidelines so that courts will have greater direction and achieve more uniform rulings; unfortunately, the proposals vary so much that they conflict with each other and are therefore unlikely to achieve coherence or consistency.

A. Inconsistent and Incoherent Admissibility of Model-Based Expert Testimony

Hill and his co-authors identify "key admissibility issues that sometimes lead to inconsistent outcomes" regarding damages experts. One issue concerns how flawed the expert’s testimony—in particular the underlying model—"can be and still be admitted" for the jury. Plaintiffs need not prove damages with absolute precision. Accordingly, courts sometimes decline to strike a damages expert’s report even though it contains numerous shortcomings, including being out of compliance with FRCP 26(a)(2)(B). Other times courts will catalogue the problems in the expert’s reasoning and underlying analysis to support ruling it inadmissible, as in Lippe v. Bairnco, Corp., where the court found eighteen flaws such as failure to explain why a more common method was not used, inability to explain variables and assumptions, declining to adjust calculations based on differences with comparators, and errors in computation.

This lumping together of flaws related to valuation method, mathematical errors, and the modeler’s choices in constructing the model suggests more fundamental problems. The first relates to methodology. Joiner and the revised FRE 702 “eschew[ ] the methodology—conclusions distinction,” yet some courts continue to insist upon it in making their admissibility rulings. Some courts have held that the expert’s choice of valuation methodology goes to weight rather than admissibility, presenting a question of fact. Other courts

168. See e.g., Hill et al., supra note 3, at 371-81; Zohn, supra note 43, at 728-33.
169. Hill et al., supra note 3, at 311.
170. Id. at 314-15 (footnote omitted).
171. Id. at 314.
174. 99 F. App’x 274.
175. Id. at 278-79 (listing flaws in damages expert’s testimony and affirming district court’s discretion to deny it admission under FRE 702).
176. Faigman et al., supra note 2, at 873-74.
177. Hill et al., supra note 3, at 313 (first citing Gross v. Comm’r, 272 F.3d 333, 343 (6th Cir. 2001); and then citing Popham v. Popham, 607 S.E.2d 575, 576 (Ga. 2005)).
expect certain types of valuation methodologies for particular types of cases, such as statistical event studies in securities litigation, and will exclude evidence that does not include them.178 These courts might admit the testimony without more than a surface inquiry if the expert uses a common valuation technique like before-and-after or an accepted statistical technique like regression analysis.179 Regression analysis is neither the only type of statistics, nor an appropriate technique for all situations, nor a common valuation method applicable in all cases,180 so rubberstamping admission might send too much dubious testimony to the jury.181 If courts maintain a methodology/conclusion distinction, where do they draw the line when it comes to model-based testimony? Economists must necessarily defend assumptions and the choice of variables in the model,182 so perhaps those defenses are part of methodology, but all models are also fact-specific,183 so perhaps those defenses support the conclusion.

A second fundamental problem is the failure, or perhaps the inability, to distinguish the science from the art of economic modeling. Granted, the two do sometimes merge because the type of math to perform and the applicable valuation method are themselves artistic choices, so separating the science from the art can present difficulties; however, sometimes this distinction is crucial.184 For example, when courts critique the statistical analysis rather than the choice of mathematical technique, they might reject too much testimony. Defendants sometimes challenge the expert’s statistical analyses, such as by arguing that the expert’s regression model suffers from omitted variable bias.185 Bazemore v. Friday provides the basis for these challenges because, although the Court held that the failure to include all relevant variables affects only the weight but not admissibility of the regression analysis, it also mentioned the possibility that a regression analysis might be so incomplete that the judge could exclude it as

178. Id. at 315 (footnote omitted) (citing In re Exec. Telecard Ltd. Sec. Litig., 979 F. Supp. 1021, 1025-26 (S.D.N.Y. 1997)).
179. Allensworth, supra note 6, at 863-64; Kaye & Freedman, supra note 52, at 214.
181. Allensworth, supra note 6, at 864.
182. Todd & Jewell, supra note 4 (manuscript at 29-30).
183. Id. (manuscript at 12).
185. Lopatka & Page, supra note 11, at 690-91.
irrelevant. Given this mixed signal, courts have reached mixed results about admissibility on this basis.

This mixed signal is problematic because admissibility decisions often hinge on the modeler’s artistic choices of the included and excluded variables. Plus, experts constructing valuation models make numerous other fundamental choices, such as the standard of value by which to measure damages, various levels of value frameworks that can result in radically different values, what discounts to use in reducing the value of a privately-held business, what discount rate to use in determining the value of a stream of cash flows, and whether the effects of events subsequent to the date for which a value is being determined should be incorporated into their analyses, thereby creating a sort of hindsight bias.

These choices and assumptions offer opposing counsel the most likely targets for attack, both because attorneys can understand them better than math and because those choices and assumptions are “frequently subjective.” Here, too, courts show inconsistency in how assumptions affect reliability—or even in whether assumptions should go to admissibility or weight.

Lloyd writes that “testimony that relies on multiple assumptions should be viewed with extreme skepticism.” Some courts feel justified excluding testimony that is based upon an accumulation of questionable assumptions, as with Lippe’s catalogue of eighteen problems, but courts do not always exclude a damages model with numerous questionable assumptions. In the antitrust case, Conwood Co. v. United States Tobacco Co., the Sixth Circuit held that the trial court did not abuse its discretion in admitting an economics expert’s testimony over defendant’s challenges to the study’s assumptions. Kaye criticized the expert’s study in Conwood, in particular the “mayhem” of the regression analysis of damages, for omitting variables on the effect of the anticompetitive practices, not considering patterns and trends in market share growth adequately, assuming that states where plaintiff had a high share of the market were unaffected by the anticompetitive practices,

186. Id. at 691-92.
187. Id.
188. See, e.g., Hill et al., supra note 3, at 352-53.
189. Id. at 338 (footnotes omitted).
190. Id. at 331 n.253, 331-32, 337-38; Todd & Jewell, supra note 4 (manuscript at 41).
192. Lloyd, supra note 10, at 409.
194. 290 F.3d 768 (6th Cir. 2002).
195. Id. at 792-94.
and assuming what plaintiff's market share would have been but not accounting for what plaintiff's experiences actually were.\textsuperscript{196} If courts split when the model contains numerous questionable assumptions, then what standard besides "the predilections of the individual judge"\textsuperscript{197} guides them when opponents challenge only one or two assumptions? Compare the expert's assumption in \textit{Polymer Dynamics, Inc. v. Bayer Corp.} that the plaintiff's business will expand,\textsuperscript{198} with the assumption in \textit{Nebraska Plastics, Inc. v. Holland Colors Americas, Inc.} that faded siding panels would all be subject to warranty claims.\textsuperscript{199} The trial judge in \textit{Polymer Dynamics} found the assumption reasonable and ruled that the "likelihood and extent" of business expansion were jury issues.\textsuperscript{200} The trial judge in \textit{Nebraska Plastics} found the assumption invalid and declined to allow the expert testimony,\textsuperscript{201} yet it seems the reasoning from \textit{Polymer Dynamics} could apply here as well because the jury could assess the "likelihood and extent" of consumers filing warranty claims.\textsuperscript{202} After all, the jury assesses whether an assertion is credible or not.\textsuperscript{203} Some scholars have questioned whether courts should exclude economics expert testimony for assumptions and omissions that are merely questionable but not clearly false. Consider two articles by Todd and Jewell related to the United States Soccer Federation losing the bid to host the 2022 FIFA World Cup because of corruption in the bidding process.\textsuperscript{204} They sketched a potential cause of action for Major League Soccer ("MLS") and calculated nine-figure damages based upon MLS losing the multi-year bump in attendance that two sports economists had found with European tier one leagues whose nations hosted the World Cup or Euro Cup.\textsuperscript{205} This damages model rested upon questionable

\textsuperscript{196} Kaye, supra note 7, at 2002-04.  
\textsuperscript{197} Lloyd, supra note 10, at 408 (footnotes omitted).  
\textsuperscript{198} 67 Fed. R. Serv. 201, 205 (E.D. Pa. 2005).  
\textsuperscript{199} 408 F.3d 410, 416, 416 & n.2 (8th Cir. 2005).  
\textsuperscript{200} Polymer Dynamics, 67 Fed. R. Serv. at 205.  
\textsuperscript{201} Nebraska Plastics, 408 F.3d at 416.  
\textsuperscript{202} See Polymer Dynamics, 67 Fed. R. Serv. at 205.  
\textsuperscript{203} Faigman et al., supra note 2, at 884 (citing Renée McDonald Hutchins, \textit{You Can't Handle the Truth! Trial Juries and Credibility}, 44 \textit{SETON HALL L. REV.} 505, 513-18 (2015)).  
\textsuperscript{205} Todd & Jewell, \textit{Major League Soccer}, supra note 204, at 26 & n.13, 27 (citing Bastien Drut & Stefan Szymanski, \textit{The Private Benefit of Public Funding: The FIFA World Cup, UEFA European Championship and Attendance at Host Country League Football} (Apr. 2014).
assumptions of similarity between MLS and the top European leagues, the sports markets in which they operate, and the quality of their respective soccer “products.” Todd and Jewell checked these assumptions when the United States hosted the Copa America Centenario—a tournament similar to the Euro Cup—and found that MLS had an attendance bump comparable to European leagues. This conclusion suggests that courts might be excluding too much expert testimony when they refuse to admit it because of questionable assumptions about the comparability of products of different quality and of similar products in different markets. These rulings prevented plaintiffs from proving their case even though the models might have been sound. This brings us back to the primary issue of who should evaluate the soundness of those models—the courts ruled them inadmissible based on the assumptions, yet the reasonableness of comparisons between products or markets seems suitable for juries, who are themselves users and purchasers.

Courts also sometimes blur the distinction between admissibility and sufficiency. FRE 702 does list as a factor for admissibility whether “the testimony is based on sufficient facts or data.” Courts should nevertheless exercise caution in basing admissibility decisions on the model’s data inputs. Courts sometimes exclude experts whose models are reliable because those models have weak but not fatally-

(unfinished manuscript) (on file with the University of Michigan Department of Kinesiology)).

206. Todd & Jewell, Copa America, supra note 204, at 656-57.
207. Id. (manuscript at 41-46).
209. See, e.g., Live Concert Antitrust Litig., 863 F. Supp. 2d at 982 (granting summary judgment after ruling damages expert testimony inadmissible because plaintiffs had no proof of damages).
210. See Allensworth, supra note 6, at 848-49 (writing that the collective knowledge of a group of jurors is superior to a single judge for decisions that require a common sense inference); Mnookin, supra note 32, at 1540 (writing that jurors assess evidence in light of their own experiences with how the world works).
211. See Green & Sanders, supra note 2, at 1079-93 (surveying cases to conclude that “some courts are examining the sufficiency of the scientific evidence rather than the methodology of the expert”).
212. Id. at 1077 (quoting FED. R. EVID. 702(b)).
flawed data inputs, what Allensworth characterizes as "letting the perfect be the enemy of the good."\textsuperscript{213} The blurring of admissibility and sufficiency creates other problems. While excluding expert testimony for admissibility or for sufficiency has the same effect at trial—the evidence does not reach the jury—this distinction has important appellate procedural consequences: the standard of review for admissibility rulings is the more deferential abuse of discretion, while for sufficiency, the Circuit Court conducts its review \textit{de novo}.\textsuperscript{214} The failure to distinguish between admissibility and sufficiency can also affect other courts and practitioners that rely on these opinions as authority for considering the admission of similar expert testimony.\textsuperscript{215}

One final example of inconsistency is how courts respond to the increasing partisanship of economics experts. Hill and his co-authors characterize the problem as exceeding the typical battle of the experts: to prove damages, each side proffers an expert who is more party advocate than dispassionate scientist, as evidenced by widely divergent damage estimates when the experts use the same methodology.\textsuperscript{216} Some courts do not seem to mind divergent opinions and instead rely on them, as the court in \textit{United Phosphorus, Ltd. v. Midland Fumigant, Inc.} did in excluding an expert based on the opposing expert’s contention that it was improper to rely on a party’s deposition testimony when other evidence of the relevant facts existed.\textsuperscript{217} Other courts justify admitting the testimony precisely because expert opinions diverge.\textsuperscript{218} Consider \textit{In re Scrap Metal Antitrust Litigation}, where the Sixth Circuit affirmed the admissibility of expert testimony in part because the “calculations were tested on cross-examination and subjected to further scrutiny and criticism by Defendants’ own expert.”\textsuperscript{219} The court reasoned that “the jury was free to give [this testimony] little or no weight, and to credit instead Defendants’ attacks on [it]."\textsuperscript{220} Lloyd criticizes reliance on cross-
examination and opposing witnesses because courts then admit too much "misleading" testimony that can "bamboozle[]" the jury—even though Daubert recognized these methods as ways to control for dubious testimony. The best approach is for judges to engage in a detailed analysis of each proffered expert’s modeling choices and admit or exclude it as appropriate. This merely gets us back to the problem that judges lack clear standards from the FRE, the Daubert trilogy, and the commentators for conducting this analysis.

Clear standards are important because the decision to exclude the testimony of an economics expert, whether in whole or in part, can result in plaintiffs losing their cases. One recent study surveyed 2127 rulings on expert challenges in civil cases in federal district courts from 2003 to 2014. Of these, 102 challenges (or 4.8% of the total) involved economics experts, and almost half of the challenges in antitrust cases—16 out of 35—related to economics experts. Defendants brought 71% of the motions to exclude expert testimony compared to 29% by plaintiffs. Defendants prevailed 50% of the time by winning at least partial exclusion of the expert’s testimony or analysis; half of those victories (25% of defendant’s total motions) resulted in the total exclusion of the expert’s testimony. Of note, antitrust challenges had the lowest rate of full exclusion—4%—but the highest rate for partial exclusion—59%. Losing a Daubert challenge reduced the plaintiff’s rate of winning the case at trial or on summary judgment from 31% to 25%.

221. Lloyd, supra note 10, at 381, 421-22.
222. See Daubert, 509 U.S. at 595-96.
223. See Allensworth, supra note 6, at 856-57, 865 (discussing cases in which judges engaged in “thoughtful, detailed analysis of modeling choices”).
224. See Faigman et al., supra note 2, at 873-74 (noting that the Supreme Court, FRE, and commentators have not offered “a clear conceptual basis for making the necessary distinctions” between admissibility and weight).
227. Id. at 3 & tbl.3, 4 tbl.4.
228. Id. at 3.
229. Id. at 3 & 4 tbl.4.
230. Id. at 4 tbl.4.
231. Id. at 4-5, 5 tbl.5.
Although the study’s author concludes that this difference is statistically insignificant, the impact may be greater in complex litigation because an economist’s model-based testimony might comprise the only proof of the amount of damages. Defendants in many cases have won motions to exclude the plaintiff’s economics expert and then won summary judgment because the plaintiff could no longer meet its burden at trial. Defendants sometimes can devastate plaintiff’s case by winning even partial exclusion. Consider the antitrust case American Booksellers Ass’n v. Barnes & Noble, Inc., where an association of local bookstores alleged antitrust violations against large stores, online retailers, and mail-order companies. The court ruled the plaintiffs’ expert’s model admissible in support of their claims for injunctive relief but inadmissible to support their claims for monetary relief. A court might also limit the testimony to certain defendants. In American Booksellers Ass’n, the court noted that even if expert testimony had been admissible in the claim for money damages, “the [online] and mail order defendants would still be entitled to summary judgment” because the model relied entirely upon competition between “physical stores in the same geographic location.” Sometimes the expert uses several methods to calculate damages, and the court rejects some but not all of those methods. For example, in Freeland v. AT & T

232. Id. at 5.
233. Casey & Simon-Kerr, supra note 4, at 1179, 1184-88 (writing that transforming financial evidence into a valuation “requires” economics expert testimony to fill the “evidentiary void”); Todd & Jewell, supra note 4 (manuscript at 8, 45-48) (claiming that losing a Daubert challenge regarding an economics expert in complex litigation results in losing the case). The impact is also great in the sense that complex litigation may not involve a large number of cases, but each of those cases might include dozens of parties or might be class actions on behalf of thousands of persons. See, e.g., In re REMEC Inc. Sec. Litig., 702 F. Supp. 2d 1202, 1212, 1273-75 (S.D. Cal. 2010) (finding plaintiff’s expert testimony unreliable under Daubert and granting defendant’s motion for summary judgment in securities class action); Freeland v. AT & T Corp., 238 F.R.D. 130, 148-49, 153 (S.D.N.Y. 2006) (denying motion to certify a class of cell phone purchasers after excluding expert’s regression analysis as unreliable); Am. Booksellers Ass’n v. Barnes & Noble, Inc., 135 F. Supp. 2d 1031, 1034 & n.1, 1037-42 (N.D. Cal. 2001) (excluding plaintiff’s economics expert and granting defendants summary judgment on several claims in action brought by an association representing California booksellers as well as twenty-seven independent bookstores).
235. 135 F. Supp. 2d at 1037-41.
236. Id. at 1042-43.
237. Id. at 1042.
Corporation, the court excluded the expert’s regression analysis but not his benchmark study. The court then denied the motion to certify the class because the benchmark study was insufficient for plaintiffs to carry their burden of proving antitrust injury. Finally, the context of “the theater of valuation,” where courts are routinely presented with opposing experts, affects the impact of exclusion. Even if the court excludes only part of the plaintiff’s expert testimony, the opposing expert’s testimony becomes relatively stronger, thus reducing the likelihood that the plaintiff will reach the preponderance of evidence standard needed to prove the damages element.

B. From Gatekeepers to Fact-Finders: The Law-Fact Continuum

A number of scholars have addressed whether economic models are law or fact, with several endeavoring to articulate clear standards for the admissibility of model-based expert testimony. Their proposals fall along a continuum from those that see this decision as primarily or exclusively a question of law that strengthens the judge as gatekeeper to those that see no difference with traditional fact-finding and thus would allow the jury to weigh more economics expert evidence.

Lloyd sits squarely on the law side of the admissibility versus weight continuum, even suggesting that courts should exclude more expert testimony purporting to prove lost profits. His rationale relates to practical consequences rather than to theory. Through a survey of cases, he argues that courts have too often admitted “misleading testimony” and that cross-examination is ineffective so that the “juries were taken in”—even “bamboozled”—by well-credentialed business and economics experts. He proposes five questions that the court must ask before admitting a damages expert and holds out the possibility that there will be additional reasons for excluding an expert. The questions address the expert’s qualification to perform the analysis in question, the

239. Id. at 156.
240. Casey & Simon-Kerr, supra note 4, at 1188-89 (footnotes omitted) (quoting 5 BORIS I. BITTKER & LAWRENCE LOKKEN, FEDERAL TAXATION OF INCOME, ESTATES AND GIFTS ¶ 135.5.1 (2d ed. 1993)).
241. Id. at 1208-10 (writing that if the fact-finder is not satisfied with either expert, then the party with the burden of proof loses); see Lopatka & Page, supra note 11, at 619 (“[A] jury’s evaluation of conflicting economic opinions rarely decides cases because federal judges’ choices limit the scope and force of expert testimony.”).
242. See, e.g., Hill et al., supra note 3, at 379-80; Kaye, supra note 7, at 1974-78.
243. Lloyd, supra note 10, at 386-98.
244. Id. at 380-81, 415-21.
245. Id. at 380.
reliability of the underlying data, the support in the record for assumptions, the adequacy with which the expert deals with facts inconsistent with his theory, and the consideration of alternative scenarios. All of the questions, except for the first, cross into the territory of assessing the credibility of the testimony and therefore expand the judge’s gatekeeping role. For example, he urges judges to reject models based on assumptions that lack support in the record or testimony for which the expert lacks a “reasonable argument” regarding contrary data.

Allensworth urges approaching models as mixed questions of law and fact, which results in taking most issues away from the jury so that they are decided by a judge. The admissibility of expert evidence “invit[es] an up-or-down determination” of the reliability of a model’s methodology. A model’s outcome depends upon the methodology, however, so the results of a model are “inextricable” from the choices and assumptions that go into its construction. This indeterminacy makes judges better suited than the jury to evaluate models because they are “more educated than juries and repeat players.” Allensworth argues that “models and their results should not be treated like facts” in part because the traditional reasons for having juries be fact-finders are absent. Models do not present issues that require the estimation of social norms or judgments about fairness, nor do models present issues of relevance that are unique to the case at hand. To the second point, she concedes that modeling choices are “highly fact-specific,” but “[p]roblems such as small sample sizes, uncertainty about functional form, and the appropriateness of simplifying assumptions recur.” Having courts reason about admissibility and provide a written decision can aid the evaluation of similar models in later cases. Lopatka and Page similarly recognize the need—at least in antitrust litigation—“to create a coherent system of law” by having courts determine

246. Id.
247. Id. at 403-05, 409-10.
248. Allensworth, supra note 6, at 839-46, 850-52 (suggesting four criteria to be used by judges when evaluating models).
249. Id. at 859.
250. Id. at 828, 860-61, 874.
251. Id. at 830.
252. Id. at 852-58.
253. Id. at 848-50.
254. Id. at 854.
255. See id. at 847-48.
admissibility and sufficiency by relying upon economic authority rather than allowing that law to develop piecemeal through jury decisions.256

Kaye calls the screening of complex statistical analyses a “salutary development,” in particular the specificity of the Daubert standard for evaluating the expert’s methodology.257 He writes that the decision to admit or exclude should be guided by whether the methodological issue is legislative or adjudicative.258 For questions that are legislative—meaning that they have an impact that is external to the case—the judge should exercise her gatekeeping function.259 For example, when methods that are acceptable at a general level and thus applicable to certain kinds of data are applied in cases with different kinds of data, the court should exclude the expert testimony.260 When the fact at issue is adjudicative—meaning that it is only relevant to resolving the particular case—then the court should admit it.261 For example, problems internal to the study—like data entry errors or data sets with outliers—should go to the jury for resolution.262 He does caution, however, that the demand for “rigor” under Kumho could lead a court to reject testimony that is based on generally accepted and valid methods, but that is “legitimately debatable,” if the court finds the testimony unpersuasive.263

Although Kaye’s article was one of the first to address the Daubert trilogy, the rationale of deciding the admissibility/weight divide for expert witness testimony by having judges decide questions of legislative fact and juries questions of adjudicative fact was endorsed in a 2016 article by Faigman, Sloboyn, and Monahan.264 Hill and his co-authors also cite to this distinction to support their practical solution of measuring damages by bifurcating the process.265 First, the parties—likely with the assistance of a neutral, court-appointed expert—would agree upon a methodology.266 Second, the parties would stipulate to the model inputs, and where the parties do not stipulate, such inputs would go to the jury as questions of fact.267 Hill and his co-authors argue that

256. Lopatka & Page, supra note 11, at 694-99.
258. Id. at 1974-75.
259. Id. at 1975-77.
261. Faigman et al., supra note 2, at 885-86.
263. Id. at 1982-83.
264. Faigman et al., supra note 2, at 885-86, 896-99. The article uses examples primarily from the hard and medical sciences. See id. at 896-99. Thus, it offers little specific guidance when the expert is an economist.
266. Id. at 376-78.
267. Id. at 378-79.
dividing proceedings around choice of methodology is sound in both practice and theory: methodological issues are technical and difficult for judges, attorneys, and juries to understand, but they also provide for "objective demarcation" because they are where pure science and valuation meet.²⁶⁸

Todd and Jewell sample cases—both pre- and post-Daubert and both in federal and state court—to identify types of assumptions.²⁶⁹ Because assumptions are a necessary part of economic models, courts should admit testimony based upon models that make comparisons to similar products and markets, when facts and data in evidence support assumptions, or when assumptions about future actions or a counterfactual past are not controverted by the record.²⁷⁰ Courts are justified in excluding assumptions that fall into three overlapping categories: "unreasonable comparisons among businesses, products, and/or markets; unfounded simplifications and excluded variables that the record suggests are necessary; and unrealistic scenarios about what parties or markets would have done but for the defendant’s unlawful act."²⁷¹ They conclude that courts can rely upon several legal grounds, including FRE 702 and the Daubert trilogy, in excluding testimony based upon models with dubious assumptions.²⁷² The authors concede, however, that their conclusions are positive rather than normative because they are based on how courts have ruled on assumptions rather than on how courts should treat assumptions.²⁷³ Indeed, the authors in a later article challenged whether courts should exclude testimony based upon the first type of assumption—the reasonableness of comparisons to different businesses, markets, and products—and conclude that questionable assumptions are not unreliable per se.²⁷⁴

Coate and Fischer are concerned specifically with the admissibility of different types of game theoretic economic models in antitrust merger analysis.²⁷⁵ At first blush, they seem to favor an increased gatekeeper role by writing that the court should "see fit to require courts to scrutinize scientific knowledge carefully."²⁷⁶ They read the Daubert trilogy as requiring courts to admit only expert testimony that is "scientific (falsifiable in theory), has survived some minimal level of

²⁶⁸ Id. at 376.
²⁶⁹ Todd & Jewell, supra note 4 (manuscript at 17-45).
²⁷⁰ Id. (manuscript at 22-37).
²⁷¹ Id. (manuscript at 6).
²⁷² Id. (manuscript at 37-39).
²⁷³ Id. (manuscript at 48-49).
²⁷⁴ Todd & Jewell, Copa America, supra note 204, at 656-62.
²⁷⁶ Id. at 129.
scientific testing, [and] offers some ability to resolve the question in dispute."\textsuperscript{277} Conversely, courts should exclude testimony that is "metaphysical opinion, totally unsubstantiated, or devoid of causal content."\textsuperscript{278} These same standards apply to economists relying upon models.\textsuperscript{279} Read carefully, Coate and Fischer's qualifying language suggests that courts should default to admitting more model-based testimony: they refer to "minimal" testing and "some ability" in deciding to admit, while stating that courts should reject models that are "totally unsubstantiated" or "devoid of causal content."\textsuperscript{280} Casey and Simon-Kerr call the distinction between lay and expert witness testimony "false" and argue that courts should approach complex valuation as "run-of-the-mill" fact-finding.\textsuperscript{281} Most of their article focuses on the judge as the fact-finder in cases like bankruptcy and tax litigation, so it does not address admissibility.\textsuperscript{282} They do claim, however, that their argument applies equally to juries, such as in tort litigation, so their conclusions are relevant to the question of whether model-based expert testimony is law or fact.\textsuperscript{283} They write that "what a valuation model needs to prove in order to satisfy a legal claim is a question of law; but the operation of that model and its technical ability to make that showing are questions of fact."\textsuperscript{284} The fact-finder must make "credibility judgments about everything from the expert's demeanor to her methodology, her choice of variables, and the way in which she combines those variables."\textsuperscript{285} Accordingly, "credibility judgments about the expert testimony on the variables and the model itself cannot be separated—at least in the absence of a clear error—from the ultimate conclusion about whether the model offers a legally relevant fact."\textsuperscript{286} The authors compare opposing experts to eyewitnesses who give conflicting testimony: just as the fact-finder determines which eyewitness is more credible, the fact-finder can determine which economics expert has the model with the better methodology that accounts for the most accurate value.\textsuperscript{287} They recognize that treating

\begin{itemize}
  \item \textsuperscript{277} Id. at 151.
  \item \textsuperscript{278} Id.
  \item \textsuperscript{279} Id. at 151-52.
  \item \textsuperscript{280} Id. at 151-52, 180-81.
  \item \textsuperscript{281} Casey & Simon-Kerr, supra note 4, at 1181-82.
  \item \textsuperscript{282} See id. at 1188.
  \item \textsuperscript{283} Id.
  \item \textsuperscript{284} Id. at 1187.
  \item \textsuperscript{285} Id.
  \item \textsuperscript{286} Id.
  \item \textsuperscript{287} Id. at 1201-03.
\end{itemize}
valuation evidence as traditional fact-finding places a “greater emphasis on experts and their models.”

These scholars all agree on the need for a better framework to evaluate the admissibility of economics expert testimony. They disagree at a fundamental level, however, about structuring that framework: some would separate the model from its inputs and results, others call such a distinction unsound—but then those writers disagree with each other over whether this means that the judge or fact-finder should evaluate the soundness of the economist’s model-based testimony. We could snipe at the particulars of each article: one does not address admissibility, another is not about calculating damages, some limit their focus to antitrust cases, and others consider practical concerns without addressing theory. These shortcomings do not necessarily diminish their contributions to increasing our understanding of economists, economic models, and the admissibility of economics expert testimony. Nor does tearing this scholarship down help us to build a sound legal framework. A better solution lies in explicating economics scholarship about models to articulate theory that can support legal guidelines on admissibility.

IV. TROPES, STORIES, AND AUDIENCE: A SURVEY OF ECONOMICS LITERATURE

Considered from a broad perspective, legal commentators share the same view of models as economists. Compare the discussion in Part II.A, with Nobel laureate Robert M. Solow ruminating on the status of his field. After the 1940s, models emerged as the dominant methodology in economics, with model-building becoming technical and data-driven. “A model is a deliberately simplified representation of a much more complicated situation.” The modeler focuses on one or two causal factors and excludes everything else to gain a better understanding of how those particular “aspects of reality work and

288. Id. at 1183.
289. Id. at 1198-1206; see also Allensworth, supra note 6, at 856-57.
290. See Casey & Simon-Kerr, supra note 4, at 1204-05.
292. See generally Allensworth, supra note 6; Lopatka & Page, supra note 11.
293. Lloyd, supra note 10, at 380-81 (worrying about juries being “bamboozled,” and trial and appellate courts being “deceived,” by expert testimony of “dubious merit” (citing SmithKline Beecham Corp. v. Apotex Corp., 247 F. Supp. 1011, 1042 (N.D. Ill. 2003))).
294. See supra Part II.A.
296. Id. at 42-43, 46-47.
297. Id. at 43.
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Models are both science and art. Models make use of natural language, though economists prefer mathematics in their models because math offers "a very efficient way to express the structure of a simplified model and it is, of course, a marvelous tool for discovering the implications of a particular model." Model building is also an art because alternative simplifications for the same situation are possible, thus the economist must make choices.

Although legal commentators cite Nobel laureates like Solow, they have not turned their attention to the economics scholarship that addresses whether Solow's calling a model a "simplified representation" is significant and that establishes the connection between the economist's choices among "alternative simplifications" and the economist's natural language. The word "model" is a methodological term, and economics methodologists and rhetoricians have engaged in a multi-decade discussion about what models are and how economists use them to generate understanding of economic phenomena. A survey of this scholarship reveals a remarkably coherent view that economists employ models tropologically, both to achieve understanding of the subject but also to convey that subject to an audience.

A. Early Scholarship Hints at Trope and Story

Methodologists have long recognized the literary character of models and modelers. Consider the most cited methodological article in economics, The Methodology of Positive Economics from 1953, where Friedman divides a hypothesis into two parts. The first suggests metonymic reduction in the "conceptual world or abstract model" that is "simpler than the 'real world.'" The second suggests an authorial role for the modeler, who must use "judgment in applying the rules" that define when the model is "an adequate representation of the 'real

298. Id.
299. See id. at 46.
300. Id. at 43–46.
301. See, e.g., Todd & Jewell, supra note 4 (manuscript at 4).
303. MILTON FRIEDMAN, The Methodology of Positive Economics, in ESSAYS IN POSITIVE ECONOMICS 3, 24 (1953); see Uskali Mäki, Reading the Methodological Essay in Twentieth-Century Economics: Map of Multiple Perspectives, in THE METHODOLOGY OF POSITIVE ECONOMICS: REFLECTIONS ON THE MILTON FRIEDMAN LEGACY 47, 47 (Uskali Mäki ed., 2009) (calling Friedman's essay "the most cited, the most influential, and the most controversial piece of methodological writing in twentieth-century economics").
304. FRIEDMAN, supra note 303, at 24.
world.” Friedman also recognizes the significance of the rhetorical situation by writing that the relevant question to ask about assumptions is not whether they are realistic but “whether they are sufficiently good approximations for the purpose at hand.” Writing a few years later, Machlup states that social scientists use “analogical reasoning” in adding new constructs to models.

Gibbard and Varian in 1978 make the first explicit connection of models with literature. They describe some models as caricatures because they deliberately isolate and exaggerate certain features, concurring resemblance with the real world to achieve better understanding of the emphasized features. The data-based econometric models that attempt to get closest to the “truth” of the real world evolve from caricatures, thus retaining some of their aspect. Accordingly, economists’ use of models involves “an element of interpretation” because “the model always tells a story.”

Kamarck connotes a tropological “model and the reality to which it refers,” writing that we are left with “a story in science fiction” if an econometric model “assume[s] accuracy and precision beyond the margins set by reality.” An econometric model adds natural language to the mathematical language constructed of symbols, which constrains application of the mathematical. For example, a model represents an underlying problem “only with certain abstractions and simplifications,” and the modeler defines the individuals and classes to be measured.

B. The Rhetoric of Economics: Models as Tropes, Economists as Storytellers

The 1980s saw the first sustained treatment of the rhetoric of economics in an article by McCloskey that she later expanded into a book. “Analogy pervades economic thinking,” such as the metaphor

305. Id. at 24-25.
306. Id. at 15.
308. See Gibbard & Varian, supra note 25, at 666-67.
309. Id. at 665, 673-76. The authors also compare descriptive approximations to realistic drawings and applied models to photographs. Id. at 665.
310. Id. at 665-68, 673-76 (writing that the distinction among models is not one of category but “one of degree”).
311. Id. at 666.
313. See id. at 2-4, 9-10.
314. Id. at 9-10.
316. McCloskey, supra note 25. Donald and Dierdre McCloskey are the same person, and
that economists call "models." Economic thinking proceeds metaphorically: economists claim that the real world is "like" a complex model," with the complex model "like a simpler [one] for actual thinking," and even that one is "like an even simpler model for calculation." Rather than mere ornament, metaphor is "a distinctive mode of achieving insight" because new meaning results from the interaction of "two thoughts of different things active together." The artistry or beauty of metaphors is important, but more so is the way that the creation of "a transaction between contexts" helps generate new ways of thinking. Consider that in choosing to compare a thing through a particular metaphor, the economist emphasizes certain aspects of the subject but necessarily ignores other aspects. Rather than "leav[ing] out' some feature of the truth," the model is instead the most apt metaphor over the alternatives for revealing a particular truth.

Other tropes achieve this purpose as well. McCloskey applies the four master tropes of rhetorician Kenneth Burke—metaphor, metonymy, synecdoche, and irony—to an essay on production function and productivity change by Solow. Explicit comparisons in the essay, such as between items under consideration and their "chalked curve on a blackboard," are metaphors. Metonymy is a reduction, often the representation of some abstraction in concrete terms, as with concepts stated as letters in an equation. Synecdoche is similar to metonymy except that a part represents the whole. Solow recognizes that a multiplier depends on time, but, while conceding that other factors could affect the multiplier, he ignores those factors and focuses his study only on time. Irony, the "perspective of perspectives," is present as well through comments that Solow inserts throughout the essay that purportedly say one thing while suggesting the opposite.
This analysis leads to the intersection of tropes and stories in economics. Burke has written that the master tropes are all varieties of metaphor,\textsuperscript{329} and McCloskey seems to agree. She recognizes that metaphors can be more or less explicit, as with simile and symbol, respectively.\textsuperscript{330} A series of metaphors woven into a story is an allegory.\textsuperscript{331} In mathematical economics, a story "is an allegory, shading into extended symbolism."\textsuperscript{332} McCloskey thus proclaims that economists "frequently spin 'parables' or tell 'stories.'"\textsuperscript{333}

One way to distinguish metaphor from storytelling is that the former looks to the future—models are simulations that make predictions—while the latter looks to the past—a story explains "something that has already happened."\textsuperscript{334} Successful economics needs to balance both modes, so that even the applied economist working with models tells stories.\textsuperscript{335} The mathematical formulas in models are metaphors that economists understand without further explanation—but not for the less familiar cases, and not for an audience of non-scientists.\textsuperscript{336} To explain the model, the modeler must move to a lower level of abstraction—must tell a story—because the reader also "figures in economic thought."\textsuperscript{337} Even empirical economics, with its stronger connection to the real world than theoretical economics, is a kind of fiction.\textsuperscript{338} The real world does not supply its own explanatory narrative any more than it offers its own predictive model.\textsuperscript{339} The economist has some purpose so he decides what matters (and by extension what does not matter) and selects the appropriate model—but also selects the story to tell around that metaphor.\textsuperscript{340}

C. Models as Mediating Instruments: The Complementary Relationship of Metaphor and Story

Subsequent writers have expanded upon the notion of model as a trope and modeler as a storyteller. Morgan argues that model usage requires a "complementary" relationship between metaphor and story:

\textsuperscript{329} See Burke, supra note 323, app. D at 503.
\textsuperscript{330} McCloskey, supra note 25, at 44.
\textsuperscript{331} Id.
\textsuperscript{332} Id.
\textsuperscript{333} Id.
\textsuperscript{334} McCloskey, supra note 26, at 59-60.
\textsuperscript{335} Id. at 60-62.
\textsuperscript{336} Id. at 66-67.
\textsuperscript{337} Id. at 67.
\textsuperscript{338} Id. at 68-69.
\textsuperscript{339} See id. at 69.
\textsuperscript{340} Id.
The identity of the model is not only given by the structure (or the metaphor), but also the questions we can ask and the stories we can tell with it. These in turn are constrained and shaped by the structure (or metaphor): we can only ask questions and tell stories about terms and relations that are represented in the structure, and only within the range allowed by the mathematics or materials of the structure. She writes that the story is part of the model, while McCloskey suggests that the economist tells a story that is outside the model. Morgan nevertheless recognizes that the economist is a storyteller: "Economists use their economic models to explain or to understand the facts of the world by telling stories about how those facts might have arisen." These stories emerge from questions first chosen and posed by the economist, who uses the mathematics of the model to help answer them, because models "don’t manipulate (or solve) themselves."

One way that models connect to the real world is through their construction: if a model’s assumptions are realistic, then the model is a "useful tool[,] to learn about the world." Assumptions are not the sole means, however, because another connection lies in their use. In the process of interpretation, the economist tells a story that answers questions about "concrete cases" that have or that might have occurred in the world. The model user must make "sensible choices" about "where to start the tale, which questions are interesting and relevant, and even the order of solving the model," and "it is the narrative which connects with the specifics of the world." Narrative operates as a "generalizing device" that allows us to grasp at a single level the ideals of economic theory and the "complete and exhaustive detail" of reality. The model thus serves as an "exemplar" to give a specific form to a general claim, but it is through "narrative we gain the possibility of grasping the whole rather than the parts."

342. Id. at 369-70 (discussing that her account is unlike the McCloskey account, because it "ha[s] neither a separation, nor uneasy co-existence of model and story — each answering ‘Why?’ questions in different ways, but instead a compatible interdependence of the two, metaphors and stories, both answering the question ‘What happens if . . . ?’"); see also id. at 362, 371.
343. Id. at 361.
344. Id. at 366-68, 371-72 (writing that the narrative does not alter mathematical resources, but rather uses them).
345. Id. at 375.
346. Id. at 375-77.
347. Id. at 377.
348. Id. at 378.
349. Id. at 379-80.
350. Id. at 378-79.
This recognition of a broad analogical role was earlier suggested by Morgan and her co-author Morrison, in which they characterize a model as “a tool of investigation” because “models typically represent either some aspect of the world, or some aspect of our theories about the world, or both at once.”\footnote{351} Models do not merely mirror some phenomenon; instead, they are “a kind of rendering – a partial representation that either abstracts from, or translates into another form, the real nature of the system or theory, or one that is capable of embodying only a portion of a system.”\footnote{352} Accordingly, the legitimacy of the model as representation depends not on how well the model accurately mirrors the subject of study but on “the model’s performance in specific contexts.”\footnote{353} The power of the model arises in the context of its use or manipulation by the economist.\footnote{354}

D. Models as Isolations or Credible Worlds
Connect Economist and Audience

Other methodologists have addressed the model and its narrative within the broader rhetorical situation. Mäki views modeling as a “method of isolation, whereby a set of elements is theoretically removed from the influence of other elements in a given situation.”\footnote{355} These elements are isolated from something, so the model seals off a small set of entities from the involvement or influence of all other entities “to isolate some important fact, dependency relation, causal factor or mechanism.”\footnote{356} An isolated factor might be an abstraction, where “a universal or quasi-universal is isolated from particular exemplifications,” but it need not be.\footnote{357} More often the economist proceeds by idealization, by making certain assumptions that the modeler knows are false so that the model is coherent.\footnote{358} These idealizations necessarily involve omissions of factors that the economist thinks do not have “an appreciable impact on the economic phenomena under investigation.”\footnote{359} Omissions are typically implicit, but the economist sometimes explains that certain factors are not considered or are assumed to have a

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\begin{itemize}
\item \footnote{351}{Morrison & Morgan, supra note 25, at 11.}
\item \footnote{352}{\textit{Id.} at 27.}
\item \footnote{353}{\textit{Id.} at 28.}
\item \footnote{354}{\textit{Id.} at 11-12, 32.}
\item \footnote{356}{Mäki, supra note 25, at 30; see Mäki, supra note 355, at 321.}
\item \footnote{357}{Mäki, supra note 355, at 322, 325.}
\item \footnote{358}{\textit{Id.} at 324-25, 328.}
\item \footnote{359}{\textit{Id.} at 330.}
\end{itemize}
negligible impact, what Mäki calls “storied idealizations.”

Idealization involves some false assumptions, but that does not undermine the truth of the model; instead, a model is true “if it correctly represents the isolated essence of the object.”

If so, then the model becomes a “surrogate system,” a representation of the real world that stands for the real world that it resembles. By examining the surrogate, one learns about the system it represents, so models are analogical tools that allow economists to infer conclusions “that are true or likely to be true about the [real] world.”

Sugden characterizes models not as “abstractions from, or simplifications of, the real world,” but as “credible but counterfactual worlds” that “parallel[] the real world rather than isolating [certain] features.”

Instead of describing an “aspect of reality, isolated from other factors,” models make no claim to “stripping out [] features of the real world and describing what remains.”

“The model world is a construction of the modeler, with no claim to be anything other than this. Its specification is just whatever the modeler has chosen it to be.”

This construct nevertheless allows for inductive reasoning through a transition from a particular hypothesis that is true in the model to a more general hypothesis that is expected to be true in the real world. We can close the gap if “the model world could be real”—if “it describes a state of affairs that is credible, given what we know (or think we know) about the general laws governing events in the real world.”

The key is similarity: inductive inferences are credible if “we . . . recognize some significant similarity between those two worlds.”

While Mäki and Sugden’s views seem to stand in contrast to each other, they have much in common. Sugden wants to avoid too literal an interpretation of Mäki’s isolation as stripping away because even isolations involve adding something if the modeler wishes to isolate real-

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360. Id. at 330-31 (emphasis omitted).
361. Id. at 344 (emphasis omitted); see Mäki, supra note 25, at 30 (writing that the falsity of idealizing assumptions “is not necessarily a reason for concern” because these assumptions are “strategic falsehoods that serve the purpose of isolation”).
362. Mäki, supra note 25, at 32.
363. See id. at 32, 41.
364. Sugden, supra note 25, at 1.
366. Id. at 17; see Sugden, supra note 25, at 25.
367. Sugden, supra note 365, at 17.
368. Sugden, supra note 25, at 19-20.
369. Id. at 25.
370. Id. at 23.
world systems with practical results.\textsuperscript{371} He also recognizes that models have idealizations, such as continuity assumptions, that do not necessarily affect the credibility of the model.\textsuperscript{372} Mäki makes a more explicit claim that credible worlds and isolations are complementary rather than rival alternatives.\textsuperscript{373} For example, building the model requires both construction and isolation,\textsuperscript{374} and credibility judgments enter the picture when we move from the surrogate system to the target system.\textsuperscript{375} Mäki even discusses different versions of credibility, including conceivability—where the imaginability of the model “is constrained by general factual beliefs” about the target system—and possibility—that something is possible given certain facts.\textsuperscript{376} Plausibility is a stronger claim, because the modeler argues that the isolated factor is in operation in the target system, so it needs support from additional information such as “empirical inquiries into specific cases.”\textsuperscript{377} “Persuasiveness is a rhetorical version in which credibility appears as a function of several things, such as the properties of the model, the beliefs of an audience, the rhetorical skills of the modeller, and the academic institutions within which persuasion takes place.”\textsuperscript{378}

Both Sugden and Mäki address persuasiveness by addressing the context surrounding the use of models, including the importance of the audience. Under Sugden’s view a model must be credible so that it allows for inductive inference, which means that someone has to assess credibility and make inferences, and that someone is the reader, who uses her own intuition to close the gap between the model world and real world.\textsuperscript{379} Consider Sugden’s continued use of the first-person plural:

We perceive a model world as credible by being able to think of it as a world that could be real—not in the sense of assigning positive subjective probability to the event that it is real, but in the sense that it is compatible with what we know, or think we know, about the general laws governing events in the real world.\textsuperscript{380}

Because credibility relates to what an audience perceives as life-like, he relates it not to truth but to “verisimilitude” or its literal-but-
clunky translation “truthlikeness.” Consider the realism of a novel: if someone acts out of character, then the reader perceives the novel as not true to life. Likewise, if an economic model uses arbitrary mixes of assumptions, then the reader becomes suspicious of the results because they are not based on “a clear conception of how the world might be.”

If assumptions do fit naturally together, however, then the economist offers a good model because it coheres.

Mâki also recognizes the importance of persuading the audience of the model—and of doing so through analogy and story. The model as representation subdivides into two aspects: first, it is a representative of the target system, an object built by the modeler; and, second, it bears some resemblance or similarity to the target. "Resemblance is a matter of how the model world . . . is related to the real world." Challenges to models often relate to issues of resemblance. For example, one might contest that a model has left out crucial factors and instead isolated those of secondary importance, thus “idealizing wrongly." Another contestation relates to the economist’s use of the model: instead of examining the model to serve as a bridge to the real world—surrogate modeling—she instead examines only the workings of the model itself—substitute modeling—so that “[c]riteria other than those indicating resemblance dominate the exercise.” In responding to such charges, the economist should emphasize that the issue is not the model’s resemblance to the real world but its “relevant resemblance,” its resemblance “relative to some purpose and audience.” This is where the distinction between model and story matters: the former “provides a more or less rigorous and skeletal representation of the relations within the isolated field,” while the latter attaches to the model as “a looser and thicker commentary which gives flesh to the thin skeleton and which may vary somewhat from audience to audience.” The story often mentions omissions from and assumptions about the model. The modeler must therefore take care in the choice of model

381. Id. at 17-18 (emphasis omitted).
382. Sugden, supra note 25, at 25.
383. Id. at 25-26.
384. Id. at 26.
385. See Mâki, supra note 30, at 92.
386. Id.
387. Id.
388. Id. at 94.
389. Id. at 100.
390. Id. at 101.
391. Id. at 92, 94.
393. Id. at 331.
While mathematics persuades experts, “familiar metaphors and visualizations of various kinds may be relatively more effective when addressing . . . lay audiences.”

E. Additional Scholarship on Analogies, Stories, and Rhetorical Context

Writers have picked up McCloskey’s suggestion that economists tell particular types of stories like parables. For example, Cartwright considers whether models are like fables and parables. The lessons to be gleaned from life are abstract, but a fable offers a concrete structure through which to distill a moral. Though not realistic—indeed, fables like those of Aesop typically feature animals, many of whom talk—their simple form allows the audience to understand and apply the moral to real life. Similarly, we apply models to complex and abstract economic phenomena. The model might have assumptions that are unrealistic, but that does not render the model a failure; instead, the model succeeds to the extent it allows us to draw more concrete conclusions. Cartwright segues from fables to parables and concludes that most economic models are like the latter. Fables typically have explicit morals while parables do not, so the latter force the audience to glean how particular parables might apply in a given situation. Cartwright offers an example from the New Testament, the parable of the laborers in the vineyard (where the owner paid early- and late-arriving workers the same wage) and this teaches a different lesson depending upon whether one contemplates the spiritual—admission to the Kingdom of Heaven—or the everyday—how many entities to include in offering to settle a complex insurance underwriting dispute. Models likewise have generalizable conclusions that can address

394. Miki, supra note 30, at 92.
395. Id.
396. See Ariel Rubinstein, Dilemmas of an Economic Theorist, 74 ECONOMETRICA 865, 881-82 (2006) (comparing models to fables because both strip away many “real-life characteristics” but still offer advice and argument useful in the real world).
398. Id. at 20, 26-27.
399. Id.; see, e.g., AESOP, The Dog, Cock, and Fox, in AESOP’S FABLES 25, 25 (R. Worthington trans., 2009) (1884) (ebook) (featuring a verbal exchange between a rooster and a fox).
400. See Cartwright, supra note 26, at 26-27.
401. Id. at 27-28.
402. Id. at 29-30.
403. Id. at 20-22, 29.
404. Id. at 20 n.2, 21 (quoting Matthew 20:1-16).
different problems; indeed, their morals might point in different directions and offer opposite predictions for the situation in which they are applied.405 The knowledge to be derived from a model is therefore context-dependent, so it falls to the economist to determine which models are relevant and how to apply them.406

Though they do not squarely address models-as-trope, Grüne-Yanoff and Schweinzer do draw from both McCloskey and Morgan in their article about stories in game theory models.407 Game theory, like other economic theories, starts with a formal construct like a decision tree or game matrix.408 To link the construct to the real world, the model needs a story, a model narrative.409 The narrative is a verbal account using common terms arranged with a clear beginning and explicit end.410 The narrative connects the events of the model, but it accounts only for those facts and events that allow for interpretation of a term or that are relevant to background conditions necessary for the interpretation.411 Grüne-Yanoff and Schweinzer write that the model is comprised of both the formal construct and the narrative.412 Though not part of the model, "a sophisticated body of theoretical work" provides the sources and constraints of the game structures as well as the solution concepts.413 While the economist draws from theory in constructing the model, theory by itself is "empirically empty[] because its terms do not have an interpretation."414 Narrative, therefore, serves two vital functions in connecting theory to a real-world economic situation. First, it provides content for the game structure, putting "empirical flesh on the formal bones" through a verbal account.415 Second, it "embed[s] the interpreted terms in a coherent account of a strategic situation."416

More recent articles have cemented the notion of models as tropological devices and the importance of their use within a broader context. Hédoin argues that evaluating the success of a model depends

405. Id. at 20, 29-30.
406. Id. at 21-22, 29-30.
407. See Grüne-Yanoff & Schweinzer, supra note 26, at 133-34, 139-41, 145 n.5 (quoting Donald N. McCloskey, The Rhetoric of Economics, 21 J. ECON. LITERATURE 481, 505 (1983)).
408. Id. at 132-33; see Machlup, supra note 302, at 570-72 (discussing constructs and their use in model formation in economics).
409. Grüne-Yanoff & Schweinzer, supra note 26, at 133-34.
410. Id. at 134.
411. Id.; see Machlup, supra note 302, at 581 ("An explanatory model should not be realistic; it should exhibit what are considered the relevant variables and relations.").
413. Id. at 134-35.
414. Id. at 134.
415. Id. at 137.
416. Id.
more upon its rhetorical situation than on the model, which is merely an “inferential device”—albeit a “powerful” one because it allows us “to produce knowledge about possible worlds.” Since the same model can represent various target systems, the inferences drawn from the model depend on the modeler’s intentions. These intentions are constrained by the social norms of the community of scientists. The model therefore succeeds if its inferences are valid given that community’s norms. Notably, the model need “not necessarily [be] part of the real world” so long as it is “perceived as ‘credible’ given the current state of knowledge in the scientific community.”

In their article about economic models as analogies, Gilboa et al. build on Sugden by focusing on case-to-case induction, or what they call case-based reasoning. This approach is based on the unique status of economics, a field that straddles the hard and social sciences by employing mathematical techniques but applying them to data drawn from observations of the real world rather than laboratory experiments. “In case-based (or, equivalently, analogical) reasoning . . . the reasoner identifies similar past cases and uses those cases to guide the prediction (or classification, diagnosis, or ethical or legal judgment) in the current case.” Case-based reasoning relates to data-based statistical methods, but such reasoning “applies even when some of the cases are theoretical.” Unlike rule-based reasoning, the economist approaches the model by making a “similarity judgment” about what prior cases are analogous enough to help resolve the problem. This judgment is not part of the formal model, yet it affects whether the audience for that model will agree that the model is similar to the problem studied. Accordingly, even though cases cannot be contradicted by other cases, the modeler should nonetheless “consider the totality of cases” and compare how they lead to different predictions.

417. Hédoine, supra note 29, at 440-42.
418. Id. at 455.
419. Id. at 442 (footnote omitted) (citation omitted).
420. Id. at 440, 442.
421. Id. at 442.
422. Id. at 443 (emphasis omitted).
424. Id. at F514-16.
425. Id. at F517.
426. Id. at F517-18.
427. Id. at F518.
428. Id.
429. Id.
V. HOW THE ECONOMICS LITERATURE ON MODELS INFORMS TRIAL PRACTICE

From this survey, we can distill key points about models as tropes, economists as storytellers, and the importance of context and audience. Like tropes, models feature an element of falsity that nevertheless reveals some important truth about reality that becomes apparent through audience engagement: in thinking about how the model compares to the world, the audience comes to a new understanding of the world. Applied to litigation and economics expert testimony, judges cannot separate methodology from inputs and results in making admissibility rulings. In addition, judges should be more willing to allow the target audience, the jury, to assess the credibility and realism of the expert’s choices and assumptions in constructing the model and telling her story.  

A. Summary and Synthesis: Models as Tropes in an Economist’s Story to an Audience

Economics scholars refer to models as “analogies” or “inferential devices” or even metaphors, thus treating them as tropes, the analogical devices that “portray one thing in terms of another or substitute one entity for another.” Metaphor and its cousin, simile, are devices for seeing something in terms of something else by making a comparison between two seemingly unlike things that nevertheless “resemble each other in some crucial respect.” Economics, therefore, proceeds metaphorically because economists approach real-world problems by comparing them to complex mathematical models. Other

430. See infra Part V.B.

431. See, e.g., McCLOSKEY, supra note 25, at 40-42 (discussing metaphors); Gilboa et al., supra note 25, at F516-17 (discussing analogical reasoning); Hédoïn, supra note 29, at 440-42 (discussing “inferential devices”); Machlup, supra note 302, at 579-80 (discussing analogies); Morgan, supra note 26, at 366-67, 369 (discussing metaphors).


433. Id. at 81; see McCLOSKEY, supra note 25, at 42 (recognizing that metaphor helps achieve insight through the interaction of two different things).

434. McCLOSKEY, supra note 25, at 40-41; see Morgan, supra note 26, at 366-70, 375.
scholars suggest models as similes because the comparisons are explicit, as with the credibility of the model depending upon the audience recognizing a "significant similarity" with the real world or the need for "similarity judgments" in comparing the current case with previous ones.435

McCloskey analyzed a model as all four master tropes simultaneously—with metonymy, synecdoche, and irony, in addition to metaphor.436 Models are metonyms because they reduce the complex to mathematical symbols,437 thus providing an empirical structure for abstract economic theory438 as well as a particular hypothesis that is true in the model about a more general hypothesis that is true in the world.439 As a synecdoche, the model represents a whole system by isolating one of its parts, thus rendering the essential aspects of the whole through the part.440 That models are metaphors/similes, metonyms, and synecdoches means that they offer a "perspective of perspectives" and are therefore ironic.441 Burke views irony as integrating multiple sub-perspectives where none is precisely right or precisely wrong, but instead they all operate on and influence each other.442 Consider Gilboa et al., who claim that prior cases can guide a current case, with no one case contradicting another but instead the totality of similar cases suggesting different outcomes.443 And Māki claims that economists achieve coherence through idealizations that they know are false so that the model can be a true representation of the "essence" of the object of study.444

Simplifying assumptions and excluded variables thus need not trigger doubt about the model because, standing alone, they do not indicate flaws.445 To the contrary, the model as a perspective, reduction, and partial representation necessarily simplifies, omits, and even falsifies

435. See Gilboa et al., supra note 25, at F517-19 (discussing similarity judgments); Sugden, supra note 25, at 23-25 (discussing significant similarity).
436. MCCLOSKEY, supra note 25, at 48-51.
437. Id. at 49-50; see Morrison & Morgan, supra note 25, at 26.
439. See FRIEDMAN, supra note 303, at 24 (calling the model "simpler than the ‘real world’"); Sugden, supra note 25, at 15, 19-20, 22.
440. See MCCLOSKEY, supra note 25, at 50; Gibbard & Varian, supra note 25, at 673-76; Māki, supra note 354, at 321 (describing the method of isolation); Morrison & Morgan, supra note 25, at 27 (calling models "a partial representation").
441. MCCLOSKEY, supra note 25, at 50-51.
442. Todd, supra note 432, at 115 (quoting BURKE, supra note 323, at 512).
444. Māki, supra note 355, at 324-25, 344.
445. See Māki, supra note 25, at 30 (writing that the falsity of idealizing assumptions "is not necessarily a reason for concern" because these assumptions are "strategic falsehoods that serve the purpose of isolation").
what is known about the real world to arrive at some previously unknown truth. To be effective as a mediating instrument, a model must stand between the abstract theory of economics and a complex world of staggering detail, affording at a single level a complete view of both. To achieve this balance, the economist draws from theory, but theory by itself is "empirically empty" until interpreted. Interpretation is difficult because the economist does not engage in laboratory experiments like in the hard sciences, but instead must rely upon data gathered in the real world. Interpretation, therefore, requires the economist to choose which questions to ask, judge the similarity of prior models, and decide what details are relevant. The model need only account for relevant details and can exclude the irrelevant because they do not affect conclusions drawn from the model. By focusing on the essential features and ignoring the rest, the model becomes its own world, a surrogate that allows us to draw inferences about the real world. Whether the model world is credible or not depends upon the context of its use. The model by itself means little. After all, economists approach a new case by comparing it to multiple previous cases, they can apply the same model to different situations and arrive at different results, and they construct complex econometric models from prior models. The relevance of the model is therefore relative to a purpose but also to an audience. Models do not explain through rules but instead force the user to engage in analogical thinking by comparing

446. See KAMARCK, supra note 312, at 9-10; McCLOSKEY, supra note 25, at 47; Cartwright, supra note 26, at 27-28; Gibbard & Varian, supra note 25, at 665-66.
447. Morgan, supra note 26, at 378-79; see Grüne-Yanoff & Schweinzer, supra note 26, at 132-36 (writing that models connect theory to the real world).
448. Grüne-Yanoff & Schweinzer, supra note 26, at 134.
449. Coate & Fischer, supra note 14, at 151; see Gilboa et al., supra note 25, at F514-17.
450. Morgan, supra note 26, at 378; see KAMARCK, supra note 312, at 10; Gibbard & Varian, supra note 25, at 666; McCloskey, supra note 26, at 69.
451. Mäki, supra note 355, at 330; see Muchlup, supra note 302, at 581 (arguing that a model "should exhibit what are considered the relevant variables and relations").
452. McCLOSKEY, supra note 25, at 47; Gibbard & Varian, supra note 25, at 673-76; Mäki, supra note 25, at 32, 41; Sugden, supra note 25, at 23-25.
453. Cartwright, supra note 26, at 21-22, 29-30; Morrison & Morgan, supra note 25, at 12, 28.
454. See Hédoin, supra note 29, at 440-42 (writing that evaluating the success of a model depends more on its rhetorical situation than on the model itself); Morgan, supra note 26, at 367-68 (writing that models "don't manipulate (or solve) themselves").
455. Gilboa et al., supra note 25, at F516-18.
456. Cartwright, supra note 26, at 21-22, 29-30; see Hédoin, supra note 29, at 442.
457. McCLOSKEY, supra note 25, at 40-42; Gibbard & Varian, supra note 25, at 667-68, 672-73.
458. Mäki, supra note 30, at 91-92; see McCloskey, supra note 26, at 69; Morrison & Morgan, supra note 25, at 28.
the model and real worlds and thereby come to a richer and more nuanced understanding of the target system. The economist constructs the model but is not the only person that draws inferences from it. For example, models appear in academic publications so that other economists can critique, expand, and incorporate them into their own research. When offered to guide decisions about policy or law, however, the model reaches a lay audience.

Because the model has an audience, the modeler must rely upon natural language along with mathematical formulae, both for trained economists and especially for lay audiences that find sophisticated statistics almost meaningless. Sometimes the audience accepts the model as a useful tool about the real world because each assumption is realistic and they all fit together well. Other times an assumption exceeds the bounds of reality or is deliberately false, or the mix of assumptions seems arbitrary, thus causing the audience to become suspicious of the model’s results. The credibility of the model need not be assessed only by its assumptions, but also by how the economist uses it to answer questions about a particular case. By using and interpreting the model, the economist tells a story.

This story has not only a literary but also a rhetorical function because the economist must persuade the audience that the model is credible. For example, the audience must agree that prior cases that go into constructing the model are similar to the problem studied. Further, the economist acknowledges that the model world is not complete and offers “storied idealizations” to articulate what was

459. See McCloskey, supra note 25, at 42; Sugden, supra note 25, at 12-14.
460. See Hédoin, supra note 29, at 440-42 (calling models “inferential devices”).
461. See id. at 440-42 (writing that models must conform to the norms of the community of scientists); McCloskey, supra note 26, at 67 (recognizing the importance of the reader in economics).
462. See Gilboa et al., supra note 25, at F517; McCloskey, supra note 26, at 60-62, 67.
463. Kamarck, supra note 312, at 2-4; see McCloskey, supra note 26, at 67.
465. Kamarck, supra note 312, at 4-6; Sugden, supra note 25, at 13-14, 25-26; see Cartwright, supra note 26, at 20, 26-27 (recognizing that models have unrealistic assumptions); Maki, supra note 355, at 344 (acknowledging that idealization involves false assumptions).
466. Morgan, supra note 26, at 375, 377; see Cartwright, supra note 26, at 20, 26-27 (writing that the model succeeds to the extent it allows for concrete conclusions); Maki, supra note 355, at 344 (calling a model true “if it correctly represents the isolated essence of the object”).
467. Gibbard & Varian, supra note 25, at 666; Maki, supra note 355, at 330-31; McCloskey, supra note 26, at 69; Morgan, supra note 26, at 366, 369.
468. See Maki, supra note 25, at 40-41; McCloskey, supra note 26, at 69; Morgan, supra note 26, at 378; Sugden, supra note 25, at 16, 18-19, 25.
469. Gilboa et al., supra note 25, at F518.
omitted—and why those omissions are not relevant.470 The story also serves as commentary on the model’s assumptions to show how they resemble in all relevant aspects the reality of the target system.471 Because relevance is relative, the economist tells the audience a particular version of a story to persuade that audience of the model’s credibility.472 In other words, credibility depends upon whether the model resembles the world as the target audience knows or thinks it knows the world to be.473 The economist as a storyteller must therefore describe the model in a way calculated to reach a lay audience, such as through natural language, common terms, familiar metaphors, and visualizations.474

B. From Synthesis to Litigation: Juries Should Assess the Credibility of the Model World

The scholarship from economics methodologists provides the vocabulary and the theory to critique the proposals from legal commentators and to recommend lowering the admissibility threshold for economics expert testimony. First, courts should not attempt to distinguish between admissibility and weight by creating artificial distinctions between the model, its inputs, and the expert’s conclusions. On the surface, evidence law seems to offer proponents of a more atomized approach some support: FRE 702 lists the method and

470. Mäki, supra note 355, at 330-31; see Mäki, supra note 30, at 100 (stating that a common challenge about a model is that it leaves out crucial factors and thus idealizes wrongly).

471. Grün-Yanoff & Schweinzer, supra note 26, at 134 (writing that the model narrative accounts for facts and events that are relevant to the background conditions necessary to interpret the model), Mäki, supra note 30, at 92, 101; Mäki, supra note 355, at 330-31; see Sugden, supra note 364, at 18 (recognizing that continuity assumptions do not necessarily affect the credibility of the model).

472. See Mäki, supra note 30, at 92 (writing that the modeler must “persuad[e] some relevant audience to adopt a point of view”); Mäki, supra note 25, at 40 (calling persuasiveness the rhetorical version of credibility that is a function of “the beliefs of [the] audience” and “the rhetorical skills of the modeller”); Mäki, supra note 355, at 330-31 (writing that the story “may vary somewhat from audience to audience”); see also Cartwright, supra note 26, at 20-22, 29-30 (writing that models like parables may lead to different interpretations depending upon the audience and situation).

473. Sugden, supra note 365, at 17-18 (writing about how the verisimilitude of the model depends upon whether the model is compatible with what the audience knows or thinks it knows about the world); see Hédoin, supra note 29, at 443 (writing that the models need only be “perceived as ‘credible’ given the current state of knowledge in the scientific community”).

474. KAMARCK, supra note 312, at 2-4 (writing that econometric models add natural language to mathematical language); Grün-Yanoff & Schweinzer, supra note 26, at 134 (noting that narrative “uses terms that have a commonly understood meaning”); Mäki, supra note 30, at 91-92 (writing that lay audiences respond to “familiar metaphors and visualizations of various kinds”); see Mccloskey, supra note 26, at 67 (writing that the economist must tell a story to move to a lower level of abstraction that a non-scientist can understand).
application of the method to the facts as separate factors; the Comments to the 2000 amendments recognize that judges should doubt testimony if the expert uses an accepted methodology but "reaches a conclusion that other experts in the field would not reach"; and the Court in Joiner analyzed each of the expert's underlying studies to conclude that they did not support his conclusion.\textsuperscript{475} The law does not mandate these distinctions, however.\textsuperscript{476}

Instead, Comments to FRE 702 recognize that not all disciplines follow the scientific method, so it guides courts to consider the standards of the expert's field.\textsuperscript{477} Economics scholars agree that the status and function of models cannot be separated because the relevance of a model is relative to the particular purpose and audience for which it is applied.\textsuperscript{478} Economics is a unique discipline that straddles the hard and social sciences because it employs mathematical techniques but applies them to data drawn from observations of the real world rather than laboratory experiments.\textsuperscript{479} A trial court considering admissibility of model-based economics expert testimony therefore does not face the concern in Joiner, a personal injury case where medical experts drew conclusions from experiments involving animals that PCB exposure caused cancer in humans.\textsuperscript{480} To the contrary, economists approach a new case by judging the similarity of previous studies, by constructing new models based upon other models, and by manipulating the model in ways that might lead to results that differ from its application in other situations.\textsuperscript{481} Further, economists tell stories about the choices, omissions, and assumptions to persuade the audience that the model offers an apt analogy for the real world, and those stories differ from audience to audience.\textsuperscript{482} Because experts in economics can and do reach different results even when dealing with similar models, and because they apply and tell stories about models in different ways, disagreement among economists is to be expected rather than serve as a basis to doubt the reliability of the expert's testimony.

Proposals to separate the model from the context of its use are therefore unsound. For example, characterizing an issue as one of

\textsuperscript{476} Mnookin, \textit{supra} note 32, at 1575.
\textsuperscript{478} See \textit{supra} notes 453-61 and accompanying text.
\textsuperscript{479} See, e.g., Gilboa et al., \textit{supra} note 25, at F514-16.
\textsuperscript{480} See Joiner, 522 U.S. at 143-45.
\textsuperscript{481} See \textit{supra} notes 455-56 and accompanying text.
\textsuperscript{482} See \textit{supra} notes 467-73 and accompanying text.
admissibility or weight based upon whether that issue is legislative or adjudicative makes no sense. To an extent, every model has a potential impact external to the case because economists draw from models by making similarity judgments to prior cases and construct new models from existing ones. But every decision about a model is also internal to the case. The context of the particular case drives the economist's choices, such as the appropriate underlying studies upon which to rely, the relevant variables to include or exclude, and the necessary simplifying assumptions. The economist also considers context in determining the appropriate story through which to persuade the target audience, the jury, that these choices resulted in a credible world. Distinguishing between legislative versus adjudicative facts does not offer a basis to distinguish between admissibility and weight so will not lead to more consistent rulings.

Another proposal that separates model and conclusions is a two-step process where the two sides have to agree on a single model, or have one imposed upon them, and then the opposing experts input data and arrive at results. This has some understandable appeal because it deemphasizes the need for "prolonged argumentation" about model choice and reduces "the rancor of cross-examination" that confuses juries. "Materially relevant information would be less likely to be lost in the smoke of methodological rhetoric and jargon." According to economics scholars, however, the methodology cannot be separated from the rhetorical context: as with tropes in a story, not all models offer the perspective, isolation, and reduction that an economics expert thinks is necessary for a particular case. The economist uses skill and judgment to construct a device that gives body to otherwise empirically empty theory and that best aids in making the inferential leap from the model to the world. The economist also embeds the model in a story so that the audience can accept the model as a credible analogy and draw the same inferences. While opposing experts arguing against each other forces the jury to make tough choices in evaluating the credibility of the competing models, our legal system tasks juries with evaluating

484. See supra notes 455-56 and accompanying text.
485. See supra notes 445-56 and accompanying text.
486. See supra notes 458-73 and accompanying text.
487. See Hill et al., supra note 3, at 372-80.
488. See id. at 375.
489. See id. at 380.
490. See supra notes 431-51 and accompanying text.
491. See supra notes 446-48 and accompanying text.
492. See supra notes 463-73 and accompanying text.
Economics scholars recognize that disagreement and differences are part of modeling, so the theory runs counter to an approach that would reduce argument or force experts to use a single model.

Several legal commentators agree that methodology and conclusions should not be separated, but they disagree over whether that means questions about a model should be answered by the gatekeeper or the fact-finder. Several commentators would admit model-based testimony that offers minimal insight even if the underlying assumptions are questionable, with some going so far as to disclaim any distinction between economics experts and eyewitnesses because the fact-finder must assess the credibility of competing inferences and conclusions. Those that support letting the judge resolve most or all questions about a model at the admissibility stage recognize several important issues of policy and pragmatics: the need for coherence in law and legal precedent, the fact that the jury’s traditional roles are not implicated, and the avoidance of dubious models that mislead an ignorant jury. The scholarship of the economics methodologists, however, controverts all three rationales.

The argument for more coherent precedent is sound—within limits. New cases in a particular area, like antitrust, present facts and questions that resemble decided cases, so economists will likely rely upon the same or similar models in calculating damages. Accordingly, judges should articulate their reasons for admitting or excluding economics expert testimony as precedent to guide other courts and practitioners. The recommendation for courts to rely upon economic authority rather than trust a jury is ironic, however, because economic authority recognizes the fluidity of models as tropes and the importance of telling a story for a particular audience with the model. In litigation, that audience is the jury. Opponents typically challenge the economist’s choices, such as the existing studies the expert includes, the variables the expert omits, and the assumptions the expert makes. These challenges

493. Faigman et al., supra note 2, at 884; see Sward, supra note 76, at 625-26.
494. Compare Allensworth, supra note 6, at 852-58, with Casey & Simon-Kerr, supra note 4, at 1198-1206.
495. Coate & Fisher, supra note 14, at 150-51; Todd & Jewell, Copa America, supra note 204, at 646-47.
496. Casey & Simon-Kerr, supra note 4, at 1201-02.
497. See Allensworth, supra note 6, at 848-50, 856-57; Lloyd, supra note 10, at 421.
498. Allensworth, supra note 6, at 854.
499. Lopatka & Page, supra note 11, at 694-95.
all pertain to whether the model worlds are "credible worlds," thus the jury should decide them. After all, questions about credibility and choices among competing inferences relate to the weight of the evidence, with the Court even stating that the choice of variables in economic models goes to probity rather than admissibility.

Further, the rationales underlying the appropriate role for the jury are implicated, and they support letting the jury evaluate modeling choices. The jury as a collective can "estimate social norms," assess evidence in light of its own experience with how the world works, and make decisions that require a common-sense inference. This language mirrors that of the economics scholars who write that the key to the model is its "relevant resemblance" to the particular issue, that the "relevant audience" must be persuaded that the model presents the world as they know it or as it could be, and that the model is an inferential device that helps the audience understand a complex issue by making the leap from model to world.

Models are ironic because they combine multiple and sometimes conflicting cases for a new perspective and include false assumptions to reveal the truth. Constructing models necessarily involves choices about what is and is not essential for this surrogate world to be an effective analogy of the real world, with even an advocate for treating questions about models as law recognizing this artistic "gray area." Disagreement about questionable choices does not render the model fatal, however, so rather than provide a basis for the judge to exclude the expert testimony, the reasonableness of these choices is for the jury to assess. Accordingly, two of the questions that Lloyd urges courts to ask—whether the record supports assumptions and whether the expert adequately deals with facts inconsistent to his theory—relate to credibility rather than admissibility. For example, he argues that courts should exercise "extreme skepticism" when considering testimony that relies on multiple assumptions and lacks support in the

501. See Lawsky, supra note 15, at 1679-83 (writing that common critiques of a model's credibility are that it simplifies facts about the real world and omits facts about the real world (citing Sugden, supra note 365)).
503. Allensworth, supra note 6, at 848-49; Hans & Vidmar, supra note 82, at 227; Mnookin, supra note 32, at 1540; Vidmar & Diamond, supra note 80, at 1137-38.
504. Mäki, supra note 30, at 92-94; Sugden, supra note 25, at 13-14, 24-25.
505. See Gilboa et al., supra note 25, at F518, F521; Mäki, supra note 355, at 324-25, 344.
506. See supra notes 446-51 and accompanying text.
507. Allensworth, supra note 6, at 840-41.
508. Lloyd, supra note 10 passim.
record, including "that a trend of increasing sales or profits would continue . . . that a terminable contract would not be terminated . . . [and] that competitors would not enter the market." If the record merely fails to support these assumptions rather than contradicts them, each assumption seems like something a jury—which is composed of people who are buyers and sellers, parties to contracts, and business owners—might find reasonable, especially since the FRE permit experts to testify based upon facts not in the record. He also argues that courts should admit testimony where facts are inconsistent with the expert’s theory or model if the expert makes a "reasonable argument" that the contrary data is wrong or does not apply; however, the court should exclude the testimony if the expert chooses to ignore the contrary data. Whether the expert has an argument is one thing. Whether that argument is "reasonable" goes to credibility, which is a question for the fact-finder.

Lowering the threshold for admissibility—at least as it relates to the economist’s artistic choices—is in accordance with the commentary to FRE 702: “The emphasis in the amendment on ‘sufficient facts or data’ is not intended to authorize a trial court to exclude an expert’s testimony on the ground that the court believes one version of the facts and not the other.” The judge, therefore, should not evaluate the applicability of each underlying study, or the realism of assumptions that lack support in the record but are not contradicted by it, or the believability of the expert’s story, to do so invades the province of the jury and blurs the line between admissibility and sufficiency. If there is debate and argument, then the court should admit the expert testimony even if it is unpersuaded by the expert’s story because that story is for the jury rather than the judge.

While economics methodologists provide theory that supports lowering the admissibility threshold, they also suggest a role for the

509. Id. at 400, 404-05, 409.
510. See Fed. R. Evid. 703; see also Todd & Jewell, Copa America, supra note 204, at 646-47; Todd & Jewell, supra note 4 (manuscript at 17).
511. Lloyd, supra note 10, at 410-11.
512. See supra notes 464-66 and accompanying text.
513. See supra notes 468-73 and accompanying text.
515. See supra text accompanying notes 480-85.
516. See Faigman et al., supra note 2, at 884, 898-99; Mnookin, supra note 32, at 1576; Sward, supra note 76, at 589-90.
517. See Kaye, supra note 7, at 1982-83 (worrying that the demand for “rigor” under Kumho could lead a court to reject testimony that is based on generally accepted and valid methods, but that is “legitimately debatable,” if the court finds the testimony unpersuasive); supra notes 457-58, 462-66 and accompanying text.
judge as gatekeeper that goes beyond merely assessing the expert’s credentials. After all, the jury can find the expert’s model a “credible world” only if the economist does in fact have a story to tell about it. If the opponent challenges a particular underlying study or omitted variable or simplifying assumption, and the expert has no narrative that responds directly to the challenge, then the judge should exclude the expert testimony. Similarly, if the record controverts a key assumption, then the judge should exclude it under FRE 702—whether or not the expert has a story—because any narrative enters the realm of science fiction by exceeding the bounds of reality.

Short of a lack of story or controverting evidence, however, the court should admit economics expert testimony as reliable under Daubert. Such an approach is sound based on theory from economics methodologists and will lead to more consistent admissibility decisions.

VI. CONCLUDING THOUGHTS

Some critics might think that conceiving of economic models as tropes, economics experts as storytellers, and a model’s conclusions as dependent upon context and audience is too esoteric or even cute. But trope, story, and audience accord with our understanding of how juries make sense of evidence—including expert testimony. Plus, the law points us toward the standards of the relevant field in determining the admissibility of expert testimony. Those standards were articulated in Part V.B through a synthesis of a significant number of articles and books. These works are not outliers but instead explain and expand upon writings from Nobel laureates that models give concrete form to

518. See Kaye, supra note 7, at 1982-83.
519. See supra notes 445-46, 453-59 and accompanying text.
520. Lloyd, supra note 10, at 410-11.
521. KAMARCK, supra note 312, at 4-6; see FED. R. EVID. 702(d).
522. Mnookin, supra note 32, at 1577 (“Bringing together multiple pieces of evidence to weave a persuasive narrative is an expected part of legal storytelling. That is, indeed, the lesson of the second half of Old Chief, and there is no reason why storytelling about scientific and expert evidence ought not to be able to be woven together out of multiple threads, just like other kinds of stories within the trial process.” (footnote omitted) (citing Old Chief v. United States, 519 U.S. 172 (1997))); see Ledwon, supra note 99, at 1149-50, 1152-56 (applying law and literature to evidence law); Richard Lemert, Experts, Stories, and Information, 87 NW U. L. REV. 1169, 1175-77 (1993) (writing that experts fill gaps so that jurors can construct narratives and that experts provide story lines that allow jurors to make sense of evidence); Carol McCrehan Parker, The Perfect Storm, the Perfect Culprit: How a Metaphor of Fate Figures in Judicial Opinions, 43 MCGEORGE L. REV. 323, 337-38 (2012) (writing that narrative metaphors are part of a story that helps the jury to understand the truth of the case).
524. See supra Part V.B.
abstract theory,\textsuperscript{525} that they represent a complex world by simplifying it or isolating its key features,\textsuperscript{526} that modelers make choices including omissions and false assumptions to arrive at new understanding,\textsuperscript{527} that the truth of a model depends upon its context,\textsuperscript{528} and that economists use natural language to convey the model to an audience.\textsuperscript{529} Legal commentators likewise concur with each of these points.\textsuperscript{530} Those commentators have disagreed on what those points mean for making admissibility decisions,\textsuperscript{531} but the scholarship from economics methodologists provides a coherent rationale for lowering the admissibility threshold, at least for questions related to the model's artistry.

Some might argue that too low a threshold will allow experts to trick juries with testimony based upon invalid models. This ignores other safeguards inherent in our adversary system and built into the rules of evidence and procedure. As the Court in \textit{Daubert} recognized, cross-examination and opposing experts can root out dubious testimony.\textsuperscript{532} Kaye applies this reasoning specifically to the battle of economics experts: the hard sciences like chemistry and physics require time and experimental effort to probe, but "the adequacy, limits, or untested assumptions of most mathematical and statistical models can be defined fairly readily by other experts."\textsuperscript{533} Accordingly, opponents can typically introduce testimony to counter the other expert, thus preventing jurors

\textsuperscript{525} See, e.g., Paul A. Samuelson, \textit{Interactions Between the Multiplier Analysis and the Principle of Acceleration}, 21 Rev. Econ. & Stat. 75, 78 (1939) ("[M]athematical methods properly employed, far from making economic theory more abstract, actually serve as a powerful liberating device enabling the entertainment and analysis of ever more realistic and complicated hypotheses.").

\textsuperscript{526} See, e.g., Friedman, supra note 303, at 24; Solow, supra note 24, at 43. That models are tropes is so well-established that one economics dictionary defines a model as an "analogy of some real-world phenomenon." See Graham Bannock et al., \textit{Dictionary of Economics} (4th ed. 2003).

\textsuperscript{527} See, e.g., Friedman, supra note 303, at 25; Solow, supra note 24, at 46.

\textsuperscript{528} See, e.g., Friedman, supra note 303, at 15.

\textsuperscript{529} See, e.g., Bannock et al., supra note 526 (characterizing models at their most informal as consisting of a "verbal description"); Solow, supra note 24, at 46.

\textsuperscript{530} See, e.g., Allensworth, supra note 6, at 832, 840 (calling all models simplifications, noting that they have no meaning outside of a particular purpose, and recognizing the gray area of artistic choices about which economists might disagree); Blair & Esquibel, supra note 43, at 134-35; Lawsky, supra note 15, at 1679 (advocating Sugden's concept of models as "credible worlds" (citing Sugden, supra note 365)); Lopatka & Page, supra note 11, at 626-27 (stating that economists use natural language to convey their model to a jury); Todd & Jewell, supra note 4 (manuscript at 10-12) (discussing assumptions, how models operate in context, and the need for economists to argue the validity of their modeling choices).

\textsuperscript{531} See supra Part III.B.


\textsuperscript{533} Kaye, supra note 7, at 1968.
from being "overwhelmed" by one side's equations.\textsuperscript{534} After all, each side has its own story to tell,\textsuperscript{535} and each expert must have a story that explains the variables and assumptions well enough to persuade the jury.

An additional safeguard is the judge herself, whose ability to keep expert testimony from a jury does not end simply because that testimony is ruled admissible. If the judge believes that no reasonable jury could be persuaded by the evidence, then the judge can rule that evidence insufficient.\textsuperscript{536} Ruling on sufficiency rather than admissibility thus satisfies the concern of some commentators to build a body of precedent and to keep dubious model-based testimony from the jury.\textsuperscript{537} Plus, it maintains the distinction between admissibility and sufficiency, which is important not only in theory but also in practice because of the different standards of review on appeal.\textsuperscript{538} The judge should tread lightly in ruling on the sufficiency of economics expert testimony, however, because studies built upon questionable sources and assumptions are not necessarily flawed and may even be shown sound by additional scholarly attention.\textsuperscript{539} Litigants likely do not have the resources or time to conduct additional studies, so excluding this testimony under either the admissibility or sufficiency label might impinge the party's right to have its full case heard by a jury.

How, exactly, a judge should approach admissibility and distinguish between admissibility and sufficiency therefore requires additional research. For example, this Article has confined itself to the challenges of an economics expert that relate to the artistic choices in the model like the similarity of the underlying studies, the necessity for including the excluded variables, and the realism of simplifying assumptions. It has not addressed the scientific aspects of modeling like regression analysis and statistical errors, even though courts address these—sometimes incorrectly—in determining admissibility.\textsuperscript{540} Further, while this Article argues that the reasonableness of assumptions is a jury issue. It has not considered the substantial body of economics

\textsuperscript{534} Id. at 1968-69. But see Lloyd, supra note 10, at 380-84 (summarizing "situations in which vigorous cross-examination was not sufficient to make the jury aware of what, to sophisticated observers, were obvious defects in the testimony").

\textsuperscript{535} See Hill et al., supra note 3, at 358.

\textsuperscript{536} Hazard et al., supra note 154, at 478-80; Lopatka & Page, supra note 11, at 626, 630-31.

\textsuperscript{537} See Allensworth, supra note 6, at 830; Lloyd, supra note 10, at 380-81.

\textsuperscript{538} Lopatka & Page, supra note 11, at 630-31.

\textsuperscript{539} See Todd & Jewell, Copa America, supra note 204, at 664.

\textsuperscript{540} See, e.g., Kaye, supra note 7, at 2011-13 (arguing that courts should not exclude economic expert testimony based on correctible statistical errors); Todd & Jewell, supra note 4 (manuscript at 13-16, 25-31) (describing cases where the courts confused statistical problems like omitted variable bias with artistic issues like choice of variables).
scholarship on the different types of assumptions,\textsuperscript{541} so it is possible that some questionable assumptions are resolvable at the admissibility stage.\textsuperscript{542} Economics experts construct econometric models, so even though methodologists often address these along with other types of economic models, it may be worth addressing the distinctions among them.\textsuperscript{543} Finally, a meta-reading of the economics methodological scholarship with legal articles on rhetoric, narrative, and economics could provide useful perspectives.\textsuperscript{544}

Though more research is needed, this Article has nevertheless provided a guide for following the law’s command to measure the reliability of expert testimony based on the standards of the expert’s particular field.\textsuperscript{545} The field of economics recognizes that the effectiveness of a model as trope and an economist as storyteller depends upon a particular purpose and audience. Courts should exercise caution to avoid setting the threshold too high when considering the admissibility of model-based testimony from economics experts.\textsuperscript{546} Opponents most often challenge the expert’s artistic choices. Accordingly, the economist tells a particular story about these choices; choices that relate to the credibility of the model as an analogy of the


\textsuperscript{542} See Todd & Jewell, supra note 4 (manuscript at 5) (recognizing that a better understanding of assumptions in economic models will “permit courts to make more sound rulings about admissibility”).

\textsuperscript{543} See Morgan & Knuuttila, supra note 24, at 59 (writing that econometrics, unlike mathematical modeling, involves numerous de-idealizing assumptions to bring the data in line with theory).


\textsuperscript{545} See supra Part II.C.

\textsuperscript{546} See Mnookin, supra note 32, at 1576 (writing that courts substitute their judgment for the jury’s even though a party makes a plausible claim if the admissibility threshold is too high).
real world. The gatekeeper should therefore step aside so that the fact-finder can hear the story and assess the credibility of the model world.